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LEISURE HOURS AMONG THE GEMS



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LEISURE HOURS AMONG THE GEMS

BY

AUGUSTUS C. HAMLIN

AUTHOR OF A TREATISE ON THE TOURMALINE

FELLOW OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

MEMBER OF THE ROYAL SOCIETY OF ANTIQUARIES OF NORTHERN EUROPE

CHEVALIER OF ST. ANNE, ETC.

“Now in matter of the knowledge of the works of nature, I would have thee give thyself curiously; so that there be no sea, river, nor fountain of which thou dost not know the fishes; all the fowls of the air; all the metals that are hid within the bowels of the earth; together with the precious stones that are to be seen in the east and south of the world. Let nothing of all these be unknown to thee.” — RABELAIS.

BOSTON AND NEW YORK
HOUGHTON, MIFFLIN AND COMPANY
The Riverside Press, Cambridge
1891

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GIFT

OF

Mary E. Morse

1886

The Riverside Press, Cambridge, Mass., U. S. A.
Printed by H. O. Houghton & Company.

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DEDICATION.

Whatever of interest or value there is to be found in these pages is earnestly inscribed

To the Memory

OF

JEAN ANDRÉ DE PEYSONNEL,

who ventured to announce to the men of science of the Royal Academies of Europe in the eighteenth century that the CORAL was the product of animal life, and not of vegetable growth. In answer to his simple discovery and honest declaration, the naturalist was met with a storm of contempt and derision that eventually wrecked his happiness and his life.

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THE DIAMOND.

LE diamant: c'est l'art des choses idéales
Et ces rayons d'argent, d'or, de pourpre, et d'azur
Ne cessent de lancer les deux lueurs égales
De pensers les plus beaux, de l'amour le plus pur.
Il porte du génie et transmet les empruntes,
Oui, de ce qui survit aux nations éteintes,
C'est lui le plus brillant trésor et le plus dur.

ALFRED DE VIGNY.

LEISURE HOURS AMONG THE GEMS.



CHAPTER I.

THE DIAMOND.

THE advice of Rabelais quoted on our titlepage indicates sound judgment, if not a glimmer of prophetic feeling; but we doubt very much whether the quaint philosopher had any conception of its extent and scope when he gave it. Could the queer, sceptical old fellow return to earth again after his long quiet sleep of almost four centuries, how astonished would he appear at the revelations of the students who have followed his suggestion during the last century even! And yet in reality how little has been revealed to the limited vision of man, compared with the vast resources of nature still unexplored and shrouded in mystery. In enumerating the precious stones among the works of nature worthy of the contemplation and earnest study of man, Rabelais not only exhibited a prophetic discernment, but he disclosed the fancies which invested these mineral objects in his day and in earlier times, and which have in a measure descended to the present era, and still exert some influence.

The study of the gems is one of the most interesting of all the objects of natural history; and although the field of research appears somewhat limited at first glance, the scene expands as we advance, and we are soon lost in the beauty and mystery of the subject, which as yet no man has been fully able to comprehend and explain. It is commonly understood that this study is simply a matter of commerce, or belonging to the province of the jeweller or the mineralogist. But the subject is really of far greater importance. Several of the ablest of our philosophers have been deeply interested in this pursuit, and have revealed to us startling phenomena, many of which have been turned greatly to the aid of science and the comfort of mankind. After so many years of study and research, the field of observation and discovery is by no means exhausted.

We may take another view of the subject solely with the artistic eye, and find much for enjoyment and contemplation. In the art of ancient times the precious stones played an important part, and by means of the engraved gems we are enabled to form an idea of the wonderful skill of the artists of those periods. By means of these engraved stones the portraits of many of the illustrious characters of antiquity have been preserved, and also representations of some of the masterpieces of sculpture, which have since been destroyed by time or the hand of barbarism. If the reader, exercising a little credulity and patience, will kindly follow me through the

observations of many years here condensed and recorded, he may in a slight degree partake of some of the enthusiasm and interest of the author.

But, before we proceed very far on the pleasant and seductive journey, let us understand each other, and, above all, allow the author to confess that his knowledge of the subject is decidedly imperfect, and perhaps somewhat visionary at times.

We will consider first the diamond, not because we regard it the foremost in interest among minerals, but because it is to-day reckoned commercially, as it was in the time of the Latin philosopher, Pliny, nearly two thousand years ago, "Maximum in rebus humanis," — "The most costly of human possessions." But we must, however, slightly modify the remark, and now apply it to the rare colored varieties of the gem, since commerce and refined taste rank the red sapphire far above the colorless diamond in value, and sometimes even the emerald and rare blue sapphires exceed it in price. It is interesting, and at times amusing, to read the views of the ancient gem-writers, and even those of mediæval times, relating to this remarkable mineral, and compare them with the accepted opinions of the present day. The ancients were completely ignorant of the nature of the stone, and called it "adamas," or the invincible, from the mistaken idea that it could resist all external violence, and was also perfectly indestructible. Modern science, however, has disclosed the fact that the gem is not only quite delicate in its

structure, but that it is also utterly perishable in its nature. The revelations of chemistry have clearly demonstrated that the glittering stone, known as the diamond, is simply crystallized carbon, and one of the allotropic forms of that protean element which, by the aid of some mysterious agency, can deposit its substance in the shape of a sooty blackness, as in the coal, or in the transparent crystal of diamond, which may be regarded as the very emblem of light. Furthermore, the gem is not only the concentrated embodiment of human valuation, but it is also the standard of hardness among all mineral substances; and yet, strange to say, plumbago, which apparently is of the same composition, is exactly the reverse, and quite as soft as talc.

Here, then, we may behold one of the strangest antitheses to be seen in the whole mineral kingdom, for we have a simple and singular mineral composed of the meanest of elements, yet whose different forms illustrate the extremes of hardness, and may also be considered to represent the antipodes of material treasures.

The crystallized and transparent variety, when it occurs in its greatest perfection, and especially with the rare colors of red, blue, and green, forms indeed the most beautiful of all the decorative stones yet known to man. For it not only far exceeds all others in degree of hardness, but it also surpasses them in its extraordinary brilliancy and the wonderful display of the prismatic colors, especially by artificial light,

which charm it alone possesses of all the gems and precious stones.

Although it is widely distributed over the world, and has been known to man for many centuries, yet its distribution, its deposition, its geological age, are not only puzzling themes to the mineralogist, but they are yet subjects of startling interest to the philosopher.

The origin of the stone has long been a subject of inquiry among experimentalists, and it has received more attention from them than all the other gems reckoned together. As for our humble opinion, after long consideration of this multitude of hypotheses, we are inclined to assert the diamond to be the product of decomposition of vegetable material, and derived from one of the numerous chemical compounds of carbon and hydrogen. We find some of these forms generated wherever vegetable matter is decomposed under water, and in the gem strata of the diamond placers we may observe abundant evidence of material for metamorphosis. If we admit the origin of the gem to be from vegetable matter, or derived from any transformations of organic *débris*, we then reduce the history of the diamond to a simple problem; for it is quite easy to explain, or rather imagine, the required chemical change under the action of electricity or telluric magnetism, and all along the true gem formations the phenomena of the earth's vitality in this respect are remarkable.

Carbon is commonly mentioned as the meanest of

elements, yet, when we come to consider its bearing in the mineral kingdom, and its vast relations in human industry, or its effect in the progress of civilization, it deserves a higher rank, or certainly a more generous classification among the constituents of the earth. For it not only occurs in various states in the air, the sea, and the more solid portions of the earth, but we find it an essential ingredient in the structure of all animal and vegetable life. It is really one of the most interesting and important of the elementary bodies, and may present itself in a variety of allotropic forms of remarkable and striking character. To its combination in the mineral substance known as coal the world owes its greatest blessing, save the golden grains Triptolemus gave to mankind. From its purest and crystallized form art derives its richest and most dazzling object of ornamentation. Without it the globe would soon become desolate and all organic life cease to exist.

In contemplating the transcendent beauties of the purest of its states, the observer can hardly realize that between the sparkling diamond and the black, lustreless mineral known as graphite, there is only the difference in the arrangement of their invisible atoms. Yet, so far as we know at the present day, the two objects are apparently of the same composition, differing only in their system of crystallization. The first we recognize as the perfection of natural beauty, the concentration of brilliancy, and the standard of limpidity, while the other is directly the oppo-

site in its effects and relations. The diamond, when exposed to sufficient heat, parts with its wonderful beauty and disappears, leaving only a minute trace of seemingly carbonized matter.

It often perplexes the student in chemistry to explain the varied forms and the different properties of substances having apparently the same composition. It is not especially in the mineral kingdom that he meets with these strange anomalies, but his mystery becomes intensified when attempting to solve the problems of organic life. For instance, in seeking to explain the odors of vegetable substances, he finds that ten parts of carbon and sixteen of hydrogen appear to form the sole constituents of many perfumes, — like the oil of lemons, lavender, turpentine, etc. And yet, with the elements known, he not only finds himself unable to combine them artificially so as to produce the perfumes, or explain satisfactorily why bodies possessing the same constituent parts exhale odors so different.

Among all these investigations and reasonings the question comes forcibly to the mind, why was the gem created, and has the day gone by when the conditions required for its formation no longer exist? With due respect to the phenomena connected with the crystallization and deposition of metals and minerals at the present time, we cannot answer this inquiry hastily.

We may affirm, perhaps, that nature possesses the power to form the diamond to-day, but are the condi-

tions requisite for its evolution present and complete? We will not now attempt to discuss the arguments bearing upon this interesting theme; but we will, however, modestly state that it is our belief that the diamond is the last gem placed upon the earth, and that the period of its deposition was subsequent to the introduction of some of the higher forms of animal life on the globe, and, possibly, since the appearance even of man.

CHAPTER II.

ANTIQUITY OF THE DIAMOND AS A GEM.

It is quite certain that the diamond is not one of the earliest gems known to man, and the facts of the stone not having been found among the ruins of Nineveh or Bassora, the Etruscan sepulchres, or the jewels of the ancient tombs of the Phœnicians of the island of Cyprus, recently explored by Di Cesnola, afford strong presumptive evidence that its discovery dates within historic times. As the gem in its natural state is not often finely crystallized with smooth planes and perfect transparency, like the limpid crystals of quartz, it was probably long overlooked by man, and its adoption in the decorative arts preceded by the bright-colored and softer stones. The rough crystals are not attractive when placed in comparison with many other gems, and their degree of hardness, coupled with their rarity, probably gave them their value among the ancients. We are inclined to think that their use was governed by the fancy of the rich and powerful nobles, and that the emerald and the blue and red stones took precedence in the selection of gems until the art of polishing was discovered.

In the time of Pliny the stone was acquired only by the richest of kings; and in the days of Alexander Severus, in the third century, it was remarkable for its price, while the emerald was estimated for its beauty. Lollia, at the Banquet of Caligula, glittering with the spoils of Asia Minor, of fabulous value, did not wear the diamond, so far as we can ascertain.

There is evidence to lead to the presumption that the gem was regarded in the early periods more of a curiosity possessing talismanic powers than as an ornamental stone. The famous crown of Chosroes, made in the latter part of the sixth century, and brought to light by Shah Abbas after a thousand years of concealment in an obscure fortress among the mountains of Lauristan, does not contain diamonds among its ornaments, but is incrustated with pearls and rubies.

The absence of the stone in this royal tiara, constructed at this early period of time, is certainly significant, and indicates that it was not high in estimation, or that the art of polishing in a definite manner, so as to reveal the hidden splendors of the gem, had not then been discovered.

The early practice of polishing the natural faces of the crystal did not reward the patient lapidary by a corresponding increase of beauty. Hence we can explain the setting of rough diamonds in mediæval times long after the process of polishing had been discovered and put in practice by the Orientals.

The crown of the Khan of the Tatars, captured on

the Oxus by the Persians in the fifth century, is described as being ornamented with several thousand pearls, but there is no allusion to any stones resembling diamonds; yet the Tatars had undoubted access to the commercial marts of India.

The cup of Chosroes I., of the seventh monarchy of Persia, and which is still extant, is composed of small disks of colored glass united by a gold setting, and having at the bottom a crystal engraved with the figure of the monarch. This royal relic is destitute of diamonds. When the treasures of the Persian palace of Dastagherd were captured in the seventh century, no mention of the diamond was made in the enumeration of the articles. Among them were the famous throne of gold called "Takdis," supported on feet composed of rubies; also the crown formed of a thousand huge pearls. If diamonds were abundant at this period, why do we not find them among the decorations of the royal jewels? Macondi, however, says that the Sassanian king had nine seals of office, the first of which was a diamond with a ruby centre, bearing the portrait, name, and titles of the monarch.

The sacred standard of Persia, the famous "durn-foh-Kawani," or leathern apron of the blacksmith Kawak, which was eighteen feet long by twelve feet broad, was richly adorned with silk and the finest gems when it was captured by the Arabs in 636, at the great battle of Cadesia. Its value was then estimated at \$150,000, but the diamond is not men-

tioned among its ornaments, and if it had been abundant we might expect to see it prominently displayed among the decorations. However, we must admit that many of these historical descriptions are very incorrect, and often partake largely of the nature of the fabulous. And so, in the description of the capture of Ctesiphon by the Arabs in the seventh century, the historian states that vast quantities of gems and precious stones and treasures of wondrous beauty, of more than one hundred millions of dollars in value were obtained. Among the descriptions of the articles comprised in this immense booty we fail to find any allusion to the diamond, and yet we know that the gem was not unknown to Persians at that time.

To give the reader an idea of the magnificent tastes of the Persian nobles at that period, we will mention some of the articles captured at this time by the freebooters of the desert.

A wonderful carpet woven of white brocade is described as being one of the marvels of the world. It was four hundred and fifty feet long by ninety feet in breadth, and exhibited a border worked in with precious stones of various hues to represent a garden of all kinds of beautiful flowers. The leaves were formed of emeralds and other green colored stones, while the buds and blossoms were composed of pearls, rubies, sapphires, and other gems of immense value.

The captured robe of state was thickly embroid-

ered with the most beautiful rubies and pearls. The arms, helmets, and scimetars found in the royal treasury fairly flashed with the gleams of the rarest precious stones, so thickly were they incrustated over the metal. At a later period of the monarchy the Sassanian kings adorned the paraphernalia of their courts to a degree of magnificence which is almost incredible. Some of the coins and sculptures yet extant have preserved faithful representations of their luxury in dress. Many of the robes were beautifully embroidered and covered with gems and pearls.

The royal crown at this period, it appears, was not worn by the monarch, but was suspended from the ceiling in the throne-room directly over the king's head when seated on the throne.

Theophrastus, a Greek writer living three centuries before the Christian era, does not mention the gem in a clear and distinct manner. It is true he alludes to *adamas*, but it is now thought by several mineralogists that this term was then applied to steel and some of the varieties of corundum. The descriptions of the splendid fêtes given by the army of Alexander at this period, when the wealth of India and Persia was brought forth to deck the Persian maidens, do not mention the diamond.

At this period, and even in later times, the royal insignia and the emblems of Persian authority were such as wreaths and vines of pure gold laden with flowers and clusters composed chiefly of emeralds,

rubies, carbuncles, and other bright-colored gems, but not including the adamas. Of like description were those famous canopies under which the ancient potentates of Persia sat and gave their audiences.

Pliny, three centuries later, was the first to describe the gem in unmistakable terms, but even then but very little of a definite character was known of it.

The Romans had access at an early period to the gem-producing countries. Ceylon and India had long been known to the Roman merchants, and their caravans traversed entire Asia from the coast of Syria to the Chinese ocean in two hundred and forty-three days. Their fleets sailed regularly in the time of Claudian from the Red Sea to Ceylon, Coromandel, and Malabar. Ceylon was then famous for its luminous carbuncles and the lustre of its pearls. The famous fairs of Armenia and Nisbis, which attracted the merchants of Asia, also furnished the Romans with many of their luxuries. There certainly were no serious obstacles to the introduction of the gem into the bazaars of the wealthy nations of the Mediterranean in early times and subsequent periods if it was then an article of commerce.

With the ancient history of the gem there is also a remarkable fact to be considered in its study,—its diminutive size. It is believed by many antiquaries that the diamonds known or used by the Romans were well-defined octahedral crystals, of

not over four or four and a half karats weight. It may be stated in reply that the exportation of larger gems may have been forbidden by the Hindoo rulers, as we have seen in later times concerning the rubies found in Burmah. But we place but little confidence in this objection. Large and fine gems, had they been known in the days of Roman prosperity and luxury, would surely have found their way from time to time to the wealthy marts of the empire.

There is other evidence to found the belief that most, if not all, of the diamonds of antiquity were of small size. The celebrated traveller and diamond merchant Tavernier boldly asserted in his day, that prior to the sixteenth century the largest diamonds seen in India were about ten to twelve karats weight. Tavernier was well informed of the history of the gem, and had visited several times the most famous mines of India. We are inclined to support the views of the French traveller, and believe that the famous diamonds known as the paragons are of modern discovery, or since the sixteenth century.

CHAPTER III.

DIAMOND LOCALITIES.

THE diamond is widely dispersed over the earth, and undoubtedly occurs in countries where its existence is not now suspected. The difficulty of detection has restricted its geographical area in history, yet enough is known to regard its deposition as almost universal, or at least quite as frequent as that of gold. In some countries the deposits are very limited, while in others, like those of Africa, Brazil, and India, they stretch away over immense distances.

We will proceed to give brief descriptions of the well-known diamond districts, and mention others but little known to commerce or the mineralogists. For more extended accounts of the historical mines we must refer the reader to the works of the authors quoted in our text. We will commence with those of Asia.

The diamond fields in India are very extensive, and occur everywhere among the hills of the great range that extends from Cape Comorin through the whole of Bengal for a distance of several hundred miles and with an average breadth of fifty miles.

How long these mines have been known to man must always remain a matter of conjecture ; but it is nevertheless certain that the famous mines have been discovered within the past thousand years, and probably a much less period of time. It is stated that many of the gem districts along this range have not been explored carefully, and that the kingdoms of Golconda and Visapour alone have supplied most of the gems known in India. And it is also related that none of these localities have been scientifically mined or surveyed with a view to thorough development.

The most ancient of the diamond mines in India are supposed to be those of Soumelpour, near the river Gonet, a tributary of the Ganges ; but the celebrated mines of Golconda and Raolconda have been known only since the fifteenth and sixteenth centuries.

The richest mine of India, and the most extraordinary of any yet discovered in the world, is that known by the name of Gani, or Couleur. It is situated under a plain at the foot of a mountain about seven days' journey west of Golconda, and was discovered by accident about the middle of the sixteenth century.

A native digging the earth to sow millet threw up a bright, clear crystal of twenty-five karats. It was soon recognized to be a diamond, and crowds of Hindoos flocked to the fields to reap the most wonderful harvest of gems yet known. A vast number of

large gems were obtained, and among them the Great Mogul, which weighed in its rough condition seven hundred and ninety-three karats. The gems of this mine were remarkable for their large size, but they were not of the clearest and purest water, the color and lustre of the stone seeming to partake of the quality of the earth composing the matrix.

This idea, which prevails among the miners in other gem districts in India and also in other countries, lends support to the belief that the diamonds were formed in the strata of gravel where they are now found, and not in the hard crystalline rocks and afterwards set free by disintegration.

The matrix of these mines, as well as of all the others in different parts of the world, is essentially the same; and consists of rolled or broken masses of quartz, mixed or united with sand or earth impregnated with a ferruginous oxide. Amongst this conglomerate, or immediately below it, mixed with clay, the diamonds are found, and generally unattached to any substance.

The earliest and best accounts of the mines of Golconda are to be found in the narrative of Tavernier, who visited them in the middle of the seventeenth century. At this time they were in prosperous condition and furnished occupation to many thousand men. There were but four mines then worked in Hindostan, and more than sixty thousand miners were employed at the mine of Gani, or Couleur, alone. About thirty years after the last

visit of Tavernier, the Earl Marshal of England, who had previously examined the diamond mines on the coast of Coromandel, visited those in Bengal. He found that diamond mines occurred everywhere along the slope of the hills extending through the country; but that very few of them were worked, and that nearly all of the diamonds then supplied to commerce were obtained from the kingdoms of Golconda and Visapour. He gives descriptions of twenty-three mines in Golconda and fifteen in Visapour.

The most famous of these at that time was called Currure, and was worked by the king for his own use. Several very large gems are said to have been found at this locality. It is related that a Portuguese gentleman from Goa, having received permission to explore a part of this mine, had the good fortune to discover a diamond of two hundred and six karats, which so overjoyed him that he erected a large stone over the spot with an inscription in Hindoo commemorative of the event.

Near this place there was another famous mine which yielded stones of fine form and water, occurring in black earth, which is regarded in India as a singular formation. In all the mines of Visapour the diamonds are found in red and yellow earth, and this is generally the color of the matrix elsewhere.

William Methold visited the mines of Golconda at a later period, and relates that at that time they gave employment to about thirty thousand laborers. The means for exploration were then exceedingly simple,

and no mechanical contrivances were adopted for excavating the pits or bailing out the water. Shafts were rudely sunk in the earth to the depth of sixty or seventy feet, and the cascalho found at even that depth. It appeared to be reddish, mixed with white and yellow chalk, and was rich in diamonds. Rarely, stones of one hundred and twenty to two hundred karats were found, while those of ten to fifteen karats were quite abundant; but by far the greater number were so minute that it required from eight to twenty of them to weigh a karat.

Within the present century Dr. Buchanan and Mr. Voysey visited the mines of India, and have left interesting and accurate descriptions of their examinations and observations.

The famous mine of Pannah was examined in 1813, and found to be situated in a table-land of great extent a thousand feet or more above the Gangetic plain. The whole plain, wherever the gravelly formation appeared, afforded diamonds at various depths ranging from six feet to twenty-four. Many mines were worked in beds or borders of rivers because they were easy of access, and the lazy natives lacked the ability and means to explore the adjacent plains, which abounded in diamonds, but were destitute of the water required for washing the gravel.

The effect of the Brazilian discovery and its yield of several tons of diamonds was severely felt in Hindostan, and many of its mines were stopped in consequence. Yet there is abundant virgin territory

left in India for future successful exploration, if conducted scientifically and with ample means.

The natives, with their rude methods of mining, generally ceased operations when the deposit required the removal of twenty-four feet of superincumbent soil. Hindoo labor, also, though apparently very cheap, is in reality costly when we come to compare their slow and feeble results to the efforts of well organized and conducted operations. Hence the diamond has always been a costly gem in Hindostan, and it is worth more in that country at the present time than in Europe.

Concerning the widespread idea of the reproduction of diamonds in India we will make only a brief allusion at the present time.

This theory does not seem to be of a very recent date, for the Portuguese traveller Garcias, who had been physician to the Viceroy at Goa in the early part of the sixteenth century, and who visited the mines, has left in his treatise published in 1565, some curious notes on the rapid generation of diamonds at that time. And he affirms that the soil a few feet below the surface will, in the interval of two or three years, produce diamonds again; but he also admits that the largest gems are only found at much greater depths.

Mr. Voysey, who examined the principal mines in Southern India in 1821, was also assured by the miners of this reproduction; and from his investigations he was led to adopt similar views.

Dr. Buchanan in 1813 visited the famous Pannah mine, and these views then prevailed at that locality. He examined the diamond-bearing earth, but observed nothing very peculiar in its formation. It seemed to be very red, and characterized by pebbles stained by iron and a great variety of quartz in broken fragments, chiefly white in color, or stained red in places, or dotted with black spots.

The miners who were then operating the mines assured the Doctor "that the generation of diamonds is always going forward, and that they have just as much chance of success in searching earth which has been fourteen or fifteen years unexamined as in digging in what has never been disturbed; and in fact," he says, "I saw them digging up earth which had evidently been before examined, as it was lying in irregular heaps as thrown out after examination."

Borneo is thought to be rich in diamonds, but concerning the extent and productiveness of the placers but little definitely is known. The island has long been known as abounding in the gem, but travellers and mineralogists have been prevented from exploring it by a variety of causes, chiefly arising from opposition of the native rulers and difficulty in penetrating into the interior of the country where the mines are found.

Tavernier was desirous of visiting these mines, but was dissuaded from going by these supposed

or fancied difficulties, and the fact that the Queen at that time forbade the exportation of the gem. Therefore we have to regret the absence of the report which this able and truthful traveller would have made if he had visited those regions.

The Borneo diamonds are reported to be the best in the world, and to owe their excellence to a faint steel-like tinge and a very vivid adamantine flash. We are inclined to think, however, that diamonds of this description may be found in various countries, and that commerce assigns their locality to Borneo as a matter of convenience and trade.

Borneo is yet a *terra incognita*, and its features have not yet been made known to geography or even commerce. The second island in size in the world, and itself almost a continent, it presents a vast field to the explorer, with its broad prairies, immeasurable forests, deep and impenetrable jungles, interspersed with lofty ridges of mountains. Its mineral wealth is undetermined, but enough is known to found the belief that the island is one of the richest in this respect on the globe.

Concerning the diamond mines we have but imperfect accounts and none of very recent dates. However, it is known that the character of the mines is the same as that of India and elsewhere, and that the gems are found in a gravelly stratum at various depths below the surface. The best of these mines are said to be situated along the river Lavi,

near Sukkademia, and to be worked in a rude manner by the Malays and Chinese. Mines on the northwest coast of the island have been worked extensively, but it is reported that no large diamonds have been discovered there. The Colonial Secretary, Mr. Low, states that the gems are found in the greatest quantities in Sango, Landak, and Banjarmassin, and that the stones, although of small size, are of the purest water.

The quantity of diamonds afforded by Borneo is not exactly known, but a recent writer in the *Journal of the Geographical Society of London* gives it as about two thousand karats annually. It is also stated by various authorities that the mines of the island have never yet yielded a diamond of thirty-six karats in weight.

If these reports are correct, how can we explain the accounts of the great diamond belonging to the Sultan of Mattan, which may be found in the *History of Java*, by Sir Stamford Raffles, and also in the *Memoirs of the Batavian Society*?

The famous mines of Brazil, which gave rise to a new era in the commerce and history of diamonds, were discovered by accident. And we are not aware of an instance of the discovery of a single diamond district or region of country, with the exception of the Urals, which can be ascribed to the results of scientific research. Even the wonderfully rich mines of the Province of Bahia in Brazil were first made known by a slave who noticed the similarity of the

soil to that of the diamond mines of Minas Geraes, where he had formerly worked.

In 1727 a Portuguese by the name of Lobo, while visiting the gold mines of the Sierra do Frio, a desolate country about four hundred miles north of Rio Janeiro, noticed some bright crystals of stone which the ignorant miners picked up from time to time and treasured as trifles. Gathering a number of them, he submitted them to some Dutch traders, who informed him as to their valuable character. The Dutch at once contracted with the Brazilian Government for all of the rough diamonds that might be found, and for a long time controlled the trade. The mines where the gems were first discovered were situated in the midst of a desolate country destitute of vegetation and of considerable elevation above the level of the sea. Since this period other mining districts have been discovered, and it is now ascertained that the whole of the vast territory situated between the twelfth and twentieth parallels of latitude and extending even to Matto Grosso, a thousand miles distant, belongs to the gem-bearing formation.

This vast space of territory has not been examined scientifically, and but little is known of its condition except that it is diamond yielding. Since their discovery the mines have been worked with more or less activity with slave labor under the direction of companies of large capital. Skilled labor with the modern appliances of science has not yet been em-

ployed in these mining districts. And the condition of the country, its laws, and the controlling power of the diamond corporations, will render the application of scientific skill a difficult and hazardous task. The explorations are conducted in a primitive manner during the dry season, which lasts from April to October. They are made generally in the beds of the streams which have been dried up by the summer's drouth. Rivers are sometimes diverted from their natural course, and their gravelly beds completely removed to sheds on the banks to await the rainy season, when water, which is required for washing, will be in abundance. The *cascalho*, a name given to the peculiar gravel, composed of quartz fragments mixed with sand and clay united with a ferruginous cement, which contains the diamonds, is then placed in shallow troughs, and a stream of water directed upon it until it is well cleansed, when it is removed and dried in the sun. The dried residue is then carefully searched for diamonds, and it is not always easy to distinguish them among a great variety of pebbles, of which the *débris* is chiefly composed.

Some of the diamond mines were of great extent and required many laborers to conduct the operations. That of Mandanga employed twelve hundred slaves in its excavations alone, besides many free persons engaged in other duties. The yield of the Brazilian mines at first was enormous, and one thousand one hundred and forty-six ounces of the pre-

cious gem were shipped to Lisbon in one year. The vast quantities of the gem thrown upon the markets brought the price of them down to five dollars per karat.

Consternation speedily spread among the diamond dealers all over the world ; and many of them, believing that the gems would soon be as common as transparent quartz, declined to invest largely, even at these low prices. But a panic was checked by the prompt action of the Brazilian Government, in claiming the working of the mines as a royal monopoly, and also regulating the supply. In this condition of affairs the working of the mines and the trade remain at the present day ; but the African discoveries and free explorations may change this restriction and monopoly if the Cape fields continue to yield their present supply. According to the estimates of Baron d' Eschwège, the quantity of diamonds obtained from the Brazilian mines under the Government restrictions averaged between 1730 and 1814 thirty-six thousand karats annually, the cost of which amounted to nearly four dollars per karat.

From a variety of causes the supply gradually diminished until about the year 1830, when the diminution was so great, coupled with the increased cost of exploration, that the rough stones cost eight dollars per karat. In 1843 the discovery of the Bahia mines increased greatly the yearly supply, which was then about thirty thousand karats. For two years after the discovery of the Sincora mines

the supply amounted to six hundred thousand karats. But the great distance of the mines from the large towns and the coast, the fearful malaria which prevailed in the district, together with the difficulty of obtaining supplies, have prevented the working of the mines to any great extent; and in consequence the supply in 1852 sank to one hundred and thirty thousand karats. In 1732 the price of the rough gem was five dollars per karat, but in three years after it rose to about eight dollars per karat, and remained at that figure as late as 1742.

The Brazilian diamonds are generally very small compared with those yielded by some of the India mines, like that of Gani, which produced a great many gems of ten to forty karats weight. Of the Brazilian yield it was found by Professor Tennant that out of one thousand diamonds, one half weighed less than half a karat; three hundred, less than one karat; eighty, one and a half karats; one hundred and nineteen varied from two to twenty karats, and only one reached twenty-four karats.

Brazil still exports annually diamonds to the value of several millions of dollars, but the exploration has probably been checked by the influx from South Africa and the consequent fall in prices.

Out of the immense number of gems yielded by these mines, — the district of Minas Geraes is said to have produced two tons in weight, — it is strange that more large gems have not been found.

Quite a number of diamonds exceeding fifty karats

have been discovered, and several over one hundred karats, the largest being known as the Star of the South, which weighed two hundred and fifty-four karats. This fine gem was found in 1853 in the mines of Begagem by a negress. It was in the form of a dodecahedral crystal. Another fine gem, called the Abaethe, was found in 1797 in the alluvium of the river Abaethe. Three convicts, banished into the interior of the savage country, wandered about from thicket to thicket and mountain to mountain, in hope of discovering some treasure that would restore them again to their friends. After six years of weary wanderings and severe privations they at length stumbled upon a diamond of one hundred and five karats in the bed of the river above named. They ventured to return to the inhabited regions and confided their good fortune to a priest. He took them at once to the Governor of Villa-Rica, who suspended the sentence of the convicts and sent the priest to Rio Janeiro with the gem.

A frigate was despatched with the treasure and the clergyman to Lisbon. The King, delighted with his acquisition, fully pardoned the convicts and advanced the priest to a high rank in his profession.

Many attempts have been made to trace the diamonds of Minas Geraes to primitive and unbroken rocks on the more elevated plateaux or even among the more distant mountains. And sometimes the gems have been found in cascalho at a great elevation, or perhaps in crevices of the sandstones ; and hence the

idea has arisen that the solid matrix has been found. The cascalho is the true matrix, whether found in the lowlands or on the mountain peaks. The color of this conglomerate is not uniform and varies in many districts. At the rich St. Antonio's mine it is of a dark gray; at the Veneno it is of a light ochre with lumps cemented with ferruginous oxide; in the Pitanga mine it is of a light gray and almost white, and contains but few diamonds, but of the finest quality. The observer is sometimes led to believe that the abundance of the ferruginous oxide is evidence of the abundance of gems, and this fact is also noticed in the famous mines of Ceylon, where, however, the diamond does not occur.

Concerning the accounts of finding the diamonds in Brazil in their native rock, as described by Clausen and later still by Redington, we are not yet willing to give full credence any more than to the stories of diamonds having been found in the "old rock" in India. We have no doubt of the gem having been found in what appears to be a soft sandstone, but which is in reality a secondary product like the heterogeneous cascalho. And we can conceive this sandstone-like deposit to be formed at the bottom of lagoons under like conditions which gave origin to the conglomerate.

Claussen published in the Bulletins of the Academy of Sciences and Belles-lettres at Brussels, in 1841, an interesting account of his observations while searching for a matrix of the diamond.

He affirms that the gems are found at the mines of Grammagou in beds of a soft sandstone, which he calls a psammite sandstone, and which resembles the itacolumite, which is much harder. He also describes several specimens in which the gems are embedded in the sandstone, but admits that they are not very common. The same writer mentions instances where they are said to have occurred between plates of mica like the flattened garnets. Furthermore, he states that the crystals found in the itacolumite are rounded octahedrons and those found in psammite sandstone are perfect octahedrons.

Claussen, although he believed the itacolumite to be the matrix of the gem, was unable to explain its total absence in places where the itacolumite was greatly developed. He was also forced, when tracing the origin of the *cascalho*, to admit the existence of a secondary itacolumite posterior to the transition formation.

It is interesting as well as perplexing to follow the multitude of views expressed by mineralogists when attempting to explain the formation of the diamond. Most of them are determined to give the gem an ancient origin, and insist upon the action of plutonic forces upon dioritic veins. Humboldt maintained that the gems of the Ural Mountains had a geological relation to the carboniferous dolomite of Adolfskoi as well as to augitic porphyry. But Verneuil and Murchison, examining the mines, found the alluvia which contained the diamonds had no carbon ;

therefore the hypothesis was incorrect, and the matrix of the stone must be sought in another direction. The mines of Brazil have been examined during a century past by a number of geologists and amateurs like Mawe, Martins, St. Hilaire, Claussen, Eschwège, Burton, Hartt, and others; and to their works we must refer the reader for extended descriptions of the geological features of the country and the peculiarities of the gem mines.

In the recent exploration of the diamond fields by Professor Hartt, the Professor decidedly opposes the views of Claussen by saying, "I do not believe that the diamond ever occurs in the true palaeozoic itacolumite in Brazil, but that it is derived from the tertiary sandstones." After casual examination of the diamond-bearing sands of the mines in Bahia, he is also led to believe that they have resulted from the disintegration of Chapada sandstones; and he regrets that they have never been critically examined, for he thinks that the mystery of the origin of the diamond may be solved from their study.

However, from the multitude of hypotheses to which the study of the subject has given rise, we find nothing to shake our confidence in the belief of the formation of the diamond in the secondary gravel beds where they are now found.

Shortly after the opening of the Bahía mines, black, brown, and even clay-colored pebbles were found associated with the transparent diamonds in the cascalho. These pebbles were of various sizes,

generally quite small, but sometimes appearing in masses as large as one thousand karats. Their nature was not at first recognized, and they were thrown aside with all other stones of little or no value. Finally a quantity was gathered and sent to a merchant in Paris, where they were seen by Count de Doulet. The Count in 1867 presented a notice of them to the Academy of Sciences and pronounced them to be massive carbon, and a variety of the diamond. The exact localities in Brazil where it occurs we are unable to describe, but believe them to be situated in the Province of Bahia. As to the quantity gathered we are also unable to give a definite opinion, but have reason to think that it is quite limited; and, moreover, we have yet to learn that it occurs in any other diamond mines in the world.

The color of the carbon, or carbonado, as it is called by the Brazilians, is generally black, but it may be light-brown or of a greenish gray color, when diluted with clay. It is always opaque, but is not always compact, being sometimes quite porous, like pumice-stone. It never crystallizes, but generally appears in angular pieces in lumps or concretionary masses whose specific gravity is 3 to 3.4, while that of the transparent diamond is 3.5.

The black and perfectly crystallized diamond, which is very rare, is not to be confounded with this variety.

The hardness of the carbon is equal to that of the transparent diamond, and probably some of the pur-

est and most compact specimens are harder even than the limpid variety; for the black gems are generally harder than the light-colored, and we have for instances the deep-blue sapphire, the black tourmaline, etc.

At first this newly discovered mineral was pulverized, and its powdered dust used to polish diamonds and other gems, and was then sold for a few francs the karat. Lately, however, science has applied its use to new inventions; and the demand for it in its application to the drill and the saw has increased its value to several dollars the karat, and the price is still increasing. Its advantages over the crystallized varieties are very decided, and it is as hard and has no cleavage planes, and is therefore far better able to resist the effects of shock.

The only diamond known to have been found in modern times in Western Europe is that picked up in a brook in the County of Fermanagh in Ireland. Its weight was not given, but it was stated to be of a reddish cast and valued by Mr. Rundell at twenty guineas. Some mineralogists have maintained that the stone in question was not in place and was probably brought in the crop of some bird of passage from Brazil or the tropical countries of America.

To us, however, a more plausible and probable theory would be that the stone was in place, and that its presence is no more remarkable than the gold nuggets found in the same country. In fact, this instance is no more strange than the finding of the

great American diamond in Virginia, which was also a solitaire and many miles below the auriferous fields whence it is supposed to have drifted. We shall not be surprised to learn of the occurrence of diamonds in other parts of Europe. Pliny ends his chapter on the diamond by stating on the authority of Scepsius that diamonds are found in Germany and in the island of Basilia along with amber.

Eastern Russia was long ago suspected of being diamondiferous; and as early as 1826 Maurice Englehardt pointed out the resemblance of the Ural districts to those of Brazil. It was, however, left to Humboldt and his companions to make known the actual occurrence of these gems in this country. For in 1829, during their visit to Siberia, they discovered several diamonds on the estates of Count Porlier, about one hundred and sixty miles west of Perm, on the western declivity of the Ural Mountains. Active search having been instituted, forty diamonds were found in the detritus on the banks of the Adolfskoi. Strange to relate, they were discovered in the gold-bearing alluvium twenty feet above the stratum containing bones of mammoths and rhinoceroses. Since this period they have also been found at several other places along the Uralian chain.

In commenting upon the occurrence of these diamonds of the Adolfskoi which are preserved in the collection of Prince Butera, some of our best geologists have come to a startling conclusion.

Humboldt, Sir Roderick Murchison, and M. Ver-

neuil, obtaining information from different points in Siberia, have been led to the belief that the diamond in these localities was formed at a date subsequent to the destruction of the mammoths.

Since this period Colonel Helmersen has made known other points along the Uralian chain of mountains where the gem has been found, as Ekaterinsburg, Kushvinsk, and Versch-Urak. But we have no information of "placers" of any considerable extent having been discovered, or the finding of the gem in sufficient numbers to warrant systematic explorations.

Future research may reveal other localities in Siberia where this gem occurs, for the country was known to the ancients as furnishing the adamas.

Amnian in the fourth century mentions the region of Agathyrsi as one of the gem-bearing countries; and this country included the Ural Mountains and part of Siberia. It is not at all strange that the exact localities should have been forgotten during the long intervening space of time and the many political convulsions that have interrupted commercial intercourse with those far-off regions.

It was well known that Scythia furnished the ancients with gold for centuries; but in modern times all trace of the localities was lost until revealed by the researches of German miners exploring for copper and iron. Stranger still, the locality of the gold mines in Spain, so famous in ancient times, is unknown at the present day.

The gold fields of the Southern States of North

America have been known to be diamond-bearing for forty years or more, but as yet no earnest or well-directed search has been made for the gems. During this period of time more than thirty diamonds have been picked up by accident along the gold belt which extends from the central and eastern portion of Alabama, through Georgia, North and South Carolina, even to the interior of Virginia. All along this auriferous formation the itacolumite appears in the gravel beds or in ledges or even in large mountains in some localities.

In Alabama, where the itacolumite is abundant, several fine diamonds of three or four karats weight have been found.

The northeastern portion of Georgia has also yielded some beautiful stones to the miners while washing for gold. Some of these we have seen and found them to be of the purest water. The Glade mines, a few miles north of Gainesville, have yielded several fine diamonds, some of which have been cut in London. They were found by accident in the riffles of the gold-washing machines, and were preserved by the miners simply as curiosities. At the Horshaw gold mines, a few miles farther to the northeast, a large diamond was picked up, but unfortunately destroyed by the ignorance of the laborers, who unluckily reasoned like the ancients concerning its destructibility, and therefore tried the effects of a heavy sledge upon it while placed on an anvil. An examination of this last deposit in 1866 convinced

the writer that it was a true diamond field; and search was rewarded with the finding of two small but well-crystallized diamonds. So far as we can ascertain, all the diamonds thus far discovered in these regions have been finely crystallized.

North Carolina has also yielded some fine specimens of three and four karats weight; but the largest diamond thus far found in the United States and preserved was picked up in 1856 on the banks of the James River, opposite the city of Richmond in Virginia. The spring floods had probably washed it down from the gold fields which are situated a few miles above. The stone was a well-defined octahedral crystal. Its weight, while in the rough state, was about twenty-five karats, and its color was of a faint greenish white tinge. Its transparency was perfect, but its refractions were somewhat impaired by a flaw or a speck in the interior.

The American diamond-cutting establishment of Morse, Crosby, & Foss, of Boston, cut this gem very successfully at the cost of about \$1,300. The stone was purchased by a distinguished American athlete in New York, and worn by him in a breast-pin for many years.

None of these diamond fields have been examined systematically by experienced miners with a view to their development, and in fact no definite idea of their limit or their value can be given. But we have the impression that they are far more extensive than has been imagined by mineralogists.

The returning gem-seekers who have been educated in the diamond mines of South Africa may investigate ere long these unknown districts and settle the question beyond further inquiry. In California, a few diamonds are reported to have been found here and there among the gold fields, but nothing like a gem placer has yet been revealed. The geological formations of Arizona and New Mexico are more promising than any part of the United States, and explorations may disclose extensive and valuable gem deposits in those regions. The originators of the famous diamond swindle in Arizona chose their locality with more than ordinary sagacity.

The account of this daring scheme reads more like romance than reality, and it was more than ordinary boldness that prompted the perpetrators to visit foreign lands, purchase quantities of rough diamonds and then plant them in a distant, desolate, and hostile country to entrap the wary speculator. The success of this piracy was fortunately checked by the sagacity of one of the United States geologists exploring the adjacent territory, who quickly disclosed the fraud, but not in time to prevent the swindlers from pocketing large sums of money from speculators in California.

Pliny mentioned Arabia as one of the localities of the gem; but modern investigators believe that he founded his views on the facts of the diamonds being obtained from Arabian merchants, and that they really came from other countries.

This probably is the true version of the commerce of the Arabians in those days; but we see no objection to the belief that Arabia may have been a diamond-bearing country in early times, and may possess undeveloped fields at the present day. Northern Africa was also asserted to be diamond yielding, and modern investigators have established the truth of the assertion.

In the year 1867 the attention of gem-seekers was turned to vague reports of the discovery of rich diamond fields in South Africa, and the pages of history were examined closely to prove that in ancient times this continent was known as a diamond country. It is undoubtedly true that Africa yielded diamonds to the ancients, for within thirty years several have been found in Algiers, and are now preserved in the collections of Paris. They were discovered in the auriferous sands of the river Goumal, in the Province of Constantine, by natives while washing for gold. They were small in size but of unmistakable character. This discovery strengthens the ancient report of the Carthaginians' procuring the gems from the Etrurians, who brought them from the interior of Africa.

In 1867 a diamond was discovered by accident in the soil several hundred miles north of the Cape of Good Hope. The report was not credited, and it was not until a number had been found and tested that the attention of adventurous men was fairly aroused. Success soon rewarded the labors

of the first bands of gem-seekers ; and the news, widespread over the world, soon brought thousands of determined and hardy men, who are even yet earnestly exploring the gem districts and also revolutionizing the country.

The gem mines now under process of exploration are situated on the Vaal River and its tributaries, the best of them being found near the junction of the Vaal and Orange Rivers and from five to six hundred miles north of the Cape. The locality known as Du Toits Pan soon became famous and yielded a great number of diamonds, some of them over 100 karats and one reaching the great weight of $288\frac{3}{4}$ karats. The topography of the country around these mines is characterized by low, flat-topped hills, which strike the observer at once by their singularity. The storm clouds, their frequency, their dull gray hue, their constant commotion, and the nearness of their approach to the earth are also quickly noticed by the new-comer, so strangely different are they from the ordinary atmospheric changes.

Five miles to the north of Du Toits occurs one of the most remarkable mines yet discovered in any part of the world. It is called Colesberg Kopje, and although one of the richest spots of the globe, it is also one of the meanest places on God's earth. Several thousand men have been actively engaged upon it for a number of years past, and many thousand diamonds have been taken from it. So rich

has been its yield that it is stated that four thousand have been obtained in a single day.

The extent of the excavation is enormous, and yet all has been done by simple and even rude means. But little advantage has been taken of the use of machinery and skilled labor, and most of the operations have been conducted in a primitive manner. The distance to the coast and the great expense of transportation is perhaps the principal reason why different and more satisfactory arrangements have not been made.

The photographs of the appearance of this field and its excavations strike one with amazement. The countless array of tents in the distance on the borders of the deposit; the thousands of busy miners; the huge and deep ditches stretching across the plain, vast enough to float a fleet of men-of-war; the lofty mounds of thrown-up earth, — all together present a startling picture never to be forgotten.

The depths of these enormous ditches vary from ten to more than one hundred feet.

All this herculean labor has been performed in less than twenty years under the stimulus of extraordinary prosperity, and it indicates a determination to explore the country thoroughly.

As yet there has been no complete survey of these regions, and the extent of the diamond fields is still unknown. Sufficient evidence, however, has been received to indicate that they cover an area of one thousand square miles, and are situated principally

in the Orange River Free State, but also extend into the Transvaal Republic and Cape Colony. These districts alone will afford remunerative labor for some time to come, and we have little doubt but that other fields of even greater extent will before long be discovered in other parts of Africa.

For a long time past we have been led to regard this continent as containing the most extensive and richest diamond deposits on the globe. A great portion of Africa belongs to the geological conditions which produce the diamonds, and the present explorations will educate a host of gem-seekers, who will not only investigate other parts of Africa, but will also explore other countries. Therefore we may expect the diamond trade to receive a strong impetus for some years to come, and that new mines may for a time reduce the present prices of the gem.

The largest diamond yet afforded by the South Africa mines is that called the Stewart. It was found at Waldeck's plant, in November, 1872, by a man named Antonies. Its form was that of a modified octahedron, beautifully crystallized, and exhibiting a faint tinge of yellow. On the outside of the crystal were a few specks and flaws, but the interior appears to be free from imperfections. Its original weight was $288\frac{3}{8}$ karats.

A vast number of the diamonds found in these fields are tinged with a faint hue, generally yellow or faint brown. This peculiarity was also noticed with the yield of the Brazilian mines.

It is quite impossible to give a correct account of the quantity afforded by these mines up to the present time. It amounts to many millions of dollars, and is sufficiently large to produce a marked effect upon the market, but nothing like the panic which followed the discovery of the Brazilian mines. The value of the diamonds exported at Cape Town in 1871 is said to have been \$7,500,000, but it was probably much greater.

Australia has afforded to the gold miners quite a number of small diamond crystals, and gem fields undoubtedly occur within its borders. Among the auriferous sands of the Maguarie River minute crystals have been picked by the careless miner from time to time, and other localities have also afforded specimens of the mineral, but no systematic search has yet been made for them. A number of these specimens of diamonds, although of minute form, were exhibited at Melbourne in 1865.

The islands of Java and Sumatra yield diamonds among their mineral treasures, but, strange to say, the island of Ceylon, which is the most remarkable gem deposit in the world, does not produce a single specimen. The island is not far distant from the gem districts of lower Bengal. The formation appears to be of the same character, but it is evident that the geological conditions which deposited the sapphire, the zircon, spinel, etc., differed from those required by the diamond.

CHAPTER IV.

ORIGIN OF THE DIAMOND.

THE origin of this precious stone has been a favorite study with man from the earliest times of its history ; and, as we have already stated, it has given birth to a multitude of hypotheses.

The peculiar fascination which attends the contemplation of the gems arises partly from their commercial distinction, as well as from certain mysterious properties with which they have been invested not only by tradition but even by scientific research.

We will not, however, venture to affirm that they are more wonderful or deserving of a higher place in the estimation of man than the beautiful and more transient flowers of vegetation. Both are indeed objects of our highest consideration.

The transparent diamonds always occur in crystalline forms, although they sometimes appear almost amorphous or even cylindrical or globular. Its primitive form, however, is the octahedron.

They are found generally in limited deposits, which are often as shallow and well defined as the gold fields, which are termed placers ; and therefore we will also call the diamond fields "diamond placers."

In some "placers" the shapes of the crystals are perfectly regular, while in others they are greatly modified and rendered indistinct. In some mines they occur in fine octahedrons with beautifully truncated edges, but in other districts the rare form of the regular cube may abound. Every section of the diamond-bearing countries seems to have some peculiarity either in color, form, or arrangement of crystal. It is indeed true that experts, from an examination of the rough specimen, are sometimes able to detect the locality whence the diamond was obtained. The same facility may be applied to the natural crystals of other gems, but it cannot be established as a fixed or general rule. The diamond "placers," distinct and well defined, are far more numerous on the earth's crust than is generally believed.

A thousand plausible and often ingenious theories on the geological character of the diamond have been advanced in modern times or within a century past; and a great variety of rocks or mineral substances extending from itacolumite to xanthophyllite have been affirmed to be the parent mineral. The real matrix, or such as we believe it to be, of the diamond is the same all over the world. The associate minerals which form the conglomerate in which it is generally found may vary somewhat, but the character of the deposit is but little changed. This matrix is a secondary product, and consists of a conglomerate gravel which once abounded in remains of animal and vegetable life.

The keen eye of Buffon early detected the formation of the true gem strata; and believing that the gems were produced in these peculiar beds by the solar forces, he boldly asserted that they were formed in the superficial strata from *débris* of older formations, mineral, animal, and vegetable. "On ne peut leur donner d'autre origine, d'autre matrice que la terre limoneuse qui rassembloit les débris des autres matieres."

This matrix is a well-defined conglomerate, which is found generally on elevated plateaux, and which corresponds to the bottoms of shallow lagoons or lakes of inconsiderable depth. In the earthy portion, which is composed of a variety of *débris*, occur the diamonds, interspersed among the quartz or rock pebbles, and in a marked and continuous layer. These formations are well known to the geologist, for they occur in almost every country on the globe.

In various parts of the earth's structure we find solid strata of conglomerate and sandstone, which have been formed at distant and different periods of the world's history. In other places we may observe the loose materials of the same formation awaiting transformation when exposed to the action of water highly charged with iron, lime, or silica, and we may even see the process taking place at the present day. For example, we will take the broad tracts of level country known in the south of France as the "Landes." Here we have an excellent illustration

of the formation of the gem beds, lacking, however, the precious stones. Below the surface of these plains, and generally at the depth of about three feet, a conglomerate called "allios" has formed, and is still in the process of forming. This stony layer, which is composed of quartz pebbles mixed with sand, has been cemented strongly together by the vegetable and organic matter which has trickled down from the surface of the earth during indefinite periods of time. The action of this organic *débris* soon renders the conglomerate quite impervious to water, and retards its passing into the sand beds or other strata below. In consequence thereof these broad tracts of level lands become stagnant lagoons of water during the rainy seasons, and all the remains of vegetable and other organic life sink down into these layers of stone, gradually filling up the interstices among the rocks and lesser pebbles.

This collection of decayed various organic substances is generally of a gray or blackish color, or may be of a rusty yellow hue like ferruginous sandstone. Its cementing power has given a special name to the formation it has caused; and to the gold-miner it is known as hard-pan, to the gem-seeker as *cascalho* or "mellan." Its peculiar hue, together with the metallic fracture of its layers, has given rise to the belief that it was composed chiefly of a ferruginous oxide. Recent analysis, however, of the "allios" has shown that this idea is partly erroneous, and that the color and the substance of the forma-

tion in reality arises from the juice and *débris* of plants loaded with tannin and other matter. Iron, it seems from these investigations, is present only in small quantities, and also is afforded by the secretion of vegetable life. However, the quantity of iron in the conglomerate varies considerably in different localities, but most of it seems to be acquired from the action of vegetable vitality.

These conglomerates of the Landes have been a long time in process of formation; but in other localities, like those of the Cape de Verde, to which the waves of the sea have had access, we may witness the transformation going on with rapidity. No great time is required by nature for this production, but rather the application or conjunction of certain materials exposed to the action of chemical changes and telluric forces.

It has been asserted that the diamond has been found embedded in the singular quartzite to which Count D'Eschwège gave the name of itacolumite, but we are inclined from examination of one of these specimens to think that its presence is quite accidental.

In the State of Georgia there are immense beds of itacolumite, appearing, also, here and there along the auriferous formation which extends from Virginia to central Alabama; and they afford ample fields for proof of the statement that the mineral is really the true matrix of the gem. But, after careful examination of some of these exposed rocks, we are led to

regard the itacolomite as an associate mineral to the diamond, and that any farther connection with the gem is very distant. Fragments of this rock are quite often found together with quartz in the conglomerate; but we do not regard their presence as essential as that of a ferruginous oxide, which is one of the distinguishing features of all gem mines, and especially of the famous deposits of Ceylon, where the diamond is never found.

The best and most characteristic mines of India, Brazil, and Africa are situated on elevated plateaux, where there is at present but little vegetation.

To give the reader an idea of the formation, we will describe one of the districts of South Africa, which may serve to illustrate all others. At Pniect Kopje, in the Vaal region, the diamonds are found on an elevated plateau one hundred and fifty feet above the river bed; and many of them have been discovered but two or three feet below the surface, in company with fossil wood and even bones. In the Orange River Republic they occur frequently in peculiar isolated and circumscribed spots, called by the miners "pans." These are basin-like hollows which are filled with water during the wet seasons. In these pans none of the diamonds exhibit signs of abrasion caused by shock or attrition, although the quartz pebbles forming the gravel and conglomerate show in their rounded angles evidences of aqueous action. The gems are not only found in the shallow edges of these hollows, but are taken from depths of

one hundred feet and more. And they are always found in their peculiar and connected conglomerate, which seems to have formed at the bottom of some pool or lake. Hence we may explain the superficial depth of the cascalho at the shores of the extinct pond, and the increased depth at central parts of the fields. If motion had taken place among the pebbles forming the conglomerate after the deposition of the diamond, we might properly look for worn surfaces on the gems from shock with contact with loose rocks; for slight blows will mar the surface of the diamond, even if its edges scratch all other minerals with perfect ease.

In these pans the diamonds are natural in form, indicating that they have not moved since the time they were deposited. But in the beds of the rivers which have in later times worn deep ravines in the face of the country we find diamonds with abraded surfaces, having been rolled about by the torrents for indefinite periods of time. Whence come the alluvial soils and the gravel beds which cover the gem strata and completely fill up the lake depression, especially when there are no surrounding elevations to furnish disintegrated material?

This serious question will naturally arise in the minds of all observers; and to answer it clearly will be a difficult task. Sometimes the thought occurs to us that much of the quartz gravel has formed in these pools at subsequent periods and has been broken up and rolled about by the waves until

another stratum of alluvium has formed above it; but we will not venture to assert an opinion to this effect. Still, it is a great mystery to ascertain whence some of the quartz pebbles came from in the present elevated condition of the placers and the absence of similar rocks in the vicinity. There is another fact connected with the diamond placers which deserves consideration, and that is their great elevation above the sea level.

The mines of India, Africa, and Brazil are situated at a considerable altitude above the ocean. Those of India are generally a thousand feet above the sea level; while the wonderful gem mines of the adjacent island of Ceylon, which are also true placers, occur but few feet above the line of the tides, but do not yield the diamond. It is certainly remarkable that Ceylon does not afford this gem among the great number of other precious stones. At first thought the idea occurs to the observer that as flora and fauna have their distribution according to certain elevations a similar rule may be applied to the deposition of minerals. But there are too many exceptions known to oppose this view, however pleasing the theory may be.

One of the strongest arguments in favor of the theory of the recent deposition of the gem is connected with its discovery in the gold mines of the Adolfskoi in Siberia. Here they were found in alluvial strata twenty feet above those deposits which contained the bones of the mammoth and the rhi-

noceros. Hence Humboldt, Murchison, and Verneuil were led to the conclusion that they had been deposited there since the introduction of animal life. There are also some remarkable evidences to sustain the view that these gems were formed in the conglomerate and earth where they are now found. In some of the mines of India they have been taken out of red earth with the earth clinging to their sides as if it had become attached to them, while the crystals were of a soft, glutinous substance. In the Museum of Rio Janeiro there is a large rounded diamond which has very distinct impressions of grains of sand upon its sides. The British Museum contains an octahedral crystal attached to alluvial gold, and Dr. Nello Franka mentions another which enclosed a leaf of gold. A number of specimens have been observed containing splinters of ferruginous quartz and crystals of other substances. The microscope often reveals in the interior of these stones germs of fungi and even vegetable fibres of higher organization, some of which resemble the moss-like appearance seen in the moss agates.

It was from the study of these conditions, connected with the fact that the stone becomes black when strongly heated, that Goppert was led to assert that it could not be of igneous origin. It was also from investigation of the refractive powers of the gem that Sir David Brewster was induced to assume the hypothesis that it was, or that it might be, a congealed secretion of a vegetable production.

This distinguished philosopher was seeking a perfect lens for microscopic use; and discovered that the diamond, notwithstanding its immense refractive power, was of very doubtful character in its adaptation to this purpose, and that its laminae were sometimes of different shades and even arranged in a series of stratification. They not only differed from each other in color and purity, but did not exhibit a common focus. Therefore, Brewster was led to infer from these and other phenomena that the mineral was of vegetable origin, and that its parts must have been held in solution before crystallization took place.

There is nothing very startling in this hypothesis, no more so than in the case of the amber, which is now admitted to be a fossil resin, and which is, in its refractive powers, second only to the diamond. Therefore we cannot object to the theory of vegetable origin on account of the property of brilliancy.

Tavernier observed that the color of the diamonds in India often partook of the color of the gravel in which they were deposited, — white, reddish, blackish, or greenish, according to the color and purity of the matrix. This fact has also been noticed in Brazil; and it lends support to the view that the gems have been deposited under stagnant water, and have received some tinge from its color.

The diamond is admitted by microscopists to be one of the foulest gems known to them; and specimens are rare that do not exhibit cavities, imper-

fections, or foreign matter in their interior. A painstaking microscopist, after examining the large collection of rough crystals of the East India Company in London, which numbered several hundred specimens, came to the following conclusion: "It seems to be a general truth that there are comparatively few diamonds without cavities and flaws, and that the diamond is a fouler stone than any other used in jewelry."

Berzelius first called attention to a black substance which he found in a diamond belonging to the collection of Countess Porlier; and since then many other examples have been observed. Frequently black specks resembling anthracite have been noticed in the Brazilian diamonds. Tavernier saw in India a large diamond of one hundred and four karats, whose central portion was so foul as to render the stone worthless. When it was cut open the cavity yielded about eight karats of filth, resembling that of a rotten weed.

The diamond is now recognized by the chemist as a crystalline form of pure carbon. Newton, in 1675, with the wonderful penetration of his genius, and reasoning from the high refractive power of the gem, which so far exceeded the degree due its density, believed it to be combustible. More than a century later the experimentalists of the Academy of Florence strengthened this view by destroying it in the focus of powerful burning mirrors. Lavoisier, however, dispelled all doubts concerning its combustibility by

burning it under a receiver filled with oxygen gas. It has since been ascertained that a temperature of 14° Wedgewood completely volatilizes the diamond, producing carbonic acid gas. An English experimentalist, however, has recently declared that the gem may be consumed at a red heat, and maintains that he has accomplished this result by enveloping the stone in certain alkaliés.

It has been admitted by eminent geologists that the diamond proceeded from the slow decomposition of vegetable material, and even animal matter, as the requisite carbon could be obtained from either source. But they have also strenuously maintained that the gem was formed under the same conditions of heat as produced the metamorphism of argillaceous and arenaceous schists, these schists being supposed to have once been altered from shales impregnated with carbonaceous substances of organic origin. To this theory the revelations of the microscope offer decisive objections, since this instrument shows that there has been no action of heat in the formation of the stone, for the vegetable remains often detected in the interior of the mineral forbid the development of any considerable degree of caloric. Therefore, as there is no evidence of the influence or effect of heat upon these organic matters within the diamond, the theory must be abandoned.

Geologists have been, perhaps, too tenacious in their views of the origin of many of the rocks that compose the earth's crust, and especially in main-

taining that many crystalline rocks are as old as the dawn of creation. We know that some of these minerals may be produced artificially at the present day, and that the forces that arranged all rocks of a high molecular organization are still in force.

We sometimes speak of old crystalline rocks with the inference that their age is beyond comparison, and therefore undetermined. Yet the microscope is constantly lessening the force of these views by revealing prodigious numbers of minute and animal forms in fossil condition in various kinds of crystalline rocks.

We also observe that various forms of silex have been deposited on the earth in recent periods of its history, and even since the appearance of animal life, for we find their remains transformed into agate. Thus it is evident that nature still possesses the power to deposit certain forms of mineral substances.

Arago and Biot, reasoning from the energy of the refractive power of the diamond, were inclined to believe that it contained hydrogen. Sir Humphrey Davy suspected the presence of oxygen, but sought for it in vain after many careful experiments. Chaucourtois, however, deriving a theory from chemical results, came to the view that the stone is derived by the humid process from a hydrocarburet. Reasoning from the process of forming sulphur from hydro-sulphuretted emanations, he believed that in the

humid oxidation of a carburetted hydrogen the hydrogen is oxidized, while part of the carbon becomes carbonic acid, and the rest remains as carbon and may crystallize into diamond.

Supposing this hypothesis to be correct, where do you find the required materials for the formation of the diamond? the reader may ask. At the bottom of these lagoons the decomposition of organic matter furnished abundant means for the production of the gem. Carbonic acid is everywhere produced from the decomposition of animal and vegetable matter. It is constantly evolved from the earth, and has the property of decomposing many of the hardest rocks. It is the cause of that mysterious decay which Dolomieu called "La maladie du granite."

In carburetted hydrogen we have the united force of two of the most active substances known as organogens, or generators of organic bodies. But of the vast range of their properties, their affinities, and their interior changes we are still profoundly ignorant. We may, however, easily recognize the fact that their combinations and also almost every other chemical compound may be decomposed by electricity or galvanism.

Here then we have a clew, though perhaps distant, to the formation of the gem. Is not the production of drops of water by passing the electric spark through a mixture of hydrogen and atmospheric oxygen suggestive of the manner in which the diamond

might be formed from carburetted hydrogen? It is true this experiment in the laboratory has failed to produce the transparent and crystalline form of carbon, although it has thrown down the element in an amorphous state. This failure is by no means decisive, for many of the simple acts of nature are beyond the imitative power of man.

And then again the chemist may exclaim, "How is it possible for the gem to be produced in this manner, when the combination of these elementary bodies is always or nearly always attended with the development of a considerable degree of heat, while the diamond contains at times germs of organic matter? Would not these organic remains be destroyed during this process? On the contrary, they do not exhibit the least trace of the effect of combustion or even heat, and are as well defined as the insects in the fossil resins." In reply we will point to the formation of fulgurites through the agency of the lightning without the evolution of heat.

History presents some almost incredible examples of the stupidity and obstinacy of mankind in the explanation of natural phenomena. It seems quite impossible that when the German philosopher Chladni, less than a century ago, asserted that meteorites were extra-terrestrial bodies, the Academies of Europe laughed at him in scorn. Several meteoric showers falling in Europe shortly after did not convince the bigoted philosophers. And when Pictet in 1802 read a paper before the French Institute in

favor of the theory, he was insulted by his learned audience. It was not until a year afterwards, when the great meteoric shower occurred in Normandy, that Biot, deputed by the French Government, succeeded in convincing the most sceptical. Yet only a few years previous De Luc, the first meteorologist of Europe, the founder of geology, declared that he would not believe it even if a stone should fall at his feet from the skies. In 1751, Peyssonnel presented to the Academy of Sciences at Naples an elaborate memoir in which he very plainly proved that the coral belonged to the animal and not the vegetable kingdom. But his admirable paper was hooted at by the European naturalists; and even the distinguished philosopher Reaumur declared that the idea which was advanced was really too absurd to be discussed.

When we come to review the hypotheses of science during the last century, we shall feel more inclined to be generous and flexible in our views of natural phenomena.

“There are more things in heaven and earth, Horatio,
Than are dreamt of in your philosophy.”

The nodular or globular forms of the gem present no serious objection to the idea of vegetable or animal origin; and we may refer for argument to the calcareous nodules of the old red sandstone. These concretionary and radiated masses are merely sarcophagi of animal remains; and their arrangement

plainly shows the chemical influences of decaying animal matter and also the multiple and varied effect of crystalline attraction and electric force. Can we say that the crystallized diamonds occurring in well-defined placers are any more remarkable than the little globular petrifications found in the cretaceous formation and known as the *Coscinopora globularis*, and which nature provided with a perforation so that ancient man adopted them as ornaments in place of beads?

We are often reminded by the antiquary of the remarkable foresight or acuteness of the ancient poet Lucretius in his explanation of certain natural phenomena which have since been verified by modern science. But of all the heaven-inspired dreamers none have come nearer the truth in terrestrial matters than the Arabian poet Fizee, who wrote:—

“The sun from whom the seven seas obtain pearls,
The black stone from his rays obtains the jewel,
The mine from the correcting influence of his beams obtains
gold.”

Plato believed that the gems were produced by a sort of vivifying spirit descending from the stars. It is undoubtedly from the influence of the solar forces and the magnetic and electric currents which are constantly playing through the crust of the earth that the gems derive their origin.

These phenomena of the earth's vitality are manifested in their greatest force along certain elliptics,

which may be traced over the true gem districts of Asia, Africa, and Brazil, and in marked contrast to adjacent territories. The miners in South Africa, disturbed by the severe whirlwinds and frequent thunder-storms, soon began to imagine that the excessive electric action had something to do with the creation of the gems they sought. Mr. Voysey, Geologist to the India Survey, also observed the very marked telluric action in the diamond formations of India, and moreover that the process of crystallization took place there with wonderful rapidity. So convinced was this keen observer of the present reproduction of gems in the alluvial soil or conglomerate that he commenced to collect the proofs of recrystallization. Unfortunately for science, Mr. Voysey died shortly after he adopted these views. Dr. Buchanan, another traveller who visited many of the mines of India, was impressed with this idea; and he was assured by the miners all over India that the regeneration of diamonds is always going on in the peculiar gravel. In proof of their statements, many men were then engaged in working over the *débris* that had been examined many years before. An interval of fifteen years was sufficient in their estimation to reproduce new gems, at least to a certain extent. This reproduction, or rather, we will say, assertion of a reproduction, reminds one of the mysterious action of the nitre beds, which yield rich returns after a rest of a few years, and especially those which occur among rocks which are destitute of potash.

It is to the learned Abbé Haiüy we owe the theory that crystals are made up of an assemblage of minute parts or molecules, each having the same definite form. To the diamond especially this hypothesis may be applied, since it is composed of thin laminae covering or concealing its primary form. With the aid of the skill of the artisan we can remove these coverings one after the other, until the definite and elementary form of the crystal be revealed. In the time of Louis XIV. it was thought that the size of diamonds might be increased by placing them in certain solutions, as crystals of salt are enlarged by immersing them in solutions of the same substance. But the difficulty then was to find the required liquid; and even at the present day we have not yet succeeded in discovering the composition of the water of crystallization of crystals of quartz or topaz, although Nature has shown the fluid to us in the cavities of certain crystals.

These curious speculations which were discussed in the days of the "Grand Monarque" are again revived by the theory that gold nuggets are not only deposited from aqueous solutions, but are actually increasing in size under certain influences and conditions.

But where does this metal come from? the inquirer may ask. From a variety of sources, we may reply. Does not the water of the ocean contain it in appreciable quantities, and did not M. Sage extract it from the ashes of certain burned vegetable sub-

stances? We also know for a certainty that iron is produced by vegetable vitality, but we will not attempt to explain the manner or whence the material is primarily derived. Cosmic dust or the invisible atoms of the atmosphere may be the source. The origin of the gold nuggets and the particles of gold-dust in the well-defined placers, as advanced in the hypotheses of Raymond and Murray within the past few years, is connected very closely with the theory of the recent formation of diamonds in similar placers.

In connection with this theme, it is proper to make a digression in explanation of the condition and formation of the gold placers, as they seem to be highly suggestive of the depositions of the diamond placers. Gold is often found in the same strata with the diamonds, and the presence of the one sometimes indicates the deposition of the other. But this is not invariably the fact. Yet the peculiar formation in which the metal and the gem occur leads the geologist to similar trains of reasoning when seeking to explain their presence in the tertiary strata of very recent times. It has been generally supposed that all alluvial gold is the result of disintegration of the old crystalline rocks. But we now distinguish placer gold into two kinds, as the alluvial and that which results from decomposition of quartz reefs. The distinction between these two qualities of the same metal arises from differences which are quite strongly marked. The alluvial gold

is generally much purer than the reef gold; and the reefs rarely, if ever, contain nuggets. The appearance of the nuggets and particles from the true placers, in comparison with the gold-dust evidently set free by aqueous action, is suggestive of a theory that they have been deposited by different agencies.

It has been suggested by Mr. Selwyn, the Government Geologist of Victoria, while studying these differences, that the gold nuggets found in the drift may have been deposited from solutions containing gold by means of electric and chemical agencies. Mr. Skey, analyst to the New Zealand Geological Survey, has recently come to similar conclusions from his researches on the subject. The theory is well illustrated by the formation of crystals and masses of iron pyrites from solutions of that metal; and as gold is often found associated, free and uncombined, in these pyritiferous depositions, there is sufficient evidence to believe there may be some connection in the manner of formation.

From the results of certain chemical experiments in the laboratory, it would appear that organic matter is one of the necessary chemical agents for the decomposition of some of the solutions of gold. Therefore, if we assume this hypothesis to have a positive bearing upon this question, the abundance of organic matter occurring in the gravel beds adds to its weight as an argument. Selwyn found in the gold-bearing drifts of Australia quantities of fragments of wood, roots of trees, and other organic

débris to serve as nuclei, or as reagents for the reduction of mineral solutions. We may introduce as evidence the formation of iron pyrites in crystalline forms, which is taking place at the present day under the action of sea-water. The metal in these instances replaces the organic structure of wood, or assumes definite forms with a particle of organic matter as a nucleus.

The formation of gold nuggets from solutions of the metal is by no means as wonderful or difficult of explanation as some other phenomena witnessed in metallurgy. The strange play of pseudomorphism is well defined in some instances, if not well understood. Here we observe that the peculiarity of form may be rigidly adhered to, while the composition is completely changed. In the waters of certain copper mines, drills, rings, and bars of iron that have accidentally been left have in course of time become transformed into pure copper. The iron of the implements has changed places with the atoms of copper held in solution.

In connection with this interesting theory, there are some puzzling facts to be deduced from the phenomena of the auriferous sand beds of some of the rivers of Europe. The gold placers along the coast of the Danube and the Rhine are situated far from the mountains, the supposed sources of the metal, and there are also wide barren districts intervening. The river Tesino affords no gold in its sands until its waters have passed through and

beyond Lake Maggiore. From these and other examples, it is quite evident that the gold which appears in these river beds has been derived from the placers through which the rivers have passed, and not from quartz reefs in the distant mountainous regions. The situation of these placers, with the evenness and regularity of their deposits, also the absence of auriferous ledges among the contiguous rocks, permit the observer to indulge in the idea that the gold may have been deposited from solutions and not from the decomposition of crystalline rocks. We certainly have sufficient evidence to object to that final explanation which ascribes all these depositions to aqueous action in distant times, and to the abrasion of primitive mountains, the evidence of whose existence is alone and doubtfully afforded by the *debris* which form the strata of the gold and diamond placers. The ancients long ago noticed the deposition of gold in the beds of rivers; hence the phrase "The gold-breeding sands of Pactolus."

It has been a favorite theory with many persons of a philosophic turn of mind that all organic forms were created upon the earth not by mere chance or hap-hazard, nor by what have been called by the early geologists "freaks of nature," but, on the contrary, with some definite intent on the part of the Creator, and perhaps for the welfare of mankind. Some of these far-sighted thinkers have advanced their views so far as to maintain that even obscure animal and vegetable forms may have some indirect

or distant effect upon the well-being of man. We all must admit that it is indeed a beautiful hypothesis, even if it be contested by stern and savage arguments. But if we indulge in this manner of reasoning, there seems to be hardly a limit in natural philosophy in which we may not seek for evidence.

Can we not include the subject of our treatise among those things which are supposed to have some influence upon the moulding of human character? Certainly its geological age, its origin, the beauties and wonders of its physical properties, and their application to art and science as well as to the wants of society, furnish evidence to sustain an inference.

But how can a cold, inanimate object like a gem influence the condition or expansion of the human intellect? the rigid materialist may say. The gems, he will maintain, apply only to the superficial wants of man, and directly tend to degrade rather than elevate our natural morals; that they are articles of commerce, and that commerce debases our natural instincts.

On the contrary, we may say that the beautiful in nature of whatever degree is calculated to assist in the development of mental culture; and without these beautiful lessons and examples constantly spread out before us, man would always have remained in a state of utter barbarism. As we look back upon the history of life, how many of the triumphs of human architecture may be traced to the suggestions arising from the observance of the

varied forms of nature! Nearly all of the beauties of the Gothic or Grecian styles may be found existing in the fossil relics of by-gone ages or even in the multiple forms of existing vegetation. What grand deductions Newton derived from his studies of the glories of the opal and the iridescent gleams of the soap-bubble!

Let us follow our theme a little longer. In reviewing the fragmentary remains of the early periods of the earth's history, the observer will admit that there has been a marked progress in even vegetable life as well as in the animal. For in the primitive ages we find the non-flowering plants were more numerous than the flowering species. Therefore, in contemplating the precedence of succession of animal and vegetable life, the thought naturally occurs to us that perhaps the most delicate and beautiful of all our flowers date from recent geological periods.

We may also apply this hypothesis to the gems, and perhaps maintain that they too have arrived at perfection by progressive stages. The corundum, for instance, in the primitive rocks is never so pure and perfect as the nodules and crystals found in the true gem strata of recent formations. The emerald of the limestone is also incomparably above the beryls of the granites. The spinels, the chrysoberyls, the zircons, and the topazes of the gem beds are generally far superior to those found in the old crystalline rocks. There are, however, some plain exceptions to this plausible theory; and the finest of the tourma-

lines are found in cavities in granite ledges that appear to be of an early age.

We are also sometimes inclined to think that color in the early ages of terrestrial life was wanting in the rich hues which now deck animate nature. For of all the relics of the old geologic forms that are preserved to us their colors are either greatly faded or were at first faintly painted. Even in the tertiary division the hues are not beautiful. The shells, however, exhibit a trace of the pearly hue of the nacre, which may once have shone as brightly as in the modern mollusca. Some of the fossil fishes display a gleam of the silver tints that now glisten on the sides of the living species. Fossil corals preserved in the marble, however, have retained the beauty of form but lost all delicacy of hue, if they ever possessed any. Still, absence of bright and glowing colors of the animals in a fossil state is by no means conclusive evidence that nature was then devoid of external decoration. For we may see on every side how the beautiful hues of animal and vegetable life may fade and disappear altogether on the suspension of vital activity; and also how the process of solidification and petrification may modify or even obliterate all traces of organic color. It is, however, a fact that the richest-colored gems and minerals are found near the surface of the earth, as though they required the direct influence of the solar rays, like the finest varieties of colored coral and the gorgeous flowers of vegetation.

In reflecting upon these phenomena, and in seeking for the causes that led to the creation of the diamond, and sifting down the evidence that science has patiently brought to light, we are naturally led to philosophic musings. It is a singular reflection that much of our commercial greatness is derived from luxuriant vegetations of early ages of the earth's history. How much pleasure, how many of the comforts of civilization and even the necessities of life, do we owe to the extinct fauna of by-gone ages! Even invalid man, seeking to restore the exhausted fountains of his shattered nature in the waters of some of the sulphur springs, quaffs the life-restoring principles from the mineral and animal *débris* of the lower ocean of the old red sandstone. Here, then, is a happy adaptation of the vague and empty theory of transmigration of the ancients, — the metempsychosis of Empedocles. Certain elements imprisoned in the earth for ages return again at last to reanimate exhausted man and improve his social life. The same agency in recent times, and by natural though mysterious laws, has produced from similar materials the gem, which seems to be quite as necessary for the superficial wants of mankind as gold or silver.

In studying the earth's history and examining the successive phases of its development, we are insensibly led to the idea that all these stages, seemingly progressive, never retrograde, were for a definite purpose, if not for the exclusive benefit of mankind. For it is only just before the introduction of

man that some of the highest orders of vegetation, such as the *Rosaceæ*, appear on the earth. There is certainly a marked intent in the appearance of the pear, the apple, plum, cherry, peach, and other fruits, with the true grasses, late in the tertiary period.

We may also trace this suggestive progression in the development of even insect life. In the Silurian age the hum of the insect was unheard; and it was not until the oölitic period that this form of animal life appeared. A fossil gem — the amber — reveals the time of the birth of the insect dearest to man; and it was not until the eocene change that the earth heard for the first time

“The soft murmur of the vagrant bee.”

May we not also place in the same category of possible intents the late deposition of the diamond? It is not so very strange, after all, when we come to consider the vast field that lies within the range of the argument.

CHAPTER V.

PHYSICAL PROPERTIES, ETC.

BEFORE explaining, or rather attempting to explain, the phenomena of some of the prominent physical properties of the mineral, it is proper that we should give a description of its forms and its natural appearance as it is taken from the mines, so that our reader may become more familiar with the subject. We will not, however, venture very far among the dry details of crystallography, even if it be a subject of great interest to the student in science. The stone which so readily attracts the eye by its dazzling splendors after it has received a definite form and polish from art, is seldom attractive to the view unless it occurs in a rare and perfect form of crystallization. Even then, in this primitive state it exhibits none of the rainbow play of color which makes the stone so celebrated and so beautiful. In reality, in these rare conditions it is seldom if ever so lustrous and pleasing to the sight as crystals of many other minerals. In general, the diamond is so obscure in its attractions that practised eyes are required for its search.

Recently the distinguished savant Von Tschudi, in visiting some of the diamond mines of Brazil, was unable to distinguish readily the gems as they lay in the washed cascalho, while the trained eyes of the negro miners picked them out with ease. It has been stated that the diamonds are always or nearly always covered with an earthy crust of various hues, especially greenish or yellowish, which is hardly the fact; for what appears to be a crust is often caused by the salient edges of the laminae, among which a little earthy or coloring matter has been introduced. These extraneous colors generally disappear when the surface of the stone is removed; and, in fact, the degree of their intensity is very much modified when the rough gem is placed in alcohol or in any fluid of high refraction.

The dull, whitish appearance seen in the natural diamonds is also produced by the action of fire, which raises the edges of the laminae, producing a faint milky aspect.

The primitive form of the mineral is the octahedron, and many irregular masses may be reduced by cleavage to that of a double pyramid. These octahedral crystals are sometimes as perfect in outline as a mathematical model, with clean-cut angles and smooth faces. In some specimens the edges may be truncated, that is, as if they had been flattened or ground off by mechanical means. Generally, however, the crystals are of the form of the octahedrons with rounded faces. The dodecahedrons, with their

twelve faces, and the cubes, with their four sides, may also be reduced by cleavage to the primitive form of the double pyramid. Sometimes two crystals are united, forming what are called hemitrope or twin crystals. Then, again, a number may be grouped together, assuming on the whole a globular-like mass. But they are decidedly different from the globular, which in their form of crystallization radiate from the centre of the crystal.

The variety of diamond called boart, or bort, deriving its name from the supposed abortive attempt of nature to form a perfect crystal, is also quite deficient in cleavage, or its laminæ are so irregular as to render splitting quite impossible and the cutting of the stone equally so. The transparency of these forms is also affected by the arrangement of crystallization; hence they are generally crushed into powder for polishing material or used for various purposes in the arts. The specific gravity of these varieties seems to be influenced by the manner of crystallization. For instances, we find that the fine transparent crystals have a specific gravity of 3.55 (water being considered the standard as 1), while the bort is somewhat less; and the massive variety called the carbonado varies from 3 to 3.4, according to the amount of earthy matter it may contain. It has also been asserted that the blue, the green, the orange, and the red varieties are heavier than the white. The phenomena of electricity observed in the diamond are not remarkable, and are inferior to most

of the gems. Some of the precious stones when excited retain their electrical properties for hours or even days, but the diamond loses it almost immediately. It exhibits vitreous electricity when rubbed.

Much has been said and written concerning the artificial phosphorescence exhibited by the diamond when removed to a dark room after having been exposed for a short time to the sun's rays. We are not able to verify this statement, and feel inclined to doubt its correctness, although we have been assured by experimenters of the fact.

One of the most remarkable properties of the diamond is its extreme hardness, in which it far exceeds all known substances in the mineral kingdom. This peculiarity is due to the substance itself, but appears to be modified by its color and its form of crystallization like some other minerals.

The more perfectly the crystal is formed, the easier its laminae become detached, and the softer the substance appears to be. In the globular forms, which are quite deficient in cleavage planes, the hardness is excessive, and often resists the most determined efforts of the lapidary. Even in fine crystals we shall find that certain angles are harder than others; and we may observe the same relative degree among crystals of other minerals, like those of the topaz. In the large transparent diamonds of irregular form, spots of excessive hardness are often found. These are called by the lapidaries "knots," and appear to be due to a change in the process of crystallization.

The coloring matter, or the mode of its formation, seems to affect the degree of hardness in many minerals; and in respect to the diamond, the rare crystallized black form is harder than the limpid or lighter colored.

Some years ago a black diamond from Borneo was placed in the hand of Gallais the lapidary, to be experimented upon at the expense of the French Institute. The chief object of the test was to ascertain the relative degree of hardness in comparison with some of the other varieties of diamond. In this trial the lapidary wore out his steel wheel and a large quantity of ordinary diamond dust without making the least impression on the surface of the black diamond. Although heavily loaded with weights, it lost none of its roughness, and was heated almost to whiteness by the friction of the wheel, which revolved with great velocity. During the period of this extreme velocity it is reported that a shower of sparks was emitted; but how shall we account for this scintillation, when the ordinary transparent diamond does not give forth sparks when struck by steel?

The carbonado, which is amorphous and without cleavage, is also extremely hard. The term "adamas," which the ancients bestowed upon it as denoting an invincible infrangibility, is not quite appropriate; for although it is far superior in hardness to all other known substances, it is in reality very fragile. And in the power to resist the effect

of shock it is also inferior to some of the other gems, and especially the sapphire. Therefore several mineralogists have thought that the ancients really applied the term to steel or to some of the varieties of corundum, like the ruby and the sapphire, and not the diamond. It is curious that this property should be ascribed erroneously to the diamond for so many ages, when a trifling experiment would have disclosed the real condition of things. In the days of the poet Lucretius the gem was believed to be able to resist violent blows.

— “adamantina saxa
Prima acie constant, ictus contemnere sueta.”

Pliny entertained the same idea, and also that its infrangibility could be overcome only by first steeping it in goats' blood. Even in mediæval times Ben Mansur, the Persian mineralogist, gravely states that a diamond laid upon the anvil and struck by a hammer would not be broken, but would be driven by the violence of the blow into the substance of the anvil. This stupid but wide-spread idea has prevailed even in modern times; and many a gem has been sacrificed by the ignorant in testing the character of the stone. The brittleness of the gem is partly due to its singular cleavage, which in regular crystals is so perfect and uniform as to permit the lapidary to remove the laminae so as to entirely demolish the structure of the crystal. But when once accomplished, no artisan, however skilful, can replace

them again. The facility with which the stone may be separated was known in ancient times among the Hindoos, and probably in Europe as early as the sixteenth century, as De Boot knew of a physician who could divide the diamond into thin scales like a piece of talc; but it was forgotten until Wollaston not many years ago stumbled upon the secret of cleavage and made it known to modern science.

The real charm and value of the diamond lie in its remarkable brilliancy, and in the wonderful prismatic display of the bright and beautiful colors, which are constantly fugitive, but perpetually returning, as the learned Abbé Haiiy elegantly expresses it. When a ray of light is reflected from the surface of a body, a particular impression is conveyed to the eye, which we may properly term the *eclat*. This impression is often so decided and so varied in its effects, that we are able to distinguish certain substances at a glance; and the reflection from the diamond exhibits a peculiarity which is seen only in a very few substances. This is known as the *adamantine flash*, and none of the gems display it to any marked degree except the rare zircon. We witness the perfection of this property in the black and opaque but crystallized diamond, when faceted by art; and also in some few minerals of which we shall soon make mention. When the rays of light are refracted, after passing through the transparent diamond after it has been cut in a certain manner, and its facets are arranged in an exact relation to each other, then we obtain

the remarkable exhibition of color which is known as the prismatic display. This singular property is seen in perfection, or even to any considerable degree, only in the diamond, among all the gems thus far known. But art, however, has succeeded in imitating it in one of her productions of glass, and so admirably, that under favorable circumstances it is quite impossible for the eye alone to distinguish the artificial from the real gem. Some of the theories relating to the causes of these phenomena we will discuss hereafter, and at the present will only say that it is to modern science the diamond owes the full development of its latent beauty; and that the result was not attained until Newton demonstrated the laws that govern the refraction of light. It is only in the brilliant and rose-cut forms, or their modifications, when made with mathematical precision, that the brilliancy and beauty of the stone is displayed in perfection. The ancients, therefore, were not acquainted with the full splendors of the gem. For, being ignorant of the laws of refraction of light, they polished the stone chiefly with the view of preserving its greatest weight; and, at the same time, producing perfect transparency. Hence most of the specimens of ancient and barbaric art are rudely cut, and therefore do not exhibit the degree of beauty which is latent in the mineral. This is also one of the reasons why the luxurious Romans preferred the opal to the diamond, since the polished, or even the rude specimens of opal exhibited their glorious reflec-

tions of wondrous hues, both by day and in artificial light by night; while the diamond, with its natural or polished faces, gave forth no prismatic display in the daylight, and but a slight degree comparatively in artificial light at night.

Whence arises this remarkable brilliancy, and to what particular cause is the property due? This inquiry has afforded a fruitful theme of speculation among philosophers, but at the present time we are content to say that the refractive power of the gem is due to the nature of its substance. This is somewhat indefinite, it is true, but what else can we say?

Under the general belief that the harder the gem the higher its refractive powers would be, it has been maintained that the brilliancy of the diamond arose from the simple property of its excessive hardness. Investigation, however, does not sustain this widespread view. Hardness, indeed, may have considerable relation with the arrangement and form of the molecules composing the gem, for in the same crystal it is not uniform,—some faces and angles being harder than others,—but it does not determine the degree of brilliancy. To strengthen this statement we will take for instances the soft minerals, crocoisite, the chromate of lead; the Greenockite, the sulphuret of cadmium; and the octahedrite, the oxide of titanium, which exceed even the diamond in brilliancy. There are also other decided examples among the transparent minerals to sustain this view; the most remarkable of which perhaps may be found in the zircon, a

gem which is soft as quartz; yet it ranks next to the diamond in brightness, and far surpasses in eclat every other gem, even the sapphire, which is next to the diamond in hardness. Density does not seem to have anything to do with the determination of the refractive power of gems, for the garnet, spinel, sapphire, and zircon are much heavier than the diamond, and are yet far inferior in brilliancy. The topaz is exactly of the same specific gravity as the diamond (3.55), but nevertheless its refractive powers have but little more than one half the energy of the diamond. The relative brilliancy of the diamond to that of the purest limpid quartz is 8 to 3; but the relative density is only as 4 to 3. All diamonds do not exhibit the same degree of brilliancy, because they do not possess alike the same quality of purity or perfection of crystallization.

We often observe among the minerals that the most perfect specimens are found of a diminutive size; and we shall also find that the finest and purest types of the diamond occur in stones of little weight. The larger crystals, or amorphous masses, seem to be wanting in purity and brightness as compared with the lesser; and this peculiarity may be observed well marked in some of the other gems. Here, then, we may find material for the argument that the degree of brilliancy is in a measure due to the perfection of the crystallization of the stone; and, therefore, the larger and coarser the laminæ of the crystal the less will be its brightness. One thing,

however, is certain; that the most brilliant gems are obtained from stones of no great weight, and which also seem, from their form, to indicate a nodular arrangement of particles in their formation; or, in other words, a certain concentric manner of crystallization. This form of deposition is not peculiar to the diamond, but is clearly shown in the sapphires, topazes, chrysoberyls, tourmalines; and the finest specimens of these gems are cut from these nodular forms. We think we are correct in stating that the greatest brilliancy and the most beautiful prismatic display may be observed in diamonds of less than ten karats in weight. In fact, the diminution of brilliancy in the gem, when above twenty karats, is easily discerned by the eye alone, as compared with the vivid and adamantine flash of a pure and perfect four or eight karat stone. The same peculiarity may be observed in the little globular masses of the chrysoberyl, which are seldom larger than a pea in size, but which, when cut, exhibit flashes of fire which are only equalled or excelled by the diamond, or the rarer zircon. We can hardly realize that the little rounded pebbles of white topaz, known as *gouttes d'eau*, "drops of water," will yield gems of such lustre as to be often exhibited, and even sold for the diamond. Yet the larger irregular masses, or finely crystallized specimens of the same mineral, do not afford gems of unusual brilliancy. In these instances we may affirm that the form or mode of crystallization has something to do with the degree of brilliancy.

The prismatic play of color which this gem alone possesses to any considerable degree constitutes its chief charm, and its cause has been a matter of earnest study among opticians. A plausible theory has lately been advanced by an English philosopher that the colored rays are produced by the relation of the high refractive to its very low dispersive power. For instance, this refractive power in the diamond, or, in other words, its property of bending a ray of light falling obliquely upon its surface, is 2.439, while that of water is only 1.336, and that of glass 1.500. But its power of dispersing a ray of white light, or, in other words, of separating it into its compound colors in reference to its refractive power, is only 0.038, while that of glass is 0.052. Hence it is surmised that this inferiority of dispersive power is required for the production of the splendid colored reflections which constitute the glory of the gem. It is also maintained that this high refractive power separates the red and the blue rays more than a high dispersive power would in other transparent bodies, and to such degree as to allow each color of the spectrum its full force. As example, the zircon, with its inferior reflections, is offered, its refraction being 1.99 on the established scale, while its dispersive power is as high as 0.044. The relations of the spinel are also as 1.81 to 0.040, and neither does the gem display the rainbow hues. This theory is certainly ingenious, and if correct the test may be applied to other transparent minerals

possessing similar relations. We may, therefore, expect the white garnet to exhibit the property of prismatic display, as it has a refractive power of 1.81 and a dispersive power of 0.033. But, unfortunately, perfectly pure and transparent white garnets are unknown, and we must therefore turn to other minerals for comparison.

To the white tourmaline, then, we will apply the test, since this mineral has a refractive power of 1.66, with a dispersive power of only 0.028. Here, then, we have nearly the same relation as observed in the diamond; and, if the theory be correct, we may reasonably expect the exhibition of the same phenomena. But, upon examination of several perfectly white and transparent tourmalines from Mt. Mica, cut into regular brilliants, we have failed to detect an increase of prismatic display, or even discover any evidence to lend support to the plausibility of the hypothesis. We, therefore, reluctantly turn to other arguments for a solution of this most interesting problem.

The snow-white diamond displays the rainbow hues in the greatest perfection; and this is the reason why this quality is sought for in preference to the light buff or deeper yellow, which are in reality more brilliant. The deeper the hue of the gem, the less becomes the prismatic display; and when the diamond becomes of deep and decided hue, the colored reflections cease altogether. It is somewhat singular that the colored gems are gen-

erally more brilliant than the pure white, that is, if the color is not so deep as to affect the transparency of the stone. For examples, we shall find that the white sapphire has an index of refraction equal to 1.768, while the blue has 1.794, and the red 1.779. The refractive of the white topaz is 1.610, while the yellow is 1.632.

The brilliancy and rainbow play of the diamond is not so apparent by daylight as by certain kinds of artificial light, when all its latent beauties are called forth as if by magic. The light of the camp-fire in the obscurity of night produces a marvellous effect upon the polished stone; and it is no wonder that the savage heart of the Russian General, Suvaroff, was fascinated by the vivid gleams of his treasured diamonds when viewed at night in the flickering beams of his bivouac fire. It may seem singular that the brilliant white light of gas does not display the qualities of the diamond as the duller flame of the wax candle. The secret lies, perhaps, in the difference in their spectra. Nevertheless, there is a great difference in their effects upon the gem, and it is a fact that the wax candle far exceeds the gas-light in calling forth the latent splendors of the gem. Therefore, we can assert that the brilliancy of toilets where the diamond is much worn depends greatly upon the manner of illuminating the apartment.

We now come to another interesting problem in the study of the nature of the diamond. We refer to the various colors of the gem. As we have main-

tained that the mineral is of vegetable origin we may be expected to explain the phenomena of its color upon this hypothesis, and also account for the various changes of the gem when exposed to the effects of heat or the fire test. But we must admit with candor that our views concerning this physical property are decidedly unsatisfactory, and shall refer the reader to one of the chapters in our treatise on the Tourmaline, in which are grouped some of the theories relating to the subject. In fact, we may repeat the remarks of Huyghens, who said at the end of the seventeenth century: "In spite of the labors of Newton, no one has yet fully discovered the cause of the color of bodies." "We must, then," says M. Babinet, "admire, without penetrating their secret, the unparalleled red of the Oriental ruby, the pure yellow of the topaz, the unmingled greenness of the emerald, the soft blue of the sapphire, and the rich violet of the amethyst. This is not the only thing the discovery of which we shall leave to posterity."

The color-suite of the mineral is much more extensive and varied than has been generally admitted by mineralogists. We are led to infer from their works that white is the prevailing hue of the gem; but Beudant declares that perfect limpidity and whiteness is rare comparatively, and that the stone is generally affected with yellowish or brownish tints. But what becomes of the vast numbers of these clouded or tinged and inferior gems, if the mines yield so many of them in comparison with

the snow-white? Are they consumed in polishing others, or expended in the arts, or have the lapidaries secret processes by which these objectionable tints are expunged from the stone?

Barbot, the French jeweller, declares that, by means of certain particular and energetic agents, aided by a proper degree of heat, he is able to remove the greens of all shades, the light-red, and the yellow, when the coloring matter is superficial, or even situated between the external laminae. We are inclined to believe Barbot in this particular reference, especially as he admits that he is unable to change much the deep-yellow, the brown, and the smoky-tinted stones. Of the yellow tints, the diamond affords the most beautiful examples, and far surpasses in variety all the other gems, with the exception perhaps of quartz. To the yellow topaz it is decidedly superior in its range of shades, and in some of its chrome-like tints it is without an equal among the gems. This hue of chrome mixed with a faint tinge of green is a delicate, yet gorgeous, shade, and is not often seen. Stones of a canary-yellow are quite common, and perfect resemblances to the Brazilian topaz are not rare. From these hues they pass insensibly into brown and black. The transparent light-brown stones are often modified in hue when exposed to the action of heat, and some of them exhibit remarkable changes of color. M. Halpen, in 1866, exhibited to the French Academy of Sciences a singular diamond of this descrip-

tion. It was a stone of sixty grains weight, and of a whitish hue tinged slightly with brown. But when it was exposed to the action of heat it changed its tint to a fine rose-color, and retained it for six or eight days, when it gradually returned to its natural hue. This remarkable effect was not an accidental result, but was tried five times at the Academy with success and without injury to the stone. In other colored diamonds the action of fire often produces permanent effects, and sometimes a brownish hue is converted into a decided red color. Buckman saw a diamond with a large brown spot in its interior change to a beautiful red, like that of the Balais ruby, after the stone had been placed in borax and exposed to a red heat. Another stone, however, of similar appearance, likewise exposed, changed to a permanent black, to the great injury of the gem and dismay of the experimenter. The red varieties of this mineral are rarely of deep tints, but when they exhibit a decided red color they form the most gorgeous of gems. The largest and finest of this description known is the ten-karat stone purchased by the Emperor Paul of Russia for one hundred thousand roubles. This gem may be considered the marvel of the mineral kingdom. The princely collection of the late Mr. Hope possessed one of a blood-red garnet shade, also a fine twelve and a half karat stone of an apricot hue, besides several others of a beautiful hyacinth red, or of a lilac pink.

The celebrated cabinet of gems belonging to the late Marquis de Drèe contained a large and beautiful rose-colored diamond. Prince Riccia, of Naples, acquired in 1830 a very fine rose-colored brilliant of fifteen karats weight. M. Halpen, in 1838, exhibited a magnificent gem of this description of twenty-two and a half karats. Among the crown jewels of France there are several splendid brilliants of a peach-blossom hue, and there are also quite a number to be seen among the princely caskets of Europe. It is, however, somewhat remarkable that this gem, although possessing several shades of red, never, or very rarely, occurs of a decided violet or purple color. Diamonds of a light aqua-marine of greenish and bluish tints are not rare, but those of a positive grass-green color are uncommon. Perfect stones of decided green form the most magnificent gems of this color. The velvety green flashed forth by the extraordinary power of the stone surpasses beyond comparison the finest emeralds with their duller reflections. In fact, we may term the splendid green diamond of forty karats, now in the Green Vaults at Dresden, as being one of the five paragons among all the gems of the world.

In the Museum of Natural History in Paris there are some small diamonds of very fine shades of green, which were collected by the celebrated Werner. Some of the diamonds which have a slight milky hue, when cut so as to allow the play of light within the stone, present a very beautiful appearance. The varied

flashes of colored rays, in contrast with the duller hues of the stone, appear like the charming effects of the finest specimens of Siberian adularia, and are therefore entitled to the name of aventurine diamonds.

The asterism, or star-like form of six rays, which is so beautifully displayed by the sapphire when it assumes a certain form of internal arrangement of crystallization, is sometimes, though very rarely, witnessed in the diamond. There is one of this description to be seen in the Museum of the *Jardin des Plantes* in Paris.

The diamond is rarely found of a perfect shade of blue; but there are now in Europe several magnificent gems of this description. Foremost of all of them stood the famous blue diamond of $67\frac{2}{16}$ karats, belonging to the French crown. This marvel of Nature's work, with two other diamonds of paler hue and lesser weight, — thirty-one and ten karats respectively, — disappeared on that fatal night of September, 1792, and have never since been discovered. At the present day, the finest known is that which belongs to the princely collection of the late Mr. Hope, and weighs $44\frac{1}{4}$ karats. It is of a fine blue; but exhibits that steel-like tint which is so often seen in sapphires. The next in value and beauty is that which is preserved at Munich. It is a magnificent gem of thirty-six karats weight, and of superb color.

The crystallized black diamond is a very rare stone; and, when polished, it forms a unique gem, since it

exhibits a remarkable brilliancy, proceeding, as it were, from darkness itself. We do not now refer to the compact variety, known as carbon or carbonado, which is never found except in the amorphous form, but the crystalline variety, which is of greater density and more homogeneous. The famous collector, Dogni, possessed a very fine specimen of this kind which had been cut with small facets, and exhibited a vivid éclat. It afterwards came into the possession of Mr. Bapst, who disposed of it to Louis XVIII. for the sum of twenty-four thousand francs. A large and unique diamond, almost black, formerly belonged to the late Duke of York. Several of the European mineralogical cabinets have interesting and valuable collections of colored diamonds; but the finest is to be seen in the Imperial Cabinet of Minerals at Vienna. This beautiful and complete series, which illustrates the great range of the color-suite of the gem, was the life-long labor of a Tyrolese gentleman, by the name of Helmreicher. This enthusiastic amateur went to Brazil, and passed most of his life in the mines, searching for the gems.

We will not fatigue our readers with long quotations of authors and philosophers concerning the spiritual properties of this gem; but we will briefly say, that a well-selected compilation of all these views and speculations, extending back to very early times, would form a chapter by itself, and quite as interesting as absurd. Even the good sense of the Latin philosopher Pliny was affected so far as to indulge

in the belief that the gem was not only an antidote to poison, but also freed the mind from vain fears. Late in mediæval times, the adamas was invested with supernatural powers, and regarded as a spiritual creation. And even in the commencement of the seventeenth century Boetius de Boot, in his treatise on gems, asserts that the diamond possesses wonderful metaphysical properties; but remarks that they do not reside in the stone *per se*, but belong to the angelic spirits whom it has pleased the Almighty to connect, in a mysterious manner, with certain substances in nature.

CHAPTER VI.

THE TURKISH CASKET AND ANCIENT GEMS.

THE Sultan of Turkey is said to possess many wonderful diamonds and other gems among the regalia and ornaments treasured up in the strongholds of the Seraglio; but very little is known, definitely and positively, concerning them.

In 1840 the Sultan granted a firman to the Duke of Devonshire and a party of friends, permitting them to examine the court-jewels. One of this party, my illustrious kinsman Dr. Cyrus Hamlin, has recently described to me the impression they made upon his memory, more than thirty years ago. The number of articles was too great, and their effect too dazzling, for the memory to be able to particularize them after so long an interval of time. He remembers that in two strongly built rooms, and displayed on mats, or cushions of velvet, were a vast number of decorations and insignia, crescents, tiaras, clasps, and necklaces, etc. Among the latter was one of wondrous beauty and perfection, which the Sultan wished to present to the Princess of Wales on her visit to Stamboul. The beautiful Princess wore it at the reception she gave the Sultan and his cabinet, but for various reasons was obliged to return the magnificent gift.

Among the arms of former Sultans were the swords of Al-u-deen, and Solyman the Magnificent. Besides their historical renown, they were interesting on account of their superb workmanship, and their decorations with gems of wonderful beauty.

In 1880 an American traveller was admitted to a view of some of the rooms in the Treasury of the Seraglio, and from memory of what he saw there wrote the following description: —

“In the centre of the first room is a throne. It is a platform about two and one half feet square, with a cushion of cloth-of-gold embroidered with pearls, rubies, and diamonds. Around three sides of the cushion is a low rail supported by miniature columns, and standing about eight inches high. The whole body of the throne is overlaid with plates of gold, and the rail is studded with clusters of rubies symmetrically arranged. The first thought that strikes one on seeing this throne is the surpassing value of its jewels, and the second is the superlative discomfort of the concern viewed as a resting-place. The rail, which answers for arms and back, is perpendicular and rectangular, and could rest neither the arms nor the back of the enthroned Sultan. Uneasy the man that sits the throne, must be the Turkish equivalent of the proverb concerning the wearer of the crown. In one corner of the room is another throne, said to be the throne of Nadir Shah, of Persia. It is of some dark wood, delicately inlaid with ivory and pearl, and has a canopy of the same materials, from the centre of which hangs a great gold ball decorated with precious stones.

“In one of the cabinets is the cradle of the imperial

babies. It stands low on its rockers, like the cradles now in use in Turkey. The two ends rise a foot above the mattress, and are connected at the top by a bar which runs lengthwise of the cradle. The whole is of solid gold, and the outside of the cradle is crusted with pearls, diamonds, rubies, and turquoises.

“In one of the galleries are the effigies of all the Sultans of Turkey down to Mahmoud the Reformer. The figures are dressed in what professes to be the state robes actually worn by the Sultans whom they represent. The costumes are all different, and differ very much in cut, indicating the changes of fashion during the last five hundred years. But all these dresses agree in the feature of richness. Cloth-of-gold and silk brocade are the materials, and many of the figures are weighed down with jewels. The swords or daggers which all of the figures wear are especially magnificent in their display of precious stones. The dagger of Sultan Mahomet II., the conqueror of Constantinople, has in its handle an emerald full two inches long and an inch thick. I use the adjective ‘thick’ advisedly, for solidity of splendor is the impression left on the mind by that emerald. All of these gentlemen wore large turbans, and bedecked their turbans with diamonds. The only exceptions are seen in the case of the boy Sultan, Osman II., who was killed by his janissaries before he had attained man’s estate, and in the case of Sultan Mahmoud, the Reformer, who alone of all his kinsmen appears in European broadcloth. His head-dress is the fez cap, with a plume of bird-of-paradise feathers fastened in place by a great spray of diamonds.

“But there is no such thing as describing in detail the splendors of these rooms. There are antique arms and

armor heavy with gold and jewels ; there are innumerable horse-trappings and saddles, covered with plates of gold and studded with emeralds, rubies, topazes, diamonds, and pearls ; there are saddle-cloths embroidered with precious stones. Several sofa-covers hang in the cabinets as background to the smaller articles. They are worth \$150,000 apiece, and are heavy cloth-of-gold embroidered with seed pearls. In one of the cabinets are three uncut emeralds, the largest being the size of a man's fist, and the smallest larger than a hen's egg. The birds of the palace realized the experience of dwelling in cages of gold, for here they hang, — these ancient cages of gold wire. Some of the cages have a clock in the bottom, face downward, so that the royal household might see the time of day as they lolled on the divans beneath. The Imperial Princes appear to have gone to school in childhood, for here are the satchels in which they carried their books, — bags of velvet embroidered with gold and pearls and diamonds. In another place you see many mottoes from the Koran, embroidered in diamonds on red velvet. There are amber mouthpieces for pipes, studded with diamonds and rubies. There are coffee-sets and tea-sets of all degrees of magnificence ; and vases of crystal and agate and onyx, — some of these profusely bejewelled. There are inkstands and snuff-boxes innumerable, all glittering with priceless gems. There are royal knives and forks and spoons of solid gold, with jewels on their handles. There is an immense array of clocks. One would suppose that every Sultan had his private clock, which ceased to tick when his heart stopped beating.

“ Among the articles in this imperial treasure-house are many which must be regarded simply as toys. Of such is

a tea-set of tortoise-shell as thin as paper. Another toy is a lady's parasol of white silk exquisitely embroidered with gold, the staff of which is a single branch of coral so long and true and well adapted to its purpose that one might search years and fail to find its like. There are also very many fans of varying degrees of splendor. Another one of the toys is a figure of a sultan seated on his throne under a golden canopy ribbed with alternate rubies and emeralds. The whole structure is, perhaps, six inches high. The body of the figure is a single huge pearl, the lower extremities are carved from a blue turquoise, and the turban is a solid mass of diamonds. There is literally no end to the marvels of this place. After every conceivable use has been made of jewels, the surplus unmounted stones are gathered by handfuls into crystal bowls at one end of the cabinets in the second room. The spoils of all the empires which preceded the Ottoman Empire are heaped up in these two dingy stone rooms in the old Seraglio at Constantinople.

"It requires some time fully to realize the enormous wealth of this treasure-house. But slowly one becomes convinced that these treasures can only be the accumulation of centuries, and represent the heritage of the Ottomans from all their predecessors. Once assured of this, the traveller will find a peculiar fitness in the aspect and attitude of the guards of the place. They stand, dressed in spotless black broadcloth, four or five feet apart, in line along the cabinets, perfectly motionless. And they are solemn of countenance, as if standing by the catafalque of some deceased monarch lying in state for the homage of his subjects.

"I first visited this place shortly after the late war with

Russia. The Turkish Government was in sore straits for the means of daily existence. The Sultan had just sent his gold and silver plate to the mint to be coined in order to buy up the depreciated paper currency. The people of whole districts were at the verge of starvation because the \$80,000,000 of paper money in circulation had lost its purchasing power. I was naturally incredulous as to the reality of what I had seen. If these jewels were real, their value must be sufficient to pay off the dishonored bonds of Turkey. It did not seem reasonable that the Turkish Government could have passed through such straits as those to which it had been reduced by the war without having recourse to their treasure-house. Multitudes of articles in those rooms have an immense antique and artistic value entirely aside from their intrinsic value.

“I spoke in this strain to one of the officers of the Imperial Ottoman Bank, and he replied that the jewels were unquestionably genuine. He said that during the war the Turks borrowed \$30,000,000 from the bank. The loan was to be secured by pledge of jewels from this treasure-house, and the bank officials were told to help themselves from its riches. They selected enough of the jewels to guarantee them amply against loss. These jewels were packed in three small boxes and removed to the vaults of the bank. But their removal left no gap in the great accumulation. Afterward I asked a Turk why the Government did not sell this treasure and be at ease. ‘Sell it?’ said the Turk; ‘why, it is the treasure of all the Sultans! It cannot be sold.’

“So there is this treasure-house to-day—a grand relic of ancient splendor—in the hands of the broken, ruined remnant of the house of Osman. The possession of this

enormous wealth must be a terrible temptation at times to the worn man who wears the Sacred Sword of Turkey. But he clings to it through all his adversity, for it is the only relic left to the Empire of the glory of its past."

Two of the oldest authenticated diamonds in Europe belong to the Sultan. One of them, a beautiful stone of twenty-four karats, and which adorns the aigrette of the Imperial plume on days of parade, was found in Constantinople in the time of Mahomet IV. It was picked up by a poor man upon a heap of dirt not far from the gate of Egrikapon. The finder had no idea of the value of his treasure, and sold it for a trifle. Passing through the hands of several purchasers, the gem was finally brought to the notice of the guild of goldsmiths, when its true character was made known. It was then seized by the Grand Vizier and annexed to the Imperial treasures by an edict. The other diamond, which is of greater beauty and weight, was found by a child playing in the Haiwanserai, or the Hebdomon, during the reign of Mahomet II., or about the middle of the fifteenth century. It was believed by the antiquaries that these gems belonged to the treasures of ancient Byzantium, and that the last may have adorned the crown of the Byzantine emperors. This jewel was lost by the fault of the masters of the wardrobe on the place of the Hebdomon during a triumphal march in the twenty-second year of the reign of Justinian, or 548 A. D. We can learn nothing more concerning the condition of these diamonds when found, but infer

that they were polished, otherwise they probably would not have attracted the notice of the finders.

Lamartine and other historians of the Ottoman Empire allude to its treasury as in reality a wonderful museum of art, whose wealth is unknown and perhaps incalculable. They state that in four vast apartments beneath the Seraglio, vaulted subterraneously to shelter them from the ravages of fire, are collected the sacred relics, the jewels, the gems, and a great variety of objects of value that have accumulated since the origin of the monarchy. The antiquary may well say in viewing this collection of treasure, "The spoils of the universe are here represented." For whatever of value and historic worth was saved from the wreck of Rome or preserved from the accumulations of the Greek conquests was gathered at Byzantium. In this fatal Acropolis at the extreme point of the continent of Europe, the Greek Empire had indeed collected all its monuments, all its masterpieces, all its riches, as if to tempt fate and render the prize all the more glittering to the eyes of the Ottomans.

Many, if not the most, of these priceless relics and treasures fell into the clutches of the Turks when Constantinople was won. Nothing escaped at that time. There is no doubt but that many remarkable gems were captured at this period, but concerning their nature and their value history has left us but little more than conjecture.

However, the historians speak definitely of the

Greek emperors during their prosperity as displaying a magnificence worthy of the luxurious periods of Rome. The costumes of these rulers are described as marvels of art, and their jewels as of inestimable price. The accounts remind the reader of the descriptions left by Claudian of the treasures of Theodosius :—

“ Sidonian mantles rich with purple fold,
Belts bossed with pearls, robes stiff with gems and gold,
And breastplates shining green with emeralds bright,
And helmets rich with precious sapphires dight.”

That diamonds were then used as gems and held in high estimation may be inferred from the single remark of the indignant historian, “One man buys entire Syria with the diamonds of his wife.” Perhaps the word diamond was thus used figuratively, and the expression referred to gems and jewels in general.

Besides these accumulations of the Greeks, much of the spoil collected by Timour in his merciless sack of India and Persia came afterwards into the possession of the Emirs of Asiatic Turkey, and eventually drifted to Constantinople. What these treasures were may be imagined from the glowing descriptions given by the historians of the last scenes of the life and reign of the great Tatar conqueror. The magnificent fêtes given by Timour on his return to Samarcand after the conquest of Arabia and Eastern Turkey, surpassed in historic splendor even the descriptions of Oriental fable. In the gigantic palace

erected by him during the days of leisure between his conquests, and which was one of the marvels of the architectural world, he celebrated in a single day the marriage of six of his grandsons. The spoils of the universe were displayed in the decorations of the marriage feasts. The wealth of the Indies had been transferred to the home of the Tatar. Pearls, sapphires, and diamonds were showered in profusion upon the married pairs. Nine times did they change their apparel, and, arrayed in different solid cinctures of a tissue of pearls and diamonds, present themselves to the view of Timour, — the last festivities of the great Tatar chieftain.

This wonderful display of mediæval times recalls to the mind of the antiquary the magnificent marriage feasts of Alexander and his eighty lieutenants with their beautiful Persian brides. This historic festivity took place in Persia 324 B. C., when the Greek army returned from India, and continued for five days. Like that of Timour, it displayed in its magnificence the gems and art treasures of conquered Asia. The diamond, however, does not appear. Art evidently had not then acquired the process by which the natural and rough crystal is developed into a gem of sparkling and lustrous beauty. And the selected brides, to enhance their natural charms, wore pearls, emeralds, rubies, and turquoises wreathed among their tresses of hair, or in their necklaces, amulets, anklets, and bracelets.

Among the treasures supposed to be gathered in

these catacombs of an Empire's wealth at Constantinople, there is one especially dear to the *dilettante*, — the wondrous ring of Ahmed. Vanquished in the long, bloody, and desperate battle fought upon the slopes of Olympus when entire Turkey was the prize, Ahmed offered to his victorious brother Selim I. a single gem to purchase the honors of a tomb. This precious stone was set in a ring richly chased in gold, and was the gift of Bajazet II. to the most beloved of his children. It was as dear as the ring Solomon wore, and which was gifted with wonderful powers extending even to the invisible world. But it was as fatal as that which Polycrates cast into the sea as an offering to the gods for his long-continued prosperity. History does not mention the nature of this remarkable treasure, nor relate whether it was diamond, sapphire, or emerald. However, we may glean some idea as to its rarity and beauty from the statement that the Genoese jewellers who were then the gem-venders of the world placed its value at a year's revenue of all Asia Minor.

The antiquary may also find among these dusty and forgotten collections some of the lost gems and beautiful works of art of ancient Rome, or, perhaps, the rich ornaments brought home by the Macedonian soldiers from their Eastern triumphs, or the holy relics which the Arabs removed from the Gothic treasury at Toledo, and concealed in their fortresses and fastnesses of Syria. In mediæval times the precious stones and all that was marvellous in decorative art

that fell into the hands of the Genoese and Venetian merchants went to Constantinople to adorn the magnificence of the Turkish nobles. Whatever the Mamelukes had gathered together in their treasury in Egypt, rescued from the dust of the catacombs, or wrested from the isolated strongholds of Western Africa, was seized by one fell swoop of the Turkish horsemen and transferred to the Bosphorus.

The extravagance of the Turkish nobility during some of the brilliant reigns of the Empire was extreme, and seems to belong to the golden age of fable rather than to the truthful periods of history. We can form some idea of the wealth of these favorites of the Sultans from the glowing descriptions left by the Ottoman historians.

Sinan-Pasha, the Turkish Marius, seven times exiled and seven times consul, yet dying at last at eighty while conducting the army to Hungary, left a heritage worthy of a king. Among his immense possessions the historian enumerates thirty-two cuirasses incrustated with rubies, fifteen strings of huge pearls, sixty bushels of fine pearls, seven tablecloths bespangled with diamonds, all accumulated during campaigns in Europe, Asia, and Africa. Another potentate, the Grand Vizier Sokolli, exhibited a love of magnificence worthy of the most reckless Roman profligates. His garden, near Tokat, was the wonder of Asia Minor, and was called the garden of Paradise, "Djennet-bagui." Its parterres, instead of being covered with natural flowers, sparkled with

rubies and precious stones imitating the form of flowers and surpassing them in splendor. This unique display of art was finally destroyed by the victorious barbarian hordes from Asia, and the beautiful imitations of flowering vegetation were borne off to the distant steppes to be transferred into ornaments for arms and horse-gear.

In forming a conjecture of the value of the treasures of the Turkish Seraglio, the antiquary naturally and justly recalls to memory the magnificence of early history and the numerous spoliations of ancient nations that eventually fell into the grasp of the Greek and Roman Emperors. Let us follow briefly the historian among some of the fragments of history which relate to this subject, and seem to indicate that the treasures of the earth gathered during the last two thousand years in reality drifted in course of time and by the fortunes of war to the Greek Capitol. It is the sad epitome of man's greatness and his insignificance. For the pillage which graced the triumphs of the Greek and Roman arms not only represented the peaceful industry of nations, but they were also often the memorials of the destruction of the earth's fairest hopes.

Rome, in the height of her glory, displayed a magnificence worthy of the valor of her arms and the magnitude of her conquests. Her temples were profusely decorated with gems, and her nobles vied with each other in the possession of the rare and the beautiful. At times the Coliseum exhibited the

wealth of the nation and the liberality of its rulers. The poet who describes the games of Carinus affirms that the porticos of the immense edifice were gilded, and the extensive circles which divided the ranks of spectators from each other were studded with a precious mosaic of beautiful stones, —

“*Balteus in gemmis in lita portico aureo
Certatim radiant,*” etc.

In the triumphs of Rome the spoils of the last conquest were not only displayed, but the accumulated riches of the Empire were ostentatiously exhibited to view at the same time.

To give the reader an idea of the magnificence of these celebrations, we will describe the triumphal entry into the eternal city by Aurelian when returning from the conquest of Palmyra and the nations situated along the great commercial highways to Asia. This was one of the greatest of the Roman triumphs, and spread a dazzling glory over the name of the conqueror. The pomp was opened by the stately procession of twenty enormous elephants, followed by four royal tigers and more than two hundred of the most curious animals from all parts of the world. Then came a fierce and haughty band of sixteen hundred gladiators, selected for their beauty, strength, and skill. The wealth of Asia followed this vanguard of brute strength. Displayed in charming arrangement or carelessly heaped in immense piles, the spectators witnessed the arms, ensigns, and a vast collection of the objects of value and luxury of many

conquered nations. Among the articles of gold were exhibited the numerous crowns of Aurelian, together with the magnificent plate and wardrobe of the Syrian queen. Amidst this glittering array appeared the embassies of foreign and distant nations; and the ambassadors of Ethiopia, Arabia, Persia, India, and China, with their brilliant or picturesque costumes, added greatly to the interest and splendor of the scene. Following these came long trains of captives from various nations, — Goths, Vandals, Sarmatians, Gauls, Syrians, etc., — with the ill-fated emperor, Tetricus, and his son, dressed in Gallic costume. But the most attractive figure of all to the Roman populace was the beautiful form of the celebrated queen of the Syrian deserts. Zenobia was on foot and alone. As if in mockery of human ambition, she preceded the magnificent chariot in which she once hoped to have entered Rome. Her elegant figure was shackled with solid chains of gold, while she tottered under the weight of the inestimable jewels which adorned her natural graces. In the rear appeared the still more sumptuous chariots of Odenatus and of the Persian monarch. The triumphal car which carried Aurelian was resplendent with gems, and was drawn by four stags.

One of the most magnificent exhibitions of extravagance and luxury of ancient times was displayed on the march of Tiridates and his Parthian nobles, when they went to Rome to receive the nominal crown from the hand of Nero. Four thousand se-

lected Parthian cavalry, clothed in rich apparel, escorted the King. The entire expense of the journey, which lasted several months and amounted to more than thirty thousand dollars a day, was paid by the Romans. The triumphal procession traversed Asia Minor, crossed the Hellespont, passed through upper Greece, around the Adriatic, and then down the peninsula to Rome.

It was a great day for Rome when the Parthians approached its walls. The city was illuminated, and decorated with garlands and the movable wealth of the Empire. The Roman nobles were clad in white; and the splendid Pretorian guards, glittering with their arms and decorations, were drawn up in two lines stretching from the end of the Forum to the Rostra. Through these lines of steel, flanked by a vast assemblage of citizens, Tiridates and his proud nobles marched to the Rostra, and received from the hands of Nero the promised diadem. The Empire impoverished herself in this barbaric display and attempt to awe and charm her haughtiest foe. The accumulated spoils of three hundred triumphs at Rome formed a glittering prize to the minds of Alaric and his devoted Goths.

But six years before the capture of the city, Rome displayed her magnificence and her wealth in the ovation given to St. Melania on her return. The extent of the decoration of the temples and their shrines may be inferred from the quotations of the historians. Serena, the wife of the Roman general,

Stilicho, on great occasions wore a magnificent necklace which she borrowed from the statue of Vesta. But the protection of the goddess could not protect the unfortunate woman from being strangled by the Romans during the siege by the Goths.

The fame of these treasures had spread all over the known world. And to the Goths the beauty of gems and the delights of luxuries were not entirely unknown. For, in previous times, they had invaded the coasts of the Euxine Sea and sacked many of the rich cities, like Trebizond. In the pillage of the city by the Goths, Alaric is said to have protected the consecrated plate and ornaments of the temples; but he undoubtedly confiscated the most valuable and notable of the treasures. The booty of the army was immense; and when the victorious soldiers took their departure the roads were incumbered with the rich and weighty spoils. The haughty victors, clad in the vestments of unexpected luxury, might have been seen resting by the wayside, waited on by their captives, — the sons and daughters of Roman senators, — drinking the wine of Italy in golden goblets, decorated with gems.

The treasures obtained by the Goths in the conquest and sack of Italy were borne away with them to Gaul. Besides these, the Gothic chieftains are said to have possessed many valuable gifts from other nations. The record of these wonderful works of art has been lost; but a few scraps of history, here and there, give glimpses of marvellous treasures. When

the Franks pillaged the palace at Narbonne in France, in the sixth century, they found many curious and costly ornaments of gold.

But most of the treasures and choice works were undoubtedly carried along with the army into Spain, and deposited in the Gothic treasury at Toledo. These were eventually captured by the Saracens and sent to Damascus. Thus, by the singular fortunes of war, these remarkable and beautiful relics returned to the Holy Land whence some of them had been taken centuries before. Among these articles was the famous "Missorium," or great dish for the service of the table, weighing five hundred pounds. It was formed of solid gold of exquisite workmanship, richly inlaid with gems, and was the pride of the Goths.

The wonderful emerald table, which has been so enthusiastically described by the Arabian writers, was also seized at the same time. The transparent top of this table was encircled with three rows of fine pearls, supported on three hundred and sixty-five feet, formed of gold and gems. This superb piece of workmanship was valued at five hundred thousand pieces of gold.

The marriage feast of Adolphus, the successor of Alaric, with Placidia, the daughter of the great Theodosius, was a memorable occasion in ancient history. It was celebrated at Narbonne, and displayed the prodigality and magnificence of the Goths. The ceremony was performed according to the lavish fashion

of the Romans and the rude customs of the victors. Adolphus offered to his bride, in accordance with the manner of his nation, the spoils of her country. Fifty beautiful youths, attired in silken robes, presented the happy maiden with one hundred basins, one half of which were filled with gold, and the rest were heaped with gems of an inestimable price. Such was the inconstancy of fortune in those days, and such the cruelty of the times, that only a year after this grand event the beautiful woman, the daughter of a Roman emperor, and the wife of the Gothic chieftain, might have been seen marching on foot with a crowd of vulgar captives, in front of the horse of the assassin of her beloved husband. However, a few short days after the usurpation, the Gothic army, struck with pity and indignation at the sufferings of Placidia, attacked and slew her barbarous master.

Genseric, with his Moors and Vandals, fiercer in their pillage than the Goths of Alaric, ravaged Rome for fourteen days and nights. Everything of value, sacred or profane, was seized and borne away to the galleys of the invaders. Even the Empress Eudoxia was rudely stripped of her ornaments; and the holy relics, brought from Jerusalem by Titus and spared by Alaric, were taken from the temples and transferred to Carthage. One of the vessels, containing a part of the sacred utensils and other treasures, was shipwrecked on the same shore which a thousand years later swallowed up the wonderful and blood-stained emeralds which Cortez wrested from Mexico

and carried with him when wrecked with the Admiral of Castile. The remainder were saved to swell the ponderous pile of booty when Carthage fell before the arms and genius of Belisarius. All these treasures, the collections of the Moor and the Vandal, were transported to the Bosphorus to enrich the city of the conquerors.

To the successful army and its general a triumph was decreed; and it was the first Byzantium had ever seen. The display on this historic occasion was worthy of the army and its hero. The wealth of nations was brought forth to heighten the splendor of the scene. Rich armor, golden thrones, chariots, varied forms of sculpture and furniture, statues, vases, and other objects of art, together with the holy relics of the Jewish Temple, were displayed in the procession.

But the grandest object of all was presented by the noble and majestic form of Belisarius, marching on foot at the head of a band of his bravest officers. Later in life, at the capture of Ravenna, Belisarius obtained the treasures of the Gothic army, which had been collected in that stronghold. These were transferred to the Byzantine palace; but the deserving general was deprived of his hard-won triumph, for Justinian had now become envious of the glory of his subject. The magnificent spectacle of the booty was not exhibited to the populace; but shown only to the flattering and subservient senate.

The results of the Persian conquests largely in-

creased the number, variety, and value of the art and gem collections at Constantinople. The Persian monarch, Chosroes, to arrange and preserve the treasures gathered by rapine or tribute, constructed an elegant palace at Dastagherd beyond the Tigris. In this stronghold, protected in a hundred vaults, were deposited most of the gold, silver, gems, silks, aromatics, and other objects collected from Persia and other countries of Asia. All these fell into the bold hands of the Roman Emperor Heraclius; but a part of them, during an unlucky tempest, were lost in the waves of the Euxine Sea. In the capture of Tauris, Heraclius obtained what were supposed to have been the spoils of Cræsus, which had been transported by Cyrus from the citadel of Sardes.

Once only, before the coming of the Turk, was Constantinople, during its many centuries of varied prosperity and adversity, subjected to serious pillage. Hostile armies had again and again surged up to its almost impregnable walls, only to retire in discomfiture; and it seemed as though the grand old city was protected by some invisible agency from external violence. Internal dissension, however, was the bane of the capital, and was the true cause of the success of the Latins, and finally that of the Turks. The successful attack by the combined forces of the Latins and Venetians was one of the results of the Crusades. It took place in the commencement of the thirteenth century.

The city, however, remained under the Latin power

for only fifty-seven years, when it was recaptured by a bold stroke of the Greeks. Injured by the pillage of the Latins, and many of its beautiful edifices destroyed by fire during the siege or subsequent occupation, the Greek capital not only lost its prestige of divine protection, but it has never recovered its former splendor. How much of the spoils were removed by the captors is a matter of conjecture. The historians of the Greeks and Latins—the spoiled and spoiler—undoubtedly exaggerate the injury of the conquest and the quantity of booty obtained.

Two of the Emperors, succeeding by usurpation, fled from the city with much treasure before it was finally captured. Even then one quarter of the accepted plunder was reserved for the elected ruler of Constantinople. And as to the remainder, which is said to have been divided equally between the French and Venetians, and valued at 11,125,000 marks of silver, or \$11,000,000, there is no record extant of the articles. We know that the bronze horses of the Hippodrome were transferred to Saint Mark's Palace, and the crown of thorns to the Sainte Chapelle at Paris. We also learn that many gems—the adamas, emerald, jacinth, ruby, sapphire—were among the spoils; but if the sack was complete, why did Venice years afterwards offer ten thousand ducats for the seamless vesture of the Redeemer, which was then among the sacred reliquaries of Constantinople? If these spoils were divided between the conquerors, how explain the fact recorded in French history, that the sacred relics sent

to Paris and placed in the church erected to receive them were purchased? It is a matter of history that the crown of thorns, with the piece of the true cross, the antique gems, and other relics that were deposited in Sainte Chapelle, together with the construction of the building, cost Saint Louis of Baldwin, Emperor of Constantinople, a sum of money equal to 2,800,000 francs. This fact, coupled with the offer of the Venetians for the holy vestment, renders the accounts of the sack of the city still more obscure. The historian Yriarte declares that the only monuments of art deemed by the Venetians as worthy of transporting to their capital were the famous bronze horses. If this statement is correct, the Venetians must have been sadly deficient in taste, or history has wrongfully accused the founders of Constantinople of spoliation.

According to the early accounts, Constantine, in the reconstruction of Byzantium, despoiled the cities of Asia and Greece of their most valuable ornaments, the trophies of memorable wars, the objects of religious veneration, the most finished statues of the gods and heroes, of the sages and poets, of ancient times. The most celebrated works of the age of Pericles and Alexander were remorselessly seized by the Emperor and transferred to his capital to enhance its beauty and its renown. So many statues and architectural masterpieces had been transported to the Bosphorus that the historian Cedrenus ironically said, "Nothing in this great city was wanting except

the souls of the illustrious men whom those admirable monuments were intended to represent."

In the reign of Justinian the city was decorated by the best of living artists. In the construction of the public edifices, the richest materials were sought for and used with lavish hand. The bright hues, the primitive lustre, of many of the stones of which the buildings were composed were so remarkable as to form the theme of a poet. Distant countries were explored for choice materials. The costly marbles of Asia, Gaul, Greece, and Africa were transported to the Bosphorus. Among the rare stones used by the Greek architects, one may recognize in the ruins of the present day, the emerald-green marble of Laconia, the golden-hued of Mauritania, the black of Gaul, and the purple and red, with intersecting veins of sea-green, of Phrygia. The shrine which stood in the Mosque of Saint Sophia a thousand years ago or more must have been of marvellous beauty. The wealth and energy of the ancient world was expended upon it; and we can form some picture of it in our imagination from the fact that the Emperor Justinian, on beholding it after its completion, exclaimed, with outstretched arms, "Solomon, I have surpassed thee."

The magnificence displayed by the wealthy houses of Byzantium in their internal arrangements must have been of an extraordinary character if we can judge correctly from the invectives of Chrysostom; and the utensils of silver and gold were in mas-

siveness far beyond the prodigality of modern times. Ramusio, the Venetian historian, dazzles the reader with his glittering descriptions of the acquisitions of his countrymen. He mentions with preciseness the vases whose forms were as grotesque and varied as the caprice of man,—the murrhines Pompey won in his triumphs over Mithridates and Tigranes; chalices decked with gems or formed of turquoise, jasper, and amethyst; crowns of gold, studded with pearls; unnumbered emeralds, sapphires, topazes, jacinths, and other gems; also the matchless carbuncles which afterwards adorned the altar at Saint Mark's, and which were believed by the superstitious to have the power of dissipating the darkness by their refulgent beams of light.

Constantinople, with its remaining works of art, again fell into the power of the Greeks and was retained by them until captured by the Turks. To describe the treasures of the Greek capital before its capture, and correctly estimate the character and value of the objects removed, and those secreted and again brought to light, will be a difficult task for some restless antiquary. We are, however, inclined to believe the Greeks successfully secreted many of their choicest gems. All through the pages of early and mediæval history, the reader will observe that by a strange caprice of fortune many of the richest and rarest works of art and nature passed into the possession of the rulers of Byzantium, Constantinople, or Stamboul. These three names, distinct in

their meaning, yet relate to one and the same city, which, during its existence of more than a thousand years, passed successively under the sway of the Roman, the Greek, and the Turk. Stamboul is still the Mecca of the antiquary.

CHAPTER VII.

RUSSIAN REGALIA.

THE Empire of Russia has the most splendid collection of diamonds of any country in the world, with the exception, perhaps, of Persia. In the Kremlin at Moscow, and the Winter Palace at St. Petersburg, are preserved a multitude of gems of the highest perfection and beauty, and also many interesting ornaments formed or captured by the early rulers of Russia. Possessing many of the avenues of approach and trade with the countries of Central and Southern Asia, this country has long enjoyed excellent facilities for obtaining the gems from Upper India and Persia. The enormous quantity the treasury still possesses, added to the great number given away in past times by various sovereigns, naturally gives rise to the inquiry, whence this great abundance of precious stones came. We may say that this grand accumulation commenced in the earliest days of the Russian dynasty, and has been steadily increasing by direct intercourse with the gem-producing countries.

Many of the fine gems that fell into the hands of the Turks in their various conquests, have indirectly

passed, by purchase or otherwise, into the possession of the Russians.

Some others recall the times of the incursions of the Cossacks of the tenth century, when the fearless hordes of the North marched even to the gates of Constantinople, and imposed menaces and ransoms upon the Greek emperors.

The crafty policy of the Russian dates back from those distant times. "Let us be content," said the old Russian chieftain to his impetuous warriors complaining of treaties and tributes; "is it not better to obtain, without fighting, the gold, the silver, the silk, the precious stones of these people?"

The still earlier Scythians, with their light active horse, performed incredible journeys even into Illyricum and Thrace. The river Danube offered but a slight barrier to these fearless riders; and they boldly traversed flood, forest, and plain, sweeping, with impunity and menace, even up to the walls of Byzantium. They pillaged, without remorse, the rich towns and country palaces of the nobles, and returned to their forest wilds accompanied by thousands of captives, and laden with booty of immense value.

We are also reminded by the historian, that a part of Russia, especially Poland, was the Sarmatia of the ancients, whence issued the fearless swarms of invincible Huns and Goths and Sclavonians, who spread desolation at various times over nearly the whole of Europe. Although these fierce hordes seldom returned to their native plains, preferring the sunnier portions

of the conquered countries, yet they did not abandon all communication with the land of their birth. Many of their incursions into the Roman provinces were rewarded with immense booty of captives, and a variety of plunder. For fifteen hundred years the customs of the Poles were but little changed. The love of nomadic life, of magnificence, of arms, dress, ornaments, was a predominating trait until a very recent period. The famous political assemblies of the Poles on the plain of Volo were among the grandest displays of barbaric splendors of any age; and sometimes one hundred thousand Poles were assembled in conclave.

The chivalry, the wealth of the country, was represented there. All the nobles and citizens of note attended, mounted upon the finest horses, and caparisoned and decorated in the most lavish manner. As the historian says, "The children of the desert strove to hide the furs and skins in which they were clothed, under chains of gold and the glitter of jewels. Their bonnets were composed of panther skin; plumes of eagles or herons surmounted them; on their front were the most splendid precious stones. Their robes of sable or ermine were bound with velvet or silver; their girdles studded with jewels; over all their furs were suspended chains of diamonds. One hand of each nobleman was without a glove; on it was the splendid ring on which the arms of his family were engraved, — the mark, as in ancient Rome, of the equestrian order, — another proof of the intimate con-

nection between the race, the customs, the traditions of the Northern tribes, and the founders of the Eternal City." But nothing in this rivalry of magnificence could equal the splendor of their arms: double poniards, double scimeters set with brilliants; bucklers of costly workmanship; battle-axes enriched in silver and glittering with emeralds and sapphires.

. After reviewing the history of ancient and mediæval Poland, we are not surprised at the accumulation of gems in Russia, nor at the fact that some of the fine gems now in the modern cabinets of Europe were obtained from that country. For instance, the splendid green diamond of Dresden came from Warsaw.

The grand repository of the Empire is in the towers of the Kremlin; and here are preserved the sacred relics and the almost innumerable treasures of the Empire. In the galleries of this ancient castle of the Muscovites are gathered such an accumulation of wonders that the visitor is fairly dazzled, and is forcibly reminded of the tales of Eastern romance, of the munificence of the store-house of the Caliph Haroun-Al-Raschid, and the wells of Aboul Kasem.

Diamonds, rubies, sapphires, emeralds, topazes, and other gems, of large size and wondrous beauty, flash from every side of the apartment; and their profusion astonishes the mineralogist, who has been accustomed to regard these natural treasures as rare. It will be quite impossible to enumerate or explain properly

the glittering arrangement of these marvellous works of art and nature. The sceptres, the crowns, the caskets, the reliquaries, the globes, thrones, and the insignia of religion and royalty collected here, fairly dazzle the eye by the reflections from the immense number of gems which decorate them. The scene reminds one of the prismatic effect of the rays of the morning or evening sun upon the numberless rain-drops on the grass, after a shower has passed.

Here we shall find the crowns of the Muscovite Czars, together with the captured diadems and regalia of the countries that form a part of this vast realm. Among them may be seen, in all of their original quaintness and splendor, the crowns of Siberia, Novgorod, Kazan, Moscow, Poland, and the Crimea. To this imperial display we may expect to see added, at no distant day, the jewels of the Southern countries, which seem to be the inevitable heirlooms of the sagacious Cossack.

To describe correctly, and in a proper manner, the works of ancient, mediæval, and modern art collected here, would require a large volume by itself. We will, however, attempt to give a brief description of some of the beautiful crowns, which, though generally of rude workmanship, are yet studded with gems of an immense value, and are also objects of great historic interest.

Foremost of all, appears the magnificent diadem worn by the former Empress Anna Ivanovna, and which is, perhaps, one of the most splendid jewels

of its kind in the world. It is well proportioned, and lightly formed of open gold work, incrustated with a vast number of exquisite gems, and among them 2,536 diamonds of great perfection. On its top, serving as a base to a slender cross of pearls, is placed the immense and wonderful ruby, which the Russian ambassador purchased at Peking, at the price of 120,000 roubles.

The crown of Vladimir, which is used at the crowning of the heir to the throne, is composed of filigree gold-work, surmounted by a cross of plain gold, with a large pearl on each arm. It is surrounded at its base by a band of sable fur, and is ornamented with 4 fine emeralds, 2 rubies, and 25 pearls.

This crown was a gift from the Emperor Alexis Comnenus, and was brought with ceremony from Constantinople, by a Greek embassy, in the year 1116.

This circumstance recalls to memory the history and fate of the last of the Comnenuses, the self-styled Emperor of Trebizond, and who afforded so many themes of ridicule to the knights and troubadours of the fifteenth century.

In connection with our subject, it may be proper to give a sketch of the appearance of this potentate when he gave an audience to foreign ambassadors.

His dress was a tight gown of scarlet silk; around his neck, down the front of his gown, and around the bottom of it, were bands of gold about four inches

wide ; these were edged with pearls, and ornamented with large rubies and emeralds in rows down the centre of each band of gold. On his arms, above the elbows, were golden armlets, and around his wrists gold bracelets, all set with precious stones of various colors. His girdle was of the same pattern, about three inches wide, and had a hanging end about two feet long, which the Byzantine emperors, for some undiscovered reason, always carried over the left arm. In his right hand he bore a golden sceptre about three feet long, with a large cross at the top, set with enormous pearls. On his head he wore a close golden crown, of which the top was arranged in metal like a helmet. From this crown a fillet set with pearls hung down on each side of his face as far as his beard, which was of considerable length. Scarlet silk hose and golden sandals completed the Imperial costume, except two round ornaments of gold, each of the size of a plate, which were affixed to his robe on the outside of his thigh.

Such was the appearance of this vain ruler when he gave audience to the envoys of Mahomet II., the conqueror of Constantinople. The plain steel-clad warriors of the Sultan briefly said, "Wilt thou secure thy treasures and thy life by resigning thy kingdom ; or wilt thou rather forfeit thy kingdom, thy treasures, and thy life ?"

The sceptre of Vladimir is also preserved here. It is about three feet long, and contains among its ornaments 268 diamonds, 360 rubies, and 15 emeralds.

The enamel covering of the rest of the surface, unadorned by the gems, represents religious subjects, painted and treated in the Byzantine style.

The tiara of Astrakhan is far more complex in its construction, and is very rich in barbaric taste. It is now known as the gold Imperial Crown of the First Order of the Czar; and is a tall, imposing structure, covered with brilliant gems. Among them are many fine rubies, emeralds, pearls, and an enormous sapphire of great value.

The crown of Kazan, captured in 1553 by John IV., is a very interesting specimen of mediæval workmanship, and shows the influence of Persian art in its arrangement. It is of gold filigree-work, intermixed with black, and is adorned with splendid rubies, turquoises, and pearls. On the summit is placed a very large ruby, surmounted with two pearls.

The ornament known as the diamond cap of the Czar is a singular combination of the rude and the beautiful in art. It is profusely garnished with 817 diamonds of the first water, besides 4 magnificent rubies and 8 emeralds. This is also surmounted with an enormous ruby, which sustains on its summit a solid Greek cross, composed of gems and pearls set in gold.

We have not space to describe the remaining diadems of ancient rulers, or those of recent times, nor the rich breast-crosses, the sceptres, and the various regalia used in the coronation of the Russian Emperors, but will mention the Grand Imperial

Orb, before proceeding to the description of the ancient and curious thrones.

The Orb is an immense globe of gold, heavily chased and richly incrustated with large and beautiful gems. It is surmounted with a tall Greek cross, also studded with precious stones of the purest water and color. It is of Byzantine workmanship, as early as the tenth century, and is said to have served as model for several other ornaments of this character, made at Venice in later times. The upper portion of the exterior of the globe is arranged in four triangular spaces, whereon are enamelled in color scenes from the life of David. Among the gems which are set in enamelled gold are 58 diamonds, 89 rubies, 23 blue gems(?), 50 emeralds, and 38 pearls.

The three unique chairs used as thrones in the coronations of the rulers of Russia are objects of historical interest and are of great value intrinsically. The smallest of the three, designated as the Stool, is the most ancient of all, having been presented in 1605 by Shah Abbas of Persia to the Czar Boras Godunoff. It is completely covered with polished sheets of beaten gold decorated with pearls and precious stones. The second seat is in the form of a high-back chair of rude workmanship, and is intended for the reigning Empress, and is called the Golden Throne. Although its proportions are uncouth, a mine of wealth has been expended in its decorations, and it is inlaid with 1,500 rubies, 8,000 turquoises, 2 magnificent topazes, and 4 rare amethysts. The

third chair, of rude construction, was made as early as 1660, and is intended for the Emperor, and designated as the Diamond Throne. It is literally a mass of sparkling diamonds; and every portion of the chair is aglow with brilliant colored flashes of the diamonds, so profusely is this gem used in its decoration. The rude and imperfect cutting of these beautiful stones indicates their Oriental origin as well as their antiquity.

The Priests' Treasury in the Kremlin is a wonderful accumulation of wealth. We will attempt to describe but one of the articles to be seen there. In a golden casket studded with the finest gems may be seen some ancient holy relics given by one of the Greek Emperors of Constantinople. Among them there is a fragment of stone from the tomb of Christ, and a bit of wood from the cross. The elegance and richness of the casket will remind the antiquary of the receptacle of the tooth of Buddha, which was formerly preserved at Kandy, the capital of Ceylon.

This relic was kept in a golden casket incrustated with the finest gems. This was also encased in four other boxes, all of which were studded with precious stones of enormous value, and forming together a priceless reliquary to which none of the shrines of civilized countries could offer an equal in comparison, not excepting that of the famous Virgin of Loretto in Italy.

In the great hall devoted to the collection of arms

and armor may be seen a great number of articles highly interesting to the antiquary and historian. Arms and armor of all periods from Europe and Asia are represented here, — the plain steel-clad vestments of the Crusader; the richly chased and inlaid coats of mail of the knights of mediæval times; the light defences of the Persian and Saracen horsemen, glittering with those gems which were supposed to possess the power of averting fatal missiles; the casques of the Circassian mountaineers, brilliant with barbaric decorations; scimetars, bucklers, scabbards, and a great variety of other arms, resplendent with the most beautiful of the rarest and most precious stones.

There is also a most costly and unique collection of saddles and horse-gear to be seen. These are mostly presents of Emperors of Constantinople in early times, and from Grand Turks and Persian Shahs of later periods. Some of these are of great value and contain gems of historic interest. Their decorations are profuse; and the bits, curbs, bridles, headstalls, and, in fact, all portions of the trappings that will admit of the setting of precious stones, are literally incrustated with splendid gems, forming stars, suns, and various ornaments of grotesque shapes.

In one of the rooms of the Winter Palace at St. Petersburg are deposited many of the jewels of the Empire, and especially those required in the court ceremonies.

Among them may be seen the beautiful crowns and coronets of the late Emperor and Empress. The crown of the Emperor is of magnificent workmanship, and dazzles the eye with the splendor of its gems. In outline it resembles the dome-formed patriarchal mitre, which was a favorite shape among the Byzantines. Upon the summit appears a cross formed of five beautiful diamonds, which is also supported by a large spinel ruby, polished, but not faceted. This ruby and cross are supported by a foliated arch composed of eleven great diamonds and rising from the back and front of the base of the crown. On either side of this central arch is attached a hoop formed of thirty-eight large and perfect pearls. The spaces on either side of these arches are filled with leaf-work and ornaments in silver, incrustated with diamonds underlaid with the richest purple velvet. The band which forms the base of the crown is of gold, and is ornamented with twenty-eight magnificent diamonds.

The coronet of the Empress is thought to be the most beautiful collection of diamonds ever presented to the view in a single ornament. It is composed of four very large diamonds of the purest water, and eighteen others of slightly smaller size, together with a multitude of lesser diamonds of exquisite water. The flash of these beautiful gems reminds the observer of a collection of rainbows.

Among the other regalia of this collection may be seen the most remarkable necklace of diamonds in

Europe. In the links which form the chain are twenty-two huge brilliants of great value, and, as pendants to the connecting chain, fifteen other diamonds of surprising size appear, forming an ornament of great beauty.

In this room may also be seen the plume of Russia's great general, Suvaroff. It is an aigrette composed entirely of diamonds of wonderful lustre, and was the gift of the Sultan of Turkey.

Among the curiosities preserved here are the Order of Saint Andrew, mounted with five pink diamonds; also two of the famous Siberian beryls, — one green, the other blue, — surrounded in their settings with diamonds.

In the museum of the Hermitage, adjoining the Winter Palace, may be seen one of the finest and largest collections of gems in the world. It is composed of choice selections from some of the most celebrated cabinets that have been formed in Europe during the past two centuries, and comprises the better portions of those known as the collection of the Duke of Orleans (Philippe Egalité), that of the famous Strozzi, and that of the Beverly, which had been formed under the direction of the learned antiquary Dutens. The cabinet is not only extremely valuable in its art treasures, in the form of engraved gems and cameos, ancient, mediæval, and modern, but it is a noble monument of the good taste and liberality of the sovereigns of Russia. The description of these alone would require a ponderous volume.

In another gallery in the same palace may be seen the plume of Prince Potemkin, glittering with gems of the purest ray, presented to him by the Sultan of Turkey; also the two magnificent bouquets of artificial flowers composed of the finest colored diamonds, topazes, pearls, sapphires, rubies, and other gems, which rival in their hues the most beautiful of the productions of the vegetable kingdom; the identical parrot which was carved from a single emerald, and given by King Pedro II. of Portugal, to his bride, the Princess of Savoy; together with a vast number of priceless objects of virtu of various ages, many of them profusely decorated with interesting and valuable gems. The Hermitage, like the Green Vaults at Dresden, is one of the jewel-boxes of the civilized world.

In the museum of the School of Mines at St. Petersburg may be seen the finest collection of the gems in their natural and rough condition in the world, not even excepting the magnificent collections of the British Museum, or that of the Jardin des Plantes in Paris. The glittering treasures of Siberia are here displayed in lavish profusion. Natural crystals of diamond, of chrysoberyl, of topaz, beryl, and emerald attest, by their beautiful forms, the great mineral wealth of that vast country. The crystals of emerald are enormous and exceed in size all others in the world. The topazes are unsurpassed in their beauty and variety of tints. The collection of beryls is truly wonderful, and contains specimens

of exquisite color and of great value. They may be seen not only of green, blue, white, and yellow, but even pink, which is an exceedingly rare hue for this mineral. The cabinet of tourmalines is superb, and nobly illustrates the beauty and variety of colors and forms of that wonderful mineral.

In the arsenal of the Alexander Palace may be seen a curious and valuable collection of arms and armor of all ages, and among them many ornaments beautifully worked in precious stones. Prominent among them are the two sets of horse-gear which came as presents from the Sultan of Turkey. The first is a souvenir of the conclusion of that peace which was signed at Adrianople when the Cossacks had passed the barriers of the Balkan Mountains and almost clutched the long-coveted prize of Istamboul in their grasp. It is superb in its construction, with its mountings and stirrups of gold, and its velvet trappings studded with flashing diamonds. But the second saddle is even far superior in its ornaments and its effects to the first. It is indeed a glorious specimen of Persian handicraft and ornamentation, and worthy of one of the heroes of the Arabian Nights. It fairly glitters with the multitude of diamonds of which it is composed, and some of which are of great size and wondrous lustre. It is indeed a barbaric mine of wealth.

This costly present was given to the Czar by the Sultan after the fatal battle of Konieh, when the Porte supplicated Russia to send an auxiliary force

to defend a tottering throne against the attacks of a rebellious vassal.

Many of the cathedrals, convents, and monasteries of Russia are richly endowed with gems and jewels of great beauty and value. In the Kazan Cathedral at St. Petersburg may be seen the miraculous image of the Virgin brought from Kazan in 1579. It is covered with gold, and incrustated with diamonds and other gems. The sacristy of the Monastery of Solovetsk is one of the richest in the realm, and is filled with jewels and gems which have been presented in times past by kings, princes, and nobles.

In the Cathedral of the Archangel Michael, in Moscow, there are some ancient reliquaries adorned with gems of remarkable beauty. The diamonds, however, are surpassed by the magnificent emeralds.

In the sacristy of the Holy Synod in Moscow are preserved some wonderful sacerdotal robes and ornaments. One of the sakkos of crimson velvet is so heavily laden with diamonds, rubies, pearls, emeralds, etc., that its weight amounts to fifty-four pounds. The great mitre is also so studded with gems, such as the finest diamonds, rubies, emeralds, pearls, and sapphires, that it weighs five and a half pounds. The decoration of these sacred objects has been made by lavish hands and from an abundance of the most costly materials.

The famous Convent of Troitza possesses rare and beautiful gems and jewels among its gifts and reli-

quaries, which are well worthy of examination by *dilettanti*. From a great variety of sources these riches have accumulated. The shrine has been famous for many centuries past; and czars, princes, boyars, and peasants have deposited their offerings both in ostentation as well as with the hope of divine dispensation.

Its treasury is indeed a colossal jewel-box, whose wealth must amount to many millions in value, and which rivals, if it does not surpass in richness, the famous shrine of Loretto in Italy. The variety of articles decorated with gems exhibited here is marvellous. Art has made use of the precious stones in her decorations with lavish hand. Some of the frames in which are set sacred pictures are literally composed of gems of the largest size and also costly in price. Even the robes of the Madonnas are spangled with diamonds, rubies, sapphires, topazes, and emeralds, forming the richest mosaics.

It is impossible, from the imperfect information we have received from travellers concerning this wonderful museum of ancient and mediæval art, to give an accurate account of its treasures; but we hope some of the learned antiquaries of Western Europe may be induced to examine them, and make known their history. Among the great numbers of engraved gems, skilled search may reveal some of the most beautiful forms of ancient art, and supply some of the missing links in glyptic history.

According to these vague accounts a volume might

be written on the description of the *armoires*, among which are comprised Bibles, Gospels, liturgical books, bound with covers of silver gilt and incrustated with precious stones, such as the onyx, sardonyx, agate, chrysoprase, aqua-marinas, lapis lazuli, malachite turquoise. The clasps of these volumes are made of gold or silver, in which antique cameos are set. Among the sacred utensils and relics are described chalices of gold belted with rows of diamonds, and a great variety of vessels richly ornamented; also crosses studded with beautiful emeralds and rubies; sapphire rings; vases and chandeliers of silver; dalmatics of brocade embroidered with flowers composed of gems, and with legends in old Slavonic, written in pearls; enamelled censers; triptychs storied with countless figures. Besides these articles we have enumerated, the museum contains a great number of others, including images of saints and Madonnas richly decorated, masses of precious metals, and heaps of precious stones in their natural state. What a glorious field of study for the amateur and the historian is presented here!

Among the paragons possessed by the Crown is the diamond known as the Orloff, which derives its name from one of the counts of that celebrated family, who purchased it for the Empress Catherine. It is one of the finest gems in the world, and is the largest in Europe. It rivals in beauty the famous Regent of the French regalia, which it surpasses in size. The weight of this diamond is $194\frac{3}{4}$ karats, and it is ex-

actly of the form of the famous diamond described by Tavernier as the Great Mogul. In shape it is ovoid, or rather, in gem nomenclature, of a high-crowned rose-pattern. It is possible that this gem is the long-lost Mogul. Were it not for the remarkable accuracy of the distinguished French traveller, we should at once pronounce the Orloff to be the missing Mogul. Hence the question arises, may not Tavernier have made an error in his calculation of weight? It is certainly very remarkable that two rare stones of such great weight, and such unusual form, should possess so great and so many degrees of resemblance. And it may be possible that the Mogul diamond is concealed in some of the obscure fastnesses of Persia, and may appear again to the world, like the crown of Chosroes, after a thousand years of concealment.

The Orloff disputes with the Regent the claim of being the finest known gem in the universe. Both have their ardent admirers. The Regent owes much of its fancied superiority to the regularity and perfection of its form, which is that of a perfect brilliant, and may therefore be regarded as the type of the style. The Orloff, likewise, may be selected as the perfected model of the form known as the rose-cut. Therefore, either gem may be considered as the perfection of the brilliant or the rose-style of cutting. The brilliant is certainly the most symmetrical of all the forms; but does it enable the gem to exhibit to a full degree its powers of refraction? It may ex-

hibit the prismatic play of color in greater perfection; but does not the rose-cut project brighter beams of light in a more extensive proportion than the brilliant? Let the opticians decide.

The Orloff now adorns the Russian sceptre, being placed in the top, just under the golden eagle.

Concerning the history of the Orloff there is considerable obscurity, even in that which relates to the time and the manner in which it came into possession of the Russians. At all events, there is no doubt but it formed a part of the spoils of Delhi, and was brought to Persia, along with the Koh-i-noor and other gems, by the conqueror, Nadir Shah. Its subsequent history, however, is somewhat mixed up with other gems. Dutens relates a romantic story of its having formed one of the eyes of the great idol at Seringapatam, and having been stolen by a French deserter, who managed to be installed as a priest and attached to the temple. Pallas, however, gives a totally different version, which he is said to have derived from the son of the Armenian who sold the gem to the Russians. This Armenian purchased the diamond from one of the Afghan generals, who formerly served with Nadir, and who received it as his share of the booty. But so far as we can learn, the gem was brought to Europe by the Earl of Effingham, who obtained it when Governor General of India. It frequently changed owners before it fell into the possession of the Greek merchant who took it to St. Petersburg and sold it to Prince Orloff. The price

said to have been paid for it is given at \$450,000, besides an annuity of \$20,000 and a patent of nobility.

The Shah is a remarkably irregular prism of slab of diamond, partially faceted by art. Tradition has associated with it adventures of a startling and bloody character.

It was one of the gems possessed by Nadir Shah, and at the time of his death was received as booty and secreted by one of the assassins. Long after the event, an Afghan visited an Armenian by the name of Shafras, who lived at Bassora with his two brothers, and offered him a large diamond, an emerald, a ruby of fabulous size, a sapphire of wonderful beauty, together with a hundred other stones of less value. The stranger asked an insignificant price for these valuable gems, but the Armenian was not at the time able to furnish the means of purchase, and entreated the Afghan to return at another time with his treasures. But suspicious of the good faith of the jeweller, the mountaineer departed and disappeared. Several years afterward the Armenian met, by chance, the Afghan at Bagdad, where the gems were sold to a Jew for 65,000 piastres. Shafras summoned his two brothers, and they assassinated the stranger and the Jew, and flung their bodies into the Euphrates. The brothers fled to the desert, and while attempting to divide their spoils fell into dispute. In the depths of night the elder brother slew his two companions in crime, and fled to Con-

stantinople. From thence he passed to Holland, and informed several of the Courts of Europe of his treasures. Catherine is said to have invited him to Russia, but would not accede to his terms of purchase. The Armenian, while at St. Petersburg, was induced by some of the courtiers to lead a life of dissipation, with the view of ultimately obtaining his treasures. But, soon perceiving the intentions of his associates, he secretly quitted the country, and was heard of no more for ten years, when by accident it was discovered that he was living quietly at Astrakhan. New overtures were at once made to him by the Russians, but he would not consent to meet the negotiators, except at Smyrna. At this city the purchase was finally made, and the Shah passed into the possession of the Muscovites for an immense sum of money, — said to be \$650,000.

Unfortunately for this romantic story, only the outlines of which we have here given, it is now reported that Chosroes, the son of Abbas Mirza, presented the gem to the Emperor of Russia. Another account states that it was purchased of Chosroes by the Russian Government. At all events, no matter what its true history may be since the death of Nadir, it is a gem of the most perfect purity of color and freedom from blemish. Upon one of its sides an inscription in the Persian language has been engraved by some lapidary of extraordinary patience. Its weight is ninety-five karats.

Many of the Russian nobles possess fine diamonds,

which are not well known to the public. We know that the Princess Yassopouff owns the fine brilliant of forty karats called the Polar Star; but what has become of the fine gem of ninety karats, which was cut for Russia by the French lapidary Jarlet, at the close of the seventeenth century?

While we are speaking of lost gems, we will call the attention of the reader to the large pear-shaped diamond of $157\frac{1}{4}$ karats, which Tavernier bought at Amadabad in India, and brought to Europe on his return. This gem also has disappeared from history, and thus far evaded all attempts for its recovery. The history of all the large and famous diamonds brought to Europe would form a most interesting chapter, if some tireless antiquary could be induced to take up the subject and clear away the obscure wanderings of some of them.

The history of Potemkin, as related by a recent writer, reveals an extravagance unequalled since the days of the Roman follies; and it reads in these sober times more like romance than reality. The Prince, when fully attired, wore a collar of the Order of Saint Alexander, which was the gift of the Empress, and profusely ornamented with diamonds of the value of 60,000 roubles. A laurel wreath, which he wore on state occasions, also the gift of Catherine, was beautifully wrought in gold, and set with superb emeralds and diamonds which were estimated as worth 150,000 roubles.

The picture presented by this bold favorite in his

sunniest days, when, for instance, he assisted the Empress to alight from her carriage, surpasses the display of Prince Esterhazy in later times. Orloff was then dressed in a scarlet coat, over which hung a long cloak of gold lace extravagantly ornamented with precious stones of enormous value. In fact, his dress was completely covered with beautiful gems; and his hat was so heavily laden with precious stones, that an *aide-de-camp* carried it for him when not in use.

Catherine was not only passionately fond of belles-lettres and the arts, but she had a generous heart withal, as evinced by the numerous gifts she bestowed upon her friends. The value of the gems and the jewels she gave to her favorites exceeds almost the bounds of belief, and far surpasses the munificence of any of the sovereigns of history. The total estimate of the worth of these gifts amounts to the enormous sum of 88,820,000 roubles. We will enumerate some of them. To Zoritz she gave diamonds of the value of 200,000 roubles. To Plato Zouboff, gems worth 100,000 roubles. To Zawadoffsky, to Lanskoi, to Zermoloff, she presented caskets of diamonds of the value of 80,000 roubles each. Wasulitschikoff and Kozzakoff each received presents of the same precious stone, costing 60,000 and 50,000 roubles. The five brothers of the Orloff family, and especially Potemkin, received gifts amounting in value to many millions of roubles. To the famous house of Bariatinsky Catherine gave many beautiful gems which are still pre-

served among the treasures of the family. Among them is a splendid solitaire diamond with a pendant, which was given to one of the Princes at his baptism.

Some of these jewels are of unique patterns and workmanship, and of immense value. Among them is a necklace of solitaires, each stone as large as the end of the thumb, with large pear-shaped pendants attached. There is also a bracelet of rude Persian art, made of beaten gold, and set with uncut crystals of diamonds, thus indicating a very ancient origin, or singular caprice on the part of the maker.

There are still preserved among the princely families of Russia, as well as in the Royal casket, many diamonds yet in their rough and crystallized forms, or imperfectly cut in the Oriental and ancient manner.

The remarkable soldier, Suvaroff, although careless of his dress and his personal appearance, was passionately fond of jewels. And the allied sovereigns of Europe, learning of his love of the beautiful, sent him several superb gems, among which was a large diamond of great beauty, from the Empress Catherine.

Like Charles *le Temeraire*, the terrible Cossack carried his gem treasures with him during his campaigns; and he took infinite delight in examining their charms, in times of danger and fatigue. They were of various kinds and of great value; but the one he prized the most was the gift of the Czarina.

This splendid gem he always reserved for the last look, after toying with the others ; and seemed fascinated with the strange gleams of the prismatic display, as the stone was viewed in the dim and flickering light of the camp-fire.

What a picture is presented of the grim and fearless veteran, deriving a gleam of comfort from his treasures during that lonely bivouac on the summit of the high Alps, in Switzerland, on that fearful night in 1799, when the victorious French, under Lecourbe, forced the Tatar general, with his twenty-four thousand desperate soldiers, and with terrible losses, over the desolate and rarely trodden pass of the Kenzig Culm !

CHAPTER VIII.

FRENCH REGALIA.

PREVIOUS to the time of the French Revolution, and commencing from periods dating back beyond mediæval days, France had accumulated a casket of gems and jewels of extraordinary richness and value. The amateur may form an idea of their beauty and magnificence, from the famous report made to the French Assembly by M. Delattre in 1791. In this list there were enumerated with special care, 9,547 diamonds, 506 pearls, 230 rubies, 134 sapphires, 150 emeralds, 71 topazes, 3 Oriental amethysts, 8 Syrian garnets, and 8 other stones not designated.

The estimated value of these treasures, together with the bijou and mounted parures belonging to the Crown, amounted to nearly thirty million francs. From this carefully arranged inventory, we have made the following selection, which will be interesting to the reader at the present day, as not only showing the estimated worth of the gems at that time, but also describing some of the fine gems whose history has since been lost.

	Weight.	Value.
	k.	fr.
1 A brilliant diamond called Le Regent.....	136 ¹ / ₄	12,000,000
2 A diamond cut in facets, perfect in lustre and brilliancy, called Le Sancy.....	33 ¹ / ₂	1,000,000
3 Diamond cut in facets.....	28 ¹ / ₂	250,000
4 A brilliant diamond.....	26 ¹ / ₂	150,000
5 A pear-shaped diamond, of a peach-blossom hue...	24 ¹ / ₂	200,000
6 A diamond called the Mirror of Portugal.....	21 ¹ / ₂	250,000
7 Pear-shaped diamond, of a yellowish cast.....	20 ¹ / ₂	65,000
8 Rose-colored diamond, with flaws.....	20 ¹ / ₂	48,000
9 An olive-shaped diamond, clear.....	18 ¹ / ₂	85,000
10 A brilliant, of a greenish cast, and flawed.....	18 ¹ / ₂	20,000
11 A pale wine-colored brilliant.....	18 ¹ / ₂	75,000
12 A steel-colored brilliant.....	17 ¹ / ₂	18,000
13 Brilliant, cloudy.....	17	50,000
14 The 10th Mazarin, cloudy.....	16	50,000
15 A brilliant, of peach-blossom hue.....	14 ¹ / ₂	25,000
16 A fine white brilliant.....	14 ¹ / ₂	150,000
17 A brilliant, of peach-blossom hue.....	14	30,000
18 Brilliant.....	13 ¹ / ₂	60,000
19 A brilliant, of brownish hue.....	13 ¹ / ₂	35,000
20 A brilliant, of yellowish hue.....	11 ¹ / ₂	15,000
21 A brilliant, of brownish hue.....	11 ¹ / ₂	10,000
22 Brilliant, of yellowish cast.....	11 ¹ / ₂	15,000
23 Brilliant, of peach-blossom hue.....	11 ¹ / ₂	10,000
24 Pale-blue brilliant.....	10 ⁷ / ₁₆	30,000
25 Brilliant, of brownish hue.....	10 ¹ / ₁₆	25,000
26 White brilliant.....	10	30,000
27 15 brilliants (of unknown weight).....	.....	833,000
28 54 brilliants, each from.....	5 to 10	756,000
29 227 brilliants, each from.....	1 to 5	332,700
30 1,631 small diamonds, together.....	425	77,228
31 12 diamonds, rose-cut and flawed.....	84	82,700
ROYAL STATE DRESS, WHITE PARURE.		
32 12 brilliants, each from.....	2 to 20	413,000
and 163 smaller ones.....		
33 The Order of St. Esprit, 9 brilliants, each from.....	7 to 14	324,000
and 286 smaller ones.....		
34 The Epaulette, composed of 12 brilliants, each....	3 to 19	306,000
35 The Croix du Cordon, 6 large brilliants and 143 smaller diamonds.....	.....	200,000
COLORED PARURE.		
36 A rich sky-blue brilliant.....	67 ² / ₁₆	3,000,000
37 Pale-blue brilliant.....	31 ¹ / ₁₆	300,000
38 Croix du Cordon, 13 large brilliants, 362 smaller... ..	.....	10,000
39 Epaulette, 9 large brilliants, 197 smaller.....	.....	47,000
40 Epée de diamonds, 2,189 rose-cut diamonds.....	400	329,075
41 Diamond buttons, large and small.....	552	294,851
42 Other diamonds of various qualities.....	.....	315,000

This magnificent and matchless collection was mysteriously stolen in September, 1792, and many of the fine gems have not been recovered. Neither has time yet divulged the authors of this bold theft, nor explained clearly the motives that led to the act. The circumstances connected with this celebrated robbery are interesting although obscure. They are as follows:—

After the fearful and bloody scenes of the 10th of August and the 2d of September, fears were entertained by the Republican chiefs concerning the safety of the public treasures. Therefore the building which contained the gems was closed to the public; and the Commune of Paris, representing the domain of the State, placed its seals upon the apartments wherein were placed the crown, sceptre, the golden wreath left by Cardinal Richelieu to Louis XIII., and a great number of gems and bijou. On the morning of the 17th of September M. Sergent and two other Commissioners of the Police perceived that during the night thieves had entered the halls of the Garde Meuble by scaling the colonnade from the side of the Place Louis XV., and opening the windows on that side. They had broken the seals, picked the locks, and, after removing many of the inestimable treasures, had disappeared, without leaving a trace of their flight.

The city was thrown into consternation at the boldness of the act and the magnitude of the robbery. Active and untiring search was at once made,

but not a trace of the plunder nor the least clew to the perpetrators could be obtained.

Not long after, however, an anonymous letter revealed the information that a part of the spoil was then secreted in a ditch beside one of the alleys of the Champs d'Elysées. Sergeant, with his colleagues, hastened to the spot indicated, and found there the Regent diamond and the magnificent agate cup then known as the Chalice of Abbé Suger.

Search was thus stimulated to further exertions, but without avail and twelve years passed without affording the least clew to the robbers. At this time a forgery was committed upon the Bank of France, and several persons were arrested for the act. Among them was a veteran soldier who had formerly served in the Pandours, and who was called by his comrades "Baba."

When arraigned before the court, Baba made the following singular confession after betraying his accomplices in the forgery: "This is not the first time," he exclaimed in an excited manner, "that my confessions have been useful to society; and if you condemn me I shall implore the clemency of the Emperor. Without me Napoleon would not be on the throne, for it is to me alone the success of the battle of Marengo is due. I was one of the robbers of the Garde Meuble. I aided my accomplices to bury in the ditch in the Champs d'Elysées the Regent and the other objects which, being easily recognized, would have led to detection. Upon the

consideration of a promise which has been perfectly kept, I revealed this hiding-place. The Regent was found; and, gentlemen of the court, you are not ignorant of the fact that the magnificent diamond was placed in the hands of the Dutch by the First Consul to procure the funds which were so much needed after the 18th Brumaire."

Baba was nevertheless condemned to the galleys, but the sentence was not enforced, and shortly afterwards he was sent to the prison in the Bicêtre, where he remained until he died. Nothing further than this was ever made known publicly, but suspicions of complicity in the robbery were directed towards the Orleans family.

Napoleon, when crowned as Emperor, and with the wealth of Europe at his command, made great efforts to restore the National regalia to their former beauty and value. The various countries of Europe were ransacked for the lost gems; and it is stated that a number of them were recovered. Great numbers of other gems were also bought and added to the Regalia; so that in 1810 the inventory of the Crown exhibited a list of 37,393 precious stones.

The changes of the one hundred days and the Restoration left the National property untouched. Under the reigns of Louis XVIII. and Charles X. additions were made, and the casket contained 64,812 gems and precious stones of all kinds. The inventory of 1849 presented the same number of articles, with a total valuation of over twenty mil-

lions of francs, without estimating the value of the bijou.

There must have been a large augmentation during this time, for the present which Louis XVIII. ordered to be made deducted from the collection diamonds of the value of three quarters of a million of francs. This costly present was in the form of the Order of Saint Esprit and constructed of superb diamonds.

Of the robbery of 1792, the Sancy diamond and the unique blue one of sixty-seven karats have never been recovered. Since the inventory of 1810 two beautiful gems have also disappeared. One of these was the magnificent opal which Josephine wore, and which was known as the Burning of Troy. The other was the beautiful brilliant of thirty-four karats which was obtained by M. Elias for Napoleon. This was the much-loved gem which the Emperor is said to have carried with him on his person, and which was asserted to have been lost in the rout at Waterloo.

The magnificent blue diamond, which was regarded as one of the marvels of the mineral kingdom, has never been recovered. Its early history has also been lost, but the gem is believed to be the identical stone which Tavernier brought from India and sold to Louis XIV. At that time it was described as a gem of a beautiful violet hue, but of a bad form, being flat and thin. Its weight in this condition was $112\frac{3}{16}$ karats, which would probably afford a fine brilliant of the size of the missing stone, $67\frac{2}{16}$ karats.

History has failed to trace the wanderings of this gem since its departure from the Louvre, but suspicion rests upon the superb blue diamond which was in the possession of the English banker, the late Mr. Hope. However, the English diamond weighs but $44\frac{1}{2}$ karats. Therefore a loss of quite 22 karats was incurred in recutting the stone in order to escape detection.

The Regent diamond, which was found uninjured in the ditch of the Champs d'Elysées, is in reality the most beautiful diamond yet known in the world. It is not the largest, but it is the most perfect of all the paragons, being almost faultless in its transparency and purity, as well as in its exact and symmetrical form.

It derives its name from the fact that it was purchased and added to the French casket by the Regent of France. This magnificent gem was found in the diamond mines of Puteal, about one hundred and thirty-five miles from the city of Golconda. It weighed in its natural condition four hundred and ten karats, but during the process of cutting it was reduced to $136\frac{1}{8}$ karats. A Parsee merchant by the name of Jamcund, who was a famous collector of diamonds, obtained possession of the stone and brought it to Madras, where he sold it to the English Governor, William Pitt, for \$60,000. Pitt brought the stone safely to London, and, after having had it cut, offered it for sale. The Royal House of England declined to invest in the gem; but

after long negotiations the Duke of Orleans, Regent of France during the minority of Louis XV., purchased it in 1717 for the sum of 3,375,000 francs. Seventy-four years afterwards a commission of experts reckoned its value at 12,000,000 francs, and even this enormous sum is exceeded by the valuation of the present day.

Napoleon, after establishing his fortunes, redeemed the Regent from the Dutch bankers, and had it set in the handle of the sword of state. Since then it has been removed and so arranged in its setting as to be placed at will either in the crown or used separately.

To the historian this beautiful gem is singularly interesting, for it has indirectly exercised a mighty influence upon the destinies of Europe and the progress of civilization. It was of infinite aid to Napoleon after the 18th Brumaire; and probably without the help of the little glittering pebble as a collateral for the Dutch loan, the decisive battle of Marengo never would have been fought. And it is no less certain that William Pitt, England's Premier, never would have been the leading statesman of Europe had not his grandfather acquired the diamond in India and established the prosperity of his family by its sale. Pitt was the master of European politics; and even after his life was crushed out by the defeat at Austerlitz, the heritage of his genius and his hate was apparent in every coalition, every blow, against Napoleon that finally culminated

at Waterloo. Therefore, in reviewing the history of the Regent diamond, the philosopher might be tempted to say that it was to the same gem, by a singular fatality or caprice of fortune, the "Great Captain" indirectly owed his success and his downfall.

The jewels belonging to the Crown of France, as collected and restored by Napoleon, and increased by the good taste of the succeeding rulers of the country, are of great beauty and value. It is, indeed, one of the finest collections of Europe. The casket, at the present time, contains sixty perfect diamonds, varying in weight from 25 to 28 karats, besides the splendid and matchless Regent. The actual crown displays eight great diamonds of the purest water, weighing from 19 to 28 karats each, besides the Regent, which may be adapted at will.

During the Universal Exposition at Paris, in 1855, the jewels of the Crown were displayed to the public. Many of the gems were mounted for the occasion in new parures; and the arrangement presented one of the most charming exhibitions ever seen in civilized countries.

We will now turn to the history of one of the lost diamonds of the Crown, and relate the facts and hypotheses concerning it as fully as we have been able to collect them. They form, indeed, a perplexing theme.

The beautiful diamond inventoried as the Sancy, and of the weight of $33\frac{1}{6}$ karats and valued at 1,000,000 francs, was also stolen and never recovered.

This gem has been associated with the fortunes of the redoubtable Burgundian warrior, Charles the Bold; and its history has done more to perpetuate his name than the record of all his misdeeds and his desperate battles. To prove, however, that this is the identical gem lost to the Swiss will be a difficult task; for the antiquaries have unearthed more Sancy diamonds than there were "Richmonds in the field." The name of Sancy has, indeed, become famous by embracing in one story the fortunes of three distinct gems.

The erudite King has patiently traced out the traditions connected with the name of Sancy, and appears to prove that three stories instead of one are included in the history of Baron Sancy. But the stone that was stolen from the French casket in 1792 is inventoried at the weight of $33\frac{1}{8}$ karats, while the gem that has lately gone back to India, and is supposed to be the stolen gem, weighs quite 54 karats. Here is a new mystery for the antiquaries to clear away; or did Delattre and his associates, who made out this inventory with exceeding care, write 33 instead of 53?

The histories of these diamonds are so interesting that we will attempt to repeat them here, following, in part, the views of Mr. King. Not long after the invention, by Berquen, of diamond-cutting by the process of abrasion, Charles the Bold, then in the full blaze of martial glory, submitted to him three large rough diamonds. The native of Bruges succeeded so well in polishing them, that Charles

presented him with the princely sum of 3,000* ducats.

One of these gems Charles gave to Pope Sextus IV., and it was mounted in the Tiara, where it is said to remain. The second was presented to Louis XI. of France; while the third was reserved by the Burgundian hero, and set in a grotesque manner to be worn as a personal ornament.

This jewel, of true barbaric design, was formed of a triangular shape, with the newly cut diamond in the centre. This diamond was $\frac{5}{8}$ of an inch in its widest diameter, and was shaped as a pyramid, with the apex cut into a four-rayed star in relief. Around the gem were set three large Balais rubies and four magnificent pearls, each more than half an inch in diameter.

One of the Fugger family, in 1555, made a careful drawing of the jewel, with a written description of it, and these were afterwards published by Lambeccius in his *Bibliotheca Cæsarea*; so there can be no doubt about the appearance of the original diamond of Charles the Bold in its early days.

When the Duke led his band of freebooters into Switzerland on his long-projected foray, he took most of his gems along with him, not dreaming of disaster, and probably loving to view his treasures even amid the hardships of a campaign. Rough soldiers are sometimes as fond of the beautiful in art and nature as more delicate and refined organizations; and Charles the Bold and Suvaroff are not the only examples.

The terrific onslaught of the Swiss at Grandson crushed the Burgundian ranks so quickly that Charles had only time to escape with his sword, leaving all his cherished treasures in the hands of the dauntless mountaineers.

In the sack of the camp which speedily followed the rout, a soldier found the golden box in which the famous pendant was kept, but regarding the jewel as a gaudy and worthless bauble, he tossed it away under a wagon, and retained the box only. Shortly afterwards he began to suspect that the contents of so beautiful a box must have some relative value, and returning to the place he recovered the despised jewel. He did not long retain his treasure, but sold it to a priest for one florin. The priest also did not appear to have a high regard for his purchase, for he disposed of it to the magistrates of his own canton for three francs.

When it became known that the Bernese Government had possession of the Duke's famous jewels, Jacob Fugger, one of the members of the celebrated Nuremberg family, went to Bern and negotiated for their purchase. The famous pendant, together with the Duke's cap, which was made of silk covered with pearls and Balais rubies, and a plume case set with diamonds, pearls, and Balais rubies, were bought for the sum of 47,000 francs. Fugger retained the pendant in his possession at Nuremberg for many years, indulging in the hope, it has been said, that the Duke's great-grandson, the Emperor Charles V.,

would purchase it as a family relic. When the celebrated capitalist died the ornament was still in his possession; but his great-nephew, who inherited the jewel, sold it to Henry VIII. of England. After the death of this monarch, his daughter presented the diamond to her bridegroom; and thus, by a remarkable coincidence, and after an absence of seventy-six years, the royal gem is again restored to the rightful heir of its original owner. So far the history of Sancy No. 1 can be clearly traced.

Now for the stories relating to the Sancy diamond No. 2. But, before proceeding further in this interesting and misty search, we will explain the history of the nobleman who has inseparably connected his name with so many gems.

Nicolas Harlai, Seigneur de Sancy, was of French descent, and the treasurer and intimate friend of King Henry IV. He had filled several positions of high responsibility, and served as ambassador to several of the Courts of Europe. He was also known as a man of culture, a lover of the fine arts, and an amateur in gems.

In the year 1589, Baron Sancy is said to have obtained a large diamond from the Pretender to the Crown of Portugal, as security for a loan of one hundred thousand livres. The antiquaries have thus far failed to ascertain whence this gem was obtained; but it cannot be supposed that it was the identical jewel Philip II. of Spain had received from the English Princess, for the Spaniard was then the bitterest foe

of Don Antonio. Furthermore, Philip, when dying, in 1598, ten years later than the above-mentioned period, gave to the Infanta a diamond of great beauty saying that it once belonged to Queen Mary of England. At all events, it is quite certain that the French Baron had in his hands a large and valuable diamond.

Not long after this acquisition, Henry IV. wished to engage the services of a select body of Swiss soldiers, to serve in his army; and as security for the pay of these hirelings, he sent the gem by a trusty servant to Harlai, who was then in Switzerland. The faithful valet, whilst on his way to Bern, was beset by robbers in the forests that conceal the entrance to the pass of the Dôle, one of the mountains of the Jura. He managed to swallow the diamond without being perceived by the bandits, before he was stripped and assassinated.

The Baron, on learning the fate of his envoy, mistrusted that he had resorted to this expedient of concealing his treasure. He therefore sent a party of soldiers to the place, disinterred the body, and recovered the gem. It was immediately placed in the hands of the Jews of Metz, as security for a large sum of money; and it is also related that the gem was never redeemed. Here ends the history of the second Sancy; and no further account of it can be found.

Concerning the history of Sancy No. 3, it is related that when Baron Sancy returned from Constantinople, where he had been as ambassador,

he exhibited a large and beautiful diamond, which he had acquired for the sum of \$120,000. This statement is somewhat obscure, from the fact that the ambassador was not Harlai de Sancy, but his son Achille, who was also sent on various missions by Richelieu during the years 1626 to 1635. However, it is certain that a new diamond was imported into France by one of the Sancys, and that it was a remarkable gem. It was described as being of the form of an almond, faceted all over its surface with small facets, after the manner practised in India. The weight of this gem has been variously stated; and these conflicting statements have served to increase the mystery concerning the Sancy gems. The weight of the diamond has been given as high as one hundred and twenty-six karats; but Delisle assured Dutens that he saw M. Jacquemin, the Crown jeweller, weigh the gem, and that it did not exceed fifty-four karats. Nevertheless, the famous inventory of the French gems in 1792 gives $33\frac{1}{16}$ karats as the true weight of the famous Sancy diamond. How shall we explain this wide discrepancy?

Forty-two years after the death of the Baron, the diamond passed into the hands of Henrietta Maria, the queen-dowager of England, and subsequently into the possession of James II. The unfortunate king, while in exile, sold the gem to Louis IV. for the sum of \$125,000; and here its history ends.

During the latter part of the seventeenth century,

Robert de Berquen, a descendant of the famous lapidary, wrote his "Merveilles des Indes," and therein he describes the diamond brought from India by Baron Sancy, as then in possession of the Queen of England, and being almond-like in form, faceted on both sides, and of fifty-four karats in weight. This account agrees with those of the French jewellers, and serves to connect the history of the gem up to this period.

Not many years after the bold robbery of 1792, a large diamond was acquired, by some mysterious means, by the widow of Charles IV. of Spain, who gave it to the notorious Prince of Peace Godoy. In 1838, Princess Paul Demidoff is said to have purchased it for half a million of roubles; and it is also certain that the Demidoff family sold it in 1865, to the Parsee millionaire, Sir Jansetjee Jejeebhoy of Bombay, for \$100,000.

Now the question arises, which was the true Sancy? And to settle the inquiry satisfactorily, will be a difficult task. From all these accounts, the reader may infer that there are three distinct diamonds included under the history of Sancy. The first is the diamond of the Duke of Burgundy, weighing, from its description, about thirty-three karats, and of a well-marked form. This gem is clearly traced to Philip II. of Spain. The second, which was of unknown weight, was last noticed in the hands of the Jews at Metz. The third was of the form of a brilliolette, and of fifty-four karats

weight, and has lately returned to the land of its birth, with the honors of the name of Sancy. Which of these gems deserves the name of the Sancy diamond ?

Madame de Pompadour, in the bright days of her prosperity, possessed some rare gems, but we can learn but little concerning them. Her will indicates that the beautiful ring containing white and rose-colored diamonds was given to the Duke de Goutaud, and also that the rare diamond of an aqua marine tint went to the Duke de Choiseul.

After having referred to the political importance of the Regent diamond, it may be proper for us to briefly mention the famous affair of the diamond necklace, which unjustly cast a stain upon the prestige of royalty in France, and ultimately exerted a certain influence, among other causes, that led to the downfall of the monarchy, and the fearful scenes that followed. The details of this daring scheme read more like romance than reality ; yet they are well substantiated in history.

It appears that Böhmer, a jeweller of Paris, had collected, in 1784, a large number of beautiful diamonds, with which he formed a magnificent necklace valued at 1,600,000 francs. The jewel had been offered to the Queen Marie Antoinette ; but she had declined the purchase as beyond her means at the time. Her regrets at her inability to obtain the splendid decoration reached the ears of Prince Cardinal de Rohan, who was then living at Paris, in disgrace, for having divulged some court secrets

while he was ambassador at Vienna. The Prince was not only handsome and conceited, but he was notorious for his gallantry and his follies. Unfortunately for himself and the court, he sought at this time to regain the favor of the Queen, and made it the grand object of his life.

He had among his intimate acquaintances a bold, dashing woman by the name of Madame de la Motte, who pretended to be a countess of the family of Valois. She had married a man by the name of La Motte, who was intimate with the notorious quacks Vilette and Cagliostro, who were then in the zenith of their fame. The Countess was well known in Paris as a woman of immorality and deeply versed in the arts of intrigue.

She became acquainted with the facts of the Queen's admiration for the necklace and the infatuation of Rohan for the Queen; and upon these she arranged her scheme for duping the Prince and obtaining possession of the property. She soon won the confidence of Rohan, and represented to him the Queen's intense longing for the necklace, and the favor he would gain in loaning the means which would enable her to obtain the coveted jewel and pay for it at her leisure. She promised, furthermore, through the aid of Cagliostro, to obtain an interview with the Queen on this subject. The promised interview took place one night in August, 1784, in the garden of Versailles; but the Queen was represented by a low character by the name

of D'Oliva, who was almost a counterpart of Marie Antoinette.

Rohan was completely deceived, and agreed to purchase the necklace; which he did not long after, giving his notes for half-yearly payments, and receiving as security a bond from the pretended Queen, which, however, was forged by La Motte's husband. The Prince Cardinal then intrusted the jewel to the Countess for conveyance to the Queen; but she passed it over to her husband, who lost no time in hurrying to London, where he immediately converted its gems into money. The Countess, however, did not hasten to join her husband, but remained at Paris, rejoicing in her audacity and good fortune, and with the hope of plucking more feathers from her princely victim. Nearly a year passed away before the secret was discovered.

Böhmer, anxious for his pay, approached the King; and the fraud was at once discovered. The Cardinal Prince was arrested just as he was about to perform mass before the court, and sent to the Bastile. After a short imprisonment, he was tried by a court of justice, but acquitted of criminal offence. However, he was sent in disgrace to reside at an abbey of his in Auvergne. Madame la Motte paid dearly for her crime and her dalliance in Paris after the prize had been secured, for she was sentenced to be branded on the shoulders, scourged in public, and condemned to perpetual imprisonment. She bore her trials with fortitude, and had the good fortune to escape from

her prison in less than a year after her sentence. She joined her husband in London, and there published a bitter pamphlet against the French Court, and especially the Queen. It is generally supposed that the Countess died in London in 1791, either from a fever or the result of an accident caused by a drunken debauch. But a startling story comes from Russia, giving another account of the last moments of this celebrated adventuress.

It appears that the Emperor Alexander, disgusted with the conduct of three lady reformers who attempted to establish a revolution in religious opinion at St. Petersburg, banished them to the Crimea. They were Princess Galitzin, Madame de Krudener, and a mysterious personage who went by the name of Countess Gauchin. After death, which occurred during her banishment to the Crimea, the strange Countess proved to be the notorious De la Motte, who many years before had been publicly branded on the Place de la Greve in Paris.

It would appear from statements in mediæval history that necklaces were not much known in France, or at least were not in fashion, until the times of Charles VIII. For one of the earliest known in that country was that given by the above-named monarch to the beautiful Agnes Sorel. The uncut gems, which were of great beauty and value, weighed heavily upon the delicate neck and bosom of the fair creature; and she complained of it to her lover as being an instrument of torture as well as a

decoration. The King, fascinated with the charming effect of the gems, together with the natural entrancing beauty of the maiden, begged her to wear it, saying, with a supplicating smile, "One might surely bear some little inconvenience to please those we love."

The late Madame Thiers possessed a rare jewel, which came to her by inheritance, and which she wisely bequeathed to the Louvre collection. This jewel is a necklace of precious stones of the sixteenth century workmanship, and is regarded as without a rival in Europe except among the regalia preserved at St. Petersburg.

There are a great many diamonds owned in France among the nobility, the landed proprietors, and the successful merchants. Paris has been for a long time the chief market in the world for the sale of the gem; and most of the stones cut at Amsterdam find their way, primarily, to the Parisian bazaars. Many of these are taken as securities by the rich; but the most of them are absorbed by the requirements of fashion and the love of display.

Adventurers, during the tide of success, prefer to invest their gains in gems, and especially diamonds, rather than in lands or bonds. There is a twofold reason for this preference. Great wealth can be concealed in a handful of gems which can be easily transported; and the glitter of the stones adds vastly to the fascinations of the investment. Disastrous wars and commercial panics generally betray hoards

of this description ; and new sources of the precious stones are thus opened to commerce. It is reported that the Bonaparte family, since the disaster at Sedan, have thrown upon the market diamonds to the value of several millions of dollars.

CHAPTER IX.

THE REGALIA AND OTHER GEMS OF ENGLAND.

THE casket of gems belonging to the English Crown is not of ancient date, for the followers of Cromwell — iconoclasts and economists — ordered all the ancient regalia to be sold. However, some of the finest of the gems were recovered not long after, and were used in the decorations of the coronation of Charles II.

The present crown of England was made by English artisans, in 1838, with gems taken from old diadems and others bought by Victoria. It is described by Professor Tennant as follows:—

“The imperial state crown of Her Majesty, Queen Victoria, was made in the year 1838, by Messrs. Rundell and Bridge, with jewels taken from old crowns, and others furnished by command of Her Majesty. It consists of diamonds, pearls, rubies, sapphires, and emeralds, set in silver and gold; it has a crimson-velvet cap with ermine border, and is lined with white silk. Its gross weight is 39 oz. 5 dwts. Troy.

“The lower part of the band above the ermine border consists of a row of 129 pearls; and the upper part of the

band, of a row of 112 pearls ; between which, in the front of the crown, is a large sapphire [partly drilled] purchased for the crown by His Majesty, King George IV. At the back is a sapphire of smaller size and 6 other sapphires, 3 on each side, between which are 8 emeralds. Above and below the 7 sapphires are 14 diamonds, and around the 8 emeralds 128 diamonds. Between the emeralds and sapphires are 16 trefoil ornaments containing 160 diamonds. Above the band are 8 sapphires surmounted by 8 diamonds, between which are 8 festoons, consisting of 148 diamonds. In the front of the crown, and in the centre of a diamond Maltese cross, is the famous ruby said to have been given to Edward, Prince of Wales, the Black Prince, by Don Pedro, King of Castile, after the battle of Najara, near Vittoria, A.D. 1367. This ruby was worn in the helmet of Henry V. at the battle of Agincourt, A.D. 1415. It is pierced quite through, after the Eastern custom, the upper part of the piercing being filled up by a small ruby. Around this ruby, to form the cross, are 75 brilliant-diamonds. Three other Maltese crosses, forming the two sides and back of the crown, have emerald centres, and contain respectively 132, 124, and 130 brilliant-diamonds. Between the 4 Maltese crosses are 4 ornaments, in the form of French *fleurs de lis*, with 4 rubies in their centres, and surrounded by rose-diamonds, containing respectively, 84, 86, 86, 87 rose-diamonds. From the Maltese crosses issue 4 imperial arches composed of oak-leaves and acorns ; the leaves containing 728 rose, table, and brilliant diamonds ; 32 pearls forming the acorns, set in cups, containing 54 rose-diamonds and 1 table-diamond. The total number of diamonds in the arches and acorns is 108 brilliant, 116 table, and 559 rose diamonds. From the

upper part of the arches are suspended 4 large pendent pear-shaped pearls with rose-diamond cups, containing 12 rose-diamonds, and stems, containing 24 very small rose-diamonds. Above the arch stands the Mound, containing in the lower hemisphere 304 brilliants, and in the upper 244 brilliants; the zone and arc being composed of 33 rose-diamonds. The cross on the summit has a rose-cut sapphire in the centre, surrounded by 4 large brilliants and 108 smaller brilliants."

The value of this beautiful ornament has been estimated by Barbot, the French jeweller, at the sum of \$600,000, which, however, is probably very far below its real value.

The great prize and boast of the English treasures is the diamond called the Koh-i-noor, one of the spoils of the East India loot.

From the many descriptions given of it and its real and supposed history, it is better known to the English reader than any other gem; yet there are in Europe several diamonds of greater size and perfection, and a number of gems of greater beauty, and certainly of a higher value. The Koh-i-noor is said to have been discovered in the mine of Gani, near Golconda, about the middle of the sixteenth century. It is thought by some to be a portion of the Great Mogul diamond; but of the correctness of this view there is considerable doubt.

The form in which it was found by the English at the time of capture certainly conveys the idea that it may have been cleft from a larger specimen;

but, according to Tavernier, the Great Mogul was ground down and not rifted by means of its cleavage planes at all. At all events, the gem, when it reached England, weighed one hundred and eighty-six karats, and its sides were polished and faceted in the Oriental manner, without regard to a symmetrical form. In this condition it was uncouth, it is true, but it was supposed to be the famous Koh-i-noor, "the mountain of light," of Eastern romance and history. Now, in its new shape, it is no longer one of the giants of its species, and the prestige which the Hindoos bestowed upon it has also vanished. The recutting of this gem, and the attempt to reduce its irregular form into the shape of a brilliant, was most unfortunate. It is now only a brilliant in name, and it is far too thin in substance to exhibit the beautiful and natural refractive powers of the mineral.

In reality, the form of the brilliant should be cut according to mathematical laws; and its depth and breadth must be of a certain fixed ratio to call forth the natural brilliancy and prismatic display of the stone. This relative degree of form and its wonderful results is well exemplified in the gems cut by Ralph Potter at the commencement of this century, who was, without doubt, the best diamond-cutter the world has seen. It is also laid down as a mathematical problem in the scale which Jeffries has prepared.

The Koh-i-noor, before cutting, weighed one hundred and eighty-six karats; and was the second dia-

mond in Europe. It is now reduced to $102\frac{1}{4}$ karats, with its splendors but little increased; and is reckoned as the fifth in size among the European diamonds; and, to our view, is inferior in value to many of the diamonds of less size, and especially the green diamond of Dresden, or the blue of the Hope collection. In fact, it is far exceeded in beauty and splendor by the imitations of art. The prestige has been injured, if not destroyed, by cutting; and its position among the great gems of the world reduced to a comparatively low degree, notwithstanding its great weight.

No amateur will say that the gem has gained any advantage in cutting, when he sums up the arguments in favor of and against the operation. He will not say the Koh-i-noor, exhibited in the London exhibition, was superior in all respects to the time-honored gem displayed among the crown jewels of the Tower of London a few years before. In reality, its appearance in the Crystal Palace was inferior to that of its glass models; and a comparison of its form with the examples offered by Jeffries will at once show its imperfections.

In its spread, as compared with that of a properly proportioned one-hundred-karat brilliant, it is quite one third too large; or, in plainer language, it is now a badly shaped stone, and cannot display its latent splendors unless surrounded by a great number of wax candles.

A comparison with the outlines of the Regent will

at once show the want of harmony in its shape so far as development of brilliancy and prismatic display are concerned; and to obtain the display of these properties, without which the diamond is not much better than common limpid quartz, the form of the gem must be invariably of a certain size and depth. A lustreless mass of diamond, no matter how large it may be, is not a choice example of the mineral, in comparison with a smaller stone, radiant with its natural, or rather developed, beauties. Size alone, without special excellence, brings no charm with it, but rather places it among mineralogical curiosities. Therefore, we regret exceedingly the recent cutting of the Koh-i-noor, which has injured its prestige, and reduced its value incomparably.

Had the lapidaries adopted the form of the Sancy, that is, the shape of the almond, with small facets all over it, a far greater brilliancy would have been obtained. Such is the opinion of Babinet and other connoisseurs, who are able to judge on this subject. The Koh-i-noor, before cutting, was submitted by Prince Albert to the examination of several eminent men, amongst whom was Sir David Brewster; and a variety of opinions were expressed upon the subject. It is generally believed that ideas of fashion directed the shape of the stone to be adopted; and that if its form had been left to Coster, the model of the brilliolette would have been copied, and but little of the stone sacrificed in the cutting. However, it

is too late to lament the accident or the error; but we hope that the experience acquired will preserve other specimens for the admiration of art, although it availed nought in the case of the Star of the South, another stone admirably adapted for the exhibition of the beauty of the brilliolette model. This form, with numerous small facets, in both instances would have given more luminous points, and therefore produced more splendid effects.

Babinet properly exclaims against the mode of cutting the large gems with large facets, as thereby much of the glory of the gem is lost. Had the Regent, even, been cut with smaller and more numerous facets, its splendors would have been greater. As we have previously stated, the most vivid play of light and color is exhibited in diamonds of about ten karats or less; we may, perhaps, attribute the difference to the violation of some law in optics, as well as to the difference in the laminæ or substance of the larger stones.

Babinet, in defence of his remarks on this interesting subject, states that the beautiful rainbow hues are produced by the light entering the upper surfaces of the gem, and, being reflected backwards from the bottom surfaces, is then refracted, after traversing the side facets. The white light is then decomposed into every variety of hue, the perfection of which depends upon the condition of reflection and refraction. If the facets are too large and the light too voluminous there is danger of neutralization of these colors, and that white light be reproduced.

We doubt very much if this historic gem has been known to history for more than five hundred years. If it is, as it has been alleged, a part of the Great Mogul, its appearance among mankind dates from 1550. Had it been known in the times when Timour so mercilessly attacked India, it could hardly have escaped the rapacity of the Tatar. And the history of this conquest, in the latter part of the fourteenth century, leads us to believe that all, or nearly all, of the great diamonds of Bengal have been discovered since that time. Had this gem been added to the Mogul treasury at Delhi in 1304, from the conquest of Malwa by Ala-ud-deen, it probably would have been known to Timour. The last Tatar invasion, in 1736, under Nadir Shah, found the gem set in the turban of the Great Mogul, and it was carried away to Khorasan by the victorious host, together with all the fabulous wealth which had been garnered up during nearly four centuries of prosperity. From Nadir it was wrested by assassination, and passed from ruler to ruler, with strange vicissitudes, until the Sikh power succumbed to the arms of England; when it passed, in 1850, with other treasures, from the stronghold of Lahore to the jewel-chamber of Windsor Castle.

Ill fortune has always attended the possession of this gem, it is said; and certainly the reduction of the stone in the blind attempt to improve its brilliancy may be classed in this category. The Hindoos have always maintained that it inevitably brought ruin to

its possessor; and surely, the history of the Mogul Empire, the reign of Nadir Shah, its conqueror, the Dooranee dynasty, and the rule of the Sikhs give strength to the plausibility of the tradition. In the chapter on the gems of Asia we shall again refer to this stone.

England has had the opportunity, during her Indian conquests, of collecting the most magnificent parure of gems the world has seen. The pride of the French Crown, the matchless Regent, was brought to London by the English Governor, Pitt, and offered to the Royal House; the great Orloff, the boast of the Russian regalia, was brought from India by an Englishman, Earl Effingham; and many other fine diamonds and gems from Hindostan have been brought within the reach of the English Crown before being offered elsewhere for disposition. The neglect to secure these beautiful and matchless treasures is inexcusable even in a commercial view, for a gem paragon is "an empire made portable."

Among the diamonds brought from India by Englishmen, the Pigott and the Nassac deserve some mention.

The Pigott was a splendid gem of $47\frac{1}{2}$ karats, and derived its name from its importer. In 1801 it was placed in a lottery in London, and valued at \$150,000. The lucky drawer of the prize was content to part with it for \$30,000 to an English jeweller, who afterwards sold it to Ali Pacha of Egypt. The Egyptian prince conceived a strange attachment to the gem.

He did not display it among the ornaments on his person; but concealed it in a silken bag which he attached to his girdle. The story goes that when Ali was mortally wounded by Reschid Pacha he gave orders to have his favorite wife, Vasilika, strangled, and also commanded Captain D'Anglas to crush the diamond in his presence. A single blow of the hammer crushed to atoms this beautiful gem, which was really one of the finest in Europe on account of the perfection of its form and the absolute purity of its water. The model alone remains. The fascinating Vasilika by some means managed to escape the sentence of death.

The Nassac diamond was brought from India by the Marquis of Hastings, and formed a part of the Deccan booty. After passing through several ownerships it was finally purchased by the Marquis of Westminster for about fifty thousand dollars. It has since been recut into a triangular form, and its original weight reduced from eighty-nine to about seventy-eight karats. In its new form it has gained vastly in lustre and brilliancy.

The famous blue diamond known as the Hope diamond, from the fact that it belonged to one of the distinguished family of bankers of that name, is really one of the most valuable diamonds in Europe, for it is indeed one of the marvels of the mineral kingdom. Its weight is $44\frac{1}{2}$ karats, but its history is unknown; and this obscurity leads to the suspicion it may be the lost gem of the French casket since

reduced in size. It is now mounted as a medallion with a border of rose-cut diamonds and twenty brilliants, each of one karat weight and of the finest water.

This beautiful gem was shown to the public at the great Exhibition of 1851 in London, and the description given of it by Mr. Hertz is worth repeating here. It is "a most magnificent and rare brilliant of a deep sapphire-blue, of the greatest purity and most beautifully cut: it is of true proportions, not too thick nor too wide-spread. This matchless gem combines the beautiful color of the sapphire with the prismatic fire and brilliancy of the diamond; and on account of its extraordinary color, great size, and other fine qualities, it certainly may be called unique, as we may presume that there exists no cabinet nor any collection of crown jewels in the world which can boast of the possession of so curious and fine a gem."

The value of this wonderful specimen of Nature's work has been variously estimated. It is understood that Mr. Hope paid but \$65,000 for it, which is a mere bagatelle to its comparative worth. To our view this matchless gem should be valued as highly as any of the fine paragon diamonds of the world, and we do not include the Koh-i-noor as among this number. In this estimate we refer only to the comparison of actual merits and qualities, unbiassed by the whims of royalty or of fashion.

A hundred years ago and more the citizens of London, transported with joy over the victory at Culloden by the Duke of Cumberland, hailed the soldier as a hero and a deliverer, and presented him with a beautiful diamond. It was a splendid gem of thirty-two karats weight, and cost the city the sum of \$50,000. Not many years ago, however, the House of Hanover laid claim to the gem by reason of certain laws of inheritance; and we are informed that Queen Victoria, after investigating the claim, ordered the gem to be given up to the claimant.

Mr. Hertz, of London, in the course of his long experience collected a very costly, as well as unique and beautiful, collection of gems. His cabinet of diamonds, embracing almost every shade and color, rivalled in excellence the celebrated Wernerian cabinet at Freiburg, and that of Abbé Haüy at the Jardin des Plantes at Paris; but was surpassed by that of Helmreicher now preserved in the Imperial Museum at Vienna.

As the reader may be interested in the tastes of the English nobility in the good old times, we will look over a few of the pages of English history, and relate some of the incidents of court life, and describe the appearance of some of the distinguished characters of different reigns.

Eleanor of Provence exhibited great extravagance at her coronation as Queen of King Henry III., who was called the greatest fop of his time (1236). It

was probably Eleanor who established the fashion of wearing chaplets of gold and gems over the hair. On the occasion of her coronation she had on no less than nine garlands or wreaths formed of gold and clusters of colored precious stones. She had, also, among her regalia, a great crown glorious with gems, and girdles radiant with the most beautiful specimens of the mineral kingdom. The wedding present from her sister, Queen Marguerite of France, was a large silver peacock, whose train was set with sapphires and pearls and other precious stones. It was used as a reservoir for perfumed waters.

It seems that the old Crusaders were wont to deck themselves with gems; and Provençal traditions declare that the first intimation Queen Berengaria had of the seizure of Richard Cœur de Lion was the sale of a belt adorned with gems, which she knew he wore and would not part with except by violence.

The coronation of Henry VIII. was attended with extraordinary splendor, and the King was arrayed with the finest gems that could be obtained.

At the famous Tournament of the Cloth of Gold, the English and French nobility attempted to outshine each other in the magnificence of their dresses and decorations. And the vanity of the festival caused the financial distress or ruin of many a gallant knight.

At the banquet at this time King Henry gave Anne Boleyn a beautiful jewel valued at 15,000 crowns.

When Bluff King Hal went to meet his bride, Anne of Cleves, he was arrayed so magnificently as to be likened by the wits of the time to the "king of diamonds." He wore a coat of purple velvet curiously embroidered with gold and lace. "The sleeves were cut, and lined with cloth of gold, and clasped with great buttons of diamonds, rubies, and Orient pearls; his sword and girdle set with stones and special emeralds; his cap garnished with stones, but his bonnet was so rich of jewels that few men could value them. Besides all this he wore a collar of such Balais rubies and pearls that few men ever saw the like."

Henry demanded of Francis I. of France, the gems and jewels which had belonged to his sister Mary, who had married Louis XII. Among them were a ruby two inches and a half long, some great pearls, and large diamonds, forming together a casket which the Earl of Worcester describes as the "goodliest and richest sight of jewels he ever saw." But they were never returned; and Francis refused to allow the claim on account of the loss of the fine diamond known as the Mirror of Naples, and which he valued at 30,000 crowns. What this diamond really was, and its subsequent history, is still a matter of historical conjecture.

Mary Queen of Scots, when married to the Dauphin of France in 1558, was decked in a marvellous manner with all that art could afford at the time. Her crown was of exquisite workmanship, and was

composed of gold, with diamonds, pearls, rubies, and emeralds of immense value, having a huge carbuncle suspended in the middle valued at half a million crowns. Around her neck was hung the esteemed jewel known in Scottish history as the "Great Harry." The inventories of her property show that she possessed a large number of valuable gems. It seems that she lavished upon Bothwell, before they parted at Carberry Hill, jewels of more than \$30,000 in value.

One of the most magnificent pageants known in English history was that celebrated by the wealth of England and illustrated with the poetry of Ben Jonson, and which was the occasion of investing the eldest son of Queen Anne with the rights of the Prince of Wales, in 1609. The "Glorious Masque," which took place at this time, has never been excelled in England. The whole court of England and all the aristocratic beauties of the day were engaged in the event. The palace of Whitehall was transformed into a scene of enchantment under the hands of the best artists of the time, guided by the taste of Inigo Jones. This magnificent festival, characterized by so many beautiful and dazzling scenes, was the happiest in the life of Queen Anne of Denmark.

A few years after this glorious celebration, which lingered in the memory of the participants like a golden dream, Queen Anne died; and the King, on opening her coffers and cabinets, discovered that all of her beautiful gems and jewels had disappeared;

and notwithstanding the Queen's maid and attendants were arrested, and diligent search made in all directions, there is no evidence that even a trace was ever found of the missing treasure. No vestige was ever obtained of the jewels which Herrick made for her, and which were worth nearly \$200,000.

When the Duke of Buckingham was sent to Paris, in 1625, to bring over to England Queen Henrietta Maria, he carried with him twenty-seven rich suits of clothing, as beautiful and valuable as the invention of the times could make them. The suit arranged for his entry into Paris was reckoned of a value of more than a quarter of a million of dollars. It was made of white satin and uncut velvet, set all over with diamonds. His spurs, hat-band, feather, girdle, and sword were all covered with diamonds. For the wedding day, at Paris, he had a suit of purple satin, embroidered all over with Orient pearls, and a cloak to match, made after the Spanish fashion; all of the value of about one hundred thousand dollars.

Charles I. had many fine gems and jewels at his disposal; and, according to the documents still extant, he made free use of them. The very first year of his reign, he examined the contents of the jewel house, with a view of pledging them in the future; and it is said that his queen, Henrietta, raised in one year ten millions of dollars on the royal jewels. The great collar of rubies was sold in Holland.

Charles, in the days of his prosperity, was an eager purchaser of gems and jewelry; and a record is preserved which shows that he bought in a year and a half, a quarter of a million dollars' worth of jewelry, and chiefly to use as gifts. It is also related that he bought the great diamond which Sir Paul Pindar brought home from Constantinople, and which he valued at \$150,000. The subsequent history of this rare gem is to be placed among the mysterious things of the past.

The queen of James II. was ornamented for the coronation in a manner that would have startled even Lollia Paulina; and a half million dollars were expended in dressing her up. The diadem also was a wondrous piece of extravagance for the times, and cost more than five hundred and fifty thousand dollars. The historian of the times states that "the jewels she had on were reckoned at a million's worth, which made her shine like an angel." The exiled Queen, in the after years of her widowhood, said to the nuns of Chaillot, "My dress and royal mantle were covered with precious stones; and it took all the jewels that the goldsmiths of London could procure to decorate my crown."

When Queen Caroline was crowned as consort of George II., she made use of all the material she could find in London. And Lord Hervey exclaims that "the appearance and the truth of her finery was a mixture of magnificence and meanness not unlike the eclat of royalty in many other particulars,

when it comes to be nicely considered, and its source traced to what money hires and flattery lends." For it is stated that she used upon her head all the pearls and necklaces she could borrow from the ladies of quality; and that she placed upon her petticoat all the diamonds she could hire of the Jews and jewellers in town.

When Philip of Spain went to England to receive his bride, Queen Mary, the ceremonies on the occasion were conducted with great splendor. The King was accompanied by sixty of the most distinguished grandees of Spain, clad in royal array. He was dressed in a robe of rich brocade bordered with large pearls and diamonds. His trunk hose were of white satin worked with silver. He wore a collar of beaten gold full of inestimable diamonds, and from which hung the jewel of the Golden Fleece. Around his knee was the Garter, studded with beautiful gems of various colors.

The daughter of Henry VIII. inherited her father's love for ornamental display; and at the time of her marriage with Philip of Spain, she appeared magnificently arrayed. She is described as wearing a robe whose ample train was bordered with pearls and diamonds of immense size and value. The large sleeves were ornamented with clusters of gold set with pearls and diamonds. Her coif was bordered with two rows of large diamonds; and she wore on her breast a splendid diamond of inestimable value, which Philip had sent her as a gift. Mary,

on her death-bed, sent the most of her jewels to her sister Elizabeth of England; and King Philip added to them a casket of very beautiful gems.

Elizabeth, when she became Queen of England, gradually acquired a passion for jewelry, which finally became absurd and grotesque. She possessed at one time two thousand dresses and an immense quantity of gems. The portrait of Queen Elizabeth at Henham Hall represents her in a blaze of jewels. She appears with an enormous ruff, which rose as a bird-like structure behind the fabric of jewels which adorned her head, until it overtopped the cross of her regal diadem. A rich collar of gold, woven in delicate filigree work, set with pearls, rubies, and amethysts, adorned her neck. The bodice of her dress was also ornamented with gold filigree set with many gems; and the sleeves were profusely ornamented to match the bodice. Horace Walpole, in describing her portraits, says, "There is not one that can be called beautiful. The profusion of ornaments with which they are loaded are marks of her continual fondness for dress; while they entirely exclude all grace, and leave no more room for a painter's genius, than if he had been employed to copy an Indian idol, totally composed of hands and necklaces. A pale Roman nose; a head of hair loaded with crowns, and powdered with diamonds; a vast ruff, a vaster fardingale, and a bushel of pearls,—are features by which everybody knows at once the picture of Elizabeth."

Sir Walter Raleigh dressed himself in a gorgeous manner, and was profusely decorated with gems. On court days, even his shoes wore gems of the value of more than \$30,000 (£6,600). His armor was of solid silver, with sword and belt blazing with diamonds, rubies, and pearls.

The Duke of Buckingham, the favorite of King James, wore his diamonds loosely attached, so that he might shake off a few at pleasure. His cloaks were trimmed with great diamond buttons; his hatbands were of diamonds; also his cockades. Among his many rich suits was one of white uncut velvet, set all over with diamonds, to the value of £80,000; besides a great feather bespangled with diamonds, as well as his sword, girdle, hat, and spurs.

In olden times the shrine of Thomas à Becket was famous throughout England and attracted countless devotees from all parts of the realm. One hundred thousand persons of all ranks are said to have visited it in one year, offering a vast variety of gifts. In the twelfth century Louis VII. of France, disguised as a common pilgrim in the meanest garb, visited the shrine and presented it with a famous precious stone, called the Regale of France, and as large as a bird's egg. Not a fragment of this glittering and splendid shrine — a mass of gold and jewels — remains at the present day to interest the antiquary; and its treasures have been scattered to the winds, leaving no trace behind.

The churches of England, as well as France and Spain, were at one time enormously rich in precious stones and ecclesiastical ornaments of the jewelers' art; but wars and insurrections are fatal to collections of the rare and the beautiful; and the fury and cupidity of the Leaguers, the iconoclasts, and the revolutionists have destroyed these treasures of art and nature, or dispersed them so that their identity is lost.

The magnificence of the English clergy led Pope Innocent III. to exclaim, "O England, thou garden of delights! Thou art truly an inexhaustible fount of riches. From thy abundance much may be exacted."

CHAPTER X.

ASIATIC GEMS.

TO Asia we naturally turn for the history of the diamond, and a solution of some of the phenomena connected with the mineral. But here we have to contend with vexations at all points; and instead of clearness, we have obscurity, disconnected histories, conflicting traditions, and superstitious fancies. However, from the mass of fragments which have been preserved, the patient antiquary eventually may be able to arrange an interesting story relating to the gem in the early days of its discovery and its adoption in ornamentation.

We will now proceed to mention some of the celebrated stones whose history has been more or less clearly defined; and regret to say that there are a large number of others of great interest and value, but of which we are unable to give a correct description.

The Hindoos prize diamonds greatly on account of their supposed spiritual properties, and they reluctantly part with them unless compelled by dire necessity, or induced by the hope of greater gain. Many of the fine diamonds brought to Europe from Asia

have blood-stained histories, and some of them are connected with appalling atrocities. Therefore we may with propriety say that few of the noble gems would have found their way to Europe had the free will of their rightful owners been consulted.

The foremost gem in the history of the diamond was that which was called the Great Mogul. This was the largest of all known diamonds, and was found in the rich mines of Gani about the year 1650, or nearly a century after their discovery. It became the property of Vizier Mirgimola, who, although a Persian by birth, had by ability and tact risen to the honor of general and vizier to the King of Golconda. By means of his rapacity in war, and his success in working the diamond mines, he became enormously wealthy, and accumulated immense numbers of gems. The King finally became jealous of the wealth and power of his favorite, and resolved to destroy him. But Mirgimola, warned of his danger in time, succeeded in escaping with all his treasures to the capital of Shah Jehan, the Great Mogul. The wily Persian gained the favor and protection of the Hindoo monarch by magnificent presents of gems, the chief of which was the immense diamond which has since been called the Great Mogul.

The original weight of this mammoth gem is said to have been $787\frac{1}{2}$ karats; but during the process of cutting it was reduced to 279 karats. Tavernier relates that the work had been intrusted to a Venetian lapidary by the name of Hortensio Borghis, who,

ignorant of the duties of his task, removed the flaws and external imperfections by grinding the surface of the stone away. The labor required by this operation seems almost incredible when we come to consider the hardness of the stone, and estimate the difficulty of polishing it, especially with the rude means then in use by the Oriental lapidaries. The cutting of the Pitt diamond (now the Regent) required two years' time, with the aid of modern appliances and the facilities afforded by means of cleavage, by which large fragments were removed and utilized. Therefore the statement that this stone was reduced solely by grinding from $787\frac{1}{2}$ karats to 279 karats is likely to meet with disbelief among the lapidaries; for the operation must have required more than the fifteen years which had elapsed from the discovery of the gem to the time Tavernier examined it. Tavernier says distinctly that cleavage was not resorted to in facilitating the reduction of the stone. We quote: "Had the Sieur Hortensio been well acquainted with his profession he might have obtained from this great stone some good pieces without doing any injury to the King, and without having taken so much trouble in grinding it away; but he was not a very skilful diamond-cutter." This statement establishes the fact that the secret of reducing diamonds by cleavage was known at that time.

Fifteen years after the discovery Tavernier saw the gem in the hands of Aurungzeb, who was then Mogul, Shah Jehan having been deposed and placed in con-

finement. The distinguished traveller was allowed to examine the gem, weigh it, and make a drawing of it. It was then of the form of half an egg, and very high-crowned, and had been cut with many facets, quite regularly arranged over its superior surfaces. It was also of fine water, and disfigured by only one crack on its lower border, and a little flaw in the interior.

The French traveller gives an account of the ceremony of his examination as conducted with great precision and the utmost solemnity, as though the gems were the crystallizations or the embodiments of departed spirits. The gems were brought in upon two lacquered trays covered with brocade, and were counted over thrice, and three lists made of them by different scribes. This process was not particularly flattering to the pride of the guest, but it serves to illustrate or establish the fact that the Hindoo character for deception and theft was quite as marked then as now.

Since this period no further mention has been made of the gem by any authentic writer; but it is supposed to have formed a part of the plunder of Delhi, when Nadir Shah captured all the treasures accumulated during four hundred years of prosperity, and which were valued at from \$150,000,000 to \$350,000,000.

The next largest diamond shown to Tavernier was one of only $54\frac{1}{2}$ karats, and all the rest were much inferior. Hence it is surmised that the Koh-i-noor,

the Shah, and the Daria-i-noor were then unknown, and were discovered at a later period. But it is stated that the former Mogul, who was still in confinement, retained many of the gems of his own collecting, and that they may have been among them. Or they may have been in possession of Mirgimola. At all events, the Mogul disappeared with the last Tatar invasion ; and new paragons, like the Koh-i-noor, became known to the world. After the assassination of Nadir Shah his treasures were scattered among many chieftains, and all record of many of them has been lost.

The fate of the Mogul is shrouded in mystery. The famous gem preserved in the Persian treasury and called Daria-i-noor, "the ocean of lustre," which Forbes saw and described, is not the lost stone. By some it is believed to be hidden away in some obscure fortress, to appear at some future day when the possessor may display his hidden treasure in safety. This view is certainly warranted by the discovery of the large flat diamond of one hundred and thirty karats among the jewels taken from the harem of Reeza Kooli at the capture of Coocha by the Persian army in 1832. Also the finding of the celebrated crown of Chosroes by Abbas in the treasury of one of the Princes in the Lauristan Mountains near the Persian Gulf, where it had lain concealed for a thousand years.

Were it not for the general accuracy and truthfulness of Tavernier, and the drawing he has left of the

diamond, we might claim the Orloff as the missing Mogul. Certainly the resemblance in form is very remarkable; and the location of the flaws, with the rare circumstance of shape, are facts very strongly in favor of the Orloff. The question now arises, did Tavernier make an error in his weight and draw the outlines carelessly or from memory? We have seen how confused history has become regarding the identity of the Sancy diamond.

The real Koh-i-noor of Hindoo history is probably the great Mogul or the Orloff; and the name would be appropriately applied to the dome-like shape of both of the stones, with their flashing beams of light, rather than to the flattened form of the English stone now called the Koh-i-noor, and which exhibited but little lustre. It is highly probable that the diamond of Runjeet Sing, the English Koh-i-noor, was one of the magnificent diamonds surrendered to Nadir Shah by Mohammed Shah at the sack of Delhi in 1739, but there is no positive proof of his obtaining the great heirloom of the descendants of Aurungzeb.

In reviewing the history of the Great Mogul gems, from the time of Tavernier down to the present day, we are inclined to regard the term Koh-i-noor, or "mountain of light," as a misnomer, and that the gem received this distinction only after its arrival at Kabul, or came into the possession of Runjeet Sing; neither have we any evidence to prove that the Koh-i-noor was the Great Mogul; for that appellation is not

given to it by the early writers. But it is not probable that the term, so superlative of excellence and superiority, would be applied to an inferior gem, while the great diamond of the Mogul, weighing two hundred and eighty karats, was in existence.

The history of all these great diamonds is very obscure; and as the value of the Indian weights and measures varies so much at different places and at different times, it is quite impossible to follow with precision the fragments of history that relate to them.

Several accounts have been given of the manner in which the Koh-i-noor fell into the clutches of Runjeet; but that of Dr. Wilson, as published in the official catalogue of the great Exhibition at London, is probably correct. It is as follows:—

“When Shah Soujah was driven from Kabul, he became the nominal guest and actual prisoner of Runjeet Sing, who spared neither opportunity nor menace until, in 1813, he compelled the fugitive monarch to resign the precious gem, presenting him on the occasion, it is said, with a lakh of rupees, or about £12,000 sterling.

“According to Shah Soujah’s own account, however, he assigned to him the revenues of three villages, not one rupee of which he ever realized. Runjeet was highly elated by the acquisition of the diamond, and wore it as an armlet at all public festivals.

“When he was dying, an attempt was made by persons about him to persuade him to make the diamond a present to Juggernaut; and it is said he intimated by an inclination

of the head his assent. The treasurer, however, in whose charge it was, refused to give it up without some better warrant; and Runjeet dying before a written order could be signed by him, the Koh-i-noor was preserved for a while for his successors. It was occasionally worn by Khurruk Sing and Shir Sing. After the murder of the latter it remained in the Lahore Treasury until the supersession of Dhulip Sing and the annexation of the Punjaub by the British Government, when the civil authorities took possession of the Lahore Treasury, under the stipulation previously made, that all the property of the State should be confiscated to the East India Company, in part payment of the debt due by the Lahore Government, and of the expenses of the war. It was at the same time stipulated that the Koh-i-noor should be surrendered to the Queen of England.

“The diamond was conveyed to Bombay by Governor General the Earl of Dalhousie, whom ill health had compelled to repair to the coast, and was then given in charge to Lieutenant-Colonel Mackeson, C. B., and Captain T. Ramsay, the Military Secretary to the Governor General, to take to England. These officers embarked on board Her Majesty’s steamship ‘Medea,’ and left Bombay on the 6th of April, 1850. They arrived at Portsmouth on the 30th of June; and two days afterwards relinquished their charge to the Chairman and Deputy-chairman of the Court of Directors, by whom, in company with the President of the Board of Control, the Koh-i-noor was delivered to her Majesty on the 3d of July,—an appropriate and honorable close to its eventful career.”

We are led to infer from the accounts of history that some of the Indian rulers collected enormous

quantities of the precious stones. It is stated that Mahmoud, in his campaign in India about the eleventh century, captured the temple Bheen, which, according to Ferishta, contained a greater quantity of precious stones and pearls "than was ever collected in the royal treasury of any prince on earth." They were carried off to Ghizna.

In another campaign the idol at Sumnat, fifteen feet high, was captured, which being broken open yielded great quantities of rubies, diamonds, and pearls which had been concealed in it. These were carried to Ghizna. Ferishta says Ala-ud-deen obtained from the Raja of Mahrattas fifty pounds of diamonds, rubies, emeralds, and sapphires, and also one hundred and seventy-five pounds of pearls.

In the middle of the sixteenth century Acher of India gave a splendid banquet in honor of his birthday; and, if the reports concerning it are correct, it was one of the most magnificent entertainments ever given on the earth. Acres of land were covered with silken and flaxen tents, and the horses and elephants were bespangled with gold and gems. The tents of the Nabob were not only exquisitely made and adorned, but even the carpets which covered the earth were richly embroidered with gold, pearls, and precious stones. In describing the beauty and magnificence of the Hindoo nobles, the historian states that they were adorned with diamonds that "sparkled like the firmament."

Shah Jehan, the greatest of Mogul sovereigns since

Timour, collected the wealth of India around him, and lavished it in a manner that reads more like a chapter in the "Arabian Nights" than a page of historic reality. At his death the treasury contained \$150,000,000; and his palace, with its embellishments and ornaments, was the most beautiful the world has ever seen. The Peacock Throne was valued at \$30,000,000, and his crown at \$12,000,000. The diadem had twelve points, each tipped with a diamond of large size and the purest water. In the centre was embedded a huge pearl, and the rest of the crown was a glittering mass of rubies, diamonds, and other gems.

The dress of the Emperor was in keeping with his extravagance: around his neck he wore three strings of immense pearls; his arms were covered with armlets of diamonds and bracelets of other gems; his sword and buckler were incrustated with diamonds and rubies; and his sceptre was entwined with a chain of pearls, rubies, and diamonds. Besides his crown, he had a rich turban plumed with long heron feathers; on one side was a huge ruby, on the other a diamond, while an immense emerald decorated the front.

The famous Peacock Throne of Indian history is no myth; for Tavernier examined it with care, and has left a description of it so clear, that its reality and its value are matters of fact. It was so called from the figures of two peacocks with expanded tails standing behind it as large as life. These figures

were constructed of gold and precious stones of all varieties, and so arranged as to represent the natural colors of the birds. The beautiful hues of the feathers were closely imitated by the arrangement of fine rubies, diamonds, sapphires, emeralds, and other gems.

The throne was six feet long and four feet wide, and was constructed of solid gold, inlaid with diamonds, emeralds, and rubies. Steps of silver were placed in front of it; while a canopy of gold, fringed with pearls, supported by twelve pillars emblazoned with flashing gems, surmounted the whole. Between the peacocks stood a representation of the parrot, carved from emerald or some green stone. On each side of the throne was placed one of the sacred umbrellas, called *chattars*, made of richly embroidered crimson velvet fringed with pearls. Their handles were of solid gold, about eight feet long, and studded with diamonds. This was the most costly and superb work of art of its kind ever invented.

Its rival was the Cerulean Throne of the House of Bhamenee in the Nizam. It was constructed in the seventeenth century, and, according to the description of *Ferishta*, the Persian historian, was nine feet long by three feet wide, made of ebony, covered with plates of gold, and incrustated with gems. Its value was estimated at quite twenty millions of dollars. At the sack of Delhi, the Peacock Throne, with many other priceless relics, fell into the hands of Nadir Shah and his ravenous followers, and was carried off by them, and broken up.

We may form an idea of the magnificent costumes worn by the Eastern monarchs, from the description given by Mr. Elphinstone, the British envoy to the King of Kabul, in 1808. At the reception given to the embassy, the king was literally covered with gems. At first sight, he appeared to be clothed with an armor composed of jewels; but, on close inspection, his dress was found to consist of a green tunic covered with large flowers in gold and precious stones. Over these a large breastplate of diamonds shaped like two flattened *fleurs de lis* was worn. Upon each thigh, ornaments fashioned after the same manner were placed; while large emerald bracelets appeared on the arms, and many other jewels were adjusted to different parts of the body. In one of these bracelets flashed the Koh-i-noor, then regarded as one of the largest diamonds in the world. Over the chest were arranged some strings of very large pearls, like loose cross-belts. The crown was about nine inches high, and formed entirely of precious stones, like the wonderful plumes of Prince Esterhazy. It seemed to be radiated, like the ancient crowns; and behind the rays appeared peaks of purple velvet. Several small branches with pendants apparently projected from the crown; but the ornament was so complicated and so dazzling, that it was difficult for the spectators to understand it, and quite impossible to describe it.

Other famous diamonds besides the Mogul are missing; and modern history is unable to account

for them. What has become of the splendid flat diamond weighing two hundred and forty-two karats, which Tavernier examined in Golconda; or the immense Agrah of six hundred and forty-five karats, in the rough, which the same traveller saw in India? Were they also gathered by the followers of Nadir, and divided in the spoliation of the property of the conqueror? We know that Persia, enriched by the last conquest of India, is immensely rich in precious stones of all descriptions; but the number, the character, and the value of them, are as shadowy as those of Turkey. However, we have a ray of intelligence from Bernier, who hastily estimated the value of the Persian jewels at thirteen and one half milliards of francs.

This prodigious estimate has been strengthened by the gorgeous appearance of the last Persian ambassador to France. The costume of this Emir fairly blazed with the brilliancy of the most costly gems, and recalled the departed glory of the last Prince of Esterhazy. The presents sent at the same time by the Sultan to the Empress Eugenie were most magnificent, especially the diamond bracelets, and were glorious emblems of Oriental favor.

Among the diamonds possessed by the Persian Crown, besides the Daria-i-noor, which is said to weigh two hundred and thirty-two karats, we have information of three others of remarkable size and beauty. They are named the Taj-Mah, or Crown of the Moon, of one hundred and forty-six karats;

the Sea of Glory, of sixty-six karats; and the Mountain of Splendor, of one hundred and thirty-five karats, valued at \$729,000.

Dr. Beke, at the meeting of the British Association, in 1851, read a paper on a new diamond that had lately come into the possession of Persia. He referred to the diamond slab of one hundred and thirty karats that had been captured at Coocha, in 1832, and which he thought might have been a part of the Koh-i-noor when in its natural state. The only account of its history the Persians could obtain, was the statement that it was found in the possession of a poor man, a native of Khorasan, who used it for the purpose of lighting his fires, by striking it against steel [the mineral does not possess the property], and that it had thereby sustained some damage. The gem was presented by Abbas Murza to his father, Futteh Ali Shah, and is presumed to be now among the crown jewels of Persia.

One of the latest accounts of the Persian treasures is given by Mr. Eastwick, who was permitted to examine them. He found them placed in a small, strongly built room, to which access was had by means of a narrow, steep stairway and very small door. In this apartment, spread out upon thick, velvety carpets, were displayed gems and jewels of the value of \$35,000,000. Conspicuous among them was the Kaianian crown, which was shaped like a flower-pot, and topped by an immense uncut ruby as big as a hen's egg, which is supposed to have

come from Siam. Beside this tiara were spread two lambskins covered with beautiful aigrettes of diamonds; and before them lay trays of pearl, ruby, and emerald necklaces, with countless rings. The famous Kaianian belt was also an object of wonder. This relic of barbaric splendor weighs about twenty pounds. It is nearly a foot in depth, and is incrusted massively with splendid diamonds, pearls, rubies, and emeralds.

The exhibition of arms was worthy of the Oriental taste for martial decoration, and recalled to memory the ancient fondness for such things, and the sword and scabbard of Mithridates, which has been mentioned in history as being of enormous value. Some of these, now belonging to the Persian Shah, are magnificently decorated with gold and gems, to the value of more than a quarter of a million of dollars.

The arms of defence of the Oriental nations have been noted from the earliest times for the beauty and splendor of their decorations, in which lavish use has been made of the finest diamonds, emeralds, rubies, and other precious stones, set in a variety of metals. The excellence of these precious productions was made known to the nations of the Mediterranean by means of commercial caravans long before the invasions of Xerxes or Alexander; and some of them are objects of admiration to the skilled artisans of the present day.

In Lahore, Benares, and Lucknow are yet preserved the secrets of the gold workers of Assyria and ancient

Phoenicia, which have long been forgotten in the countries where they were invented. The enamels of these artisans, especially the green, red, blue, and turquoise hues, are not surpassed in beauty of tint by the finest enamels of Paris.

As Persia is the home of the turquoise, the traveller would expect to see the finest representative of the mineral species in this collection. And he will not be disappointed, for the specimen of turquoise treasured here above all others is of a magnificent color, from three to four inches long, and without a flaw. Its value is not given; but we may draw an inference from Shylock's turquoise, which was worth "a wilderness of monkeys."

Besides the above enumerated articles the treasury contains numberless objects of value not described, and among them piles of gauntlets and belts, massive with pearls and diamonds.

The present ruler of Persia, Nasiru'd-din, during his late visit to Europe, displayed upon his person many of the chief treasures of his crown. They were not, however, exhibited to advantage, for his costume was an incongruous mixture of the amplitude of nomadic ideas with the close-fitting symmetry of the French tailor. The ridiculous figure of the Shah, surmounted by the ancient lofty Persian hat, heightened in comicality by a pair of gold-bowed spectacles, presented a picture that detracted from the splendor of the gems which he wore. His coat, which was made after the style of the Parisian frock, was plaited over the hips

and adorned with extraordinary gems. From waist to shoulder, arranged in *echelon*, were placed five enormous diamonds, each said to be larger than the English Koh-i-noor. The collar and sleeves of this garment were also fairly incrustated by brilliants of great beauty; while over his breast hung his various insignia and orders set with the finest of gems. His sword-belt and sheath were formed of gold, studded with diamonds, rubies, and emeralds; while his golden spurs were formed of diamonds of such perfection as to flash like sunbeams as he walked along.

Many fine diamonds are undoubtedly to be found among the nabobs and princes of India. And their concealment may have been advised by the lessons of the past. Fears of English rapacity may have caused the fracture of the famous Nizam diamond, or a report to that effect. This beautiful gem, which is said to have weighed three hundred and forty karats, belonged to the King of Golconda, and is said to have been broken at the commencement of the last Indian revolt.

In 1807 a fine diamond of seventy-seven karats was obtained by the Ranee Ruthen from the bed of the river Sumbhulpore; and in 1809 a fine gem of one hundred and sixty-eight karats was found in the sands of the river Mahamuddee.

The King of Ava possesses many diamonds, but of unknown value. Colonel Symes saw, in his visit of 1795, many rude ornaments of remarkable splendor and value. One of the state carriages fairly blazed

with its decorations of burnished gold, covered with diamonds and other gems.

The Sultan of Mattan in Borneo is said to possess a remarkable diamond; but there is some doubt as to its authenticity, like its great rival, that of the King of Portugal. But Mr. Hugh Low, Colonial Secretary of the Island, declares in his work on Sarawak and its productions, published in 1848, that the gem of the Sultans is a real diamond, and of the great weight of three hundred and sixty-seven karats. It was, at that time, in the rough state, and its shape was that of an egg indented on one side. Its value was estimated by Mr. Crawford to be £269,378. Sir Stamford Raffles relates that the stone has remained as an heirloom in the royal family for four descents, and is almost the only appendage of royalty now remaining. The Governor of Batavia, desirous of obtaining the gem, is said to have sent Mr. Stewart to Borneo to negotiate for it. But although the tempting offer of \$150,000, with two brigs of war with their guns and ammunition, was made to the Sultan, he refused to deprive his family of the rich inheritance which was supposed to be in the possession of the diamond.

In the time of Sir Stamford Raffles few courts in Europe could boast of a more brilliant display of diamonds than was exhibited by the ladies of Batavia in the prosperous days of Dutch commerce, when the trade of India and Eastern Asia was to a very great extent in the control of Holland.

We cannot properly close this chapter on the

gems of Asia without making a brief allusion to that master-piece of architecture, the Taj Mahal, the palace-tomb, which Shah Jehan erected at Agra in memory of his beautiful and beloved wife. The Mogul Emperor promised the dying Empress the most beautiful tomb the world had ever seen; and he kept his promise. Even to-day, after so many centuries of neglect and pillage, the fairy-like structure rises to the view more like one of the dreams of the "Arabian Nights" than a material edifice constructed by human hands.

In its construction the wealth of India was placed at the service of its architects, and thousands of laborers were employed for many years. The chief architect was a Frenchman, M. de Bordeaux, who also designed the famous Peacock Throne at Delhi. Enormous quantities of precious and semi-precious stones of all descriptions were used in its ornamentation, and inlaid in its walls, its columns, and ornaments. The images were masses of glittering gems, and some of the mosaics were marvels of beauty and human skill.

In a curious manuscript, still preserved, is given an account of the gems, jewels, etc., and their value, used in the construction. All parts of Asia were searched for the richest gems, — Thibet for its turquoises, Ceylon for its lapis lazuli, Persia for its amethysts, Lunka for its sapphires, and Pannah for its diamonds. The famous Hindoo temple of Sunnat was, in the days of its perfection, one of the most

renowned of all the shrines of India, and must have been a structure of wonderful richness, when its fifty-six pillars, incrustated and inlaid with multitudes of precious stones, sparkled in the morning light. Even at the present day its ruins, though despoiled of their ornaments, are very beautiful and impressive.

CHAPTER XI.

MISCELLANEOUS.

THE royal family of Brazil are said to possess diamonds of great beauty, selected for their superiority from the best of the products of the mines of the country. But we have not been able to obtain reliable descriptions of them.

The Crown of Portugal, by virtue of its inheritance, is said to own immense numbers of the gem; and it is understood that they are held in reserve, and only a certain quantity are to be sold from time to time according to the demands of the market. In corroboration of this report it is said that the Bank of Lisbon sold, in 1863, rough diamonds to the value of 1,800,000 francs out of the collection brought from Brazil by John VI. in 1821. It was also stated that the value of the remainder was estimated at 35,000,000 francs.

Mr. Mawe, at the time of his visit to Lisbon, stated that the treasury of the King contained diamonds amounting in weight to four thousand or five thousand karats. The same traveller and gem-expert says that a vast number of the Brazilian diamonds have passed into the possession of the King of Portugal. And

he furthermore states that he examined diamonds belonging to this potentate, which were worth more than two million pounds sterling.

Among the crown jewels of Portugal there is a gem of large dimensions which has been reported to be a diamond weighing 1,680 karats. Mr. Murray described it to be as large as an ostrich egg, and added that Mr. Mawe informed him that it was a white topaz. Romè de L'Isle, in his treatise on Crystallography, published in 1783, describes the stone as a diamond, but admits that it is suspected to be a white topaz. It is a little singular that this discrepancy and obscurity has not been definitely cleared up during all this time, when the character of the stone can so easily be ascertained. As the massive variety of diamond is found in masses of more than one thousand karats, it is even probable that the crystalline and transparent variety may occur of equal weight.

Mr. Murray mentioned a beautiful gem of two hundred and fifteen karats, called the Round Brilliant of Portugal, and estimated its value at £388,290. Mr. Mawe describes another a little less in size, and also two nearly perfect octahedrons of one hundred and thirty-four and one hundred and twenty karats each.

The state waistcoat of Joseph I. had twenty buttons, each button being composed of a solitaire diamond of the value of \$20,000, and the rest of its ornaments were corresponding in beauty and value. This garment is said to have been the richest ever seen in Europe, with the exception of the recent

grand illumination by the Shah of Persia. It has also been stated that the golden cane of John VI. had in its top a splendid brilliant of the value of a million of francs.

The largest of the Brazilian diamonds was discovered as late as 1852, by a negress working in the mines of Begagem. Like most of the large diamonds, its form was not symmetrical, and its shape was much modified from the regular crystalline forms. In 1856 it was brought to France and exhibited to the members of the Academy of Sciences. The gem then weighed in its rough state $254\frac{1}{2}$ karats, and appeared perfectly transparent and without tint. It was placed in the hands of Coster, of Amsterdam, for cutting, and reduced in weight to 127 karats. The form given it was the brilliant; but the gem was cut too thin to exhibit its full beauty. The spread of its table will be found, on comparison, to be much greater than that of the Regent diamond, which weighs 136 karats, or almost 10 karats more; therefore Babinet properly exclaims against the taste which adopted an imperfect brilliant, at a great reduction of weight, when the form of the brilliolette, like that of one of the Sancys, would have preserved three fourths of its weight and given it a more splendid lustre. It would then have been the second diamond in weight and beauty in Europe. This gem is known as the Star of the South, but is sometimes called the Halphen diamond, from the name of the gentleman who bought it on its arrival in Europe.

The gem treasures of the Elector of Saxony are among the most valuable and unique in Europe. The commencement of their collection dates from an early period. The famous silver mines, prior to the discovery of America, placed the Saxon princes among the richest sovereigns of Europe; and they took pride in exhibiting their magnificence, in expending vast sums of money in the purchase of gems, jewels, and works of art.

The treasures thus accumulated during a long period of time are of immense value; and the apartments where they are displayed remind the observer of the gorgeous descriptions of Oriental magnificence. And unless we except the unknown collection in the Turkish Seraglio and those of the Crown of Russia, it is the most extensive and interesting in the world. All that is rare and beautiful on earth is here represented; and the total valuation of all the objects of art and nature must amount to many millions of dollars. They are contained in eight large consecutive rooms, each surpassing the previous one in the splendor and richness of its contents. Among the diamonds are some large and unique gems of the rose pattern. The gala dress and the decorations of the Elector, which fairly dazzle the eye with their floods of brilliancy, are also kept here. In the epaulette there are three splendid brilliants which weigh nearly fifty carats each.

But the chief attraction among all this vast collection of gems is the famous green diamond. This

wonderful stone is of oblong form, $1\frac{1}{12}$ inches in length by $\frac{10}{12}$ of an inch in width, and weighs $31\frac{1}{4}$ karats. It is mounted in a clasp, set with large white brilliants. The price paid for it is kept a profound secret; but it is reported that it was obtained at Warsaw by Augustus the Strong, and that he paid 60,000 thalers for it. Amateurs generally regard the blue diamond as the most astonishing and perfect of the products of the mineral kingdom; but we fail to perceive, in the exhibition of this color, any advantage over the fine green or the pure red diamonds.

There is another diamond in this collection which is one of the finest in Europe, although it weighs but $48\frac{3}{4}$ karats. It is known as the Saxon white brilliant, and is of rare perfection of form and brilliancy. It is about $1\frac{1}{12}$ inches square, and is set in the insignia of the Order of the Golden Fleece, surrounded with other fine brilliants. Augustus purchased it, and is said to have given more than \$700,000 for it. This gem has a great reputation for its beauty. Comparison with the Regent, the Orloff, and others, can alone determine its degree of excellence.

The fifth and sixth divisions of the eighth apartment are devoted to the display of diamonds, and the insignia of Saxony. The decorations of the Elector, consisting of buttons, collar, sword-hilt, and scabbard, all glittering with diamonds, present a charming appearance. There are also to be seen, profusely decorated with gems, the Saxon Order of

the Rue Garland, and the seven orders of the Golden Fleece.

Among the royal treasures in Munich there are several beautiful pink diamonds of large size, and a magnificent blue one of thirty-six karats, which is set in the Order of the Golden Fleece.

In the treasury of the royal palace may be seen many fine single diamonds, together with magnificent emeralds and sapphires of great value. The King's and Queen's crowns, resplendent with brilliants, are kept here, with others of older date which belonged to the former Counts Palatine. Among the relics are preserved the ancient diadems of Henry II. and his Empress Kunigunda of the date 1010; also, the orb and sceptre of the Emperor Charles VII., together with his crown.

Prussia has but few diamonds, the policy of the Hohenzollerns having been adverse to the purchase of gems as baubles. Austria, however, is rich in diamonds, and possesses some extraordinary gems. The Imperial Jewel Office at Vienna contains a rare collection of great value. Here is preserved the famous Regalia of Charlemagne, which were buried with the great conqueror in his tomb at Aix la Chapelle. Barbarossa, in 1165, dared to violate the sanctity of this sepulchre, and removed the barbaric jewels, which are of great interest to the antiquary and the historian. For several centuries past they have been used at the coronation of the German emperors. The crown is a magnificent specimen of

the art of the Middle Ages, and is ornamented with rough diamonds and other gems in their natural state.

The crown and sceptre of Rudolph II. may be seen here. They are also adorned with uncut diamonds and gems, and were formerly worn by the German emperors elect on their entrance into Frankfort.

The chains, collars, decorations, regalia, belonging to the dresses of the various Austrian Orders, namely, Golden Fleece, Maria Theresa, etc., and worn by the Emperor, exhibit a splendid collection of diamonds, topazes, emeralds, etc., unique in size and perfection.

Here is also to be seen the famous yellow diamond known as the Florentine. It is in the form of a double rose with facets cut all around, and weighs $139\frac{1}{2}$ karats. It is of a fine lustre, but of a yellow tinge, sufficient to impair the beauty of the prismatic reflections. The Emperor Francis, as Grand Duke of Tuscany, inherited the gem, which accounts for its presence in Vienna.

This gem has been confounded with the diamond given to the Pope by Charles the Bold; but its history is very obscure, and its introduction into Europe is unknown. There is, however, a story among the Italians that it was first discovered by an amateur while hunting over the relics and objects of vertu in a curiosity shop at Florence, where it was regarded as a crystal of yellow quartz. Tavernier

saw it in Florence in the middle of the seventeenth century, but does not mention its history. Besides this gem there are several large diamonds in Europe whose history has become very confused, and it is now difficult to trace their identity in several instances.

The Florentine is the rarest specimen of the kind known, and, although it is not cut with regularity, its lustre and its brilliancy are greatly increased by its star-like cut. It is $1\frac{1}{8}$ inches in length, by one inch wide, and is neatly set in a large *sevignè*, surrounded by other fine diamonds. Its value is placed at \$450,000. There is also another large and fine diamond intended as a button for a hat, but its history is unknown.

The finest rose-colored diamond known belongs to the Austrian jewels. It is of a beautiful rose-color, thirty-two karats in weight, and of remarkable lustre. It is now placed in the centre of a knot of white brilliants to which the decoration of the cross of Maria Theresa is attached. Here is also the beautiful bouquet of flowers made for Maria, and constructed out of colored diamonds and other precious stones.

The finest collection of colored diamonds in the world is to be seen here. It was made by a Tyrolese named Helmreicher, who went to Brazil and spent the most of his life there in searching for them among the different mines. They illustrate finely the wide range of color possessed by the gem.

The Empress of Austria, in 1800, during the war with France, wishing to emulate the manners of ancient warriors, sent to the Archduke Charles, then in command of the army of Bohemia, a helmet set with magnificent gems.

In ancient times it was not rare for Eastern monarchs to array themselves richly, which the stern Romans affected to despise, believing in the virtues of unadorned steel. The decorations of Artaxerxes Mnemon and Mithridates are said to have amounted to millions of dollars in value. It is also reported that Alexander, at the battle of Arbela, wore a helmet with a gorget of polished steel set with gems. Murat, however, the gayest of all modern generals, obtained his picturesque effects by means of colored fabrics and feathers rather than from gold and gems.

There were few persons among the frequenters of the courts of Europe during the past three-quarters of a century who had not heard of the value and the splendor of the Esterhazy jewels. It appears that near the close of the last century Nicholas, Prince Esterhazy, assisted at the crowning of Francis II. as King of Hungary. He was then captain of the Guard of Honor, which was composed of twenty-four nobles and princes of inferior rank, and on this occasion first appeared in his ornaments of precious stones. The Prince, not content with the usual decorations belonging to his rank and his corps, transformed all parts of his equipments which were of metal into open gold-work incrustated with

gems. The effect was so beautiful as to stimulate the Prince to continue and complete his designs in a magnificent manner. And therefore he sought far and wide for the finest gems to adorn his person.

This passion for collecting and decorating soon ripened into a mania, and developed a prodigality greater than the Curii or Fabricii ever dreamed of. Ample means were at hand to foster this love of magnificence, for the Prince was feudal proprietor of a third of Hungary, being possessor of thirty-three manors, and lord of seventeen grand seignories.

The uniform of his rank as general of Hungarian huzzars, composed of jacket, pelisse, and pantaloons, was woven with pearls of the finest description; and among the multitudes of gems which formed the decorations were fifty thousand fine diamonds of the brilliant form. The weight of these mantles of magnificence was more than one man could endure for a length of time; and its profusion of ornament recalled the barbaric splendor of Lollia Paulina as she appeared at the banquet of Caligula. Gems of all colors and varieties were employed by the Prince, and many fine rubies, emeralds, and topazes were made use of. The most valued and the most delicately formed of all his ornaments was the aigrette of diamonds which replaced the ordinary plumes on his huzzar cap. It was called the most beautiful jewel in the universe. These artificial plumes,

which flashed like flames of fire, contained five thousand diamonds of the purest transparency and most beautiful colors. Their weight amounted to one pound and a half avoirdupois. Around the huzzar cap were placed a wreath and a band, over which were ranged, in many rows, the finest and most brilliant pearls. The sword and scabbard were incrustated with the rarest brilliants. The broad band which hung over the shoulder to the belt was a remarkable article of workmanship. It was a simple band covered with fine pearls and the most precious diamonds, one of which, at the shoulder, was valued at 20,000 livres and another at the waist at 12,000 livres. Besides these ornaments he had for decorations six orders, — of the Toison d'Or, of the Bath, Saint Andrew, and others, all constructed of unequalled magnificence.

These costumes were worn by the Princes Nicholas and Paul at the coronation of Francis II., of George IV., of William IV., of Victoria, and of the Emperors of Russia and Austria; and were the themes of admiration, even among the glittering uniforms of higher ranks. But finally, by the fatality that attends collections of all that is beautiful on the earth, there came a change in the fortunes of the heir of Esterhazy. Paul, the last Prince, died some years ago harassed with debts. His estates were hypothecated; but his jewels passed into the hands of his creditors, and many of them were sent to London to be separated and sold. Since then most of the beautiful

gems, which sparkled so brilliantly in former times in the courts of Europe, have been scattered over the world, and their identity lost, their history forgotten.

There is a very beautiful diamond of thirty-six karats owned in Holland, but its history we have not learned.

The famous crown of St. Stephen of Hungary, which disappeared during the Revolution of 1848, is said not to have any diamonds among its gems. Whether the absence of this stone is due to the extreme antiquity or to the whims of the constructors of the crown, we are unable to state.

The late Duke of Brunswick had before his death a marvellous collection of diamonds, partly acquired in gratification of his eccentric tastes and partly obtained by inheritance. Among the latter was the famous Cumberland diamond of thirty-two karats, which had descended to the heir of the House of Hanover. We have not been able to obtain a description of these treasures, nor can we learn of their disposition by the remarkable will of their late possessor.

Among the church regalia of Catholic Europe, and the offerings presented in past times to the various shrines of the saints of their religion, are yet preserved many gems of great beauty and value, and among them a great number of diamonds. Some of them have been stripped during the ravages of war, or by the iconoclastic fury of civil disturbances; and

the pious monks have, in instances, restored their loss by the substitution of paste, which has pleased the pilgrim's eye quite as well. For instance, the celebrated shrine of the Three Magi at Cologne has been despoiled of a great part of its vast treasures. And the skulls of the kings, inscribed with their names — Gaspar, Melchior, and Balthazar — written in rubies, were once crowned with gold diadems, resplendent with brilliant gems, now replaced by silver, gilt, and paste, or imitations. The custodians of the relics and jewels still assert, through pious fraud or a convenient ignorance, that their value amounts to 6,000,000 francs.

Catholicism, when it had the means, spared no expense in decorating its shrines and beautifying its relics. It well understood the effect of the glitter of gold and the brilliancy of gems upon the human imagination. The examples of this barbaric and yet cultivated taste are to be seen in all parts of Europe. Relics and insignia were not only lavishly adorned, like the Remonstrance at Prague with its 6,666 diamonds, but the bones of their saints were committed to the earth ornamented with costly gems, like those of Cardinal Borromeo interred at Milan two hundred years ago. The shrine of Loretto in Italy has been the most favored of all in Europe in attracting gifts from the rich and powerful as well as from the sick and the conscience-stricken. If reports are true, it has been and now is the receptacle of many of the most beautiful treasures of the mineral

kingdom. As its history is not generally known, we will briefly allude to it, and give a still briefer description of its jewels.

Casa Santa denotes the chapel of the Holy Virgin at Loretto in Italy. Its chief room is the chamber in which the Blessed Virgin is said to have been born, where she was betrothed to Joseph, where the angel saluted her, and where the Holy Ghost overshadowed her, etc. Tradition says it was carried, in May, 1291, through the air by angels from Galilee to Tersato in Dalmatia, and four and a half years afterwards was taken to Italy and set down in a wood in the district of Recanati, a thousand paces from the sea.

Strange to relate, it was more than two hundred years before any author in that country took any notice of the event or of the building. It was, when first brought to notice, simply a house of one room; but as religious enthusiasm became excited it also became necessary to repair its decayed condition and improve its appearance. Therefore, Clement VII. caused a vaulted roof to be placed upon it and new foundations to support its tottering walls. At a later period it was completely encased in the finest Carrara marble, under the directions of the most celebrated sculptors of the age and during the pontificates of Leo X., Paul III., and Gregory XIII. The edifice which encloses the chamber within its spacious walls was designed by Bramante, and its sculptures were designed and executed by the most famous artists.

This is composed of Istrian stone resembling the Travertine stone so much used at Rome.

Within the ancient chamber, which is regarded as one of the holiest of all the holy precincts known, stands the sacred image, called the Great Madonna, five feet high, made of cedar, and carved, as tradition says, by St. Luke, who was a carver as well as a physician. Upon her head is placed a triple crown of gold, enriched with diamonds and pearls, a gift from Louis XIII. of France. Over her shoulders an ample robe is cast, glittering with jewels of all descriptions and said to be of inestimable price.

The niche in which the image is placed is also decorated with gems, and among them are seventy-one of the finest of the Bohemian topazes [quartz].

Adjoining the Virgin on the right side appears a statue of an angel cast in pure gold. This is also profusely enriched with diamonds and other gems. Some of these, which are said to have cost 50,000 ducats, were the offering of Eleanora of the House of Este, the Queen of King James II. of England, when she sought for the intercession of the Virgin to grant her an heir. The Pretender to the British Crown was born not long after, to the delight of all those who believed in miraculous intervention.

On the left side of the Virgin a silver statue of an angel is placed, and still further on the right appears another costly image. This last was the gift of Louis XIII. of France, in gratitude for the birth

of the Dauphin, afterwards "Le Grand Monarque," Louis XIV.

Seven lamps of solid gold are continually burning with a sacred flame before the image of the Virgin, and other parts of the room are illuminated with thirty-seven silver lamps.

Although many of the reports concerning the valuables belonging to this famous shrine are probably fiction, there is no doubt of the immense value of the gems and jewels that have been presented to it. The donations to the wealth of this famous shrine have been given from all parts of the world where the Catholic religion has been venerated. And all classes, both rich and poor, have zealously invoked the blessing of the mysterious spirit by their liberal bequests.

The rich Abbey of St. Denys, before the Revolution, is said to have possessed a rare and costly assemblage of gems, jewels, and jewelled relics. They were reported to have been the accumulation of many centuries, dating back to the Carlovingian kings.

Among them were said to have been valuable presents from the Emperors of Byzantium. But this is doubtful, for the Greeks despised Catholicism and the Crusaders. There may have been, and probably were, fine gems of various kinds from the spoils obtained by the Franks in the conquest of Constantinople. There is no doubt, however, as to the richness of the works of mediæval art; for we find sufficient evidence in the old work of Dom Doublet's,

“Tresor of St. Denys,” although the collection itself has long since been dispersed and almost forgotten.

The iconoclastic fury of the Revolution collected many of the treasures of this Abbey, with those of other chapels of Paris, and offered them at public sale in 1794. It is said that this collection embraced a great quantity of precious stones, — rubies, topazes, sapphires, etc., — both in the rough crystal and rudely cut, thus proving their Oriental origin. It is also stated that this much-to-be-lamented assemblage of beautiful things brought but 80,000 francs.

CHAPTER XII.

CUTTING OF THE DIAMOND.

THE art of polishing the diamond was discovered by man at an earlier age than history has generally ascribed to it. Positive evidence, however, is wanting as to exact dates; and the proof is chiefly presumptive. However, there is no doubt but that it was far anterior to the times when Berquen announced his improvements on the process. We are quite willing to admit that the process of abrading the diamond against diamond was really discovered by the native of Bruges; but we cannot entertain the idea that the Hindoos were too stupid to pulverize the diamond and use its powder in polishing the gems. The natives had made use of powdered corundum in the earliest days, and it is preposterous not to admit they pulverized the diamond also.

Most of the gems of antiquity, whether rubies or diamonds, are cut rudely; and often, with the latter gem, the natural faces of the crystal are alone polished. Tavernier found that the native Hindoos polished the natural faces of the crystal if it was

clear, and covered the flawed and the defective with facets to disguise them. And so common was this practice, that the traveller was always suspicious of the quality of the stone, whenever it was offered to him cut in this manner.

The improvement with many of these diamonds is so slight, that we consider the fact to be one of the reasons why certain natural crystals, like those in the crown and clasp of Charlemagne, for instance, were left in their rough state; the advantage derived from cutting not being equal to the time and labor expended.

It is true that we have no direct evidence of the cutting of the diamond in ancient times, and those that have descended to us from undoubted early Roman periods are in the shape of natural crystals; but still there is indirect testimony bearing in favor of the view.

The ancient gem engravers were wont to use splinters of broken diamonds in their labors upon various kinds of gems; and they probably powdered the adamas, as well as varieties of corundum, for the purpose of polishing the hard stones. Scarcity of the mineral, rather than ignorance of its properties, may have prevented its general use.

Janon de St. Laurent, in his work on engraving tools, maintains that the ancient instruments for the purpose of cutting gems were the same as the modern; and not only the wheel was used, but diamond dust was also employed in the process. There is no

doubt that the wheel and other tools were in use in Asia for a long period before their adoption by the nations on the Mediterranean. So far as we know, Persia was the birthplace of gem engraving. Why are there not more examples of polished diamonds, if the process is so ancient? the reader may ask. We may in part answer this question by saying, that the process of cutting regular facets on the gems was not early known, or the custom adopted; and, the polishing being so difficult, that the lapidaries were content to polish the natural faces only. Polished crystals of diamonds of this character have descended to us from early times, and other examples are to be seen in ancient jewels. So little beauty was obtained by this polishing, that not much was gained in the vast labor required; and the native crystals were often used without any aid from the lapidary. We may see them in their rough crystalline forms in the crowns of the Gothic princes, the Iron Crown of Italy, and the ornaments of Charlemagne, besides other relics of ancient and even mediæval times.

This custom of using the rough gems prevailed to some extent in recent times; and De Laet states that as late as the middle of the seventeenth century rough spinels were preferred to the cut for ornamentation. However, we will briefly allude to one or two instances in history, which lead the reader to infer that the diamond received a definite polish at an early day. Chrysostom, an authentic writer of the fourth century, in describing the magnificence

of the Greek emperors at Byzantium, mentions the dazzling splendor of the diamonds scintillating by agitation. If the historian does not use this description for the gems in general, we may infer that the diamonds had been polished; since the unpolished stones do not exhibit much, if any, play of the prismatic hues. The maxim, "diamond cut diamond," is of ancient origin, and may perhaps be referred to the saying in vogue among the Greeks as early as the seventh century, "that for the purpose of cutting diamonds, a diamond was most effectual."

The accounts of the Oriental historians concerning the fêtes of Timour in the fourteenth century, where diamonds were showered in profusion upon the guests, leave no doubts as to the art of polishing the gem as early as that period.

The inventory of the *joyaux* belonging to the Duc d'Anjou, in 1360, shows that diamonds were then cut, although rudely. It makes special mention of several diamonds, and one in particular set in a reliquary, and cut in escutcheon. Other polished diamonds are described in the account given of the splendid entertainment given at the Louvre, by the Duke of Burgundy, to the King and Court of France.

There is also evidence to prove that diamond lapidaries were at work in Paris, when Berquen came to reside there. However, it was not until 1475, after Berquen returned to his native city, Bruges, that the mode of polishing diamonds by direct

abrasion became known in Europe. And when Charles the Bold intrusted the three famous gems to his skill, and rewarded him with 3,000 ducats for his labor, the name of Berquen became famous and widespread throughout Europe.

Nearly two centuries after this success, Cardinal Mazarin attempted to establish the business of diamond-cutting in Paris, and confided to the lapidaries he had invited to reside there, twelve of the finest diamonds belonging to the Crown to be recut. These gems, from their beauty, and the circumstance of cutting, were called the twelve Mazarins. History has neglected to record the fate of these magnificent gems save one. In the inventory of the French jewels in 1791, there is the solitary description, "the tenth Mazarin." The others have disappeared.

The Cardinal made every attempt to establish the favorite project on a firm basis; but they were in vain; for the Dutch marine had complete control of most of the exports of India, and decided in favor of Amsterdam. Moreover, the establishment of the diamond trade in Holland was one of the indirect results of the revocation of the Edict of Nantes, and it was controlled by Israelite refugees from France. The business gradually languished at Paris, and of the seventy-five diamond-cutters of Mazarin's industry, but five were left in 1775; and soon after this, in spite of individual efforts and influences, it ceased altogether. Even at the recent period of 1852, Paris did not possess a single diamond-cutter. At this

time M. Philippe resolved to make the attempt to revive the good intentions of Mazarin, and has thus far succeeded well. But, in spite of all the English and French opposition, the diamond trade is still controlled by the Amsterdam Jews, several thousand of whom are engaged in the business of cutting the stones.

Diamond-cutting was also practised to some extent in London during the last century and the early part of this; but concerning it we have learned but few particulars. It was conducted on strict mathematical principles, however; and the gems cut during this time in London are eagerly sought for by amateurs, under the name of the "Old English Style." The brilliants of Ralph Potter, cut at the commencement of this century, are by far the finest exponents of the art as well as of the natural powers of the gem. Since the discovery of the African mines the London establishments have been actively engaged, and we also learn that branches of the business have been located in other cities of England.

The process of diamond-cutting is a very simple matter to those acquainted with the nature of the gem. To cut the facets, two stones are cemented on two sticks and rubbed against each other until a facet is cut; then the position of one of the stones is changed, and another flat surface cut. The process is thus continued until the gem is faceted all over, at the expense, however, of the other stone, which does most of the cutting. After the facets are cut, and a

definite form given to the stone, the gem is placed in the hands of the polisher, who fastens it in solder, and then places it upon a small steel disk which revolves horizontally with a rapidity of 1,500 to 3,000 times a minute. This disk is moistened with diamond powder mixed with oil, and one facet is polished at a time. The diamond-cutting proper is a rapid operation; but the polishing is slow and tedious. One cutter can generally furnish sufficient work for four or five polishers.

There are a number of forms adopted by the lapidaries for these gems, but the two principal ones are the brilliant and the rose. The first pattern, which was invented in Europe in the seventeenth century, is perhaps the best of all to call forth the powers of the gem. The second is of unknown age, and was practised by the Hindoos in ancient times. It affords the largest beams of light for the weight, but it lacks in colored reflections when compared with the brilliant.

For the perfection of the rainbow play of hues, it is essential that the facets of the superior and inferior parts of the stone should correspond in exact proportions and at fixed distances, so as to multiply the reflections and refractions, and produce the colors of the prismatic spectrum. Therefore the perfect cutting of the diamond is a mathematical problem, governed by rigid laws.

All limpid and white gems must be cut according to this rule, but in case of colored stones the case is

far different ; for perfection of color is to be attained, and brilliancy is a secondary thought. Therefore a fine ruby or sapphire may be decidedly thin in form, and yet be a gem of great beauty and value. It is very rare we obtain the full perfection of brilliancy and color in the colored gems ; for generally the depth of the finest hues prevents a display of the refractive powers of the stone.

The process of rifting diamonds by splitting them in their cleavage planes was known long ago to the Hindoos ; but, strange to say, it was forgotten by modern lapidaries until revived by Wollaston not many years ago. By this means masses of the crystal may be removed to escape a flaw or remove a spot, and yet preserve material that may be utilized, and which would have been lost by the process of grinding away the exterior.

Some diamonds of the spheroidal form are deficient in cleavage planes, and are quite impracticable for cutting ; and the fact of the impossibility of polishing them is sufficient proof of their peculiar origin, and that their form is not due to aqueous action.

Others, known as bort, seem to be of concentric arrangement, as though crystallization radiated from the centre ; and it is very difficult to polish them. The Hindoos avail themselves of this natural cleavage, and form table diamonds by adroitly striking along one of the planes of the stone with a sharp-edged tool, thereby separating the layers of the gem as the slate is rifted by the miner.

The operation, which seems so simple, really requires considerable skill and much of that acquired instinct or tact which is best exhibited by our Western Indians, who chip, with marvellous rapidity and certainty, a glass bottle into symmetrical arrow-heads. This method of reducing diamonds by cleavage was early known to the Hindoos, and is mentioned by Tavernier in an unmistakable manner in his published travels.

The process of reduction by this means is very rapidly accomplished by the skilful workman. At a glance he ascertains the direction of the laminæ, which remind one of the layers of the onion, and then cuts a small notch with another diamond in the place he selects. In this minute rift he places the edge of his blunt steel knife, and, tapping the back of it with a light iron rod, the diamond is split with perfect ease. By this process flaws and imperfections in the external layers of the stone are removed without delay. In reducing the natural diamond to a regular form much of its substance is lost, and sometimes as much as one half of the weight of the stone. This loss, however, depends greatly upon the natural form of the crystal. The perfect octahedrons lose but one fifth of their weight when transformed into the shape of the brilliant; but the rhombohedrons lose over one third in taking the same form.

The following will give the reader an idea of the losses of the rough stones when converted into fine gems. However, it must be remembered that these

great stones are generally of irregular shape and are rarely of fine crystalline forms. The Mogul weighed in the rough $780\frac{1}{2}$ karats, but was reduced in cutting to $279\frac{9}{16}$ karats. The Regent weighed 410 karats, reduced to $136\frac{1}{16}$ karats. The Koh-i-noor weighed $186\frac{1}{2}$ karats, reduced to $102\frac{1}{2}$. L'Etoile du Sud, $254\frac{1}{2}$ karats, reduced to $124\frac{4}{16}$.

The process of cutting diamonds of large size is always attended with risk, and is necessarily a costly operation. The Regent cost in cutting \$25,000, and occupied two years' time. The Star of the South, which was cut by Coster, occupied but ninety days, and the Koh-i-noor only thirty-eight working days. This great feat in diamond-cutting was performed by the ablest of the Holland lapidaries, with the aid of steam power. Although the time expended was less than forty days, yet the cost of cutting is said to have been \$40,000, which sum was lessened by the sale of the rifted fragments.

The Oriental lapidaries, destitute of mechanical appliances of any considerable aid, consumed years in cutting some of the paragons of India. This condition of affairs will explain the reason why the Armenian lapidaries asked the immense sum of \$80,000 to cut the slab of diamond weighing 130 karats, which was captured by the Sultan of Persia at Coocha, in 1832.

The process of diamond-cutting has within a few years been established in the United States, and is due to the energy and superior inventive talent of Mr. Henry D. Morse, of Boston. This gentleman

conceived the idea of arranging a machine for the cutting and polishing of these gems, to enable the American jewellers to have their work performed at home, instead of sending it to Europe.

While engaged in perfecting his appliances, chance threw in his way an itinerant vendor of porcelain, who had in former years served as laborer in the diamond ateliers of Amsterdam. The sight of the rough gems and the apparatus recalled to the Jew the scenes of his youth, and awakened a desire of renewing his former occupation; and he offered to perform the part of diamond-cutter. But, as the process was carefully considered, it was discovered that the Jew could only cut the facets of the diamond, and the art of the subsequent polishing he did not understand. It seemed strange that an artisan who possessed the rare ability to tell at a glance how large a gem the stone would cut, how to avoid internal imperfections, and how to take advantage of its cleavage planes, could not polish the facets after he had cut them. But such was the fact; for the two processes of cutting and polishing are widely different, and require separate instruction. However, the deficiency was soon supplied by an acquaintance, who was induced to leave Holland and act as polisher in the American diamond adventure.

The establishment was now complete, but the business was at first confined to recutting and repolishing gems that had been damaged by long use or accident. The inventive genius of Mr. Morse

made several important changes in the machinery required by the lapidary, and displaced the rude and cumbersome apparatus of the old system. At first but two or three men were employed; but after the discovery of the South African diamond mines, the rough gems imported to this country soon furnished material for a more extensive establishment than was at first contemplated; and so the workshop was enlarged, and the workmen increased, until twenty-four polishing wheels were put in operation by steam power, and a force of thirty persons employed in the various parts of the process. At first none but foreigners were employed in the labor; but Mr. Morse believed that American ingenuity could master all the difficulties of the process, and finally succeeded in educating a corps of workmen who soon proved to be far superior to any of the artisans imported from the diamond-cutting establishments of Amsterdam. Now the atelier of Mr. Morse may be considered as essentially American both in its artists and its arrangements.

Many fine gems of large size have been polished by Mr. Morse, and among them four of the great weight of fifty karats each. And very recently he has ventured to attempt the cutting of a great diamond from South Africa, weighing one hundred and twenty-five karats. The operation was a successful one, and after three and a half months' labor a beautiful gem of seventy-seven karats weight was obtained, which is greatly admired by amateurs and experts, not

only on account of the rare beauty and perfection of the mineral itself, but also as a remarkable specimen of workmanship in shaping its present form.

The process of cutting the diamond is divided at Amsterdam into several distinct branches, and workmen are educated to perform one part, but not another. Thus the cleaving, the cutting, and the polishing have special operators, who become expert in performing well the parts assigned to them without attempting the others.

This ceremony and care adopted by the Jews has undoubtedly produced skilful workmen; but we see no reason why all the parts may not be perfectly acquired by an intelligent mechanic. The art of cleavage, however, requires tact, and ought to include some knowledge of mineralogy.

For the particulars of the art of diamond-cutting, we will refer our readers to the interesting chapters by Jeffries, Mawe, and Barbot; but we will, however, briefly mention some of the forms adopted for the diamond, and how they are produced.

The table and the rose patterns were the first regular forms adopted by the lapidaries. The first was simply the top of the stone ground flat with a corresponding flat bottom of less area, with its four upper and lower sides parallel to each other. As the light passed through the stone without much refraction, the beauty of the mineral was not developed by this pattern.

It has been stated that the rose shape was

invented in Paris under the auspices of Cardinal Mazarin, but Tavernier describes the diamonds of Aurungzeb of India as being of the rose-cut. Therefore we must give a more ancient date to the pattern than Mazarin's day. The form of the rose-cut is simply that of a hemisphere covered with small facets. Its flattened base is therefore admirably adapted for incrustation work, and the foil on which it is generally set serves as a refracting mirror for the entering rays of light.

The rose pattern has several names which indicate the number of facets which they may bear. If it has but twelve or less facets it is called an Antwerp rose; if but eighteen or twenty it is a semi-Holland, and a Holland rose if it bears twenty-four facets. At the present time these gems are not in much demand, unless for incrustation work, for which they are superior both in effect and in adaptability to the surface of the object to be ornamented.

The form which appears to exhibit the splendors of the gem to the best advantage is that known as the brilliant, and is rightly named from its effects. It was discovered in Italy in the latter part of the seventeenth century by Peruzzi of Venice, which city was then one of the chief gem marts of the world. The conclusions which led to the adoption of the shape were derived from experiments upon colored stones. This form of the brilliant is that of the ancient deep table modified by receiving thirty-two facets above and twenty-four below its girdle. The

great relative depth of the gem, aided by the numerous facets of the sides, appears to increase the natural refractive power of the stone by confining, as it were, the rays of light inside of it.

Another pattern, called the brilliolette, shows the beautiful qualities of the gem to great advantage. It is formed like two rose diamonds joined together at the base ; or may be flattened and elongated like the almond, and faceted all over with small facets. This is the form of the Sancy, and should have been given to the Koh-i-noor and the Star of the South. The Austrian yellow diamond is of this pattern, and was probably cut in India, but when and where is still a mystery. And it is thought that the famous twelve Mazarins were also cut after this shape.

The star pattern, which was invented by Caire, is but little used at the present time.

CHAPTER XIII.

TESTING OF THE DIAMOND, ETC.

THE testing of the diamond is generally an easy matter to the expert, but the merchant and the amateur are often unable to decide quickly concerning the character of a gem that may be offered to them. The learned Abbé Haüy was often called in consultation upon matters of this kind, and even appeared in court as an expert of diamonds. Fortunately, the methods of ascertaining the diamond beyond a doubt are now so easy and numerous that few attempts are made like those of the last century, when white topazes and zircons were sold or substituted for diamonds.

We may be permitted to say that the first and surest test of the gem is that of hardness, and that the diamond scratches all other substances with ease. The application of this test is not always made with facility, but a little practice with a rough crystal of diamond will soon enable the experimenter to perform it satisfactorily. In performing the test for hardness for all gems it is well to be provided with a fine English file, and splinters of quartz, topaz, and

sapphire. The file, adroitly applied, will detect the character of gems below the quartz in hardness, and the splinters above mentioned will determine all others but the diamond.

In applying these tests, it is well to touch the middle of a facet, if the gem be polished, and remember that the edges of many of the gems are very brittle. The diamond, for instance, although it is so very hard when its surface is directly tested, yet its thin edges, when cut into a gem, are broken down with the greatest ease; therefore the test of hardness should be applied to the polished face of the stone.

But when the stone has been polished and set in such a manner that the test of hardness cannot be easily applied, then the easiest method of distinguishing its character is to expose it to the rays of artificial light and observe their effects. If the stone, when placed at a certain distance from the candle, flashes out the prismatic hues in a marked manner, then the observer may safely conclude that the object is either a diamond or one of the artificial gems known as strass. To distinguish them by means of the eye alone will be a difficult task, for both possess very high refractive powers and exhibit remarkable displays of the prismatic hues; but the application of a fragment of diamond, sapphire, or topaz to the object will at once make known its character, and even the test of the steel file will betray the softness of the glass.

The transparent zircons closely approach the diamond in brilliancy, and are among the rarest of gems;

in fact, a fine specimen of perfect purity would be worth more to the amateur than a diamond of equal weight. The pure yellow are declared by King to be among the rarest and most beautiful of gems on account of their remarkable brilliancy and lustre. He also states that they are seldom found above two karats in weight.

The white zircon, which resembles the diamond so closely, is always minute and rarely above one karat in size. All that are known in commerce come from Matura, in Ceylon, and are sometimes called Matura diamonds. In times past they were in great demand for incrustation work of watches and jewelry, for when cut in the form of roses and set upon brilliant foil they could not be easily detected by the eye from the diamond. At the present day they are seldom seen in commerce, but whether from scarcity, or from an improvement in the ideas of honor in the jewelers, we are unable to state. We know, however, that they are still mined by the natives of Ceylon, and are used in Asia for ornamental purposes. The white spinel is sometimes mistaken for the adamas; but its inferiority in hardness and its want of the prismatic hues render its detection easy. The white topaz, when of two or three karats weight, resembles the diamond in the rough very closely, especially when in the modified or globular forms of crystallization. The degree of specific gravity is exactly the same; but the test of hardness and the want of the prismatic display serve to dispel all doubts as to its

nature. Neither of these gems, nor the white sapphire, has that peculiar sharp flash of the diamond which is known as the adamantine eclat. It has been stated by Hoppè that some of the Brazilian diamonds do not exhibit any more play of color when cut than rock crystal; but we have no doubt but that the writer is in error, and has probably been deceived by some of the white spinels or topazes which are sometimes found in the diamond mines of Brazil and are of great brilliancy.

To estimate the value of a rough diamond and ascertain its purity is often a difficult task, and one that requires both education and tact. For the surface of the natural gem, especially the modified and spheroidal crystals, is generally dull and chatoyant. This singular appearance, which has been erroneously represented as a thin crust, is in reality produced by the salient edges of the laminae of which the stone is composed. The same or a similar effect may be artificially produced in the polished diamond by heating it to a white heat, as has been seen in the diamonds injured in the great fires of Hamburg and Chicago.

Barbot, the French jeweller, declared that he had discovered a means by which the apparent rough, translucent coating could be changed into perfect transparency so as to give a clear view of the condition of the interior. This statement, however, is very much doubted by lapidaries.

When the rough diamond is placed in turpentine,

alcohol, or even water, it appears more transparent than before and like a bubble of air. We have therefore sometimes thought that Barbot had really discovered some fluid of high refractive power, immersed in which the rough diamond became transparent. For it is a well-established fact known among chemists, that rough gems of a lower refractive power, like sapphire, chrysoberyl, spinel, etc., if placed in a fluid possessing an equal refractive energy, like that of muriate of antimony, become clear, and the observer is enabled to look through them. This discovery strengthens Barbot's statement and places it within the possibilities; but as yet we know of no fluid that possesses a refractive power equal to the diamond. Topaz, emerald, and other gems of low refractive power can be readily examined by using the oil of cassia, which has the refractive energy of 1.64.

The rough diamonds often exhibit various colors, but generally of faint tints. Sometimes the hue is not perfectly distributed throughout the stone, but may be confined to a part of it, as in the sapphire, or even in one of its laminae. It is a singular fact that the external coverings of the mineral often contain the shades which render the rough gem of a disagreeable hue, and which may be made to disappear by the process of cutting. Therefore, it sometimes requires experience and tact to determine the value of a rough diamond which possesses a decided hue. However, those stones which exhibit a greenish or

reddish color are considered safe stones for investment, and will develop into superior gems after cutting. The bluish and the blackish are thought to be harder than the others; while the yellowish and grayish colors indicate inferior stones. The brownish and yellowish hues may disappear in process of cutting, but there is greater uncertainty in these shades than in the others. Sometimes a stone which promises to yield a perfectly white gem, after cutting turns out to be of a decided disagreeable tinge. Therefore the cutting of a rough diamond is often attended with some hazard.

The Hindoos have a practice of examining their stones before purchase by placing them in an aperture in the wall, with a lighted lamp in the rear. And to ascertain their color they take them under the cover of a tree thick with foliage, where the verdure of the shade quickly reveals any other tinge, especially the bluish. It is quite difficult to distinguish the snow-white, except by contrast. The officers of the Junta Diamantina, in Brazil, have a rough way of testing the native diamonds from quartz, white topaz, and spinel, by rubbing them together close to the ear. The sharp tone which is thus produced is characteristic, but the test requires a keen and practised ear.

Specific gravity is one of the best tests for determining the nature of polished stones. By this means some of the precious minerals can be detected with ease, like the zircon and the emerald, notwithstanding

their color. But when applied to the diamond the experimenter should remember that its weight is exactly that of the white topaz; yet to distinguish them, the degree of hardness or the phenomena of electricity will at once enable the expert to discriminate with ease and without a doubt. For the best methods of ascertaining the specific gravity of the stones, we must refer the reader to elementary works on chemistry and physics.

The test of its electrical phenomena is an important one, as one can thereby almost instantly detect it from other gems, especially the white topaz. When rubbed it exhibits vitreous electricity like glass, but loses it in a very few moments.

Another curious phenomenon, called single refraction, enables the observer to distinguish the mineral from all other gems except the garnet and spinel, the others having double refraction, or, in other words, giving a double image of a candle-light when it is viewed through their facets.

For the purpose of observing this phenomenon, Sir David Brewster invented an instrument which he called a lithoscope. It consisted of a small glass prism which moved around a fixed joint so that the lower surface of it could be laid upon the surface, or a facet of the stone to be examined. In this position, the two surfaces being parallel, the image reflected from the lower surface of the prism would coincide with that reflected from the surface of the stone. A drop of the oil of cassia or of sulphuret of carbon is

placed between the prism and the facet, and then the observer turns a screw to raise the prism a little round its joint. The effect of this is to separate the image of a light or a small luminous aperture as given by the prism from that given by the facet; and the difference in the intensity and the color of these two images is an infallible indication of the nature of the stone. The image from the diamond will be many times brighter than that reflected from the face of the prism when testing any of the other precious stones.

A simpler mode is sometimes adopted by experts, but it requires some dexterity to exhibit the property. The method is this: the diamond is held up to the eye, and a needle point or a small hole pierced in a card is looked at. If the object is seen double, as if there were two needle points or two holes, then the stone examined is not a diamond, as but one aperture should be seen.

With the aid of the tourmaline tongs, however, we have an easier method—subject to a few exceptions—of detecting the properties of refraction of all gems even when they have been cut. The transparent tourmaline, when cut in thin plates parallel to the axes of its natural crystals, possesses the strange and extraordinary power of extinguishing or causing to disappear one of the rays of polarized light, while the other is preserved. Therefore, when a body possessing single refraction, although perfectly transparent, is placed between the two thin slices

of tourmaline composing the tourmaline tongs or polariscope, no light passes through; the instrument does not afford the least glimmer of a ray of light. But when the transparent body interposed in the polariscope is of double refraction, light passes through as if by magic.

When the gem has been cut for ornamental purposes it is often difficult to adjust the faces of it to the plates of the polariscope. Then recourse may be had to the use of a glass cell containing a fluid of a high refractive power, like the oil of cassia, turpentine, sulphuret of carbon, etc. The stone immersed in these fluids admits the light in all directions, and is then easily viewed through the plates of the instrument. These fluids, however, are not of sufficiently high refractive powers to do justice to the diamond and the zircon, but they answer admirably for all gems of a less refractive power, like the varieties of sapphire, spinel, topaz, garnet, tourmaline, emerald, etc.

The tourmaline tongs furnish the expert with a rapid and easy method of detecting many of the gems by reason of the phenomena of their refraction. But the experimentalist must be on his guard lest he pronounce substances to be of double when they really possess but single refraction. Glass has a tendency to crystalline regularity when heated and cooled suddenly, and may therefore acquire the property of polarizing the ray that passes the first plate of tourmaline and dispose of a part of that which

passes the second. Certain minerals of the cubic system produce the same result by reason of a certain rare but forced arrangement ; and some crystals, like the topaz, when cut in a certain direction to their optical axes cease to exhibit the phenomena of double refraction.

One of the chief tests used by the jewellers of olden times to distinguish the diamond was the test of the tincture. This tincture was a varnish made of ivory black and mastic, and when applied to the back of the diamond seemed to increase its lustre, while other gems were impaired in their natural effects. Modern investigators, however, have shown that this procedure is a fallacious one, and is in reality one of the absurd traditions which have been attached to the gem from early times, like some of the supposed spiritual properties.

A perfect diamond must stand the tests for purity, faultlessness, and transparency, and when these are carefully applied to the stone perfect gems will be found to be very rare.

As we have said before, the diamond is the foulest of gems, and is exceedingly liable to be injured by faults, such as are described in the technical terms of the jewellers as ashes, gray spots, rusty places, flaws, cavities, fissures, veins, feathers, foreign bodies, wavy and vitreous spots. Very few diamonds can stand the test of the microscope and be pronounced perfect. Still these microscopic faults are not to be considered in the commerce of the gem, but only

in the study of its origin and nature. The jeweller may properly pronounce perfect the gem whose faults cannot be detected by the human eye. Even the magnificent Regent has one small foul speck in it, according to Jeffries; and Sir David Brewster found in the Koh-i-noor three specks, or rather cavities, in its central portion, which appeared to view in more or less distinctness according as the light reached them.

After a diamond has been cut it is not easy to ascertain its degree of perfection without careful examination, and this occupies considerable time. And gems which appear at first glance to be pure and perfect are often found to be defective after examination.

Babinet, of the French Institute, adopted the following method to study the effects of the diamond, and it was his intention to apply the test during his leisure moments to the principal diamonds in France; but other important labors diverted him from his purpose. He pierced a hole in a white card, a little larger than the diamond to be examined, and then passed a ray of sunlight or of the electric lamp through this hole. In the pathway of this ray, at a certain distance from the hole behind the card, he placed the diamond so that the ray of light fell upon the anterior surface of the stone. The rays reflected from this anterior surface, or, in other words, the table of the diamond, and those which pass through the stone are reflected back on the card, where they

exhibit a white image of the table surrounded by small bands iridescent with the prismatic colors. By this simple method Babinet found that if the diamond had been well cut the colors were considerable in number, were well separated, and equally spread around the white reflection of the table. As each of these bands indicates one of the lustres of the stone, it is easy to estimate them both in number, quality, and symmetry. Therefore the observer can not only detect the errors of the cutting of the gem, but decide upon the form best adapted for the stone.

The term used to express the weight of the diamond and all the gems is derived from the word *Keration*, a kind of vetch, whose seeds, being generally of a uniform weight, furnished the Orientals with the means of estimating the value of precious stones. It is supposed to represent the equivalent of four Troy grains, but by actual measurement the diamond karat weighs but $3\frac{1}{3}$ Troy grains at the present day, and it may descend even lower in the scale, unless the unit be established by law. The history of the series of diminutions by which the karat has reached its present weight is obscure, but as the term is supposed to represent four Troy grains it should equal them in reality. That it is a mere conventional weight is shown by its variance in European countries, as well as in the gem-producing countries of Asia. In making use of the term to express the weight of precious stones we would suggest

that it be written karat, as more in accordance with its derivation, and that the commonly accepted word carat be used when we wish to define the alloy of certain metals, like that of gold and silver coins.

Before proceeding to the subject of the valuation of diamonds, we will say a few words concerning the imitations produced by the skill of man. Many attempts at imitating the diamond have been made by experimentalists for a long time past, and much ingenuity shown by them. To those of our readers who desire to study especially these experiments we will refer them to the works of Silliman, Hare, Latour, Saix, Despretz, Dumas, Ebleman and Gaudin, Mohler, St. Clair, Deville, Gaunal, Becquerel, Joyce, Cagnard de la Tour, Mactear, Hannay, and many other well-known experimenters.

Despretz's experiments, which were based upon certain combinations of carbon, are deserving of mention. The chemists have discovered that in combining sulphur and carbon a colorless liquid is produced resembling water, and apparently containing nothing but sulphur and carbon. Therefore, Despretz reasoned, if he could get rid of the sulphur by some manner, the carbon might be crystallized. And to obtain this result, the action of the volcanic battery offered the most plausible means. With the aid of this battery the experimenter really succeeded in obtaining on a thread of platina, passed through a solution containing carbon, some small crystalline

depositions, which by their form and hardness seemed to be embryonic diamonds. But here the experiment ended. Nature refused to reveal her secrets.

The alchemists of the Middle Ages seeking the transformation of gold from baser metals, have been well represented by the chemists of the present century attempting to imitate the diamond. Philosophy and science have united their efforts in these fascinating experiments; but Nature still defies the most determined efforts of art in respect to the reproduction of the diamond.

The mineral appears to be an allotropic form of a simple elementary body which Nature offers to us with lavish hand. And when we consider the triumphs of chemistry, the process of transforming this element into the coveted form does not seem to be so very difficult to the casual thinker. But Nature is stubborn in revealing her simple acts. However, we are not without faith in these determined efforts of scientific skill; for we know that art now produces the brother of the diamond, graphite, at will. And we see that at the soda works at Aussig this form of carbon is obtained as a secondary product by the decomposition of cyanogen and its combinations. We do not, however, look forward with much pleasure to the realization of this idea; for success in producing the diamond will annihilate at a single blow an important article of commerce, and rob ornamentation and investment of one of its most desired objects.

Art, however, in its researches on this subject, has succeeded in producing a glass which, when cut, approaches very closely the brilliancy and prismatic display of the diamond. The artificial gems made from this glass, which is supposed to have thallium as a base, instead of lead, are really superior examples of art. "Nothing but glass," is a phrase too often used contemptuously and unjustly; for these imitations are quite as charming as the adamas itself. In the flash of their rainbow hues, they surpass some of the great diamonds, like the Koh-i-noor; and in brilliancy they exceed all other gems. Their refraction reaches 2 on the established scale, while that of the diamond is reckoned at 2.4, and that of the sapphire, 1.79. They lack, however, hardness; and the effect of time dims their lustre. But this defect may yet be remedied; for the ancients made glass quite as hard as quartz. And when we come to examine those wonderful specimens of ancient glass, with their exquisite colorings, exhumed by General Di Cesnola in the Phœnician tombs of Cyprus, who will venture to establish a limit to the art of glass-making? Even within the past few years, a process has been discovered by which the elasticity and hardness of glass have been increased to a remarkable degree; and if the defect of brittleness can be overcome, a new era in glass-making will have been reached.

Artificial diamonds are often worn at the present day; and the fair wearer consoles herself with the

hope that, when sunnier days come, the artificial will give place to the real. It will not be soon forgotten by the votaries of fashion, that the Duchesse de Berri, arriving in France, received for her bridal ornaments only the imitation, and that she wore them.

CHAPTER XIV.

VALUE OF THE DIAMOND.

THE history of the commercial value of the diamond, extending back to a distant period of time, forms an interesting chapter for the philosopher as well as the merchant. It would appear that the gem had been comparatively independent of the caprice of fashion, and that it has had for many years a value quite as fixed as gold or silver. This comparative valuation only applies to the snow-white diamonds, and to those whose imperfections are not readily discernible to the naked eye.

In estimating the value of diamonds, Barbot divides their shades into fifteen degrees, as follows: In the first degree he places the rare diamonds which exhibit the vivid gleam like the flash of polished steel; second degree, snow-white, first water; third degree, white, first water; fourth degree, white, with faint shades, red, yellow, and blue; fifth degree, white, yellow, or green, second water; sixth degree, grayish-yellow or green, second water; seventh degree, orange yellow; eighth degree, translucent topaz

yellow ; ninth degree, translucent deep green ; tenth degree, translucent brick-red ; eleventh degree, translucent deep red ; twelfth degree, quite opaque, dingy blue ; thirteenth degree, quite opaque, deep bottle green ; fourteenth degree, quite opaque, brown or blackish ; fifteenth degree, quite opaque, black as jet.

In ancient times, the gem probably had no fixed commercial value, and was sought for as a curiosity or as a talisman. In the fifteenth and sixteenth centuries, the goldsmiths of Italy, which was then the richest country in the world, established a comparative valuation for the four precious stones, ruby, emerald, diamond, and sapphire. From these accounts we learn that the diamond of one karat was valued at 100 gold scudi, and that the emerald was estimated at 400, and the red sapphire, or ruby, at 800, or eight times the price of the adamas. These valuations, if we estimate the scudi at nine English shillings, make a diamond of one karat worth \$225, and the ruby of the same weight at \$1,800, or nearly two thousand dollars, a statement which is quite incredible.

In the sixteenth and seventeenth centuries and even before these dates, Venice was the chief gem mart of Europe. Her merchants had control of a great part of the trade with the Eastern countries ; and most of the Oriental luxuries passed through their hands. From the account of the auction sale, in the year 1606, of the effects of a diamond

merchant in that city, we learn the value of diamonds of one karat weight at that time. They were then valued at £21 13s. 4*d.*, which was an enormous sum, compared with the value of money at the present day.

In 1750, the price of the stone in Europe was \$40 for one-karat gems. This was just before the discovery of the Brazilian mines. The sudden influx of the gems reduced the price shortly after to \$5 per karat ; but the market soon recovered from the panic, and in 1791, at the time the inventory of the French jewels was made, the price had arisen to \$30 for the same class of diamonds. Since this period, the prices have varied, from the influences of the wars of Europe, sinking at the time of the disturbances of the Revolution of 1848, to \$20 and \$25 per karat. But after the year 1850, the price of the gem steadily advanced, and in 1865, its quotations were almost the same as that of Venice in 1606. This comparison, however, should not be made without remembering the vast difference in the value of money of the two periods.

The valuations of the diamond for more than a century past have been based upon the form of the brilliant, while those of the star, table, rose, and others, have been valued at lesser and sometimes almost nominal prices.

The price of the rose diamonds has been affected by the views of fashion for a long time, and at the present day we are unable to establish any fixed scale.

We will, however, append the views of some of the gem experts as to the valuation of this pattern, during the past two centuries.

Robert de Berquen, in 1669, valued the rose cut

of	1	karat	at	100	francs.
“	2	“	“	500	“
“	4	“	“	1,500	“
“	8	“	“	6,000	“
“	10	“	“	9,000	“

This estimate, however, was not founded upon any principle; and it was not until the celebrated Tavernier formed his rule for the valuation of the rose cut, that the diamond had any definite value. Tavernier, in 1692, took for an example a rose of one karat, of fine water, white, and of good form, and fixed the valuation at 150 francs, and for gems of greater weight multiplied this figure by the square of their weight. The justly celebrated jeweller and traveller also followed the same rule with fine diamonds that were not of regular form. The brilliant cut was not then known.

In 1858, in France, the comparative values were: for one karat, fine brilliant cut, 300 francs; for one karat, fine rose cut, 200 francs.

The following list has been kindly furnished me by Henry D. Morse, Esq., of Boston, as giving the value of diamonds in the United States at the present time, January, 1884. The prices have fluctuated considerably during the past year, and the estimates

given are wholesale prices, and regarded as being quite low for fine stones:—

Lots averaging	$\frac{1}{2}$	karat	each,	\$60	per	karat.
“	“	$\frac{3}{4}$	“	“	80	“ “
“	“	1	“	“	100	“ “
“	“	$1\frac{1}{4}$	“	“	110	“ “
“	“	$1\frac{1}{2}$	“	“	125	“ “
“	“	$1\frac{3}{4}$	“	“	145	“ “
“	“	2	“	“	175	“ “

Above two karats the prices are not much increased per karat, because of their not being as much in demand. Stones of five karats and upwards, being very slow to sell, at the present time can be bought at \$175 to \$200 per karat, of the same qualities as the two-karat stones quoted above. Very extra white perfect stones, when well cut, bring, when sold singly or few at a time, from 20 to 25 per cent more than the prices quoted. The lower grades of stones are generally sold in lots, and the sizes do not make much difference in price. The larger they are the less desirable, and oftentimes stones of from five to ten karats are sold cheaper than stones of one to two karats; the price depending upon the shade of color and skill in cutting. Lots of this description can be bought for from \$75 to \$90 per karat. If the tinge is a little more decided they will bring but \$60 per karat. The yellow diamonds even ranging as high as ten to twenty karats bring about \$45 per karat. Flawy stones bring from \$15 to \$35 per karat, according to their color, size, and brilliancy. Fine rough

stones of assorted sizes, varying from three to ten karats, bring from \$30 to \$45 per karat according to their shape and perfection. Smaller sizes are reckoned in value from \$15 to \$20 per karat. Cheaper grades and off-colored crystals are sold as low as \$8 to \$12 per karat. The bort diamonds vary in value; those coming from Africa bring but \$1.50 per karat, while the same variety found in Brazil bring \$6. The carbon variety of the best sizes bring about \$20 per karat. Fifteen years ago the same mineral could be bought for \$2.50 per karat; while the Brazilian bort was quoted at \$9.

Of colored diamonds, those slightly tinged with various colors, especially the yellow and brown, were valued in London and Amsterdam, in 1872, as follows:—

Under 1 karat	30s.	to	£2 10s.	per karat.
1 to 2 “	40	“	4 10	“ “
2 “ 3 “	£3	“	5 10	“ “

The following account of Cape of Good Hope diamonds which were sold by auction at Covent Garden, February, 1872, may interest the reader in comparison with other sales at various periods of time:—

One white rough diamond, $9\frac{1}{2}$ karats, £60; one slightly off color, $7\frac{1}{4}$ karats, £37; a curious cabinet specimen of native diamond in matrix, £14, one large rough gem, drop shape, $14\frac{1}{2}$ karats, £42. Among the cut diamonds the following were sold: a magnificent brilliant, 8 karats, 430 guineas; a fine yellow brilliant of great lustre, $7\frac{1}{2}$ karats, 140 guineas; a bril-

liant of great spread and good water, about $7\frac{1}{2}$ karats, 140 guineas; a large, lustrous brilliant of fine color weighing about 7 karats, 480 guineas; a court tiara of five graduated brilliant stars, 185 guineas; a brilliant necklace of forty graduated collets, £300.

The following sale by auction, in London, of some of the Imperial jewels belonging to the Empress Eugenie, may also interest the reader; and we have therefore thought proper to insert the account. It took place in July, 1872, at the rooms of Christie, Manson, & Co.:—

Lots 16 and 17. A bracelet, with forget-me-nots formed of turquoises and small diamonds, and another, with pearls and diamonds,—175 guineas. (Attenborough.)

22, 23. A heart-shaped locket, formed of bands of brilliants, and a pair of gold solitaires, with large diamond centres,—215 guineas. (Copeland.)

24. A very small keyless watch, with E. in diamonds, with gold chain, set with rubies and emeralds,—120 guineas. (Agnew.)

26. A chased gold snuff-box, the top set with flowers in brilliants, with the Pasha of Egypt's cipher in brilliants on blue enamel,—165 guineas. (B. Benjamin.)

33. A brooch, with pendants, formed of five large turquoises and brilliants,—105 guineas. (Streeter.)

35. A brilliant brooch, with sprays set with brilliants,—120 guineas. (Attenborough.)

36. A pair of large pink pearl ear-rings in enamelled setting with brilliants,—105 guineas. (Thompson.)

37. A heart-shaped pendant, formed of a fine large turquoise surmounted by brilliants, — 250 guineas. (Martin.)

38, 39. A large black pearl, with brilliant top, and a heart-shaped brilliant locket, — 300 guineas. (Woodgate.)

40. A pair of shell-shaped brilliant ear-rings with pearl centres and drops, — 106 guineas. (B. Benjamin.)

41. A brilliant brooch, formed as a corn-flower and group of foliage, — 348 guineas. (Phillips.)

43–45. A ring with a large brilliant, a fine single stone brilliant ring, and a ring with a large brilliant and two fine emeralds, — 485 guineas. (Woodgate.)

46. A ring, with a splendid ruby and two brilliants, — 300 guineas. (Challens.)

47, 48. Three very fine emeralds, set as a ring, and a pair of hairpins formed as rosebuds, of pink pearls and brilliants, — 275 guineas. (Gibbons.)

49. A marquise ring, with a pink diamond surrounded by brilliants, formerly the property of the Empress Josephine, — 400 guineas. (Martin.)

50. A beautiful pendant, the centre a fine emerald, surrounded by bands of brilliants, with emerald and pearl drop, — 605 guineas. (Brown.)

51, 52. A group of three wheat-ears tied with a ribbon formed of fine brilliants, making a brooch or head ornament, and the companion group, — 975 guineas. (Lennox.)

53, 54. A group of two wheat-ears, en suite, and the companion group, — £810. (Martin.)

55. A fine pendant, with a large square emerald,

surrounded by brilliants, with very large pearl drop, — 620 guineas. (Ford.)

56. A scroll-pattern brilliant brooch, for a miniature, with large pearl drop, — 470 guineas. (Challens.)

57. A broad chain-band bracelet, with sapphire and two large brilliants, — 340 guineas. (Lomax.)

58. Two fine emeralds and three large brilliants, mounted as a bracelet, — 810 guineas. (Hancock.)

59. A beautiful cross, formed of eleven large brilliants, — 900 guineas. (Carter.)

60. A ribbon tie brilliant brooch, — 335 guineas. (Grindley.)

61. A handsome pendant of brilliants and pearls, with a fine large black pearl centre and drop, — 420 guineas. (Martin.)

62. Two fine large brilliants and an emerald mounted on a buckle set with small brilliants, — 430 guineas. (Harborough.)

64. A splendid brooch, formed as a rosebud and leaves, composed entirely of brilliants, — 820 guineas. (Attenborough.)

65. A magnificent bracelet, with sapphire centre, surrounded by rubies, brilliants, and emeralds, — £650. (Rothschild.)

67. A fine large pearl, mounted as a hairpin of chased gold, with chain set with small diamonds, — 188 guineas. (Chapman.)

68. A splendid fly brooch, the body a very large opal, the head and wings set with rubies, brilliants, emeralds, sapphires, and opals, — £320. (Greenwood.)

69. A beautiful watch, in blue enamel setting, surrounded by eleven large brilliants, suspended from a hook, set with a cluster of brilliants, — £1,660. (James.)

70, 71. A fine polished emerald, surrounded by brilliants, and a bracelet with splendid ruby centre and large brilliants, — 975 guineas. (Hancock.)

72, 73. A brooch, formed as an anchor, composed entirely of brilliants, and the companion brooch, — £2,150. (Eaton.)

74. A tiara, formed of a band of brilliants, the centre a cluster of fine brilliants and emeralds, surmounted by a large oval emerald, with brilliant sprays and pearl drop, — 780 guineas. (Challens.)

75. A bracelet, the centre a very fine sapphire surrounded by large brilliants, with trellis pattern open-work bands, studded with brilliants, — £1,105. (Martin.)

76, 77. A brilliant set as a brooch, with fine pearl drop, and a brilliant brooch with colored stone centre and pearl drop, — 730 guineas. (Keane.)

78. A brilliant tiara, formed as a group of leaves, — £970. (Carter.)

79. A pearl necklace, composed of forty-one large pearls of the highest quality, with cluster brilliant snap, — £2,400. (Marquis of Bristol.)

80-84. A pair of polished emerald drops, four pairs of larger ditto, and a single ditto, — 750 guineas. (Masters.)

85-89. Two pairs of emerald drops, with bril-

liant tops, three pairs of larger ditto, — 550 guineas. (Carter.)

90–92. Three pairs of very large emerald drops, — £1,275. (Garrard.)

93–103. A brooch, with a fine large emerald surrounded by brilliants, nine larger ditto, and one with a square emerald, — 5,000 guineas. (Keane.)

104–106. A brooch with emerald centre, surrounded by fine brilliants, with emerald and brilliant drop, and two larger ditto, — £3,525. (Graham.)

107. A tiara, composed of ten fine large emeralds, surrounded by bands of brilliants, — £2,625. (Keane.)

108. A brilliant brooch, formed as a group of leaves, with six large brilliant drops and pendants, set with smaller brilliants, — 1,050 guineas. (Keane.)

109–111. Three brilliant pendants composed of very fine large stones, with brilliant drops and pendants of false pearls, — 2,600 guineas. (Keane.)

112. A bracelet, composed entirely of brilliants, the centre an oval sapphire, — £2,250. (Carter.)

113. A pair of long ear-rings composed of very large brilliants, — £3,255. (Stevens.)

114. A brilliant brooch, formed as a double pink, — £1,470. (Stevens.)

The whole realized upwards of £50,000 (\$250,000) gold.

The quantity of diamonds now in circulation in fashion, and hoarded by commerce, is enormous, and may be estimated by the ton. Yet the requirements of society and the arts are so vast that the gem

apparently seems to be a rare stone, while in reality it ranks low down in the scale of rarity.

Although we believe that there are immense diamond placers yet to be discovered in Africa, Asia, and America, we do not think that the gem will ever lose its high rank in the wants of fashion and ornamentation, or that its price will ever again descend to the valuation of 1848 except in transient times of far-extended commercial distress. The misfortunes of any one country will not affect the established price to any great extent, since the demand from other countries is so great as to preserve a well-marked equilibrium.

India, with its millions of people who prefer to invest their gains in a gem to all other known property, will furnish an eager market for the diamond for many ages to come. The history of the influx and absorption of silver by that country furnishes an interesting parallelism.

Most of the people of the earth entertain superstitious fancies, and especially invest the gems with spiritual powers or special attributes. Hence the innate love of ornament, combined with the desire of possessing a rare treasure, will always give to the gems a prestige and a commercial value above all other things. Puritanical morality may rail against the gems as luxuries; but the nature of man must be changed before these ideas can be universally adopted. The refinements of civilization, as well as the follies of barbaric ages, call for the ornamentation

of jewels and gems. And modern economy may, with Tiberius, complain in vain of that "rage for jewels and precious stones which drains the empire of its wealth, and sends, in exchange for its baubles, the money of the commonwealth to foreign nations."

A brilliant writer has lately stated that "Pictures, gems, china, bronzes, *bric-à-brac* of every sort, rare shawls, rare engravings, and even rare fruits, flowers, and dogs are steadily tending upwards in value, as if their price depended upon a want and not a caprice. It is the most curious illustration of the unchangeableness of the law which governs even caprices that we are acquainted with; and tends to indicate that the desire for the rare, which we all notice and smile at, in bibliopoles, antiquarians, entomologists, and every variety of the genus collector, is not an exceptionable eccentricity, but a permanent attribute of the human mind, though only noticed in those who have wealth to indulge in some unusual or splendid form. It is like the desire of accumulation, one of the passions, and not one of the mere tastes of men; and may be relied on in business, almost as certainly as self-interest, vanity, or ambition."

The relative worth of the diamond has never been better described than by the following lines from the pen of an able English author:—

"It is in truth the very essence of property. It is riches condensed and wealth secured; too small to be seen by the midnight burglar; too easily hid to be seized by the tyrant; and too quickly carried away to be wrested

from the patriot exile or torn from the hunted outlaw. In vain would the vanquished monarch strive to remove his bags of gold, or transport his territorial domains ; but a diamond is an empire made portable, with which he might purchase a better kingdom, and mount a prouder throne. Had the treasure of Cræsus been invested in brilliants he might have founded a nobler Lydia beyond the reach of his Persian invader."

THE EMERALD.

“THE emerald burns intensely bright,
With radiance of an olive light ;
This is the faith that highest shines,
No need of charity declines,
And seeks no rest and shuns no strife,
In working out a holy life.”

MARBODEUS.

THE EMERALD.

DUTENS and several others who have written upon gems and precious stones during the last two centuries, have asserted that the ancients were unacquainted with the true emerald, and that Heliodorus, when speaking nearly two thousand years ago of "gems green as a meadow in the spring," or Pliny, when describing stone of a "soft green lustre," referred to the peridot, the plasma, the malachite, or the far rarer gem, the green sapphire. But the antiquary has come to the rescue with the treasures of the despoiled mounds of Tuscany, the exposed ashes of Herculaneum and Pompeii, and now exhibits emeralds which were mounted in gold two thousand years before Columbus dreamed of the New World, or Pizarro and his remorseless band gathered the precious stones by the hundred-weight from the spoils of Peru.

Although these specimens of antique jewelry set with emeralds may be numbered by the score or more in the museums and reliquaries of Europe, but very few engraved emeralds have descended to us from ancient times. This rarity is not due to the

hardness of the stone, for the ancient lapidaries cut the difficult and still harder sapphire; therefore we must believe the statement of the early gem-writers that the emerald was exempted from the glyptic art by common consent on account of its beauty and costliness.

Stones possessing a green color have been used for ornamental purposes from the very earliest periods of the social life of man. And as we review the archæological history of the human race, it would seem as though minerals of this hue had been especially selected among all others for ornamental purposes.

For instances of this primitive selection, we will refer to the green stone hatchets found among the ancient tombs of Brittany; the axe heads of jade in New Caledonia; the green serpentine implements of Africa; the articles carved from green zoisite, revered among the Chinese from time immemorial; as well as the green jade and amazon stones, which the Mexicans wrought with wondrous skill into strange and grotesque forms, and which they prized above even their magnificent and matchless emeralds. It is also clearly evident that the emerald was discovered in very ancient times, and that it was early adopted in ornamentation, and was prized as among the most valuable of the gems, if not the highest in estimation, for its color and fancied virtues.

Pliny was undoubtedly familiar with the true

emerald, and expressed his satisfaction in the following language :—

“There is no color so pleasing to the eye as that of the emerald. Whoever delights in the verdure of herb and leaf must enjoy infinitely more the contemplation of emeralds; for no verdure can compare to theirs. They are the only stones that charm the eye without wearying it. It loses its lustre neither in sun nor in shade, nor in artificial light. It shines continually with the same soft glow.”

In the time of Alexander, the emblems of authority of the Persians consisted of golden imitations of vines, loaded with clusters of emeralds, carbuncles, and other gems. At the famous marriage feast of Alexander and his eighty companions with their beautiful Persian brides, emeralds appear to have been the favorite gem used, and to have been esteemed above all other ornaments except the beautiful pearls of the Persian Gulf.

In ancient times this gem was not only prized as an ornament, but also as a talisman, and even as a medicine in the powdered state. Its beauty captivated the vain and frivolous, and its supposed virtues endeared it to the rich and the wise. It was supposed to exercise a good effect upon the eyesight; hence it was worn as a seal to be looked at; when worn as an amulet it endowed the wearer with courage, drove away evil spirits, assuaged terror, and prevented attacks of epilepsy.

Pliny states that Paulina, at the Banquet, was literally covered with emeralds and pearls, arranged over her dress in alternate rows.

The famous and fatal ring which Polycrates cast into the sea, as an offering to the gods in return for forty years of prosperity, was set with a beautiful emerald.

The ancient Etruscans carved the emerald at a very remote period, and the fact is proven by the scarabeus in the Townley collection.

The Castellani collection exhibits ear-rings of gold set with pendants of emeralds which were found in the tombs at Bolsena.

In the Devonshire gems there is a large emerald cut into a Gorgon's head, in high relief, — evidently a gem of great antiquity and of exceeding value at the time of its conversion into a work of art.

Within the sarcophagus of Maria Honorii fifty rings set with different stones were found, and among them an emerald set in gold and engraved with a head supposed to be that of Honorius himself. It was probably fashioned for a royal signet and buried with the remains of its owner.

The famous mirror or lens, in or through which the cruel and near-sighted Nero was wont to view the bloody combats in the arena at Rome, is supposed to have been cut from an emerald; but it was probably a lens cut from green glass.

It appears, however, from the researches of the antiquaries, that the gem was very rare until the

Imperial epoch, when they were introduced from Asia and other countries in accordance with the luxury and extravagance of the age. Castellani's collection displays some fine examples of the jewelry of this period set with emeralds. Among them there is a beautiful necklace formed of sixteen natural crystals of emerald fastened in gold; and also another composed of ten natural crystals of emerald set in double chains of gold. Among the engraved gems may be seen an emerald intaglio, representing a Nereid on a sea bull, and two other intaglios of beryl, with pictures of Mars, and a portrait of Julia Paula.

From the earliest times of history monarchs and potentates of all ranks and races, from Solomon to Montezuma, were wont to wear signet rings, which were sometimes engraved, and were then often used to impart authority either by the exhibition of the ring itself, or its impression upon papyrus, parchment, or wax. The most celebrated ring of this description we have any authentic knowledge of, was that formed of a large emerald set in gold and worn by Alexander the Great, whose portrait was engraved upon the stone. The hero, when dying, bestowed it upon his favorite general, Perdiccas, and thereby invested him with the authority of succession. History refuses to make known the fate of this splendid gem. It is probable that Ptolemy Soter obtained possession of it when Perdiccas was slain in Egypt, and that eventually Augustus Cæsar may have worn it for his first

imperial seal, which was an emerald engraved with the head of Alexander.

After the death of Pompey in Egypt, his seal ring, which represented a lion holding a sword in his paw, was taken to Rome and presented to Cæsar, who burst into tears on receiving the signet of his former associate and unfortunate rival.

The practice of interring with the dead some of the jewels worn in life, has been practised in recent times. When Cardinal Borromeo was buried at Milan two hundred years ago or more, a large gold cross, containing seven large and fine emeralds surrounded with diamonds, was placed in his tomb. When Lord Palmerston was buried at Westminster Abbey, the officiating clergyman threw into the grave several diamond and gold rings as a peace offering. In ancient times the custom was of frequent occurrence, and to this habit we owe the preservation of many beautiful gems and jewels, which have in this manner escaped the pillage and fury of thieves and iconoclasts.

The mineral has borne the name of emerald since the middle of the seventeenth century, at which time it was adopted by the mineralogist, Wallerius. But whence it is derived, and on what particular grounds, we are not informed. In Asia, in ancient times, it was described under the Sanskrit name, "marakat," which is connected with "esmark," signifying a sea monster, or "makara," meaning the sea. As it passed westward, among the Persians it became "zabagat,"

and still farther on its journey it was changed by the Greeks and Latins into "smaragdus." The derivation of its ancient terms is also exemplified by the use or purposes in which the gem and its varieties were used. It was therefore frequently chosen by the antique gem cutters and engravers, as the proper material for the representation of all maritime subjects or any allusions to the sea gods.

The emerald is now one of the rarest of gems ; and its scarcity gives rise to the inquiry as to what has become of the abundant shower of emeralds which fairly rained upon Spain during the early days of the conquest of Mexico and Peru, bringing down the value of fine stones to a trifling price. As with all commercial articles, there is a waste and loss to be accounted for during the wear of three centuries ; but this alone will not explain their present rarity in civilized countries. Even in the times of Charles II., when the destitution of the country was extreme, the Dukes of Infantado and Albuquerque had millions in diamonds, rubies, and precious stones, yet hardly possessed a single sou. So impoverished was the land, and so slender were the purses of all, that the Duke of Albuquerque dined on an egg and a pigeon, yet it required six weeks to make an inventory of his plate. At this period, when the nobles gave fêtes the lamps were often decorated with emeralds and the ceilings garlanded with precious stones. The women fairly blazed with sparkling gems of fabulous value, while the country was

starving. Most, if not all, of this missing treasure was transferred to Asia, and with the silver current which flowed steadily from the Spanish coffers into India went many of the emeralds also; for in those regions this gem is regarded as a foreign stone, and the natives, investing it with the possession of certain talismanic properties, prize it above all earthly treasures.

When the Spaniards commenced their march toward the capital of Mexico, they were astonished at the magnificence of the costumes of the chiefs who came to meet them as envoys or join them as allies; and among the splendid gems which adorned their persons they recognized emeralds and turquoises of such rare perfection and beauty that their cupidity was excited to the highest degree. During the after years of conquest and occupation the avaricious spoilers sought in vain for the parent ledge where these precious stones were found. Recent times have, however, revealed the home of the Mexican turquoise, which has proved to be in the northern part of Mexico, as the Totonacs informed the inquiring Spaniards. The first of these mines, which is of great antiquity, is situated in the Cerillos Mountains, eighteen miles from Santa Fé. The deposit occurs in soft trachyte, and an immense cavity of several hundred feet in extent has been excavated by the Indians while searching for this gem in past times. Probably some of the fine turquoises worn by the Aztec nobles at the time of the

Spanish Conquest came from this mine. Another mine is located in the Sierra Blanca Mountains in New Mexico, but the Navajos will not allow strangers to visit it. Stones of transcendent beauty have been taken from it, and handed down in the tribe from generation to generation as heirlooms. Nothing tempts the cupidity of the Indians to dispose of these gems, and gratitude alone causes them to part with any of these treasures, which, like the mountaineers of Thibet, they regard with mystical reverence. The Navajos wear them as ear-drops, by boring them and attaching them to the ear by means of a deer sinew. Lesser stones are pierced, then strung on sinews, and worn as necklaces. Even the nobler Ute Indians, when stripping the ornaments of turquoise from the ears of the conquered Navajos, value them as sacred treasures, and refuse to part with them even for gold or silver.

All the Spanish accounts of the invasion of Mexico agree in the great abundance of emeralds, both in the adornment of the chiefs and nobles and also in the decoration of the gods, the thrones, and the paraphernalia. The Mexican historian Ixtlilxochitl says the throne of gold in the palace of Tezcucó was inlaid with turquoises and other precious stones; that a human skull in front of it was crowned with an immense emerald of a pyramidal form.

The great standard of the republic of Tlascala was richly ornamented with emeralds and silver-work. The fantastic helmets of the chiefs glittered with

gold and precious stones, and their plumes were set with emeralds. The mantle of Montezuma was held together by a clasp of the green chalchivtl (jade), and the same precious gem, with emeralds of uncommon size, ornamented other parts of his dress.

The Mexicans carved the obdurate jade and emerald with wonderful skill, using, like the Peruvians, nothing but silicious powder and copper instruments alloyed with tin. They also worked with exquisite taste in gold and silver, and they represented Nature so faithfully and so beautifully that the great naturalist Hernandez took many of these objects thus portrayed for his models when describing the natural history of the country.

When Cortez returned home he displayed five emeralds of extraordinary size and beauty, and presented them to his bride, the niece of the Duke de Bejar. On his famous expedition along the Pacific coast and up the Gulf of California he was reduced to such want as to be obliged to pawn these jewels for a time. One of them was as precious as Shylock's turquoise, and Gomara states that some Genoese merchants who examined it in Seville offered forty thousand golden ducats for it. One of the emeralds was in the form of a rose; the second in that of a horn; the third like a fish with eyes of gold; the fourth was like a little bell, with a fine pearl for a tongue, and it bore on its rim the following inscription in Spanish: "Blessed is he who created thee!" The fifth, which was the most valuable

of all, was in the form of a small cup with a foot of gold, and with four little chains of the same metal attached to a large pearl as a button: the edge of the cup was of gold, on which was engraved in Latin words, "Inter natos mulierum non surrexit major." These splendid gems are now buried deep in the sand on the coast of Barbary, where they were lost in 1529, when Cortez was shipwrecked with the Admiral of Castile whilst on their way to assist Charles V. at the siege of Algiers.

Mariana, in his history of Spain, declares that Cortez had, besides the five great historical emeralds, also two emerald vases which were valued at 300,000 ducats. Whether these remarkable treasures were swallowed up by the sea with the other five when the conqueror of Mexico was shipwrecked, history does not relate.

Among the presents sent to Charles V. of Spain by the first Spanish commissioners, Puerto Carreso and Montijo, in 1519, and also by Montezuma through his governor Teuthlili, were the following articles, according to the description given by Peter Martyr, the learned Italian, who enjoyed the friendship of Columbus and the confidence of the Spanish Court. The Chronicles of Gomara also contain the same list: a gold necklace composed of seven pieces with 183 small emeralds set in it, and 232 gems similar to small rubies, from which hung 27 little bells of gold and several fine pearls; another necklace composed of four pieces of gold with

102 red gems like small rubies, 172 emeralds, and 10 fine pearls, with 26 little bells of gold attached.

The historians, Gomara and Martyr, mention among the prizes which fell into the hands of Cortez, an immense emerald of a pyramidal form, whose base was as large as the palm of the hand; and which may have been the identical stone which crowned the skull which stood before the throne in the palace of Tezcuco. At all events, an emerald of this description Cortez sent as a present to the Emperor of Spain, together with his letters of explanation, after the fall of the city of Mexico. The letters and the various presents were intrusted to the care of two of his confidential officers, Quinones and Avila. Arriving at the Azores, Quinones lost his life in a brawl, and jeopardized the mission; but Avila escaped and put to sea, to be captured shortly after by a French privateer; and the rich spoils of the Aztecs were presented to the King of France, instead of the Emperor of Spain. Francis I. gazed with delight upon the splendors of the gem, and with a feeling of envy exclaimed that he "would like to see the clause in Adam's testament, which entitled his brothers of Castile and Portugal to divide the New World between them." What has become of this historic stone?

The quantity of emeralds obtained by the Spaniards in their pillage of Mexico was large; but it was trifling when compared with that collected by Pizarro and his remorseless followers in the sack of

Peru. Many large and magnificent stones were then obtained by the Spaniards; but the transcendent gem of all, called by the Peruvians the Great Mother, and nearly as large as an ostrich egg, was concealed by the natives, and all the efforts of Pizarro and his successors to discover it proved unavailing.

Previous to the plunder of America by Cortez and his followers, emeralds were not numerous in Europe; but early in the sixteenth century they began to appear in Spain, and were soon afterwards distributed among the powerful and wealthy throughout Europe. England seems to have had at one time a large share of them, and perhaps many of them were taken by her freebooters from the richly laden Spanish galleons. In the days of Queen Elizabeth emeralds were exhibited in profusion, if we can give credence to the chronicles and inventories of that period.

The parure of emeralds which the Queen of Navarre bequeathed in 1572, to her daughter Catherine, must have been of wonderful beauty and perfection.

What is the stone lately given to Mustapha, the ex-premier of Tunis, by the Bey, and described as the famous emerald once belonging to the Spanish Crown? Was it one recovered from the shipwreck of Cortez, or was it one of those given away by the Spanish rulers in the early days of the conquest of Peru, when they imagined the emerald mines were as broad and exhaustless as the silver beds of Potosi?

The finest emerald in Europe is said to belong to the Emperor of Russia. It weighs but thirty karats; but it is of the most perfect transparency, and of the most beautiful color. There are many other fine emeralds among the imperial jewels of the Czar, some of which are of great size and rare beauty. The ancient crown of Vladimir glitters with four great stones of unusual brilliancy. The grand state sceptre is surmounted by another emerald of great size. The sceptre of Poland, which is now treasured in the Kremlin, has a long green stone, fractured in the middle. It is not described, and may be one of the Siberian tourmalines, some of which closely approach the emerald in hue. The imperial orb of Russia, which is said to be of Byzantine workmanship of the tenth century, has fifty emeralds. This fact alone would seem to prove that emeralds were known in Europe or Asia Minor long before the discovery of America; but, on the other hand, the ancient crown which was taken when Kasan was subjugated in 1553, is destitute of emeralds. And hence we are inclined to believe the imperial orb to be of modern workmanship, especially as some of the ancient state chairs do not exhibit emeralds among their decoration of gems and precious stones.

The immense uncut Peruvian emerald, given by Rudolph II. to the Elector of Saxony, is still preserved in the Green Vaults at Dresden.

Queen Elizabeth of England sent to Henry IV.,

the champion of the Reformed faith, a beautiful emerald, which she herself had worn. She gave it as a token of esteem, and reminded the gay monarch that the gem possessed the virtue of not breaking so long as faith remains entire and firm.

It has been stated that the Emperor Charlemagne regarded the gift from the Empress Irene as the dearest of all his talismans. This treasure consisted of a piece of the true cross, enclosed in a large emerald, which was attached to a strong chain of golden links. When his sepulchre was rifled of the treasures deposited with the deceased monarch, this relic was removed with the rest of the jewels; and in 1811 was presented to Napoleon by the Burghers of the city of Aix-la-Chapelle. Bonaparte one day playfully threw it over the neck of Queen Hortense, declaring that he had worn it on his breast in the bloody battles of Austerlitz and Wagram, as Charlemagne had worn it on the field of battle in the Middle Ages. Hortense wore it until the day of her death.

The emeralds of the French Crown at the time the famous inventory was taken in 1781, do not appear to have been of very great purity. Several of them exhibited fine color, but had many faults. Five of the best were valued at that time at fifty thousand francs, or ten thousand dollars, each.

In the famous Hungarian crown, the large sapphire is surrounded with four green stones of oblong form, whose species are unknown. It is also a

mystery how they came there, as they are not mentioned in the inventory made of the jewel when Queen Elizabeth of Hungary pledged it to the Emperor Frederick IV.

The Sultan of Turkey is known to possess some exquisite emeralds; and Rambusson, a French writer on gems, declares that they are the finest in the world. One of them is said to weigh one hundred and twenty-five ounces, and is probably another lump of antique glass. Another of three hundred karats weight, and of less doubtful character, is a gem of great purity and perfection of color. It adorns the handle of a poniard.

In the museum at Florence there is a small vase carved in emerald, and also another ornament of similar form, fashioned from a fine beryl. The mineralogical collection at Munich boasts of some immense emeralds which are supposed to have been obtained from Spain, and part of her Peruvian booty. There are also some splendid specimens of uncut emeralds in the cabinet of minerals at Vienna. The Saxon and the Papal crowns contain very beautiful emeralds.

Probably the most beautiful specimen of the natural emerald in the world is that presented to the renowned shrine of Loretto in Italy, by Don Pierre Daragon, when Spanish ambassador at Rome. He was formerly viceroy in Peru and obtained the treasure at that time. The specimen is a mass of white limestone, crowned with great crystals of emeralds

more than an inch in diameter and of exquisite color and lustre.

The name of Emerald Isle is generally supposed to have been derived from the ever green appearance of its shores but an antiquary asserts that it arose from the ring which was set with "Optimo Smaragdo," and which Pope Adrian sent to King Henry II. as the instrument of his investiture with the dominion of Ireland.

There is a very fine and large crystal of emerald in the museum at Leiden, but its history is unknown.

Dhuleep Singh of India possesses a flattened crystal of three inches in length by two in width, and half an inch in depth, which is regarded as of great value in India. It is said to be of very fine color and with but few imperfections.

The Duke of Devonshire's crystal in its natural state is reckoned as one of the finest, if not the finest single specimen in the world. It is from Muzo in New Granada, and more than two inches in length. Its form is that of a hexagonal crystal, and its weight is 8 oz. 18 dwts. The color of the stone is beautiful, but several flaws impair the value as a gem.

During the visit of the Prince of Wales to India, many fine emeralds were exhibited to the royal party by the Hindoo nobility. At the grand reception given them at Madras, the Prince of Virianagram wore a bracelet composed of three splendid emeralds of very great size. At Kandy, in Ceylon, the Buddhist priests brought forth from their sanctuary for the

inspection of the Prince, an immense emerald four inches long by two inches in depth.

A ring cut out of a single emerald, $1\frac{1}{4}$ inches in diameter, with the name of the Emperor Jehangir engraved upon it, was presented to the East India Company.

One of the most costly and difficult works in engraving upon the emerald in modern times, was that executed by Carlo Costanzi during the last century. Upon a table of emerald two inches in diameter, the head of Pope Benedict and those of St. Peter and St. Paul were engraved. Two years and a half were required by the lapidary for the execution of his task. The engraved gem may now be seen in the treasury of St. Petronio at Bologna.

Some very fine emeralds are said to be preserved in the royal collection at Madrid, one quite as large as the Devonshire emerald and without many flaws.

The Spanish freebooters, returning home from their American fights laden with gems, did not forget the shrines of Spain in their peace offerings. Marshal Lannes, in sacking the church of our Lady of the Pillar, which was one of the richest in Spain, obtained an immense booty. Madame Junot declares in her memoirs that it was not far below five millions of francs in value.

Harsh stories are also told of the acts of vandalism of Marshal Junot while he was military governor of Spain. It is related that when he visited the Cathedral of Toledo, the church dignitaries freely

exhibited to him the magnificent jewels and treasures which belonged to the church and had been accumulating for many ages. The crown of the Virgin, which was beautifully constructed of gold and adorned with exquisite gems, was placed in his hands for close examination. The summit of this admirable and holy piece of human art was surmounted by a large emerald of almost transcendent beauty. The French freebooter examined the beautiful jewel for a few moments, and then coolly twisted off the emerald from its setting and placed it in his pocket, exclaiming, with a Parisian grimace, "Ceci doit être à moi."

Finely formed crystals of emerald, when not too large, were in early times mounted in gold and in jewelry without receiving any artificial polish from the lapidary. Examples are often found in the tombs of antiquity. The Princess Bariatinsky has a valuable necklace of ancient emeralds fashioned in this manner.

The Orientals, taking advantage of the facility with which the prisms are broken at right angles to the axis, frequently used slices of the crystals, sometimes artificially polished, but often with the natural planes of cleavage preserved. This practice was quite common prior to the fifteenth century. They also adopted the unfortunate custom of engraving them with condensed quotations from the Koran, and often drilled holes through the centre of the stones so as to string them as necklaces or as ear ornaments.

One of the finest gems that adorned the gorgeous harness of Runjeet Singh was a beautiful emerald maltreated in this manner. Major Pearse found in a Punjaub tope a reliquary formed from an emerald three inches long and two inches thick, with the ends rounded off. It was originally a gem of fine color, but had been bored half through its axis to contain two finger joints of some revered Buddhist saint or petted monkey.

The emerald has been a subject of controversy among the chemists and mineralogists, and its character, especially the cause of its beautiful color, is not clearly defined even at the present day. But that distinguished chemist, Professor Lewy of Paris, seems to offer, thus far, the most correct and plausible theory. More than ten years ago he boldly asserted that the hue is not due to the oxide of chromium, and with this opinion he confronted such eminent men as Vauquelin, Klaproth, and others of high rank in the scientific world. Not content with his researches in his laboratory in Paris, he resolutely crossed the ocean and sought the emerald in its parent ledges in the lofty table-lands of New Granada. Here he obtained new information of a geological character which goes far to strengthen his position. The experiments of M. Lewy indicate, if they do not prove, that the coloring matter of the emerald is organic, and readily destroyed by heat, which would not be the case if it was due to the oxide of chromium. All my own fire-tests with the

Granada emerald corroborate the views of M. Lewy, for in every instance the gem lost its hue when submitted to a red heat.

Nevertheless, the recent researches of Wöhler and Rose give negative results. These experienced chemists kept an emerald at the temperature of melted copper for an hour, and found that, although the stone had become opaque, the color was not affected. They therefore considered the oxide of chromium to be the coloring agent, without, however, denying the presence of organic matter. The amount of the oxide of chromium found by many chemists varies from one to two per cent, while Lewy and others found it in a quantity so small as to be inappreciable, and too minute to be weighed.

Before the ordinary blowpipe the emerald passes rapidly into a whitish vesicular glass, and with borax it forms a fine green glass, while its sub-species, the beryl, changes into a colorless bead; with salt of phosphorus it slowly dissolves, leaving a silicious skeleton.

M. Lewy visited the mines at Muzo in Granada, and from the results of his analyses, together with the fact of finding emeralds in conjunction with the presence of fossil shells in the limestone in which they occur, he arrived at the conclusion that they have been formed in the wet way, — deposited from a chemical solution. He also found that when extracted they are so soft and fragile that the largest and finest fragments can be reduced to powder by

merely rubbing them between the fingers, and the crystals often crack and fall to pieces after being removed from the mine, apparently from loss of water. Consequently, when the emeralds are first extracted they are laid aside carefully for a few days until the water is evaporated.

This statement relative to the softness of the gem and its subsequent hardening has been met with a shout of derision from some of the gem-seekers,—none louder than that of Barbot, the retired jeweller. Barbot seems to forget that the rock of which his own house in Paris is constructed undergoes the same change after being removed from the deep quarries in the catacombs under the city.

This phenomenon is observed with many rocks. Flints acquire additional toughness by the evaporation of water contained in them. The yellow gneiss of Ceylon is soft when quarried, but hardens on exposure to the atmosphere. The Egyptian verde antique marble, which was named after Augustus and Tiberias, was easily quarried with steel implements, but quickly hardened on exposure to the external air. The mosaic plates of this mineral which are inlaid in the decorative work of the Tuscan Gothic buildings are yet quite hard. The steatite of Saint Anthony's Falls grows harder on exposure, and other minerals, when quarried from considerable depths, become firmer on exposure to the action of the air. Observations of this kind led Kuhlman to investigate the cause; and he believes that the hardening

of rocks is not owing solely to the evaporation of quarry-water, but that it depends upon the tendency which all earthy matters possess to undergo a spontaneous crystallization by slow desiccation, which commences the moment the rock is exposed to the air.

The coloring matter of the emerald seems to be derived from the decomposition of the remains of animals who have lived in a bygone age, and whose remains are now found fossilized in the rock which forms the matrix of the gem. This rock in Granada is a black limestone, with white veins containing ammonites. Specimens of these rocks, exhibiting fragments of emeralds *in situ* and also ammonites, are to be seen in the mineralogical gallery of the Jardin des Plantes in Paris. Lewy believes that the beautiful tint of these gems is produced by an organic substance, which he considers to be a carburet of hydrogen, similar to that called chlorophyll, which constitutes the coloring matter of the leaves of plants; and he has shown that the emeralds of the darkest hue, which contain the greatest amount of organic matter, lose their color completely at a low red heat, and become opaque and white; while minerals and pastes which are well known to be colored by chromium, like the green garnets (the lime-chrome garnets) of Siberia, are unchanged in hue by the action of heat.

At the present time the composition of the emerald is supposed to be a silicate of alumina and glucina, with traces of organic matter and also other

earths and oxides ; but silica, alumina, and glucina are the principal component parts. It resembles quartz in some of its physical properties, having a specific gravity of 2.6 to 2.7, and a refractive energy of 1.58, but its degree of hardness is slightly greater, ranging from 7.5 to 8.0, while that of quartz is but 7.0.

The Peruvians maintain that the emerald ripens and deepens in color after having been mined and exposed to the air and light. Whether this assertion has been corroborated or not we cannot yet say ; but it is a well-substantiated fact that some minerals do gain in color and hardness on exposure, and equally well proved that many others lose their tints very perceptibly. Strange to say, the cystine calculi undergo a similar change of color, and assume a fine greenish-blue tint when exposed to the light, changing from a fawn color. The specimens in Guy's Museum described by Dr. Marcet in 1817 were of a pale brown, but according to the report of Golding Bird they now resemble the green sulphate of iron. Dr. Peter observed the same mysterious change of color in the two cystine calculi preserved in the museum of Transylvania University, and noted the fact that the change takes place on the side exposed to the light.

But one locality thus far has been discovered in the United States or even in North America, and this occurs in North Carolina. For several years previous to the year 1880, Mr. J. A. Stephenson, a collector of minerals, had obtained in Alexander

County a number of beryls and crystals of transparent minerals which had the shape of beryl with a tint of the emerald hue, also other crystals of acicular form which exhibited the true color of the finest Granada specimens of emeralds.

Some of these minerals were shown in 1880 to William E. Hidden, a young naturalist then engaged in searching the mineral belts of North and South Carolina and Georgia for rare minerals. The beauty of these specimens led the young enthusiast to make a thorough search for the parent ledge; and, after a few weeks of earnest labor in cutting deep ditches in the soil near the spot where a number of crystals had been found, he was rewarded with the discovery of the original deposit in a rock of gneiss. In this rock, in which felspar preponderates, he found implanted in open pockets and lenticular fissures crystals of emeralds, quartz, rutile, monazite, beryl, and also many crystals of long and slender shapes which appeared to be diopside, but which exhibited colors of white, yellow, and green of the most beautiful emerald hues. The mineral which appeared to be diopside was submitted to the examination of the distinguished chemist, J. Lawrence Smith, who soon pronounced it to be a new form of spodumene, and named it Hiddenite after the young explorer. Since then the explorations have been continued, and have yielded many very beautiful specimens of both the emerald and the hiddenite. At the depth of thirty-three feet below the surface of the rock several

pockets were discovered which yielded some beautiful emeralds and hiddenites. They occurred at the bottom of the pockets, just as the finest crystals of tourmaline are found in the cavities of the granite ledges at Mount Mica in Maine. Twelve of these pockets were found within an area of forty feet square, extending to thirty feet in depth. The largest crystal of emerald found was more than three inches in length and three quarters of an inch in breadth, but its color, although of the true emerald hue, is, however, rather faint. Some of the smaller crystals are of much deeper tint, and resemble the pure specimens from Granada. But the most interesting treasures of the mineral kingdom revealed by this exploration were the crystals which analysis proved to be composed of a silicate of alumina and lithia, otherwise known as spodumene. Some of these crystals were white or light yellow, others were of a rich yellow hue shading into brown, while others exhibited the purest prismatic green of various depths of hue. In some of the green crystals the color has been uniform, while in others it is more intense at one end of their extremities.

Quite a number of the crystals and their fragments have been cut and polished into gems which rival, by their lustre and beauty of color, the best of the South American emeralds. On account of their extreme rarity, as well as their beauty, they have been sought for by amateurs, and have commanded high prices. As the field of deposit thus

far known is quite limited, we fear that the yield of this charming mineral will not meet even the demands of science.

Professor Cleaveland, who was one of the best authorities of his day, maintained more than half a century ago that emeralds which exhibited a lively and beautiful green hue were found in blasting a canal through a ledge of graphic granite in the town of Topsham in Maine. Several of the crystals presented so pure, uniform, and rich a green, that he ventured to pronounce them precious emeralds. But to-day we are unable to verify the assertion, or point to a single specimen similar in hue to the emerald from the above-mentioned locality.

The nearest approach to the emerald in color, with the exception of the incomparable green tourmalines from Maine, and the emeralds and hiddenites of North Carolina, are the beryls of North and South Royalston, in the State of Massachusetts. These beautiful stones exhibit the physical characteristics of emeralds, with the exception of the color, in which they differ very perceptibly. But to appreciate fully the difference in hue we must compare the two gems. Then the lively green of the beryl fades away before the overpowering hue of the emerald, whose rich prismatic green may be taken as the purest type of that color known to the chemist or the painter.

Several years ago we visited the localities in Massachusetts which were famous in the days of

Hitchcock and Webster. We found that the beryls occurred in a very coarse granite, where the quartz appeared in masses and the felspar in huge crystals. These also occur in finer granite, and exhibit no indications of veins or connection with each other. They are few in number, and are soon exhausted by blasting, being generally very superficial. After removing several tons of the rock at the locality at North Royalston, where the beryls appear on the summit of the loftiest hill, our labors were at length rewarded with two beautiful crystals. One of them was a fine prism an inch in diameter, of perfect transparency and of a deep sea-green color, which, however, is far from being similar to the transcendent hue of the Granada emeralds, which exhibit an excess of neither blue nor yellow. The other was yellowish-green, resembling the chrysoberyls of Brazil.

Other but imperfect crystals were brought to light, some fragments of which exhibited the deepest golden tints of the topaz, and others the tints of the sherry-wine colored topazes of Siberia. Magnificent crystals have been found in these localities in times long past, and from the fragments and sections of crystals found in the *debris* of early explorations, we observed the wide range of color, and the deep longitudinal striæ which characterize the renowned beryls from the Altai Mountains, in Siberia. Lively sea and grass green, light and deep yellow, also blue crystals of various shades, have been found here.

At the quarries on Rollestone Mountain in Fitchburg, beryls of a rich golden color have been blasted out. Some of these approach the chrysoberyl and topaz in hardness and hue. Others so closely resemble the yellow diamond that they may readily be taken for that superior gem. The refractive power of these yellow stones is remarkable; and the goniometer will probably reveal a higher index than is accorded to all the varieties of beryl by the learned Abbé Haiüy.

Beautiful transparent beryls have been found among the granite hills of Oxford County in Maine; and the late Governor Lincoln, nearly half a century ago, possessed a splendid crystal, quite three inches in length and of great purity and brilliancy. Some very beautiful transparent blue crystals of beryl have recently been found in the western part of Oxford County, Maine, which have yielded gems of considerable value. Probably active search for this mineral in this region will bring to light some charming specimens.

New Hampshire is famous for its gigantic beryls; and the localities of Acworth and Grafton have yielded some enormous crystals. One was removed by Mr. Alger, of more than a ton in weight; and a still larger one was observed by Mr. Hubbard, who estimated its weight at two and one half tons. These gross specimens are generally opaque, with patches of translucent or even transparent mineral on their sides. The regularity of their crystalline forms is also much impaired or distorted.

At Haddam, in Connecticut, beautiful crystals of beryl have been discovered; and one of these of fine green color, an inch in diameter and several inches in length, was preserved in the cabinet of Colonel Gibbs. Professor Silliman possessed another fine one, seven inches in length.

The mountains in Colorado have yielded some fine specimens. But the finest of the beryl species come from Russia. In the Ural Mountains the crystals are small, but of fine color; in the Altai Mountains they are very large and of a greenish-blue; but in the granitic ledges of Odon Tchelon in Daouria, on the frontier of China, they are found in the greatest perfection. They occur on the summit of the mountain in irregular veins of micaceous and white indurated clay, and are greenish-yellow, pure pale-green, greenish-blue, and sky-blue. The chief matrix of the beryl all over the world is graphic granite, but it may occur in other rocks. The light green stones of Limoges, in France, appear in a vein of quartz traversing granite. At Royalston we observed them to spring seemingly from the felspar and project into smoky quartz, becoming more transparent as they advanced into the harder stone.

The beryl possesses the same crystalline form and specific gravity as the emerald, but its hardness, especially in the blue and white varieties, is sometimes greater. They are both silicates of alumina, and the only perceptible difference in the two stones

is in the color. Cleaveland thought that as the emerald and beryl had the same essential characters, they might gradually pass into each other; and Klaproth, finding the oxides of both chrome and iron in one specimen, was led to take the same view. The crystals of true emerald are almost always small, with the exception of those found in the Wald district in Siberia, whilst those of the beryl vary from a few grains to more than a ton in weight. The crystals of both are almost invariably regular hexahedral prisms, sometimes slightly modified. Those of the beryl we sometimes find quite flat, as though they had been compressed by force; then again they are acicular and of extraordinary length, considering their slender diameter. Sometimes their lateral faces are longitudinally striated, and as deeply as the tourmaline, so that the edges of the prism are rendered indistinct. Other crystals are curved, and some perforated in the axis like the tourmaline, so as to contain other minerals. Sometimes they are articulated like the pillars of basalt, and separated at some distance by the intervening quartz. These modified forms give rise to curious speculations as to their formation and origin. If we admit the action of fire (which is improbable), then the separation may be easily explained; but if we insist that they were deposited in the wet way and by slow process, how can we account for the dislocation? "By electricity," whispers a friend,—"by telluric magnetism, that wonderful unexplained and mysterious force which

has caused the grand geological changes of the globe, and is still at work."

Sometimes the crystals of beryl are of two distinct colors, but generally they are of one color, often shading into white at either extremity. They may exhibit the richest golden-yellow, or a light cerulean blue, or a clear sea-green like those described by Pliny, now called aqua-marines. "Qui viridatem puri maris imitantur."

One distinction between beryl and quartz is afforded by the appearance of its fracture. A crystal of beryl breaks into smooth planes, the faces of which are at right angles to the axis of the prism; while the fracture of the surface of broken quartz is invariably conchoidal.

Blue beryls were highly prized by the ancients. Beautiful specimens are found in the glens of the Mourne Mountains in Ireland. But finer gems are brought from the granite district of Nertschinsk, in Siberia, and also from various localities in the Uralian and Altaian Mountains, where the Romans were supposed to have obtained them in early times.

Its name is derived from the Persian "belur," which the Romans changed into "beryllus." Sometimes it occurs of a rose color. A few have been found at Elba and one at Haddam by Colonel Gibbs. One of the most beautiful specimens of beryl known was discovered in Siberia. It consisted of a magnificent crystal of smoky quartz, in the base of which

appeared several fine crystals of beryl, of an exquisite yellowish-green and greenish-blue.

In the princely collection of Mr. Vaux, of Philadelphia, may be seen a crystal of beryl from the Mourne Mountains of Ireland, two inches in length by five eighths of an inch in diameter. It is of a celestial blue color, much deeper in hue at one extremity than at the other. But the gem of this collection among the beryls is a specimen purchased in Russia, in 1875. It is a six-sided prism nine inches in length and six inches in circumference. The color is of a rich oily green, and several inches of its upper extremity is transparent, while the rest is translucent. It rests upon a mass of granite, and is a specimen of extraordinary size and beauty.

Mr. Clay of the same city has a remarkable prism of Siberian beryl two inches in diameter, which exhibits a tint of celestial blue externally but which appears of a decided green hue in its interior.

At the Centennial Exhibition Brazil exhibited a fine crystal of a warm celadine green color. Russia displayed some very beautiful specimens of the yellow, green, and blue beryls from Siberia. Some very beautiful crystals of emerald, both solitary and fixed in the matrix, were also exhibited from the same country.

Several of the mineralogical cabinets of Europe possess fine suites of the emerald and beryl in a great variety of forms and degrees of perfection. Those of the *École des Mines* at St. Petersburg, the *Jardin des Plantes* at Paris, and the British Museum,

are of very great commercial value and mineralogical interest.

At the French Exposition in 1867, the celebrated jeweller, Froment Meurice, exhibited a beautiful specimen of modern glyptic art cut in beryl. It comprised the bust of the Emperor Napoleon III. carved in pure aqua-marine. The image was placed upon a miniature pedestal of blood-red jasper, before which the imperial eagle spread his wings and perched upon a base of red jasper, which was studded with stars of topazes, bosses of pearls, and bordered with roses formed of minute amethysts.

A beautiful blue stone adorns the summit of the crown of England, and has been described as a sapphire of unusual purity. But mineralogists affirm that the gem is a blue beryl, and it is surmised by others that it is the identical and famous stone which Edward the Confessor wore in a ring. It is of a lovely color, oval in form, and measures $2\frac{1}{10}$ inches in length by $1\frac{1}{2}$ in width, and $1\frac{1}{5}$ in depth.

A superb aqua-marine formerly adorned the tiara of Pope Julius II. and was considered as one of the most celebrated in the world, notwithstanding it exhibited a slight flaw. This gem, which was of an exquisite sea-green color, was $2\frac{1}{10}$ inches in length and $2\frac{2}{5}$ in depth. After having been kept in the Museum of Natural History in Paris for more than three hundred years, Napoleon presented it to Pope Pius VII.

The Asiatics, and especially the Turkish officers, prize the prisms of beryl as handles to their scimeters

and daggers. This fondness for decoration of sword-blades and arms is by no means confined to the soldiers of the East. The officers of Napoleon's armies exhibited the same taste. Murat adorned the hilt of his sword with one of the finest beryls ever seen in Europe. Another famous aqua-marine formed the handle of the sword of the poet Moncrif, who, like another celebrated swordsman, the painter Caravaggio, compelled admiration of his works at the point of his sword. This blood-stained gem bore as inscription the epitomized history of the author, a quotation from the poet Theophile, "Tous mes jours sont des Mardis-gras."

One of the most beautiful beryls known is that purchased by the English banker, Mr. Hope, and placed in his collection of gems. It weighs six and one half ounces, and cost its princely owner nearly twenty-five hundred dollars. It is reported to have come from the mine of Cangazum, in the district of Coimbatoor in India, a locality which has been long famous for its fine beryls.

The most magnificent aqua-marine described in history is that belonging to Dom Pedro. It was found in the diamond districts of Minas Geraes, in Brazil. In form and size it resembles the head of a calf. Only on one side does it preserve any trace of a crystalline form; the rest is water-worn. It is said to be of a fine color, without a flaw, and perfectly transparent.

For many ages the shrine of the Abbey of St.

Denys, at Paris, received rare and valuable gems as offerings; and at the time of the French Revolution the collection had become very valuable. The iconoclasts ordered it to be separated and sold. It brought 80,000 francs, and was scattered along the commercial highways of the world, never again to be reunited. One of the finest aqua-marines, mounted in sapphires and pearls, and engraved with the portrait of Julia, the daughter of Titus, was fortunately rescued, and may now be seen in the collection of the National Library of France. This splendid gem is of the unusual magnitude of $2\frac{1}{2}$ inches by $2\frac{3}{8}$. For quite a thousand years it formed a part of a golden reliquary celebrated as "l'escrain de Charlemagne." History relates that it was presented by the great Emperor before his death to the Abbey of St. Denys. This is one of the finest specimens of an ancient intaglio carved upon beryl that has survived the destructive pillage of armies and the wreck of time since the early days of the Roman Empire. It is said that specimens of antique engraving upon this gem are about as rare as those carved upon the emerald, and their rarity is believed to be due to their great value, as well as to their scarcity in the gem markets in ancient times.

Several royal relics of the lower Empire containing emeralds are still preserved, to attest the use of the gem in those days as well as the esteem in which it was held. The famous Iron Crown of Lombardy, made perhaps before the sixth century,

contains several emeralds. This renowned relic is simply a circlet of gold, covering an iron nail of the cross, beaten out thin. The crown of the queen of one of the Gothic kings of Spain, of the seventh century, was recently exhumed at Toledo, and also exhibits emeralds among other gems. And there are other examples to prove the use of the emerald in mediæval times for ornamental purposes.

No other gem has been counterfeited with such perfection as the emerald; and in fact it is utterly impossible to distinguish the artificial from the real gems by the aid of the eye alone; even the little flaws, which lull the suspicions of the inexperienced, are easily produced by a dexterous blow from the mallet of the skilled artisan. Not only emeralds, but most of the gems and precious stones, are now imitated with such consummate skill as to deceive the eye; and none but experts are aware of the extent to which these fictitious gems are worn in fashionable society, for oftentimes the wearers themselves imagine that they possess the real stones. There is not one in a hundred jewellers who is acquainted with the physical properties of the gems; and very few can distinguish the diamond from the white zircon or the white topaz, the emerald from the tourmaline of similar hue, the sapphire from iolite, or the topaz from the Bohemian yellow quartz. Jewellers are governed generally by sight, which they believe to be infallible, whilst hardness and specific gravity are the only sure tests.

Artificial gems, rivalling in beauty of color the most brilliant and delicately tinted of the productions of Nature, are now made at Paris, and in other European cities. The establishments at Septmoncel in the Jura alone employed a thousand persons, and fabulous quantities of the glittering pastes were made there and sent to all parts of the world.

A fine specimen of prase, when cut, affords a fair imitation of the emerald. The green fluor-spar which Haiiy called "emeraude de Carthagène" may also be substituted, but the application of the file detects the trick with ease. Some of the green tourmalines approach the emeralds in hue very closely, and by artificial light it is impossible to distinguish them from each other. Fragments of quartz may be stained by being steeped in green-colored tinctures. The Greeks stained quartz so like the real gem, that Pliny exclaimed against the fraud, while declining to tell how it was done. The Ancona rubies at the present day are made by plunging quartz into a hot tincture of cochineal, which penetrates the minute fissures of the rock.

But notwithstanding the high art reached by modern glass-makers, they are yet far behind the ancients in imitating the emerald in point of hardness and lustre. Many emerald pastes of Roman times still extant are with difficulty distinguished from the real gem, so much harder and more lustrous are they than modern glass. The ancient Phœnician remains found in the island of Sardinia by Cavalier

Cara, in 1856, show fine color in their enamels and glass-works. The green pigment brought home from the ruins of Thebes by Mr. Wilkinson, was shown by Dr. Ure to consist of blue glass in powder, with yellow ochre and colorless glass. From Greek inscriptions dating from the period of the Peloponnesian war, we learn that there were signets of colored glass among the gems in the treasury of the Parthenon.

Of all the emerald imitations that have descended to us from antiquity, none are more remarkable, none more interesting to the antiquary and historian, than the famous *Sacro Catino* of the cathedral of Genoa. This celebrated relic is a glass dish, or *patena*, fourteen inches in width, five inches in depth, and of the richest transparent green color, though disfigured by several flaws. It was bestowed upon the Republic of Genoa by the Crusaders, after the capture of *Cæsarea* in 1101, and was regarded as an equivalent for a large sum of money due from the Christian army. It was traditionally believed to have been presented to King Solomon by the Queen of Sheba, and afterward preserved in the Temple; and some accounts relate that it was used by Christ at the institution of the Lord's supper. The Genoese received it with so much veneration and faith, that twelve nobles were appointed to guard it, and it was exhibited but once a year, when a priest held it up in his hand to the view of the passing throng. The State, in 1319, in a time of pressing need, pawned the holy relic for 1,200 marks of gold

(\$200,000), and redeemed it with a promptness which proved its belief in the reality of the material, as well as in its sanctity. And it is also related that the Jews, during a period of fifty years, lent the Republic 4,000,000 francs, holding the sacred relic as a pledge of security. Seven hundred years passed away, when Napoleon came; and as he swept down over Italy, gathering her art treasures, he ordered the "Holy Grail" to be conveyed to Paris. It was deposited in the Cabinet of Antiquities in the Imperial Library, and the mineralogists quickly discovered it to be glass. It is due to the memory of Condamine to state that he was the first to doubt the material of the *Sacro Catino*; for, when examining it by lamplight in 1757, in the presence of the Princes Corsini, he observed none of the cracks, clouds, and specks common to emeralds, but detected little bubbles of air. In 1815, the Allies ordered its return to the cathedral of Genoa. During this journey the beautiful relic was broken; but its fragments were restored by a skilful artisan, and it is now supported upon a tripod, the fragments being held together by a band of gold filigree. This remarkable object of antiquity, which is of extraordinary beauty of material and workmanship, furnishes a theme over which the antiquaries love to muse and wrangle.

Another of the antique monster emeralds, weighing twenty-nine pounds, was presented to the abbot of Reichenau, near Constance, by Charlemagne.

Beckman has also detected this precious relic to be glass. And probably the great emerald of two pounds weight brought home from the Holy Land by one of the dukes of Austria, and now deposited in the collection at Vienna, is of the same material. Another, more than eight inches long, was preserved in the chapel of St. Wenceslaus at Prague. The hardness of our glass is yet far inferior to that of the ancients; and even the ruby lustre of the potters of Umbria, which was so precious to the *dilettanti* of the Cinque Cento period, has not been recovered.

The enormous emerald dishes and statues and obelisks described by Herodotus, Theophrastus, Appian, and others were undoubtedly constructed of glass, and exhibited to the ignorant multitudes as formed of monster emeralds.

One of the most curious of these impositions was the sculptured lion on the tomb of Hermias on the island of Cyprus, which had emerald eyes which shone so brightly as to frighten away the fish in the sea near by.

The wonderful "Table of Solomon" which formed a part of Alaric's Roman spoils, and was taken by his Goths to Spain, where it was captured by the Arab invaders and afterwards sent to Damascus, was probably another specimen of the ingenuity of the glassworkers of Alexandria or Tyre. It is described by one of the Arabian historians as of a marvellous beauty, being formed of a single slab of solid

emerald, encircled with rows of pearls, and supported on many feet composed of gems and gold.

The famous Barberini vase, found in one of the tombs of the Roman emperors, and exhibiting white figures upon a dark-blue ground, was long thought to be carved from some variety of sardonyx, but proved in modern times to be of hard antique glass. Of similar material the unique ewer in the Brescian Museum and the vases in the Palace Borbonico are composed, and all of these are of great antiquity. The sapphire cup of Theolinda, the once celebrated Queen of Lombardy, now preserved in the Cathedral at Monza, is glass.

There are but very few stones whose colors resemble that of the emerald, and therefore frauds are easily detected. A well-selected specimen of prase may be passed as an inferior emerald, as well as the translucent stones cut from the Chinese jade; but their want of transparency offers a serious objection to them as a gem. The green tourmaline, when it approaches the emerald in hue, is of equal value. The green zircon and the green spinel would be far superior to the emerald in brilliancy, and therefore of greater value to the amateur. The chrome-green garnet of Hungary and the emerald-green garnet of Siberia would command a high price, if of pure color, as they surpass the glucina emerald in éclat and are moreover exceedingly rare. The peridot may assume the exact hue of the Granada emerald. The glass imitations are almost *fac-similes* in hue, and

are far superior in brilliancy to the mineral itself; but their softness, which readily yields to the file, betrays their nature without difficulty.

Since the time of the Spanish Conquest, New Granada has furnished the world with the most of its emeralds. The most famous mines are at Muzo, in the valley of Tunca, between the mountains of New Granada and Popayan, about seventy-five miles from Santa Fé de Bogota, where every rock, it is said, contains an emerald. At present the supply of emeralds is very limited, owing to restrictions on trade, and want of capital and energy in mining operations.

Blue as well as green emeralds are found in the Cordillera of the Cubillan. The Esmeraldas mines in Equador are said to have been worked successfully at one period by the Jesuits. The Peruvians obtained many emeralds from the barren district of Atacama, and in the times of the Conquest there were quarries on the River of Emeralds near Barbacoas. Emeralds of a poor quality are found at Limoges in France, and also in Norway. In some of the felspar quarries in Finland they occur in large thick crystals, several feet in thickness, of a fine color, but not transparent.

Emeralds are found in Siberia, and some of the localities may have furnished to the ancients the Scythian gems which Pliny and others mention. In the Wald district magnificent crystals have been found embedded in mica-slate. One of these—a

twin-crystal, now in the imperial cabinet at St. Petersburg—is seven inches long, four inches broad, and weighs four and a half pounds. There is another mass in the same collection which measures fourteen inches long by twelve broad and five thick, weighing sixteen and three-quarter pounds troy. This group shows twenty crystals from a half inch to five inches long, and from one to two inches broad. They were discovered by a peasant cutting wood near the summit of the mountain. His eye was attracted by the lustrous sparkling amongst the decomposed mica where the ground had been exposed by the uprooting of a tree by the violence of the wind. He collected a number of the crystals, and brought them to Katharineburg and showed them to M. Kokawin, who recognized them and sent them to St. Petersburg, where they were critically examined by Van Worth and pronounced to be emeralds. One of these crystals was presented by the Emperor to Humboldt when he visited St. Petersburg, and it is now deposited in the Berlin collection. Quite a number of emeralds are now brought from the Siberian localities, and it is believed that enterprise and capital would produce a large supply of the gem.

Near Salsberg, in the Tyrol, the emerald occurs in a mica-slate which appears on the face of a very steep precipice difficult of access, and about 8,700 feet above the sea-level. They are of good color, but much impaired in their transparency by foreign

matter and imperfect crystallization. Some of the finest stones yielded by this locality were exhibited as cabinet specimens by the Emperor of Russia at the Paris Exposition.

The supply of emeralds from South America is very limited, and may be ascribed to want of skilful mining, as well as to climate, the political condition of the country, and the indolence of its inhabitants. The localities cannot be exhausted, for they are too numerous and extensive. The elevated regions in Granada admit of scientific exploration by Europeans, and at the present day the only emerald-mining operations conducted in South America have been prosecuted near Santa Fé de Bogota by a French company, which has paid the Government \$14,000 yearly for the right of mining, all the emeralds obtained being sent to Paris to be cut by the lapidaries of that city. In the Atacama districts, and along the banks of the River of Emeralds, the physical obstructions are difficult to overcome; and pestilential diseases of malignant character forbid the long sojourn of the European. Yet the introduction of Chinese labor may prove successful and highly remunerative, since the coolie reared among the jungles and rice-swamps of Southern China is quite as exempt from malarial fevers as the negro.

Hassaurek was surprised not to find emeralds for sale at Guayaquil, as they had been found in abundance in Equador at the time of the Conquest. The Alcalde of the region around the River Bechile gave

Stephenson, the traveller, three emeralds which were found in the sands at the mouth of the river.

Concerning the emerald mines whence the ancients drew their supplies of gems, there remains but little positive information. They were undoubtedly established in Arabia, Africa, and Scythia, but all record of them is lost. As regards the Egyptian mines, modern travellers have proved their existence. At the ancient mines at Gebel Zabara, which were worked in the time of the Ptolemies, M. Callaud found the tools of the miners as they had left them, and also many inferior emeralds among the *débris* of the pits. Mehemet Ali attempted to reopen them, but was unsuccessful, as the matrix of the gem proved to be exhausted. This discovery establishes the truth of Pliny's remark concerning some of the localities of the emerald. They are the same gems whose beauty was praised by the Persian poets. We have no evidence of ancient mines of emeralds in Asia; and Tavernier, who sought in vain to discover them, ventured to state that he believed that some of the emeralds he saw in India must have come from Peru, by way of the Philippine Islands, long before the Conquest by the Spaniards.

Other mines undoubtedly were worked in Africa; and we know that in the time of Justinian, the Abyssinians searched the coast, even as far as the equator. The African emeralds were not of the first quality; and at a later period of Roman history the Scythian emeralds were reckoned as the first in value

and beauty, the Bactrian second, while the African were classed as third. About the fourth century the throne of the White Huns was famous for the splendid Scythian emeralds which adorned it.

The price of the emerald has no fixed and extended scale, like that of the diamond, and the fluctuations of its value during the past three centuries form an interesting chapter in the history of gems. In the time of Dutens (1777) the price of small stones of the first quality was one louis the karat; one and a half karats, five louis; two karats, ten louis; and beyond this weight no rule of value could be established. In De Boot's day (1600) emeralds were so plenty as to be worth only a quarter as much as the diamond. The markets were glutted with the frequent importations from Peru, and thirteen years before the above-mentioned period one vessel brought from South America two hundred and three pounds of fine emeralds, worth at the present valuation more than seven millions of dollars. At the beginning of this century, according to Caire, they were worth no more than twenty-four francs (or about five dollars) the karat, and for a long time antecedent to 1850, they were valued at only \$15 the karat. Since this period they have become very rare, and their valuation has advanced enormously. In fact, the value of the emerald now exceeds that of the diamond, and is rapidly approaching the ratio fixed by Benvenuto Cellini in the middle of the sixteenth century, which rated the emerald at four times, and the ruby at eight

times, the value of the diamond. Fine stones (the emerald is exceedingly liable to flaw, the beryl is more free, and the green sapphire is rarely impaired by fissures or cracks) of one karat in weight are worth at the present day \$200 or more. Fine gems of two karats weight will command \$500; while larger stones are sold at extravagant prices.

Most of our aqua-marines come from Brazil and Siberia, and small stones are sold at trifling prices. Some of them, however, when perfect and of fine color, command fabulous sums. The superb little beryl found at Mouzzinskaia is valued by the Russians at the enormous sum of \$120,000, although the crystal weighs but little more than one ounce. Another rough prism preserved in the Museum at Paris, and weighing less than one hundred grains, has received the tempting offer of 15,000 francs.

THE OPAL.

“WHAT radiant changes strike the astonished sight !
What glowing hues of mingled shade and light !”

FALCONER.

THE OPAL.

WHAT is the composition of this wonderful stone, which displays such wondrous hues? What is the nature of this remarkable mineral, which seems to concentrate within its substance all the glories of the rainbow, and which rivals in its hue the finest gem of the mineral world? The Turk believes that it falls from heaven in the lightning's flash, and it is often regretted by the mineralogist that the theory cannot be sustained. Surely a gem so beautiful, so delicate, and so pure ought to be of celestial origin, and free from the impurities and imperfections of the earth. Alas, we have but one precious stone that comes to us from the far-off region of celestial space, — olivine, — and that as yet has been found only in minute grains.

But if we cannot ascribe the origin of our beautiful gems directly to the stars and other bodies in space, we may affirm that their birth or development in the bosom of our earth may be due in a great measure to extra-terrestrial influences. And as regards the precious opal, if we cannot prove it of divine origin, we can with truth affirm that there is a deep mystery

connected with the mineral both in its composition and its physical properties. The liberal-minded physicist to-day finds himself somewhat baffled when attempting to explain the phenomena of the gem in accordance with our imperfect knowledge of natural laws. Apparently it is nothing more than hydrated silica or quartz; but it is of a lower specific gravity, and some of its varieties are so tender and delicate in structure as to be at the caprice of the atmosphere.

It has been maintained that the peculiarities of the opal depend in a great measure upon the quantity of water it contained, and which, mixed mechanically with the silica, varies from three to twenty per cent. But some chemists who have interested themselves in the study of the composition of the mineral do not regard the presence of water as absolutely essential for the development of the varied flashes of color. We will only state in this brief sketch that there is certainly a mystery connected with the part water plays in producing and perfecting the beauty of the opal. This quantity or factor of water varies greatly in the different varieties of opal. Apparently when heat is applied to the mineral the brilliancy of its hues is increased, either from evaporation of its water or some structural change. But if the degree of heat is too great, or its application too prolonged, the hues of the opal vanish and cannot be recalled by human skill. The same results from the effects of heat may be noticed in other gems of greater density and hardness, as the emerald, the topaz,

and the tourmaline. It has been maintained that a faded opal may be restored to beauty by immersion for a time in water, with the view of restoring the fancied loss by evaporation; but we fear that the experimentalist will be often disappointed with his results. However, there is one singular variety of the mineral known as the hydrophane, which does not exhibit colors until after it has been immersed for a time in water, and when removed from its bath and becomes dry again its hues vanish. Therefore, we may justly affirm that there is a mystery in connection with the influence of water in producing the color of the opal. The optical properties of this mineral do not afford decisive distinction, and it never crystallizes in regular and definite form like quartz, neither does it exhibit a trace of double refraction.

We will say no more at present concerning the composition of this interesting substance except to allude briefly to the experiment of Damour, who found the opal to turn black when sulphuric acid was applied to it; hence he inferred that the substance contained some organic matter, but precisely what he could not determine, although he suspected the presence of bituminous matter. Similar foreign bodies have been detected in many other precious stones. In fact, many of our gems are impaired by impurities; and so generally, that a stone of absolute purity is of rare occurrence. Even the diamond, which is regarded as the emblem of light and purity, is reckoned by microscopists as one of the foulest of gems.

Werner divided the opal into four sub-species, and Jameson has separated it into seven varieties. The principal divisions, however, may be classed as follows: precious or noble opal, presenting refulgent tints; fire opal, with fire-like reflections; girasole, with reddish reflections when exposed to the sunlight; common opal, translucent and without reflections; wood opal or petrified opal, possessing the characters of common opal; hyalite, clear and colorless as glass. There is another kind of opal which we have never seen, but which is described as the asteriated opal. We are not able to give a minute description of its appearance or draw a comparison between it and that of asteriated quartz, sapphire, or garnet. It is said to display great beams of light which undulate over its surface like the flashings of lightning piercing the storm cloud. The variety known as the moss opal sometimes displays in its interior dendritic crystallization of a dark substance resembling delicate mosses, ferns, or trees. And the gleam of the colored rays flashing amidst these miniature forests and groups of foliage often present charming effects.

The grand characteristic which gives to the gem its value and renown is the wonderful play of the colored reflections which it displays, and which embrace all of the prismatic tints of the solar spectrum. As we view its vivid rainbow flashes when the gem is held in the sunlight, we must admit it to be the most magnificent of gems, and join with the Latin philosopher, who remarked that it was made up of

the glories of the most precious stones. For as the light falls upon it in varied directions, its reflections recall the lively green of the emerald, or the tender blue of the sapphire, the rich yellow of the topaz, or the gorgeous red of the ruby.

This mineral has not only been an object of delight to the fashionable world, but it has also been a wonder and a perplexity to the philosophers. In admiring its beauties and attempting to account for its phenomena, Newton was led to the series of experiments and to that train of sublime reasoning that gave to science the most brilliant and extraordinary of his discoveries. The colored refractions of the gem reminded the philosopher of the iridescence of the soap-bubble, and the soap-bubble suggested the undulatory theory of light. Newton, after long study of the opal, is said to have declared that its hues were produced by the refractions and reflections of light at the numerous minute fissures which traverse the stone in all directions. But this theory is denied by many at the present day, and especially by Mohrs, who maintains that the thin films of air filling the cavities of the stone would produce iridescence only. Other opticians believe the colored reflections to be due to laminæ formed by incipient crystallization, as seen in the equally remarkable mineral known as labradorite. Babinet believes the brilliant colors of the opal to be due to the narrow fissures in the stone, like those produced in the partial fracture of glass or quartz. He also refers for

example to the colors of thin transparent plates, and believes that the colors of flowers are produced in like manner from the overlaying of the transparent tissues of which the petals are composed. This, then, according to the French philosopher, is the secret of the gorgeous hues of vegetation from their first development to the period of their final decay. The diamond, when cut in a regular form, displays the most magnificent flashes of the prismatic hues by artificial light; and although the mineral is composed of an infinite number of laminae, no one maintains the theory that the color is produced by thin films of air like those in the soap-bubble. We also may observe the same hues sparkling among the dew-drops in the morning sunlight, and likewise in the artificial diamonds, which are composed of solid glass and apparently homogeneous.

In examining the interior of an opal, we often fail to perceive any cause for the reflections of color, especially in the limpid varieties. The flashes appear when the light enters the stone at a certain angle, but when viewed in any other direction the gem presents the usual appearance of common transparent quartz. In other varieties of the mineral, however, especially the milky or translucent, a cause for the colored reflections is easily observed. We have under observation the beautiful opal known as the "Oberon," and beneath its translucent surface appear thin films of a faint reddish hue suspended at different depths within its interior. They are

so well defined that their edges may be recognized, and they lie like thin clouds suspended in a hazy sky. But as the gem is turned so that the light strikes the film at a different angle, the scene is instantly changed, and a mass of flame replaces the sombre tint. It is a little curious that some of the films exhibit the different colors of the spectrum as the angle of light is changed, while others display only the green and blue color, no matter how the light strikes them. In fact, the films or patches, which are apparently alike, produce different results from the same rays of light; and some display the continuous spectrum, while others exhibit but one color. It is a little singular that all transparent minerals when fractured do not exhibit alike in their fractures the prismatic gleams displayed by quartz and glass. We have before us a beautiful transparent white crystal of adularia or moon-stone from St. Gothard, and although it is fissured and fractured in a thousand places, yet we observe little iridescence in it even when exposed to the sunlight.

The localities where the precious opal is now found are but few, and none of them were probably known to the ancients. All record of the old opal mines is now lost; but there were undoubtedly deposits of the mineral in Arabia, Syria, and in Asia, whence the ancients derived their gems. The famous Hungarian mines were not discovered until late in the fifteenth century, and the country was quite unknown to the Romans.

The principal mines explored at the present day, and whence most of our opals are now derived, are those of Hungary and Honduras. The Hungarian mines are of great extent and are now scientifically explored, but those of Central America are undetermined and but rudely mined. It is believed that there are other mines in Central America besides those of Honduras, for the natives at times bring fine specimens to the coast from localities widely separated. It is quite true that most of the opals of America are less hard than the Hungarian, but they are no less brilliant, and some of them withstand atmospheric effects and the wear of time quite as well. The Honduras opals are found near Gracias a Dios in porcelain earth, and are extracted in irregular masses, sometimes uniform or globular concretions, with rough and deeply indented surfaces. These masses do not exhibit the least tendency to crystallization like quartz, and they are generally quite small. Their natural colors are pale, and vary from brown to a pearly gray. They often exhibit a rich and varied play of the rainbow hues, even in their natural and rough condition. But sometimes, when this rough exterior is removed by the lapidary's wheel, and the gem is highly polished, the colors vanish as if by magic. The polished stone no longer displays a single ray of the brilliant fires which illuminated every angle of the stone when in its rough state. This singular disappearance may be explained by the theory that the surface has been too highly

polished, and the substance of the stone is rendered too transparent to permit the requisite degree of reflection, for when the surface is slightly roughened the play of colors again returns. The finest specimens are therefore those which are translucent, or those which, being transparent, are backed by an opaque ground which refracts the light.

The opal-bearing districts in Central America are far more extensive than is generally supposed. The Province of Honduras abounds in them, and we have evidence of others occurring in the State of Gautemala on the Pacific coast. The following descriptions of some of the opal mines of Honduras were published by Dr. J. Le Conte, in 1868, in his report of the Inter-oceanic Railroad survey :—

“Extensive beds of common opal and semi-opal are seen along a belt extending through the central part of the department of Gracias ; but these varieties, though very beautiful and possessing high interest to the mineralogist, are without commercial value from the ease with which artificial products may be made which precisely resemble them. The localities worthy of exploration are those in which the opal forms veins (not beds) in compact but brittle trachyte of a dark color. The veins, as will be seen, are not confined to such rock, but seem to have their origin in it, and are probably not found except in connection with it. The best-known mines of precious opal are in the department of Gracias ; several localities have yielded valuable gems, but they are

all remote from the line of road. Some are in the vicinity of the town of Gracias, others near Intibucat ; but the most important are at Erandique. The working is now carried on in a very small way ; but the locality is extensive, and in my opinion mining on a large scale would be attended with profit. The country near by abounds with beds of common opal, as in many other places, but the gems occur in somewhat irregular veins running in a northeast and southwest direction, and with a nearly perpendicular dip. The veins are not continuous, but branch off and disappear at short intervals ; neither are the contents of uniform quality, but the valuable parts are usually in belts in the vein, and limited on each side by portions of ordinary opal without play of colors. These lines of light are sometimes numerous and narrow, alternating with the common opal forming a very beautiful gem. Many again, even of large size, are uniform in structure, and exhibit a play of colors as brilliant as the finest opals from Hungary. The hill in which they are found is about two hundred and fifty feet high, and two or three miles in length, and for a width of half a mile for its whole length opals have been found wherever excavations have been made. The rock in which they occur is a hard, brittle trachyte of a vitreous lustre, and splintering into acute fragments when struck ; a bed several feet in thickness overlying this rock is of a gray color and soft consistence, and also contains opal veins ; it is probably a trachyte changed by atmospheric action.

“Other localities within two leagues of Erandique have furnished very fine opals, but as they are not now worked I did not visit them. Many places on the road between

Intibucat and Las Piedras appear favorable to the existence of opal mines ; but only careful scrutiny by a number of explorers can discover them. I would mention as most worthy of future attention the vicinity of Lepasale and of Yucusapa and the ascent of the great mountain of Santa Rosa. Greater expectations and indeed almost certain success will attend the search for opal mines in the valley leading from Tambla towards the pass of Guayoca, nearly on the line of the proposed road. Within half a mile of Tambla are immense beds of common opal of various shades of color. Near Guayoca are banded opals of alternate layers of opaque and semi-transparent white, having the appearance of onyx ; these occur in a red vitreous trachyte and sometimes in contact with the masses of petrified wood which strew the ground for a considerable distance. Veins of a pearl-colored opal, with red reflections, are also found here ; they have no commercial value, but serve as indications of better things in the neighborhood.

“Between the two localities mentioned (that near Tambla and that of Guayoca), Mr. W. W. Wright, chief assistant of the survey, has, by following some obscure indications, arrived at a vein of very pretty glassy opals and yellow fire opals, not of great value, but serving to strengthen the opinion expressed of the ultimate discovery of precious opals in the vicinity. Near Choluteca are found fire opals, some of which I was told possess merit. One (not of the best) given me is precisely similar to those obtained by Mr. Wright near Tambla. Within one league of Goascoran, as I am informed by Fernando Gaillardo, a resident of that town, is a mine producing opals with a good play of colors.”

Another remarkable deposit of opal was found by Mr. Wright about five miles east of Villa San Antonio in the plains of Camayagua. Though not of high value, it may be of use for ornamental purposes, being of a fine red color with transparent amethystine bands. It occurs in veins in gray porphyry, sometimes several inches thick, and may be procured in large quantities. Precious opal has been discovered in the iron mines at Barcoo in Queensland, and a number of specimens were exhibited at Philadelphia, at the Centennial. Some of these specimens were very fair, and gave promise of choice gems. The blue tints displayed by some of them were of great purity. They appeared to be of the hard variety, and therefore less liable to be affected by the ravages of time, or influence of exposure.

We will not fatigue our readers with a long dissertation on the formation of the opal. We will however, quote one theory which all may understand.

The boiling waters of the Iceland geyser are projected into the air at a considerable height, and are heavily charged with silica. As the waters fall upon the earth, large piles of earthy and stony material are formed in process of time. When these silicious masses are broken open, translucent and transparent portions of silica are found, exhibiting the colored reflections of the noble opal as long as they remain hydrated, or, in other words, as long as they retain a certain quantity of water in their composition.

This observation has led M. Descloizeaux to the belief that opals found in volcanic rocks or igneous rocks have had their origin in phenomena analogous to those of the Iceland geysers. The matrix of the opal is a varied one. The gem is not only found in porcelain earth, but it occurs in fissures and seams, in what appear to be old igneous rocks. It has also been deposited in recent periods, as in the limestones of the argillaceous beds, and even in the formations of the silicious waters of the hot springs of the present time. The decomposed cement of the old Roman ruins around the hot springs of Polombieres, uniting with certain chemical properties of the waters, has changed into opal and hyalite. Trees within historic times have been transformed into opal or semi-opal; and on the island of Unja one may see blocks and trunks of trees (some even showing the marks of the hatchet) converted into opal. Silicified trees forty or fifty feet in length, may be seen stretched from Cairo to Suez. In many other parts of the world trees and plants have been transformed by the mysterious processes of nature into a silicious substance possessing the characters of opal; but none of these vegetable metamorphoses exhibit the rainbow hues to any marked degree. Quartz, when flawed in the interior, sometimes exhibits a remarkable iridescence, and may imitate the opal, especially if viewed at a distance. Such specimens of iridized quartz are called "iris," and they may be artificially produced by a sudden blow upon the

stone, or by heating it and suddenly dropping it into cold water. The superb iris ornaments worn by the Empress Josephine were of remarkable brilliancy and play of colors. In ancient and mediæval times, iridescent quartz was held in great esteem; and fine specimens mounted in antique jewelry are preserved at the present day. It is described in the "Lapidarium" of Marbodeus as follows:—

"By the Red Sea the swarthy Arabs glean
The iris, splendent with the crystal's sheen;
Its form six-sided, full of heaven's own light,
Has justly gained the name of rainbow bright."

The fire opal occurs in its greatest perfection in the porphyritic rocks at Zimapan in Mexico. It is generally of a translucent hyacinth-red color and flashes forth dazzling beams of fiery carmine-red with yellow and green reflections. This Mexican gem is the most beautiful and gorgeous of all the varieties of opal; but, alas! it is also the most sensitive, and is frequently irreparably injured by water or exposure, or even by sudden atmospheric changes. So easily affected are the opals by the vicissitudes of the weather that they are almost always brighter in summer than in winter. But there are some varieties that are not so easily influenced, and are not injured by contact with water. The fact that this variety of opal is injured in course of time by contact with moisture or careless exposure is not remarkable when some of the harder gems undergo a change from similar

23.91
247.82
31.00
25.00
7.65

exposure. The hard amethystine quartz, when worn as a finger ornament, will completely bleach out and become colorless in a few years. The black opal is the product of art, and for this purpose harlequin opals are used. The harlequin opal is simply the matrix of other gems spotted here and there with flakes of color dispersed over an opaque ground, and its name was suggested by the resemblance to the motley tints of the harlequin's dress. Masses of the matrix, with fragments or specks of opal interspersed in its substance, are soaked for a time in a saccharine solution, and afterwards in diluted sulphuric acid. The porous parts of the matrix absorb a minute quantity of the solution, which is afterwards charred by the sulphuric acid; while the solid and transparent parts remain unchanged and exhibit an increased play of colors upon the black ground.

The ancients undoubtedly obtained their opals from Syria and Arabia or other Eastern countries, for the Hungarian mines which now supply the world with most of the finest gems were not discovered until the fifteenth century. The famous mines are situated on a mountain which is one of the spurs of the Carpathians. They belong to the Seignory Peklin, and are near the village of Czernizka. In the early days of their discovery, and for a long period afterwards, they were explored casually and from time to time. At the present day, however, the explorations are conducted with regularity and the appliances of skilled labor. The surface of the mountain has been

removed to a great extent during this long-continued search of many centuries, but as yet no explorations have been attempted into the interior of the ledges. The true matrix appears not to be more than four to eight yards in depth below the alluvial soil. It is arranged in continuous beds of little hardness, but resembling porphyry in color. The opal formation appears to extend to a considerable distance beyond the flanks of the mountain; for, in the cultivated fields below, the laborers often find beautiful gems washed out by violent rain-storms from the exposed and superficial soils.

The opals from these mines are the hardest and most enduring of all the known localities of the earth, yet they have to be carefully tempered to heat and moisture before they can be utilized. M. Frangoll Delius, the Commissioner of the Austrian mines, states that these opals, when first extracted from their rocky beds, are soft, friable, and tender, and not in a condition to be worked. But after they have been exposed to the air and sunlight for some days or a definite time, they become harder, and the stones also become decidedly smaller from contraction. This exposure is required to be carefully regulated lest the stone become fissured by sudden contraction. When exposed to the effects of artificial heat, colors appear sooner than when it is submitted to the action of the sun's rays. It is curious to watch the gradual unfolding and the display of these beautiful hues. At first the stone is limpid and rayless as pellucid quartz. But

as the quarry water is evaporated by the effect of heat or time, and the stone contracts in volume, the iridized reflections then begin to appear, increasing in perfection and variety, until the requisite degree of moisture is expelled. If this evaporation is carried too far by heat the splendors of the gem vanish completely, never to be recalled. It is a singular fact that exposure to the sun's rays gives the opal much finer hues than the action of artificial heat. And it is also a remarkable circumstance that of all the variety of prismatic hues displayed by this gem, the violet invariably appears the first, according to M. Delius.

The ancients rarely engraved upon the opal, influenced perhaps partly from its enormous value in those times, and partly from its soft and fragile nature. They imitated the gem, however, with such perfection that Pliny declared that it was almost impossible to distinguish the false from the real. Modern gem imitators have utterly failed in producing anything approaching the precious opal in beauty. The assertion of Pliny in regard to the imitation of the glories of this gem has always been received with incredulity by the moderns on account of the failures of our most skilled artisans; but the discoveries among the ancient Phœnician tombs in the island of Cyprus by Di Cesnola rather strengthen Pliny's remark.

In this collection we may view a great and elegant variety of glass-ware exhumed from the tombs of

the Phœnician nobility who lived three thousand years ago or more. Many of these vessels gleam with what appear to be iridescent tints of gold, blue, red, and other colors of the loveliest tints, recalling to mind the most beautiful and gorgeous reflections of the opal. Some of the articles are entirely of one color, while others are composed of patches of various hues resembling enormous opals with broad gleams of pure color. Peligot maintains that these superb colors are due to the effect of great age; and the substance of the glass being separated into laminæ, the colors may be explained by the law of iridescence. But we are half inclined to believe that they may be due to the skill of the artisan in a great measure,—hence the variety of color in different vessels of the same age. In the famous collection of Signor Castellani there is a solid glass ring quite two inches in diameter taken from the ancient Etruscan tombs. This interesting relic exhibits patches of color as bright as the prismatic gleams, and they do not appear to arise from any disintegration of the material, but rather to be produced by the design of the workman. We surely will not ascribe to effect of age the decided iridescent glaze which we see in the Maiolica pottery of Hispano-Moresque objects of the thirteenth or fifteenth centuries, or in the Gubbio products of the sixteenth century.

The famous opal of history was that which was worn in a ring by the Roman Senator Nonius in the

days of the Triumvirate. Its size scarcely exceeded that of a hazel-nut, yet its beauty and perfection were such that it was considered a marvel among the *dillettanti* of Rome, and valued at the enormous sum of nearly a million dollars. Marc Antony, remembering the sacrifice of the matchless pearl by Cleopatra, and still enslaved by her irresistible charms, sought to obtain the opal, intending it as a present to the siren queen of Egypt. But Nonius refused to part with the treasure which was the idol of his heart, and sought safety in flight. The beauty and charm of the gem may be estimated by the fact that banishment then to a Roman was worse than death. History makes no further mention of this wonderful opal, and even if preserved among the spoils of ancient Byzantium its glories have probably vanished ere this, yielding to the destructive effects of time.

The finest opal of modern times was that which was worn by the Empress Josephine in the days of Imperial splendor. It was indeed a magnificent gem. Its flashing beams of light were so strong and vivid as to give the appearance of living flames of fire, and hence the name of *l'incendie de Troie*, — “the burning of Troy,” — was bestowed upon it. The base of this opal was completely opaque, but the superior portion was perfectly transparent, and through it were reflected a multitude of fiery gleams of red light. The fate of this beautiful gem is unknown. There are two splendid opals still to be

seen among the Crown jewels of France, notwithstanding the frequent change of dynasties. One is placed in the centre of the Order of the Toison d'Or, and the other forms the clasp of the royal mantle.

In the imperial cabinet at Vienna is exhibited the grandest specimen of this gem yet discovered. It was found in the mines of Hungary in 1770, and purchased by the Austrian Government. It measures $3\frac{3}{4}$ inches in length, and is $2\frac{1}{2}$ inches in thickness. Its weight is about seventeen ounces, and its value is estimated at about \$300,000. Although it is injured by several cracks and fissures, it possesses a brilliant play of color, and is justly regarded as the finest specimen known, even surpassing the beautiful fire opal brought home from Mexico by Humboldt, and which is still preserved in the museum at Berlin.

At the close of the last century, but before the Revolution broke out in France, Mons. D'Auguy, a financier of Paris, came in possession of a most remarkable opal of the harlequin variety. It was of oval form, $\frac{7}{8}$ of an inch in length by $\frac{5}{8}$ in breadth. This gem was of wondrous beauty, and was pronounced perfect by the connoisseurs. It is now in the hands of the family of Count Waliski. At the same time the well-known amateur Fleury owned a rival to Auguy's opal, which it exceeded slightly in size.

Another magnificent opal is described by Jackson as having been exhibited at Vienna. It was nearly

an inch in length, and was of the harlequin order, having three longitudinal bands from which flashed resplendent flames of light and color. It was pronounced by the virtuosi of Dresden and Vienna to be the third in rank of all the fine opals then known.

In the Musée de Minéralogie of Paris may be seen a splendid opal which has been carved into a bust of Louis XIII. when a child. King very properly exclaims against the barbarism and extravagance where work and material mutually destroy each other's beauty and value. The Spanish historians, in their marvellous stories of the wonders seen in Mexico at the time of the Conquest, describe the image of the mystic deity Quetzalcoatl (God of the air) on the great pyramid of Cholula, as wearing a mitre waving with plumes of fire, and which was supposed to have been produced by masses of the fire opal.

Dr. Le Conte brought home from his geological surveys in Honduras, a number of beautiful opals from the mines in that country. They have since been cut and mounted in gold with diamond settings, in the form of a necklace, which is regarded by connoisseurs as one of the most valuable jewels in the United States.

At the Centennial Exhibition of the United States, Austria exhibited some very beautiful opals of various kinds, both polished and in the natural state. One of the polished gems was two inches in diameter and valued at \$25,000. It was of a faint milky white

tint, like most of the Hungarian opals, and displayed a charming arrangement of colors.

The splendors of the opal are best seen when exposed to the direct rays of the sun, and viewed through a magnifying glass of low power. The dazzling scene has no equal in art or nature, for the vivid hues of the solar spectrum are here displayed with the most charming effect. The colors are in broad patches, and not blended with their complementary hues as seen in the continuous spectrum, and the effects of the pure green, red, blue, and yellow, flashing forth in perfect purity and intensity, without definite arrangement, remind the observer of the brilliancy of the kaleidoscope. In this fascinating display of hues one might expect to see the colors pass into each other as in the solar spectrum, and as the field of view is changed; but such is not always the result. The red may exhibit a tinge of yellow, or the green a shade of blue before they disappear from view; but generally the patch of color ends abruptly, preserving its purity of tint to the last.

The alternate and irregular flashing of all these varied hues always presents a harmonious spectacle, such is the wondrous power of Nature in all her arrangements and groupings. The stone, when arranged by the art of the lapidary, is almost always cut with a convex surface. However, when the opal is attached to an opaque substance which serves as a reflector to the rays of light, the stone may then have its surface cut almost flat. The colors displayed by

this gem embrace quite all of the tints seen in the solar spectrum, and they are as pure. The shades of green, blue, yellow, and red will bear comparison with the hues of the solar spectrum, and the gems of other minerals are rare that can bear this decisive test. Sometimes but one color is visible in the stone, and then it is called emerald or golden opal, according to the tint exhibited.

The purchase of opals in the rough natural state is attended with danger, for often the glittering mass, after being shaped and polished by the lapidary, is transformed into a transparent but hueless stone. The cutting of the opal is always a hazardous operation, from the fragility of the material and the special tact required in determining the shape to be given the gem. We will relate an instance to illustrate the history of the whole.

A traveller from Central America brought home a splendid rough fire opal which dazzled the eye with its fiery reflections. We took it to an honest lapidary, who received it with a doubtful look. The next day the opal was returned, having been shaped into the usual oval form, but only a faint gleam of any of the colored rays flashed from its surface, or the interior. "Is this the gem we gave you yesterday?" we demanded of the artisan. With a smile the lapidary took the transparent stone and roughened its finely polished surface upon the wooden wheel. In an instant the lost fire returned as if directed by magic's wand. The perfect transparency of the gem,

with its high polish, had allowed the rays of light to pass directly through it, and there was but little refraction, but on roughening the surface the light was interrupted and the peculiar property of the mineral displayed. Unfortunately the lesson was not concluded here. At the last touch of the wheel the beautiful gem flew into two parts, and its glories departed in an instant. Saddened with the day's experience, we took the two fragments, cemented them together, and tossed the stone into a drawer which contained other mineral specimens of no great value. Some months after, while searching for a misplaced mineral, a gleam of light suddenly flashed out as we opened the drawer. It was the neglected and abused opal, which now gleamed with the energy of a living coal of fire. It had recovered its beautiful reflections, and still adorns, notwithstanding its fracture, a most cherished jewel.

Whence this mysterious change? the reader may ask. We can only say that the complete transparency of the stone had been lessened, and perhaps the change was due to the action of some of the ingredients of the cement with which we united the fragments of the broken gem.

Some of the Central American opals have the reputation of fading and becoming translucent and opaque in course of time, or according to the circumstances of exposure. We will relate an instance which forms a part of our experience and education in the study of gems.

A few years ago, two Spaniards arrived in New York with a bag of rough opals brought from Central America, but from what particular locality we never learned. The specimens varied in size from that of a bean to that of an English walnut, and were extremely beautiful. They had a fresh appearance, as though they had been recently extracted from the mines, and many of them had portions of the soft sandy matrix still attached to them. They excited suspicions of not having been properly tempered and hardened by exposure; but their beauty, which reminded one of the perfect glow-worm, or lumps of phosphorus moistened with oil, did not allow the spectator to hesitate about the purchase of them, especially as they were offered at a moderate price. We invested in the purchase of several charming specimens, and never wearied in examining their exquisite effects. Still, we felt a vague suspicion of the enduring qualities of our newly acquired treasures. The most beautiful stone, the size of a small almond, we carried in our pocket for a long time, not only for our gratification but for the purpose of studying the effect of the atmosphere upon its reflections. Soon after our acquisition, we fancied a slight shadow or nebulosity appearing in one end of the stone. We carefully watched it, and before long an indistinct cloudiness began to appear, like the dim and distant haze of a summer sky on the commencement of a storm. Even then we thought it might be mere fancy on our part. But when the

shadow changed to opacity, and the transparency of the gem, with its beautiful reflections, vanished, never to return, we were compelled to admit that even substances of the mineral kingdom had their diseases as well as forms of the organic world.

This is indeed but one example to illustrate a theory; but most of those we purchased at that time of the Spaniards have altered in appearance, and some of them quite as seriously. Therefore we have arrived at the conclusion that recently mined opals should be bought with caution; and that the perfection of a rough opal as a gem cannot be safely estimated until after it has been cut by the lapidary.

No definite idea can be given in relation to the price of the opal, so much depends upon the degree of its brilliancy and play of colors. The gem is not sold by weight, but its value is estimated by its size and the perfection of its charms. An opal half an inch in diameter exhibiting fair colors may be worth \$5, and another of the same size, of greater perfection, may bring \$5,000, or more. The palmy days of the opal were during the period of Roman luxury, as the beauties of the diamond were not then fully revealed, and the opal flashed forth its marvellous beams of color both by daylight and artificial light. The gem then commanded enormous prices. According to the tables of Dureau de la Malle, the opal of Nonius was valued at twenty million sesterces, or about eight hundred

thousand dollars. Enormous as this sum of money appears, Catherine of Russia would have given as much for the gem, if its beauty had been in keeping with its reputation.

The commerce of the opal affords a curious example of credulity and superstition, which is in singular contrast with the progressive ideas of our advanced civilization. In times past the changes that sometimes occur in the opal from physical causes have impressed the minds of some excessively superstitious people as due to supernatural causes. And from these trivial fancies the most beautiful and *recherché* of all that Nature has offered to us in the mineral kingdom has been placed under ban. This superstitious dread may be of ancient origin, and whence its source we know not. But it is a matter of history that the opal was the favorite gem among the Romans in their best periods of intelligence and refinement. So far from being feared at that time, it was eagerly sought for, as it was supposed to possess the power of warning against disaster, and exhibiting the rosy herald of joy. Hence it has been thought that a feeling of superstition as well as of avarice influenced Nonius when his paragon was demanded of him.

It is possible that the dread of the opal may be derived from the superstitious fancies that have descended to us from neolithic times, like the superstitions connected with the ancient stone implements which are now called in Western Europe

elf-stones. In Scotland at the present day the ancient arrow-heads of stone are known as elf-bolts or fairy shots, and believed to protect the wearer from disease or misfortune. Thus it appears that stone weapons of an extinct race are used as ridiculous charms by later nations far advanced in civilization. History shows us how elves and fairies were created in the popular imagination from neolithic sources, and how weapons and ornaments of stone, amber, and metal became invested with mystic powers as objects of handicraft of the elves themselves. These objects are not only regarded as fairy charms among the races of the East, but the belief in their powers and use is quite as strong and tenacious among the Celtic portions of Europe. In other countries these primitive ideas of fairies and charms have become modified, and blossomed into poetic fancies to please chiefly the innocence of childhood. Some of these the genius of Shakspeare and other poets have made beautiful, and to these we offer no objection. Poetic license may sometimes invest an object with a positive effect which eventually may assume the appearance of fact. Thus the allusion to changes in the beauty of the opal in connection with misfortune, which was made by Sir Walter Scott, in his novel "Anne of Geierstein," was taken to heart seriously by many of his readers, and the gem was placed under ban. The popular imagination became so strongly affected that the commerce of the opal in England became very seriously injured; and even

at the present day many a timid maiden hesitates over the selection of the opal for ornamentation. Every mineralogist and man of science will rejoice to learn that Queen Victoria exhibits sterling good sense in selecting the opal among her choicest family gifts, thereby presenting a pleasing contrast to the superstitious and foolish fancies of the Empress Eugénie.

To the amateur who loves the rare and beautiful, with a feeling untrammelled by any of the misty traditions of the past or the caprices of fashion of the present, the opal is the dearest of all the gems. For it is not only rare, but it displays the glories of all the other gems; and it is the only one that defies the skill of the modern artisan to imitate. Its flash instantly betrays its character, and places it above suspicion, while quite all of the precious stones regarded as gems are now imitated so perfectly as to require close and careful inspection, and sometimes the application of scientific tests.

When we recall the phenomena of the opal, and the wonders of its reflections, with their strange and sudden disappearance, we may pardon the credulity of the Arabian romance writers in ascribing to the gem supernatural powers. It was a beautiful theory with them that it falls from heaven in the lightning's flash, and is the veritable Ceraunia. Its charming and mysterious play of colors suggested to their ardent imaginations the glories of Paradise, and hence they invested it with wonderful

talismanic properties, and believed it to be the abode of afreets and genii. Alas for romance! Science clearly demonstrates that many of the phenomena which puzzle the superstitious are simply due to atmospheric influences and to the natural laws which regulate the decay of organic and inorganic forms.

THE SAPPHIRE.

“THE azure light of sapphire stone
Resembles that celestial throne,
A symbol of each simple heart
That grasps in hope the better part,
Whose life each holy deed combines,
And in the light of virtue shines.”

MAREODEUS.

THE SAPPHIRE.

THE colored varieties of sapphire were probably known to primitive man, and were gathered in their rough state to serve as rude ornaments long before the diamond, with its less attractive natural appearance, was recognized as a treasure or a gem. The mountain torrents, laying bare the superficial strata of the gem beds, early exposed to view the sapphires of bright and attractive colors, which readily caught the close, observing eye of the savage; while the diamond, lustreless within its apparent crust, was unnoticed and unknown until civilization became far advanced and revealed the hidden splendors of the gem by the application of art.

We may therefore infer with a reasonable degree of probability that the colored sapphires, though perhaps not the most ancient in mineralogy, were in reality among the earliest gems known to man. The researches of the antiquary and the archæologist rather strengthen this view, for specimens of these stones are found among the ruins of the ancient and long-forgotten cities of Arabia and Persia, while the diamond is not.

This beautiful mineral has been known in the land of its birth from time immemorial as "korund ;" and under this harsh name were included all those beautiful gems known to commerce as the Oriental ruby, topaz, emerald, and sapphire. The ancients in the days of Pliny bestowed upon the blue variety the more euphonious name of "hyacinthus." Modern nomenclature, however, has adopted the term "sapphire" for all the transparent forms of the mineral, reserving the name "corundum" for the opaque and translucent or non-crystallized varieties.

In making use of this word, we have another illustration of the strange adoption of a term which is destitute of any relationship to the characters of the object it is intended to describe. The "sapphirus" of the ancients referred to lapis-lazuli, a blue opaque mineral spotted with minute metallic flakes ; and the only significance it bears in connection with any of the forms of corundum is the simple fact that it means azure. If we follow the antiquaries still farther into the mists of early language, in seeking the etymology of the name, we shall probably find even less satisfaction. The nature of this gem, as well as most of the other precious stones, was mere conjecture to the ancients, and they formed their estimate of them chiefly from their hardness and color.

Among the early Greeks, Theophrastus strove in vain to discover some satisfactory basis of arrangement for these minerals, and to explain their forms,

their constituents, and the manner of their creation. But his efforts and those of his contemporaries were of little avail; and so Ictinus, when he constructed the marvellous façade of the Parthenon, and Phidias, while he adorned it with immortal statues of marble and other stones, were alike ignorant of the nature of the materials they employed in their work. Several centuries later the treatises of the Latin philosopher Pliny show that science had made but little progress in this respect. The people of India and of the valley of the Euphrates, however, undoubtedly studied at a very early period the internal structure of the precious stones, and the revelations thus obtained had some effect in shaping their religion and their views of civilization.

In searching for the mysterious in the gems, the Assyrians discovered the cuneiform crystals in the interior of transparent sapphires, and adopted the forms for their own use, believing them to be the language of the genii. We have little doubt but that the cuneiform character which now reveals the history of the extinct Oriental empires had its origin from the wonderful crystallizations sometimes seen in the internal structure of the sapphire. These crystals are sometimes visible to the naked eye; but when the polished surface of the mineral is exposed to a magnifying lens of even low power, they appear with startling distinctness, and exhibit forms of perfect arrow-head shape of all colors. The field of vision may at first include but a single arrow-head

crystal of perfect symmetrical outline floating in the azure of the stone; but as the field is shifted myriads of crystals may suddenly come into view, presenting a scene of such remarkable beauty and fascination that the observer ceases to wonder at the credulity of Arabian superstition. These crystallizations may occur in sapphires of any hue, and then again we may search in vain for them in many other specimens of the same mineral. Some specimens may contain a very few of these arrow-head forms, while others seem to be composed of multitudes and masses of them. One large red sapphire of four karats weight submitted to our inspection appears to be composed of clouds of these cuneiform crystals; and under the magnifying power of about twenty diameters it presents fields of arrow-heads flashing forth the most brilliant hues, and changing into new scenes of startling and transcendent beauty as the focus is varied. Whatever startled the imagination of the ancients with a new and mysterious beauty was at once invested with supernatural power.

In connection with this theme it is interesting and instructive to trace back the history of the gems and precious stones even within the period of the past two hundred years, and read the descriptions and definitions bestowed upon them by mineralogists. Some of the most gifted of men, like Linnæus and Wallerius, labored diligently to place them correctly in science; but their efforts to define and arrange them properly seem at the present day like schoolboy fancies.

Daubenton conceived the brilliant but erroneous idea of arranging them according to their color, taking the solar spectrum for a standard. His idea was to place them in seven genera, according to the seven principal prismatic colors, and constitute species according to the different shades. This able man was not then aware that the sapphire and the tourmaline exhibit quite all of the colors of his seven genera.

Romè de L'Isle was the first mineralogical writer who classed the gems systematically; but it has since appeared that the amateur, Chevalier Baillou, preceded him in his crystallogical ideas; for in 1747 this observer described, in the catalogue of his collection, his views in relation to the properties of gems, and how their characters might be readily ascertained by the tests of hardness and specific gravity, and also by the form of their crystallizations. The distinguished and learned Abbé Haiüy became interested and even fascinated with the study of the history and physical properties of the gems and the precious stones; and to his genius we are indebted for much of the information we have at the present day on this subject. He was deeply interested in the nature and characteristics of the Oriental precious stones; and being dissatisfied with the harsh term and the vague synonymy of "korund," as applied to some of them, he proposed the more elegant name, "telesie." But science, often disdainful of new terms, finally adopted the name proposed by Wallerius; and at the

present time all of the fine and transparent varieties of corundum are called sapphire.

This remarkable mineral is found in mineralogical specimens in China, Siberia, America, and other parts of the world; but all of the fine gems, with perhaps few exceptions, come from Burmah, Pegu, Siam, lower Bengal, and Ceylon.

The island of Ceylon is the most famous of all the localities thus far known, and it is in reality the most wonderful gem deposit in the world. It was known in the period of the Roman Empire, as the land of the luminous carbuncle. This island, which is situated at the southeast extremity of the peninsula of Bengal, and separated from it by a broad but shallow strait, is about as large as England in its area. In the southern centre of the island a group of lofty mountains appears, rising to the height of about 8,000 feet above the level of the sea. On one side this great upheaval descends in successive ranges of hills until the flanks of the mountains subside into the alluvial plains; whilst on the other side the mountain range is characterized by abrupt precipices sometimes of several thousand feet in height. The great gem-producing districts of the island extend along the base of this mountain range for about fifty miles; and the central and richest part is considered to be located around Ratnapoora, which is scarcely two hundred feet above the level of the sea. This want of elevation in the Ceylon gem strata or placers becomes a marked feature when considering the

high plateaux in which the diamond occurs in other parts of the world, also coupled with the fact that the two gems are not found together in the same placers. Here are situated the celebrated mines which have yielded vast quantities of the sapphire, especially the blue variety, for an indefinite period of time. They are not small and trivial deposits, but extend over large areas. Some of the plains which cover the deposits are more than thirty miles in extent, and form a large tract of country. Among them are the Kondapalle, Elk, Tolapella, Horton, Bopatavala, Moonstone, Newera Ellia, and many others.

The amount of labor expended in excavations on these plains is stupendous, and evidences still remain which indicate vast operations and remunerative labor in far distant times. The eastern portion of the plain at Newera Ellia furnishes a good example of the extent of the explorations. This region is still called the vale of rubies, and was mined on a grand scale by the ancient kings of Kandy. Many acres of this plain have been completely upturned, and the surface is still indented with numberless pits of large size, varying from three to seventeen feet in depth. The period of these extensive operations is unknown, and is so far distant as to be beyond the mention of history or tradition.

Most of the gem-bearing districts are classed as wild lands, and belong to the English Crown. As yet the authorities have never bestowed a thought upon their value as a source of revenue, and the

search for gems is free to the world. Although much territory has been mined in a rude manner in past times, the fields are by no means exhausted, and offer excellent inducements to skilled labor. If some of the energy and determination now exhibited in the South Africa diamond mines could be transported to Ceylon, the gem marts would soon display the splendors of ancient times.

Ratnapoora, which is the gem mart of Ceylon, and situated in the midst of the mines, means literally the city of rubies. The mines adjacent to it and in the district of Saffragan are the principal ones now worked in the island, but the gems are found under the western plains that extend from Adams Peak to the sea. The plains and valleys southeast of Ratnapoora are all gem fields; and the beds of the torrents sometimes contain so great a quantity of broken fragments of sapphire, garnet, zircon, etc., that the sifted sands are used by the lapidaries in polishing gems.

The mining operations are generally carried on by the native Cingalese, who labor in the light of a pastime and only during intervals of their agricultural employments. Some few, however, undertake the labor as a regular business, but they belong to a low and dissipated class, and do not work systematically or with regularity. Therefore, the gem-mining of Ceylon cannot be regarded as a fixed and permanent business.

When an exploration has been determined upon,

a small party of villagers set out for the promising region provided with the implements of mining and the means of camping out. The times selected for the operations are after the heavy rains which prevail in June and October, and the floods have subsided. The beds of rivers or smaller streams are often chosen as easier of access than the plains. If the river-bed is selected, the first act of the explorers is to seek for the proper locality where the gem-bearing strata may be found. To ascertain this, the Cingalese thrust a long iron rod of ten or twelve feet in length into the earth, and test the nature of the sub-soil. By means of long practice, the natives can adroitly penetrate the earth to a considerable depth, and, by the resistance to the movement of the rod, can detect the gem deposit of which they are in search.

If the indications are good, the natives proceed to build a hut if they are at a distance from their village, and prepare for the operations, which often extend over many weeks. After diverting a part of the force of the stream so as to form a quiet pool, they proceed to excavate the sand and gravel within a certain area. In order to accomplish this they use hoes with handles fifteen or more feet in length. The top strata are hurriedly raked up and thrown away; but as the pit deepens and the gem stratum is approached, the work is performed with greater care. As soon as the hoes bring up fragments and bowlders of white quartz, or strike a thin

ferruginous crust, every particle of the gravel drawn up is carefully preserved. The gravel and sand thus obtained are then placed in large baskets woven of split bamboo and shaped to a conical point at the bottom. The basket thus filled is placed in the current of water, and its contents washed by imparting to it a circular motion. This washing process is kept up until the stones, gravel, and lesser particles are cleansed. During this operation the gems, which are much heavier than common stones, settle at the bottom of the basket, and are there collected together, so that when the superincumbent gravel is removed, the sapphires, garnets, zircons, etc., are easily discovered at the bottom and removed. This is the manner in which the wet diggings are carried on, and is the easiest mode of exploration; but it is by no means as sure or often as profitable as the operations in dry ground on the river banks or in the plains. The dry diggings are much more laborious, as the soil is firmer and the gem strata must be transported to water to be washed and sifted. These dry deposits are found the richest beneath the alluvial plains, which seem to have been in distant times shallow lakes and lagoons.

The gem stratum called *mellan* is always well defined, and occurs at a certain depth, which seems to correspond to the bottom of the lake at a definite period. This depth varies from two to twenty feet, and is perhaps even greater; but the natives rarely excavate below the depth of twenty feet. This peculiar

formation, which is generally horizontal, is composed of a conglomerate of quartz gravel resting upon or mixed with a stiff clay, often indurated by a ferruginous oxide. In among this cascalho, or just below it and adhering to it, are found the fine pebbles and crystals of sapphire, tourmaline, garnet, zircon, spinel, and chrysoberyl. Under these rocks and in peculiar hollows in the plastic clay, which the natives call elephants' footsteps, the gems are found clustered together heterogeneously, and often so perfect in form as to appear as though created there. At other places they are collected together in these pockets in such a manner as to suggest the idea that they had been washed in by a current of water.

All these varieties of gems, some of them widely differing from each other in composition and form of crystallization, are here embedded together, and seem to have one common origin. This is the true matrix, and the gems are not found in other portions of the soil unless some disturbing force has removed them, like a strong current of water breaking up the cascalho and transporting the gems to alluvions of its own deposit.

It is maintained and generally believed by mineralogists that the sapphire is formed in crystalline rocks; that in process of time the matrix is disintegrated, the gems set free, and washed down to the alluvial soils where they are now found. It is also thought that the gem-seekers might with patient care trace the precious stones to their source

in the primitive ledges or the mountains, as the gold miner often follows for long distances the particles of gold in the soil until he discovers the parent vein in the solid ledge. But in Ceylon this view is not entertained by the natives; and all scientific efforts to find the sapphires in the mountain ledges have utterly failed. All trace of the sapphire and its attendant gems ceases as soon as we reach the limit of the gem stratum, and what seems to have once formed the shore of the lagoon. Beyond this plainly marked outline we may search in vain for the least sign of a connection with the older rocks either adjoining or at a distance. The result is the same if we examine the ledges on the same level or those of a higher elevation.

In some countries, in the granular limestone of New Jersey for instance, or the ripidolite of North Carolina, the granite of Siberia, or the dolomites of Switzerland, we find sapphire, or more properly corundum, of undecided colors, of inferior transparency or even of opacity; but it is very rare that a specimen is found of sufficient purity for ornamentation. The most transparent and perfect of these sapphires are generally impaired by cleavage planes which traverse the stone in several directions, preventing refraction of light, and often so marked as to appear like flaws. This circumstance indicates that the forces that deposited corundum and the fine sapphires were certainly different in character, or that the conditions in which they were exerted were

not the same. For in Burmah, Pegu, India, or Ceylon, and wherever the perfect sapphires are found, they have one common matrix, and that is the peculiar ferruginous conglomerate.

This conglomerate is recognized as a recent formation; and how came these gems, which are believed to be as old as creation itself, to be found among it? This formation is not only recent, but it is actually taking place all over the world at the present day, and examples may be found in almost every country. We find in many places the peculiar strata of sand, gravel, and masses of stone in proper position to change into conglomerate, which requires the action of water highly charged with iron and lime or silica. Darwin found these stony layers in process of forming on the beaches of the Cape de Verde Islands, and in vain attempted to knock out a bolt of iron which had been cast ashore from some wreck not long before, and had in a short space of time become firmly fixed in the conglomerate. We may observe the same process taking place to-day on the coast of Cornwall, and among the *débris* of the ledges of the Abrolhos Islands. In dredging rivers large masses of solid conglomerate are often brought to light. The Thames has furnished many examples; and not many years ago a cannon-ball embedded in a crystalline calcareous rock was taken from the bed of the Mediterranean not far from the mouth of the Rhone. Fresh water laden with *débris* of vegetable matter also possesses the same cementing action as sea

water, and an excellent example is seen in the allios now forming in the Landes of southern France. This allios is also a conglomerate, which has formed and is now forming at the depth of about three feet below the surface. Here the conglomerate of sand, pebbles, and angular fragments of rock is firmly cemented together by the rain-water, which filters down from the surface of the earth laden with vegetable matter. The cascalho in which the diamond is found is of similar character, and has a similar origin, for we likewise find there traces of vegetable *débris*, and the diamond itself contains germs of fungi and vegetable fibres of higher organizations.

But whence come the elements which form the gems? the inquirer will say. Can we gather figs from thistles? Marco Polo in the thirteenth century visited these gem beds, and has left his views in the following lines: "In ista insula nascuntur boni et nobiles rubini et non nascuntur in aliquo loco plus. Et hic nascuntur safri et topazii, amethysti et aliquæ aliæ petræ pretiosæ et rex istius insulæ habet pulchriorem rubinum de mundo." Buffon, four centuries later, in seeking for the causes of the formation of this mineral, observed the peculiarities of the matrix on this island, and boldly stated that the origin of the precious stones like the rubies, the sapphires, and topazes of the East is the same as that of the diamond. He also stoutly maintained that these stones form and are found in the conglomerate in which is collected the *débris* of

other matters. The researches of Sir Samuel Baker and others on these deposits seem to indicate, if they do not prove, that the sapphire in particular was formed in the sands, clay, or conglomerate where it is now found, and was not set free by the disintegration of the old crystalline rocks. Nordenskiöld recognized these gem beds as true placers, but was inclined to think the gem strata had decayed and left the gems free. An article published some years ago in "Once a Week," and supposed to have been from the pen of Sir Samuel Baker, who had lived many years at Ratnapoora, and had attentively examined the gem-bearing formations, gave the following account:—

"A common but erroneous belief is that the gems are formed in the mountains and washed down by the abrasion of the rocks and deposited in the alluvial bottoms. If it were so, they would have been traced to their source and sought for in the mountains, where they would naturally be found in greater quantities; but the natives never think of searching for precious stones in such places, and in the localities where they are found there does not appear to have been any local alteration in the veins of gravel since they were first thrown there; and my own conviction formed from observation on the spot, and for this and other reasons following, is that the sapphire and other gems have been formed and are still forming in the places where they are now found. In the first place, rounded sapphires and sapphire crystals with facets of brilliant lustre are found lying side by side.

Secondly, both the rounded stones and the numerous perfect crystals, with their pyramids unbroken, show that they were never broken from other rocks, but were formed unattached to any matrix, in a soft medium such as fine sand or clay. I have seen hundreds of these taken loose from the same spot. Thirdly, crystals of sapphire are found with their edges reduced, yet with brilliant facets, which is inconsistent with their reduction by rolling. Fourthly, sapphire being much harder than any other stone with which it could come in contact, it is not easy to understand how any attrition could be brought to bear upon it to bring it to the beautifully translucent polish which the rounded stones usually bear more especially considering the short distance from the mountains to the alluvial bottoms between which the water-wearing process is supposed to be effected.

“It is remarkable that the rounded sapphires and rubies are always the densest and of the finest water and color; showing that they were formed by different chemical forces from the others. In short, there is no more reason for supposing rounded sapphires to be water-worn than for supposing that the bowlders of jasper, for instance, on the Egyptian desert were so formed, when a fracture shows them to have been formed in concentric layers and to be in their original state. The same remarks apply to the crystals of some other minerals, as zircon, tourmaline, and spinel.”

The mineralogist, in contesting this opinion, will point to the round pebbles of sapphire as evidence of disintegration and subsequent aqueous action. But upon careful inquiry we shall find that these nodular

masses are regular concretions and natural formations, which do not owe their form to the abrasion of exterior force, but are the results of crystalline action. We shall also find that these peculiar stones always form the finest specimens of the class of gems to which they belong, whether sapphire, diamond, tourmaline, topaz, or chrysoberyl.

In regard to beauty of color, density, hardness of texture, and brilliancy, these apparently water-worn masses are decidedly superior to the perfectly shaped crystals, and among all the true gem mines of the world this rule is observed. In the conglomerate of Ceylon we often find gems whose appearance indicates the shock and abrasion of waves or currents of water, while we find in adjoining places perfectly formed crystals whose facets display a lustre as brilliant as on the day of their creation. Some, then, have perhaps been moved about by aqueous action, while others have never stirred from their first position.

Among all the multitudes of sapphires taken from the mines of Ceylon, we have never seen or heard of a specimen fairly attached to any rock as a matrix. Sometimes the ferruginous cement which is one of the necessary components of the matrix unites accidentally the rough gem to a mass of quartz, but all the sapphires we have seen exhibit no sign of having been attached permanently to any mineral substance. In fact, all the rounded stones and the more perfect crystallized specimens have the appearance of

having been formed in a soft medium like sand or clay.

Whence come the masses of quartz that are always found in the conglomerate, and which sometimes occur of a large size? may be asked by the inquirer. This is a question which cannot be answered satisfactorily, especially when the adjoining ledges do not contain the material. We can, however, solve the problem by supposing that beds of quartz have been formed on the beds of the lagoons, and were afterwards broken up by the action of the waves, frost, or other agencies. The clay, which is often a component of this matrix, is sometimes argillaceous and at other times kaolin. We are generally inclined to believe that these substances are always the results of decomposition; yet there are abundant evidences to show that they may be original deposits. The distinguished geologist Jameson was forced to admit this from his extended observations. We find blue, reddish, and yellowish mud in cavities of the hard crystalline rocks enveloping crystals of quartz and topaz, as at Greenwood, in Maine, or Schneckenstein, in Germany. The phenomena are well marked in the felspar quarries at Bowdoinham, in Maine, and also at Schemnitz, in Hungary, in a vein four or five inches wide traversing porphyry. Whence comes this substance, when there is no opportunity for infiltration, if it is not an original deposition? Perhaps by pseudomorphism.

How and why were these sapphires deposited in

globular forms when the law of crystallization is so rigid and inflexible? This is a question which requires considerable assurance to answer, in the view that they are original depositions; but Nature offers many examples to sustain the theory if we search her domain; for instance, how were the rounded nodules of flint formed in the chalk-beds? Their shape is not due to attrition, and their peculiar arrangement forbids the belief that they have been rolled or abraded by the agency of water. In the interior of solid ledges we find nodules of quartz with rounded edges, as though they had been exposed to some dissolving agency or abrading force; yet they have been beyond the reach of external violence. Hence we must conclude that their globular form is perhaps due to some deviation in the usual process of deposition or crystallization. Huronite occurs in spherical masses in hornblendic bowlders; and we may find nodules of tourmaline in the interior of the most perfect crystals of the mineral. There are other examples.

The Cingalese do the mining and sell the gems to Moors, who resort to Ratnapoora to attend the jewel fair, which is held at the annual Buddhist festival of the Pera. Purchasers not only from all parts of Ceylon, but India, come to buy gems at this time. It has therefore become the great jewel mart of the world; and one can find there many of the rare and beautiful gems found in other parts of the world: the emeralds of Peru, the topazes of Brazil, the opals of Honduras, the turquoises of Persia,

the jade of China; in fact, most of the gems that have a commercial value, or any tradition attached thereto, are to be found at these fairs. They are of greater importance than the famous fairs at Novgorod in Russia, to which the gems and precious stones of Northern and Central Asia are annually sent.

The Hindoos are the best buyers of gems of all the nations of the world. Their rajahs and princes pay the highest prices for the paragons; and the poor native had rather invest in a gem, which to his simple belief adds to his security and happiness, than hoard gold coins, which are no better for concealment. The Moors are also generally the lapidaries. The tools which they use in cutting the gems are rude and primitive, and often the stones are much impaired under their hands; but some of the workmen are skilful and are able to copy with exactness the most perfectly cut gems of the European lapidaries. Workmen of the inferior class may be found in the little towns all over the island; but the artists of the first rank are located at Callatura and Colombo. Immense numbers of garnets, zircons, and inferior sapphires, with other gems, are cut by these rude artisans, who place but little value on their time, and therefore work for a trifle. These precious stones are then sold on the island or exported to foreign lands, but are generally taken to India by travelling merchants, who exchange them for produce or money. The demand is so great from the populous

Mohammedan nations, that many of these gems are really higher in price in India than in the gem marts in Europe, as in the time of Tavernier, three hundred years ago. Another potent reason prevents the market from being glutted: the Hindoo parts with his gem reluctantly, and only in case of necessity or in hope of greater gain; and the wealthy Parsee prides himself upon his display of gems, as well as upon his degree of caste. The quantity of gems treasured up by the inhabitants of India must be immense.

The composition of the sapphire, when found in the clear, transparent form, is pure alumina. Its degree of hardness is 9, being inferior only to the diamond; and its range of colors is very extensive, embracing most of those seen in the solar spectrum. Its specific gravity varies from 3.9 to 4.3; and, with the exception of the zircon, it is the heaviest of all the gems. It is also compact and exceedingly tough in its texture, and resists the shocks and wear of time better than any other gem, not excepting even the diamond, which is harder, but far more fragile. In point of brilliancy, it is below the zircon, garnet, and the spinel, its refractive index being 1.77 to 1.79. This mineral possesses remarkable electrical properties, but not so marked in degree as in the tourmaline or topaz; when this property is excited in the polished specimen, the attraction continues for a considerable length of time. The property of double refraction is not often very distinct, and by means of this peculiarity it is sometimes detected from the spinel.

The term corundum is now applied to the coarser and less transparent kinds of the stone, which have been used as a polishing material from time immemorial. The granular variety known as emery is largely mixed with iron ores, and is far inferior to the transparent and purer varieties as an abrading agent. It is always of a blackish or dark-gray hue, and is often mistaken for iron ore. Asia Minor furnishes nearly all of the emery used in the arts. It is found there in masses or bowlders, either free or in granular limestone. In the United States it is found along the gold belt in the Southern States; and in Chester, a town of Massachusetts, it occurs in a large and valuable vein associated with diaspore, ripidolite, etc., which generally accompany it. At this mine at Chester, translucent sapphires of bipyramidal form are sometimes found. Dr. C. J. Jackson found one small blue crystal quite transparent and doubly terminated.

The corundum belt of the United States has been traced, with wide intervals, however, from Philadelphia to Northern Georgia. All along this distance of several hundred miles, masses of corundum, more or less transparent, have been found during the past forty years, but active search failed to reveal the mineral in its matrix. A few years ago exploration in the extreme southwestern part of North Carolina discovered the long-looked-for corundum *in situ*. It was found on the side of a mountain, in a mica-like substance called ripidolite. The corundum from this

locality appears in geodes and also in well-marked crystals, ranging from small size to even the weight of three hundred pounds. It is often of perfect transparency, but may be translucent or opaque. The transparent crystals and masses, although possessing limpidity, are traversed in all directions with cleavage planes, which prevent their use in ornamentation. The colors are also irregularly distributed in patches, clouds, or in thin veneers; many specimens have been seen of variegated hues, — red, white, yellow, and blue, — and even the whole of these colors have been seen in a single specimen.

From the great number of specimens submitted to our examination we have no hesitation in saying that gems cannot be quarried at will from these mines. The inequality of color and the frequency of cleavage planes will forbid. Small gems of few grains weight may be cut from some of the transparent masses if the clear portions are selected with care, and cut with that skill which is required in the shaping of gems whose color is unequally distributed. But it is doubtful if fine gems are found in this formation, for the conditions which deposited the corundum here, and the more perfect specimens in the true gem strata elsewhere, are quite different.

The colors of the North Carolina corundum are often very fine, and we have seen specimens of a superb blue that retain their hues by candlelight. None of the reds we have ever seen have the true pigeons'-blood tint, but are tinged with blue, and are

therefore of a finer shade when seen by artificial light than by daylight. The yellows are also of a decided shade, and generally form a portion only of the crystal or mass of sapphire.

Some fine crystals have been found here, but we have seen none so perfectly crystallized as the pyramidal specimens from the Asiatic mines. Several large crystals have been exhumed, one of which weighs three hundred pounds, and is well defined in its form of crystallization. It is now preserved in the valuable cabinet of Professor Shepherd, of Amherst College.

A few years ago the gold-miners, while seeking for gold in the river-beds and alluvial deposits among the mountains of Montana, observed little transparent crystals of stone among the nuggets and flakes of gold, as they cleared out their rude apparatus used in washing the auriferous soils. But little notice was taken of these limpid stones, as their colors were generally faint; but the observing gold-seekers remarked their great weight and the remarkable coldness to the touch, as they passed them around to each other in wonderment. For a long time the miners flung these minerals away with other refuse, unconscious of their character or their value; but one day there appeared in the dark sands of the gold-pans a stone which flashed forth such brilliant red gleams as to excite anew the curiosity and cupidity of the miners. This discovery led to inquiry, and the gold-seekers learned too late concerning the value of the treas-

ures they had carelessly thrown away. Afterwards the gems were preserved and sent with the gold-dust to the States. They proved to be sapphires. Some of them were finely crystallized in long, regular prisms, but the most of them were without definite form. None of the several hundred specimens that have been submitted to us exhibited smooth faces, like the brilliant facets of crystals found in cavities of the crystalline rocks or in the gem mines of Ceylon; but all exhibited a roughness of the exterior, as though they had been abraded by aqueous action.

The colors of these sapphires are generally faded or faint; some are snow-white, but the most of them are of a faint bluish or greenish cast. We have, however, seen small gems of fine red, yellow, hyacinth, light-blue, and celadine green. We have also information of a beautiful red sapphire of six karats, but failed to trace it after it was sent from Montana.

This discovery establishes the fact beyond a doubt that the gem occurs in quite perfect form in the territories of the United States. Most of the specimens we have seen were collected at El Dorado Bar, which has since been abandoned by the gold-seekers. From this superficial search and incomplete information concerning the locality of the gem, we are unable to determine whether regular gem mines are to be found in this country, or along the slope of the mountains, which extend either north or south to a great distance. We have been

assured, however, by officers of the army, that fine sapphires have been brought to them by the Indians in Colorado living on the same range and formation that stretches into Montana. Therefore we shall not be surprised if well-directed search along this formation should reveal gem beds of value; and the mere circumstance that the gold-washers do not discover them is of but little weight; for gem-seeking and gold-mining are two different explorations.

It is a little singular that none of the beautiful gems occur in huge specimens, like some of the products of the vegetable kingdom. Nature, however, in the mineral line, or certainly with the gems, creates her perfections in small bodies. We sometimes find a clear crystal of topaz, tourmaline, or emerald of a few ounces or even pounds in weight, but they are very rare; while the generality of all the choice specimens are comparatively of a diminutive size. When occurring above a certain weight they become defective either in color, limpidity, or form. They are precious stones, it is true, so far as composition is concerned, but they are not gems according to the acceptance of the word. By the word gem we not only mean a precious stone, but its transformation into a form possessing limpidity, brilliancy, attractive color, or some other charm.

As regards the sapphire, its perfect forms occur in diminutive size. This mineral is also found in Bohemia, near Merowitz, in an argillaceous or marly

cement, with garnets, zircons, and even fossil shells. Tavernier relates that he saw in possession of General Wallenstein, when at Prague, some beautiful rubies, which were obtained in Bohemia. Fine stones of even five karats weight have been discovered at these mines. Concerning the mines of Lower Bengal we have but little information, and will not venture to give a description. We think they have the same characteristics as those of the gem beds of Ceylon. The Ilmenes Mountains, in Siberia, furnish sapphires of a strong blue. In Greece and Saxony they are also found in small quantities of undecided colors, and generally opaque. Impure specimens of well-defined colors are found in the volcanic *débris* of Expailly, in France, or among the snow-white dolomites of St. Gothard; in the granite ledges close to the base of the glacier of Bois, in the Alps of Savoy, we may observe regular prisms of sapphire, quite transparent and sometimes of a decided blue or a tender green.

The massive and opaque varieties known as adamantine spar are said to be found in granitic rocks in China, and on the coast of Malabar; but very little is known concerning the exact condition of these localities. Fibrolite and magnetic iron are said to accompany the corundum in several of its localities. Brard believes that the blue diamond of Pliny of the Island of Cyprus is no other than the blue sapphire. And this belief is not without foundation, as some of the varieties of corundum are

found on the islands and coasts not far distant. Occasionally stones of fine blue tints and of considerable size are found. In 1853, a large and beautiful piece was found in the gem strata near Ratnapoora, and sold to a Moor at Colombo for \$20,000. Fragments as large as goose eggs are also sometimes found in the Saffragan district, but are of an inferior character, according to Dr. Davy. Mawe describes one of three hundred and ten karats. We have in our collection a transparent, light-blue, and finely shaped crystal of three hundred and eight karats, but we fear that it will not match the distinct crystal of three inches in length which belonged to Sir Abram Hume.

The suite of blues exhibited by this gem is very extensive, and embraces all known shades and even the purest prismatic hue. The deep regal blue is too intense a color for a night gem, as by artificial light it becomes black. But there are sapphires of a celestial blue possessing perfect limpidity and rich velvety reflections that retain their splendid colors by night as well as by day, and they merit the distinction bestowed upon them by the ancients when they consecrated them to Jupiter. These superb gems are, however, exceedingly rare, and are eagerly sought for by amateurs at prices far above that of the colorless diamond. The general color of the blue sapphire is a light shade, from which it passes through various gradations to a blue black. Perfect stones of fine colors are quite rare, for they are apt to be clouded,

and the color distributed unevenly in the mass. Frequently the color is in one extremity of the crystal, or appears as a spot on the surface of a nodule. In other specimens it is arranged in bands or thin clouds. Hence much skill is often required to cut them so that the gem may display a proper distribution. Frequently the color is left in the bottom of the gem, and when the stone is set the color is diffused by refraction through the upper portions, so as to give the gem the appearance of being colored throughout.

One of the most perfect and beautiful specimens of sapphire is the magnificent blue gem now in the Natural History Museum of Paris. It was given by M. Weiss in exchange for a collection of choice minerals. It is of the form of an oblique angular parallelepipedon of $132\frac{1}{16}$ karats. Haüy thought it had been cut and polished; but Satrin believed that only its natural faces were polished, and that the form of the primitive crystal was not altered. This is the most probable view, for no lapidary of even ordinary skill would select the rhomboidal form for so beautiful and valuable a gem. This remarkable gem, without defects, notwithstanding its great size, was found in Bengal by a poor wooden-spoon maker. It finally was acquired by Rospoli, of Rome, but was purchased for the French Crown after several vicissitudes. It was obtained at the price of 170,000 francs, which price is certainly below its true value. France also possesses several other superb sapphires of large size.

There is also in Dresden a fine sapphire, a gift from Peter the Great.

There was in the ancient Hungarian crown a fine large sapphire, surrounded with four oblong green gems, the nature of which has not yet been made known. These mysterious green stones, rendered still more interesting by the disappearance of the crown, are perhaps of modern introduction, as they are not mentioned in the inventory of the jewel when Queen Elizabeth pledged it to the Emperor Frederick IV. Hence the inquiry arises, are they green sapphires, emeralds, tourmalines, or antique glass?

In the Universal Exhibition at London, in 1855, two immense and beautiful sapphires were displayed among the collection of gems and jewels which had been gathered from all parts of the world; they belonged to Miss Burdett Coutts, and were valued at nearly \$200,000. At the same exhibition might have been seen a beautiful oval sapphire, and another in the form of a drop, and of very unusual size and beauty, belonging to a rich Russian countess.

The Imperial Crown of the First Order of the Czar of Russia contains an enormous blue sapphire of great beauty and value. The Russian treasury also possesses some others of great size and rare beauty. Among them is the famous light-blue stone which formerly belonged to the cabinet of the English banker, the late Mr. Hope. There is also a very large and celebrated sapphire, said to be of marvellous beauty in the Vienna Kronenschatze. Most of

the treasuries and regalias of Europe contain fine sapphires of value and beauty. Among the Crown jewels of France, there are two superb gems of twenty-seven karats each, one of nineteen karats, and about a dozen ranging in weight from nine to thirteen karats each.

The Hindoos took great pleasure in carving images of their idols, and in making grotesque forms as well as talismans, from the precious stones found in their country; and very many examples are shown to the traveller. The sapphire was often chosen for this purpose; and neither its excessive hardness nor its high price offered any serious obstacles to the determined votary or the superstitious grandee. There is a statuette of Buddha, one inch in height, carved by the Hindoos out of a perfect sapphire, in the British Museum, which came from the sack of India. One of the richest reliquaries of any age or any country is the golden case at Kandy in Ceylon, which contains a tooth of Buddha, but which the naturalists declare to be the tooth of a monkey. Never was fancied sanctity so dearly enshrined. The dental specimen is enclosed in five golden cases fitting each other *en suite* and incrustated with the finest rubies, sapphires, and other gems Ceylon and India has afforded.

Philostratus describes a chamber in the ancient Royal Palace of the Parthians at Babylon as follows: "It has a roof fashioned into a vault like the heaven, composed entirely of sapphires, which are the bluest

of stones, and resemble the sky in color. This is the chamber in which the King delivers his judgment." The Asiatics, in all periods of their semi-civilized history, made a lavish use of this gem in the decorations of their dwellings and their temples. Even the partial ruins of some of these edifices still to be seen in various parts of India, exhibit great beauty in their impaired mosaics of precious stones.

The red sapphire is known in commerce as the Oriental ruby, and when in perfection is the most magnificent of gems, and is rarely approached in the beauty of its gorgeous hue by any other gem. The term ruby is an indefinite one, and refers to any stone of a rich red color. All these gems were classed together in the time of Pliny, under the generic name of "carbunculus," but the red sapphire was reckoned a variety, and especially referred to under the name of "lychnis." It is seldom found exceeding three karats in weight, and the distinguished mineralogist, Beudant, declares that a perfect red sapphire of thirty troy grains is unknown, and would be of inestimable value. It is a singular fact that while the blue variety should occur in masses and crystals of even several ounces in weight, the red is rare even at four karats. Modern mineralogists now maintain that all of the large historic rubies are spinels, but it is within the bounds of possibility that large red sapphires do occur sometimes as exceptions to an apparently rigid rule; for we have lately received from the Ceylon mines a transparent crystal of pink

color which weighs two hundred and forty-one karats. It is also stated that the King of Arrakan possesses two magnificent prisms of one and a half inches in length and an inch in diameter.

But of all the fine red sapphires which are known and proved, there are but few above five karats. The largest one of which we have any definite knowledge is the beautiful gem set in the Toison d'Or of the French Regalia, and which weighs $8\frac{3}{16}$ karats (=26 grains troy). The inventory of the French gems in 1791 justly illustrates the comparative rarity and diminutive size of the stone; for in this splendid collection, which had accumulated during a long period of time, and was then the richest in Europe, there were but four red sapphires above five karats, and only five above four karats. This variety is singularly liable to imperfections, and far more so than either the blue or the yellow. It is rare to find a ruby of the pure and characteristic pigeons'-blood tint that does not in some degree exhibit silky and opalescent fibres. This defect, which generally appears as a milkiness in the interior of the gem, is due to minute crystals dispersed throughout the stone, and which become apparent when the mineral is viewed parallel to the primitive axis of the crystal. Hence, in cutting the rough stone, considerable care must be exercised by the lapidary, so as to shape the gem and render its opalescence invisible. Rubies of exquisite color are often rendered comparatively valueless on account of fibres, clouds, and

chalcedony-like bands. All the red sapphires, however, are not affected in this way. The blood-red are much more liable than those which have a tinge of blue. We have examined a number of red sapphires perceptibly tinted with violet, which were completely free from internal defects. This opalescence is never possessed by the spinel, and is therefore one of the distinguishing marks in testing the nature of the red gems. The red tourmaline is also strangely liable to internal fibres, hollow threads, clouds, and longitudinal streaks, and sometimes presents an appearance similar to that of the ruby. The red sapphire is also distinguished from the other varieties by being decidedly heavier, and also by being softer than the deep-blue.

Ceylon is famous for the abundance of blue sapphires, while the red variety is comparatively rare. In Burmah, however, the red variety is the most abundant and of the finest hue. The Ceylon rubies are regarded as inferior in tint to those found in Ava and Pegu of the Burmese Empire; but they are less inclined to be opalescent, and are therefore more brilliant. The violet tinge of the Ceylon rubies lessens their beauty when viewed by daylight; but it disappears in a great measure by artificial light, and the hue then becomes of a fine prismatic red, accompanied by the most vivid lustre; therefore we may say in general terms that the Burmese rubies are the most beautiful by daylight, and that the Ceylonese are superior by night.

The finest mines of rubies in the world are near the Capelan Mountains in Ava. But concerning their extent, history, and exploration, very little is known. Colonel Symes, who visited the country in 1795, with the British Embassy, stated that the richest and most valuable of the mines were then situated in the vicinity of the capital; but that there were many other mines in various parts of the kingdom. The information concerning these remarkable deposits is vague and uncertain even at the present day; but sufficient is known to establish the fact that the geological formation is very similar to the gem beds of Ceylon and Lower Bengal. According to the publications of the Asiatic Society of Bengal, the principal mines of Burmah are situated about seventy miles east of the capital; and the deposits are discovered by sinking pits at various depths in the earth until the gem stratum is reached. It appears to be precisely like the conglomerate of Ceylon, and occurs at a depth varying from two to forty feet below the surface.

It is stated that all of the fine gems above a certain weight are monopolized by the king, who styles himself "Lord of the rubies," and consequently but very few find their way to the marts of other nations. It is also stated that the gems are polished at Amarapoora, where there are about twenty lapidary establishments; and that pulverized blue sapphire, or the massive corundum spar, which is a trifle harder than the red variety, is used

as the abrading material. All of the mines are jealously guarded from the visits of Europeans; and when Professor Oldham was allowed to examine some of them in 1855, he could learn of but one European who had previously seen them. This favored person was a deserter from the British army, and was employed by the king as superintendent of the mines.

This gem is so highly prized in Burmah that when a fine gem is discovered a procession is formed of grandees, elephants, and soldiers, and sent out to meet it and escort it to the royal treasury. The long and exclusive possession of these mines has enriched the Crown immensely; but nothing is known with certainty. Colonel Symes, however, saw some of the state carriages of the King of Ava, which were splendidly decorated with jewels. One of these carriages was a magnificent and singular production of art. Its decorations were so profuse and contained so many precious stones set in silver and gold, that it presented one entire blaze of the most brilliant colors. A vast variety of gems were used in the construction of this truly Oriental vehicle; and among them were to be seen diamonds, rubies, white and blue sapphires, emeralds, amethysts, garnets, topazes, and crystals of all kinds. Another of these queer barbaric monuments of art was lately exhibited at Rangoon. It is known as the Royal Hitee. This grotesque piece of architecture, with fantastic name, is a light edifice thirty-five feet high,

formed of seven terraces, surmounted by an umbrella, which is the emblem of royalty. The terraces were richly inlaid with gold and precious stones; and the sacred umbrella was profusely decorated with valuable rubies, pearls, diamonds, and emeralds.

Rambusson has recently stated that none of the mines yielding rubies have been worked for one hundred and fifty years; and that all of the gems now offered in commerce have been collected previously. We think this author is somewhat mistaken in this statement; for we know that the Ceylon gem-deposit yields more of these gems at the present time than for a long time past; and we do not quite believe that search for them has been entirely suspended in Siam or in Burmah. During the last years of the occupation of Ceylon by the Dutch, they exacted from the tribes of the interior of the island an annual tribute in the form of a certain quantity of precious stones. Hence the King of Kandy forbade further exploration for gems by the natives; and so the gem-fields lay neglected for a long time. Lately, however, under the English rule, the ancient fondness for gem-mining has revived among the Cingalese, and some fine gems have been discovered. In 1875 a native hunter found in a remote district of Siam some remarkable mines of red and blue sapphires; and explorations brought to light many valuable stones, which found their way to the gem marts of Rangoon and Calcutta. Splendid specimens were shown to Admiral

Coote; and the consul at Bangkok saw a magnificent stone of three hundred and seventy karats, which yielded a blue gem of one hundred and eleven karats weight, and of the finest water.

Rubies are even now scarce in India, and probably always will be, since the demand for them is very great among the wealthy of the populous nations of that country. Even three centuries ago Tavernier found it profitable to buy them in Europe and sell them again in the country whence they had been taken perhaps many centuries before. Red sapphires not only exhibit singular internal structures, but they may be colored strangely, thus puzzling the experimentalist to account for the distribution of coloring matter. Davila possessed a fine and rare ruby which exhibited a clear white band between two parts of red. Another gem showing a strange arrangement of color was to be seen in the cabinet of Chantilly. It was half red and half yellow. Stones of such distribution of color are marvels of rarity; but it is quite common to meet with them partly red and blue or white, or blue and yellow. They sometimes display a vague dichroism which is not so well defined as in the iolite or tourmaline. The naturalist Fanzas found at Expailly, in France, a transparent sapphire which, viewed in one direction, exhibited a green hue approaching the emerald in its beauty of tint, but when seen in another light it appeared of a very beautiful blue. In the Orleans collection there was a curious sapphire which had been engraved with the

figure of a woman, the head being formed of white, and the dress of intense blue. It is related that M. Bossi, of Milan, who was an excellent connoisseur in gems, saw in possession of Prince Metsch a superb sapphire which appeared to be dotted with flakes of gold. We sometimes notice this singular appearance in the interior of other gems, and find by the use of the microscope that it is due to internal flaws or reflections from plate-like crystals within the stone. We are inclined to believe that this gem of Prince Metsch is to be classed with the sapphire owned by Abbé Pullini, which had been engraved upon by the ancients. This stone, when viewed in a certain direction, exhibited flakes of gold in the interior, which disappeared when the view was changed, which would hardly have been the case if the reflections had been produced by opaque bodies. We have before us a polished Siberian beryl which shows flakes of silver-white in certain lights, but which appear of dark-brown when the axis of vision is changed.

The Crown of England possesses some large and beautiful colored rubies, but they are probably spinels. The large one standing in the centre of the Maltese cross on top of the British crown is probably a spinel, but nevertheless of great beauty. It is also a gem of considerable historic interest, if we can believe the traditions that cluster around it, and it is believed to be the identical stone given to the famous Black Prince of England, by King Pedro of Castile, after the battle of Najara. Tradition also

asserts that King Henry V. of England wore it in the front of his helmet, in the bloody battle of Agincourt, about a hundred years later. Its earlier history seems to be lost. Perhaps this is the identical ruby given in 1360 to Rudolph II. of Austria by the Queen Dowager of France. When Peter the Great visited England he gave one of the members of the royal family a very beautiful ruby which he carelessly took from his vest pocket. The last message sent by Mary, Queen of Scots, before execution to the Duke of Guise was accompanied with a beautiful ruby ring, as proof of the credibility of the messenger.

The King of Burmah is said to possess an immense ruby of wonderful beauty, of the size of a pigeon's egg, but there is no authentic record of it. Tavernier mentions a ruby of 50 karats and another of $17\frac{1}{2}$ karats, which he saw in possession of the King of Visapour; but as all gems of fine red color were then classed as rubies, we are ignorant of their nature. Among the numerous articles of loot obtained by the French in the sack of the Summer Palace at Peking, was the necklace of the Emperor of China. This celestial jewel was formed of green jade stones of delicate color, perforated and strung upon a cord, to the centre of which was attached a monster red stone, of the nature of which we are not informed. It has been stated that the East India Company has the largest specimen of red sapphire known, but we are unable to vouch for the statement. The largest ruby seen in India by Garcia was of twenty-four karats

weight. Chardin, however, describes a magnificent one among the crown jewels of Persia, in the year 1666. This matchless gem was as large as a hen's egg cut in half, and was of superb color. On its superior face the name of "Chaic Sophy" had been engraved by one of its former possessors.

The Crown of Russia possesses the finest and most valuable collection of rubies in the civilized world. Some of them are of enormous size and are probably spinels, but they are nevertheless of great beauty and value. The degree of color gives the true value to the gem, no matter what its composition may be, if its hardness is equal to quartz. Among the red gems of lesser size there are undoubtedly red sapphires of value, but we have no positive details concerning them. In fact, all of the red stones of fine hues are classed as rubies without regard to their nature. The famous ruby placed under the cross in the Russian crown of Anna Ivanovna is said to have been bought at Peking by the Russian ambassador for 120,000 roubles. It is indeed a wonderful gem, and is one of the marvels of the mineral world, whether its material be corundum, tourmaline, or spinel. It is now known that the Chinese have mines of rubies in the mountains of the Province of Yu-Nan, and it is possible that this gem may have come from that locality. The tourmaline deposits of Nertschinsk, which yield gems of splendid red hues, are not far distant from Peking, and those mines may claim the honor of producing this rare stone.

The throne of gold, called by the Persians *Takdis*, was supported on feet formed of rubies. One of the seal rings of Chosroes II. was a pink ruby, with the legend engraved upon it, "Riches are the source of prosperity." The fifth seal ring was a red ruby, bearing the legend, "Splendor and prosperity."

The flowers, composed of the finest gems afforded by the mines of India, and placed by Shah Jehan on the tomb of his beautiful wife, in that wonderful mausoleum, the *Taj Mahal*, were the most precious ever made. The roses of these garlands were made of the finest rubies; and the leaves were composed of emeralds, which were made to glisten with diamond spray. The screen which was built around the tomb was carved from marble, and as delicately wrought as a veil of lace; and along its borders, lilies, tulips, roses, and other beautiful flowers, composed of precious stones, were inlaid in the marble.

The tomb of Mahomet, at Medina, must contain some superb gems and works of the goldsmith's art. Here is to be seen that masterpiece of embroidery, the veil of *Kunderas*, which is composed of inwrought pearls and various precious stones of the value of ten millions of rupees. The faithful relate, that when the rays of the morning sun glance over it, its wonderful beauty seems enhanced by invisible influences. The famous sympathetic ruby of the sacred *Kaaba*, now preserved in the temple at Mecca, and believed to have fallen from the heavens at the beginning of the world, is undoubt-

edly an aerolite. The fiery red hue which it exhibited when traversing the sky, coming from unknown space, gave rise to the tradition of its being a latent ruby whose gleams of beauty had been temporarily suspended.

The yellow variety of sapphire is quite common, and exhibits many of the finest shades of yellow; but they are generally very faint in tint and often like the lemon in hue. They are exceedingly liable to imperfections, and especially to that opalescence which so often disfigures the red sapphire. Fine specimens, therefore, possessing transparency and beauty of color, are rare gems. But when it does occur in perfection, it forms a magnificent gem, which is only surpassed by the yellow diamond and zircon. Its rich golden hues, with soft and satin-like flashes, are far superior to the Brazilian topaz.

The Museum of Natural History in Paris possesses one of the finest yellow sapphires known. It is a wonderfully lustrous gem of fine color, and measures nearly an inch in length by half an inch in breadth. There is also in the same cabinet a strange gem which was once placed among the crown jewels of France. It was mentioned in the famous inventory of 1791, as a singular corundum of $19\frac{2}{16}$ karats weight, and of 6,000 francs value. It had been polished in the form of an elongated oval, and exhibited the remarkable appearance of being deep-blue at the extremities and yellow in the

centre. This singular distribution of color is not often seen in fine specimens, although it is frequently met with among the inferior. We have also had the pleasure of examining another large gem, cut into the form of a brilliant, whose diagonal corners were blue and yellow, and yet, such was its play of dichroism, that light reflected through these two colors produced but a faint tinge of green.

This double arrangement of coloring is sometimes seen with blue and red sapphires, or yellow, blue, and white; but we have learned of but one fine gem displaying the red and yellow. Several of the transparent crystals from North Carolina exhibit the two hues in the same crystal; and we have seen one that was actually red, yellow, white, and blue. But the specimen was not sufficiently perfect to form a gem. Sometimes the yellow hues are of a greenish cast, and then they resemble the finest of the golden chrysoberyls, or they may approach the more verdant shade of the peridot. It is said by the antiquaries that none of the collections of ancient Greek and Roman engraved gems possess a single specimen in yellow sapphire. This singular absence may be partly accounted for by its rarity in perfection, and also from its liability to appear pale when set in gold.

In the French casket of gems, in the year 1791, mention was made of a superb yellow sapphire of $27\frac{1}{6}$ karats, two of 13 karats each, and one of 11 karats, all of which were valued at 8,900 francs.

The beautiful specimen now exhibited in the Cabinet of Minerals, in the Garden of Plants at Paris, which is of the purest and richest color, joined with wonderful lustre, is supposed to be the gem mentioned above among the crown jewels. The French amateur and writer on gems, Caire, once possessed a remarkable and charming yellow sapphire of the great weight of twenty-nine karats. Its former Hindoo owner had seriously impaired its beauty by drilling a hole in one extremity for the purpose of suspension; and had also engraved on its sides inscriptions in Arabic, which were probably condensed quotations from the Koran to preserve the possessor from harm.

The green variety is probably the rarest of all the forms of sapphire, and finely tinted stones are very seldom seen. They are generally of a faint sea-green tinge, and resemble beryls in their hues. But when they do occur of grass-green color, they form magnificent gems and far exceed the true emerald in lustre and brilliancy. We very much doubt, however, if they ever approach the emerald in its exquisite shade of green. We have examined many green stones from the Ceylon gem mines, and with one exception have found them to be green spinels, zircons, and tourmalines of various intensities of shade. The one undoubted specimen referred to was of an impure hue. The celebrated Romè de L'Isle possessed two beautiful crystals of green sapphire. When they display the sea-green hue or the mountain-blue of

the beryl, they are then called Oriental aqua-marines, but fine stones of this description are not common. We have seen some small but very beautifully tinted gems of this class from the gold fields of Montana. Barbot speaks with ecstasy of two green sapphires from Matura in Ceylon, and which far exceeded any other gem in their velvety color, limpidity, and brilliancy. It is possible that these two gems may have been zircons, as these stones abound in Matura, and are of the most vivid lustre when perfect. But stones of fine green hues of this mineral are exceedingly rare. We have also seen a specimen of transparent corundum from Siam which was dichroite, blue and green one way, and entirely green the other. It called to mind that found at Expailly in France, by the naturalist Fanjas, and which appeared of an almost emerald green when viewed in one direction, or of a most beautiful blue when the axis of vision was changed.

The name girasole is applied to those gems that exhibit a peculiar radiance when exposed to the sunbeams. This curious play of light is seen in the transparent and translucent stones, but especially in the translucent. When the gem which possesses this quality is cut in the boss form it shows a glimmering light brighter at one part than at another, owing to a peculiar internal refraction. The effect is very beautiful when the gem is of fine color, and the bright spot moves mysteriously over a more sombre ground as the stone is turned in various di-

rections. The sapphire rarely shows this property to the same perfection exhibited by one of the varieties of opal. We have seen two specimens from the North Carolina corundum mines, which would have been very superior gems if they had not been traversed in all directions by numerous cleavage planes. They were quite an inch in diameter, of a nodular form, and had been deposited in a ledge of ripidolite.

One of the most remarkable varieties of the sapphire is known as the *asteria*, which was so named by Pliny from the fact of its displaying diverging rays of light. This phenomenon is only seen in stones of semi-opacity or inferior clearness, and the star-like rays are so arranged as to be inclined to each other at an angle of 60 degrees. These stones may be of various colors, — blue, red, or gray, — yet the rays of the star are always white or faintly tinged, and stream forth in beautiful contrast to a ground of delicate blue or decided red. The stars appear the most distinctly to view when the polished gem is exposed to direct sunlight or a small bright flame. This mysterious play is seen in but few of the gems, and the sapphire exhibits it in its greatest perfection. It is indeed a curious thing to see a six-rayed star with long silken beams of light suddenly appear to view as the gem is turned to the light, and as quickly disappear as the focus is changed. No wonder the ancients believed the appearance due to supernatural powers. The microscope, however, has disclosed to the moderns the cause of the asterism. This instru-

ment reveals multitudes of minute crystals within the stone, arranged in three different but equal angles. To obtain the stellate appearance in perfection, then, the stone must be cut and polished in cabochon or dome-like form. The apex of the gem is then in a direct plane to these angles, being perpendicular to the axis of the primitive form of the crystal, and therefore the rays of light are reflected from the sides of these multitudinous crystals producing the asterism.

As we have said before, some other minerals exhibit this phenomenon at times. We find it in rare specimens of quartz and in some of the mica group. In some rare fragments of quartz from Siberia the stellate appearance is seen in extraordinary perfection. The six-rayed star is not only seen by refracted light, but is even visible by transmitted light. Sometimes these stones also exhibit reflections of red and blue as the direction of the stone is changed, thus combining the girasole and asteria in the same gem. Lancon relates that M. Desmaret possessed a little plate of this variety of quartz, of so great beauty and perfection as to refuse 25,000 francs for it. There is in the Museum of the Jardin des Plantes a remarkable diamond asteria; and there are also in this collection and in the cabinet of the *École des Mines* some superb blue and red sapphire asterias.

The pure white sapphires are not often found. When well cut they exhibit a vivid éclat, and are sometimes mistaken for diamonds; but they are

easily detected by the expert, since they do not possess even three fourths of the degree of brilliancy of the diamond, nor the prismatic play of color. Some of the faint-colored stones lose their tints when subjected to a high degree of heat, and improve in brilliancy and lustre. It is said that the Orientals practise this trick extensively, and sell the altered gems for diamonds. We are not aware of the refractive index of these fire-tested stones having been measured with the view of ascertaining the degree of change; but it is certain that their lustre is increased in a marked degree. Heat, however, does not affect all colored sapphires. Some of the red are often changed to deeper hues, and others are not affected. Brogniart found that the French sapphires from Expailly were actually rendered more intense in color by the action of fire. After numerous experiments with the faint-colored sapphires from Montana, we also have come to the conclusion that the stones from this locality are not perceptibly affected by long-continued heat.

Sir David Brewster, in conducting his famous experiments in optics, was of the opinion that the white sapphire, on account of its structure and its refractive power, was superior to all other transparent minerals for lenses for the microscope. The diamond, which one would naturally suppose to be the most perfect material for the purpose, on account of its high refractive power and apparent clearness, is really faulty, and comparatively worthless on account of its internal

structure. If the white sapphire is of such excellence in this respect, on account of its compactness and refractive power, why will not the white zircon prove far superior as a lens, as it is the most compact, transparent, hard mineral known, and its refractive power is much greater than that of the sapphire? Black sapphires are now and then mentioned by authors, but we are inclined to believe that they are very rare; for Davy declares that he met with but two or three specimens in his travels in India or Ceylon. Blue stones of very deep hue appear sometimes quite black; but when they are placed in a strong light, and viewed in another direction, the blue tinge clearly appears. The violet sapphire of perfect hue is a very rare gem, and may be regarded as an accidental stone, being formed of an admixture of the blue and the red. Davy, in all his extended researches in Ceylon, found but two specimens of violet sapphire; and in our examinations of the rough gems from the mines, we are inclined to think the purple spinel is often supposed to be a purple sapphire. Romè de L'Isle found that this variety of sapphire is oftener ruby-violet than sapphire-violet, or that the red tinge prevailed more distinctly than the blue. The lilac-blue are exceedingly rare, and are eagerly sought for by amateurs.

There are some sapphires which exhibit a double play of colors when viewed by natural and then by artificial light. For instance, they may display a decided blue color by day and an amethystine tint

by night. D'Auguy possessed a stone that showed in the daylight a beautiful, clear, and sparkling blue, but by candlelight it changed to a royal purple. The cause of this phenomenon is perhaps due to an excess of latent red in the stone, which, however, is not visible in the daytime; but which is called forth by the difference in the illuminating lights, as is shown in their spectra. The hyacinth sapphire is seldom seen, and when perfect is regarded as among the marvels of the species. Dutens possessed a fine one which had been engraved upon by the Greeks.

The subject of the glyptic art, or engraving upon stones, is very interesting to the student who seeks for evidences and traces of the social life of man in early ages. The engraved cylinders of Babylon and Nineveh, with their cuneiform legends, carry us back to traditions two thousand years before the Christian era; and from the engraved scarabei of Egypt and Etruria we form some ideas of the people whose history has otherwise been lost. We may, perhaps, consider the true era of the glyptic art as dating from the time of the Macedonian princes and the Persian conquests, although it had been practised in a rude way from far earlier times. This art of cutting figures upon bright and richly colored, though minute stones, was quite as much admired among the ancients as the laborious skill, with its powerful blows, which produced the heroic statues out of bronze or marble. And perhaps we may say that these gems, in their estimation, were of greater value, not only on account

of their beauty and rarity and their minuteness, but also on account of their hardness, which defied the steel instruments of the ordinary sculptor, and yielded only to the dust and splinters of the hardest minerals, like the sapphire and the diamond. We may also safely affirm that the gem-engravers of the Alexandrian and Augustan ages were, in all that concerns excellence of design and composition, rivals of the most famous workers in marble and bronze. These admirable and wonderful artists contrived to enclose within the narrow limit of a little stone all the complicated details of an event in history, or of a fable in mythology; and to make them stand forth in beautiful relief as a cameo, or to sink them down as an intaglio, with all that truth of design and power of expression which characterize the excellence of the largest works of the most consummate masters.

By means of these engraved gems, miniature but accurate copies of some of the celebrated masterpieces and noblest works of ancient sculptors have been preserved to us, while the originals have been destroyed, and even the record of them lost. An instance may be observed in the engraved gem in the Orleans cabinet, which is the only representation we now have of the famous statue of the *Repose of Hercules*, by Lysippus. As a learned critic has said, in these gems we have the emanations, ever fresh and unfaded, of the feelings and the taste of those ages when the love of the beautiful was the all-prevailing and almost sole religion, and flourished unfettered by

tradition, prejudice, and conventional rules; whilst from the universal demand during those same ages for engraved gems, whether for signets or for personal ornaments, artists of the highest ability did not disdain the narrow field of the precious stone as the arena for the exercise of their power. The unparalleled vigor and perfection of many of these performances are a sufficient proof that they proceeded directly from the master's hand, and were not mere slavish copies, by a mechanic, after designs created by the genius of another. The lovers of the fine arts may derive much benefit from the study of the antique in this particular branch of workmanship. What is there more pleasant than the contemplation of the work of the artists of antiquity; and to behold, shut up, as it were, within the narrow compass of a small gem, all the majesty of a vast design and a most elaborate performance? During the flourishing periods of the Greeks countless statues were carved by numerous artists; and it has been stated that Lysippus alone executed fifteen hundred, all perfect, and some of them colossal. Throughout Asia Minor, Greece, and Italy every town had its temple, gymnasium, or forum peopled with statues of those among her sons who had in any way distinguished themselves in arms, letters, or public games. These became the spoil of the later Romans, and an incredible number were transported to Rome from time to time. Nero is said to have selected from Delphos alone five hundred bronze statues for transportation to Rome. The

Etruscan bronzes were quite as plentiful; and Flaccus is said to have carried away in triumph two thousand statues from the sack of Volsinii.

From these statements in ancient history concerning the number of large works in statuary, we can form some idea of the inexhaustible treasury of portraiture in another and oftentimes less costly material. It is estimated that for a period of three hundred years, the engraved gems were manufactured in countless numbers all over the Roman world. It is a little curious that licentious scenes and figures are never or rarely found on antique gems.

Among the gems preserved in the museum of the Vatican may be seen two engraved intaglios of early date, upon sapphires of an amethystine hue. Among the most beautiful of the engraved sapphires that have been preserved to us from ancient times is that of Cneus, now placed in the cabinet of the Strozzi, in Italy, which represents the figure of young Hercules. In the collection of gems at Turin there is a white sapphire, on which a fine head of Tiberius has been engraved. There may be seen among the crown jewels of Russia a beautiful sapphire of two shades, engraved with a representation of a female figure enveloped in drapery. The figure is engraved in the darker shade of the stone, while the drapery is carved from the lighter part. The French cabinet boasts of a very fine blue sapphire with an engraving representing the Emperor Pertinax.

King, the excellent and tireless antiquary, mentions, in his chapter on the hyacinthus, several beautiful and unique engraved sapphires. He states that engraved gems of this class, dating to times previous to the Imperial epoch, are extremely rare; still, there are extant some undoubted specimens, among which are a small Etruscan scarabeus and a magnificent head of Jupiter, executed in the purest Greek style. The accidental discovery of the last indicates how many more of the fine gems of antiquity may yet appear in course of time to gladden the lovers of the glyptic art. This gem was an inch in diameter, and of fine color; but to utilize it to the wants of the Turkish possessor, who wished to set it in the handle of his dagger, the engraved side was set downward and thus preserved from injury, while the back of the stone was rudely faceted by some Eastern lapidary. A Medusa's head of the same style of execution, upon a stone of remarkable beauty, is one of the chief glories of the celebrated Marlborough collection. In the same museum there is another larger and deeper-hued sapphire bearing the head of Caracalla, the short, curly hair of the irascible tyrant being represented by a series of minute holes closely drilled together. One of the most famous of all engraved gems of this material is the signet ring of Constantius. The stone is one of great beauty and perfection, and weighs fifty-three karats. Its engraving represents the Emperor as spearing a monstrous wild boar before a

reclining female figure, personifying Cæsarea of Cappadocia, the scene of exploit. It bears an inscription in proof of its royal use,—the letters “Constantivs Avg.” King mentions another fine specimen of the time of Hadrian, representing “Hebe feeding the eagle.” It was heart-shaped in form, of fine color, and quite an inch and a half in diameter.

The museums of Europe contain many examples of mediæval and modern engraved sapphires, one of the finest of which is the famous portrait of Pope Paul III. among the Pulsky gems, and attributed to Il Greco. It is a very beautiful stone, and three quarters of an inch square. In the Marlborough cabinet there is an extraordinary specimen of a thumb ring of high antiquity, cut from a single stone, but of rather a pale tint. Rings containing both plain and engraved sapphires have been the appointed symbol of church authority from a very early day. They have often been bestowed as the badge of pontifical rank, and the custom has descended to the present day. King devotes an interesting chapter to the history and description of this class of ornaments and symbols; and to his pages we must refer the interested reader.

Engraved red sapphires of ancient date are extremely rare, so rare that the experienced antiquaries, Lessing and Clarac, deny the existence of any antique intaglios of this variety. Investigation has proved that many of the supposed engraved rubies are really red spinel, garnet, or zircon. Neverthe-

less, there are a few examples to prove that the ancients did make use of the gem in the glyptic art, although the act was regarded as one of extreme extravagance, from the rarity, costliness, and beauty of the material. The Devonshire parure exhibits a convex red sapphire of about three karats weight, of pure pigeons'-blood tint, and engraved with a Venus Victrix in the latest Roman manner. Another shows a full-length figure of Osiris, in half-relief, of the time of Hadrian. In the museum of the Jardin des Plantes there are said to be two engraved red sapphires.

There are but few gems with which the blue sapphire can be confounded. The blue diamond can be easily detected by its superior brilliancy and hardness. It is very rare that the tourmaline appears of a deep blue, and still more rare for the topaz to assume the appearance except of the very light varieties, and the same may be said of the beryl. The iolite, which, however, is a very rare mineral, may resemble the blue sapphire, but its inevitable dichroism betrays its character. Turn the gem before the eye, and the deception vanishes; the blue disappears as if by magic, and the stone is gray. Kyanite sometimes appears of the most beautiful blue tints, but its softness indicates its nature, and prevents its use as a gem. The glass-workers, however, produce the most beautiful and attractive imitations of sapphire, and of all colors, lacking but one desideratum, and that is the thus far unattainable degree of hardness. The red,

green, yellow, and white varieties may all of them be closely approached in color by other gems, and the best methods of detection are the tests of specific gravity, degree of hardness, and the optical phenomena.

The blue variety of sapphire being less sought after in ornamentation than the diamond, has not had a fixed scale in valuation. Still, prior, or for a few years prior, to 1850, the ordinary sapphire was placed by jewellers upon the same valuation as the emerald, or at about \$15 the karat. Since this period its value has quadrupled, but has not kept pace with that of the emerald. The pale-blue stones have only a nominal value, and the same may be said of the very dark blue. But those sapphires which exhibit the perfect tint of the prismatic blue can command very high prices.

The ancient Romans excelled in their imitations of the ruby, both in hardness, color, and lustre; and a number of examples are yet preserved in some of the European cabinets. The bold robber, Charles, the Duke of Burgundy, was the possessor of several famous gems which he carried with him on his campaigns, and used as personal decorations on particular occasions. One of the choicest of them was a monster ruby more than an inch in diameter, which the famous Margaret of Anjou had given him. On that fatal day at Grandson it was placed with the historic diamond in a golden box, and left in the tent of the Duke, where it was captured by the mountaineers. The gems were carried to Berne by the

victorious Swiss, and afterwards offered for sale to the rich Nuremberger, Jacob Fugger. Then it was discovered by the expert that the ruby was indeed a lump of red glass of ancient make, and probably of the date of the Roman Empire.

As the red sapphire is one of the rarest as well as the most beautiful of all gems, its value is in keeping with its attributes. As it overpowers all other gems with its gorgeous red, which is a pure prismatic hue, so it transcends all others in price. There are but very few gems with which it can be confounded in color. But no matter what the material may be, provided it displays the royal tint. It is extremely rare that the red tourmaline or spinel exhibit the perfect tint which is the characteristic of the red sapphire. The zircon sometimes displays a fine red color, and may imitate the sapphire. It is also within the range of possibilities that the diamond and garnet may closely resemble the true ruby. We have seen small garnets that exhibited the pigeons'-blood tint. The scarcity of the ruby is so great that fine gems are only to be acquired by the very wealthy. In the times of Cellini, three centuries ago, the price of the red sapphire was eight times that of the diamond. And to-day we may safely adopt Cellini's estimate, for the gem is so rare that we cannot readily compute its value in comparison with the diamond, which is so abundant.

King, in commenting upon the valuation of precious stones during the past three hundred years,

mentions two fine rubies which were sold in London recently for enormous sums of money. One of three karats brought \$1,500 ; while another of finer tint, of less than four karats (11 grains), was sold for \$5,500, or for \$500 a grain, which price is quite equal to Cellini's estimate made in the year 1560.

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