

# *Gems and Gemology*

SPRING 1955



See Inside Cover

# Gems & Gemology

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## IN THIS ISSUE

Recent Discovery of Fine Gem Tourmaline in Maine.....	131
<i>by B. M. Sbaub, Ph. D.</i>	
The Art of Gem Engraving.....	137
<i>by H. L. Richardson</i>	
A Coat-of-Arms .....	145
<i>by H. L. Richardson</i>	
Strontium Titanate .....	148
<i>by Richard T. Liddicoat, Jr., and G. Robert Crowningshield</i>	
Stichtite, An Ornamental Stone.....	149
<i>by Robert Webster, F.G.A.</i>	
Advantages in Recutting Star Stones. . .	151
<i>by John G. Ellison</i>	
Lattice Structure in Precious Opal .....	154
<i>by G. Frank Leechman, F.G.A.</i>	
Book Review .....	157

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## On the Cover

*A Cameo Portrait of  
Mr. A. Masters of Sid-  
ney, Australia. Engraved  
on Carnelian.*

*Size 18 x 21mm.*

*Photo G1A*

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# Recent Discovery of Fine Gem Tourmalines in Maine

by

B. M. SHAUB, Ph. D.

The story of the Maine tourmalines is one of interest to every mineralogist and gemologist. It begins in the year 1820, when two students, Elijah L. Hamlin and Ezekiel Holmes, made the original discovery of splendid tourmaline crystals in the town of Paris at the locality which became known as Mount Mica and which is today known to mineralogists and gemologists throughout the scientific world.

Mount Mica has long since given up its wonderful gems to the numerous individuals who worked the unusual mineral deposit intermittently for more than a century.

Within recent years the well-known and authentic Maine tourmalines of good quality have become very closely held in museums and private cabinets, to the extent that the present generation of mineral collectors and amateur lapidaries find it difficult to gain possession of gem tourmalines from this state

except at prices which to many people, often seem excessively high. However, when the supply of a material is exceedingly limited and the desire and pride of possession of enough individuals is sufficiently great for some particular natural product, the price usually advances sharply, especially during a period of inflation of more than two decades standing. There is no longer a general price level at which one can expect to acquire good quality tourmalines of unqualified Maine origin. Crystals that could be purchased a few decades ago for forty or fifty dollars are now prohibitively high priced to the average collector — if and when they are available.

It is interesting to note that the sustained interest in the famous Maine tourmalines has been caused by the relatively small quantity of gem quality specimens which has been found intermittently over periods of

several decades, and by the breaking up or dispersing of the contents of the older cabinets of Maine minerals by sale or other means.

The last three decades of operation of the pegmatite mines have been relatively lean years insofar as gem tourmalines are concerned. None of the mining operations in recent years have been carried on exclusively in search for gem minerals of any kind. The principal economic products are feldspar and mica. Only recently has a pegmatite been mined for beryl as an industrial mineral. In these mining ventures it is a rare occasion when exceptional gem quality tourmalines are found in any number. But the ever-present hope or expectation that another Mount Mica may someday appear and amply reward the discoverer for his efforts and untiring search for the elusive tourmaline — a highly prized by-product has been sufficient to sustain an enduring interest, and the miner is continually on the lookout for indications of the possible presence of this exceptionally fine gem mineral during his operations. Any operator of a sodium-lithium pegmatite has an equal chance of being another lucky discoverer of one or more gem tourmaline pockets.

The mining area which has produced the best and practically the only gem tourmalines in Maine is a relatively narrow zone near the southwestern border of the state extending from Auburn to Andover and West to New Hampshire. It is within this area that so many of the fine mineral specimens and gems have been found. The prospects of further discoveries are always fair to good depending on the demand for the usual commercial minerals present. The very high price for domestically mined mica has been a factor greatly favoring one of the more recent operations in the Maine pegmatites.

The story of the recent discovery of gem tourmalines began when Stanley L. Perham of West Paris, Maine, obtained a lease from a Mr. Benson and a Mrs. Brown to develop a mineral deposit on their properties near Nobles Corner, in the town of Norway, for

the recovery of mica, which gave indications of being of sufficient abundance and quality to warrant an attempt to mine it commercially. It appeared that the operations could be conducted as an open pit mine without much preparatory work other than removing some topsoil with a bulldozer. This work was started in 1952 by the T.C. Mining Company, an organization controlled by Mr. Perham and his associates. The site of the immediate operations for the mica was called the B.B. Mine from the initials of the lessors.

As operations got under way and considerable mica was obtained, it was discovered that the mineral pollucite was present and associated with cleavelandite. The latter mineral occurred abundantly but in relatively small blades or grains. The combination of small-grained minerals prohibited the separation of the pollucite by hand sorting. Moreover, while pollucite is a rare and often valuable mineral for some industrial purposes, the present market is quite unfavorable for recovering the mineral when it is disseminated with the feldspar.

In the search for pollucite by mineralogists and mineral collectors, a guide for its discovery consists of its known association with clear, transparent beryl (goshenite); spodumene; lepidolite; cassiterite; cleavelandite; transparent colorless, colored, or color-zoned tourmalines; smoky quartz; muscovite; often columbite and some microcline. Black or very dark blue tourmalines are also present but they are often scattered throughout the mass of the pegmatites. Since most of the minerals usually associated with colored tourmalines, especially the pollucite, were present in the mine operated by Mr. Perham, it was to be expected that at least an occasional colored tourmaline might be present. However, in the initial pits to be worked the grain of the pegmatite was small, and the cavities or the porous, powdery and clayey material in which the fine tourmalines might occur were absent; also, the muscovite was in rather small "books"

and not too well separated from the associated minerals to yield the larger and more valuable cleavage sheets.

Consequently, in the spring of 1954 the mining operations were moved along the pegmatite about 75 yards to a place where the surface showings, after the soil was removed, indicated a more favorable site for commercial muscovite. This site is the B.B. No. 7 pit.

During the summer, as the mining operations progressed in the new location, it became more and more likely that some of the rarer minerals might be encountered, since the common pegmatite minerals were coarser grained and the presence of purple lepidolite was occasionally noted. It was not until Friday, August 13th, that the first small pocket of green tourmalines was found, and it was then definitely established that the pegmatite was of the proper makeup to yield colored gem tourmalines. The unknown factors, quantity and quality, had yet to be determined. From the time of the discovery the work progressed very slowly, because only light charges of dynamite in shallow holes could be used without endang-

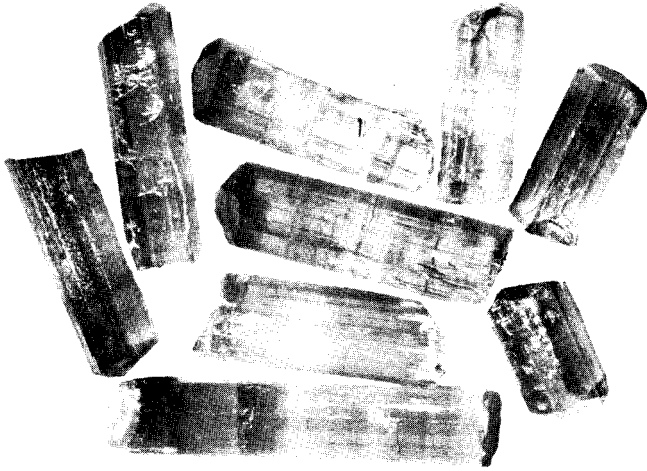
ering any gem crystals in the vicinity. The location of a pocket could not be readily predetermined; only the specialized mineralized zone was evident. But the apparent edges of the zone served as a guide and as the limit for locating the blasting sites. Nearly two weeks were spent in excavating the crystal pockets with the utmost care to avoid any unnecessary breakage of the gem material. Much of this phase of removing the crystals had to be done slowly with hand tools.

The zone in which the gem-bearing material occurred was divided into tourmaline-bearing sections and/or pockets by large rounded masses of cleavelandite. The bulk of the matrix material consisted of a very porous and friable mass made up of a mixture of albite, cookeite, and quartz. The pockets in each section were filled with clay, loose pieces of quartz and feldspar, as well as lepidolite, cleavelandite, and cookeite.

After the cavity or pocket material containing the tourmaline was removed from the mine, it was softened by the addition of water. From this material the tourmaline crystals were readily removed. The softening



Tourmaline Removed from the No. 7 Pit of the B.B. Mine.  
14,000 Carats.



**Gem Quality Tourmaline Which is to be Fashioned into Gems.  
5,000 Carats.**

was effected quickly so that the tourmaline crystals, even those that were completely surrounded by the matrix, could be tipped out easily within a few minutes. Many of the crystals contained adhering claylike material which filled the vertical striations. Most of the crystals were recovered from the matrix without additional breakage; however, many had been broken across the prism by natural forces before the mining operations had opened the pockets.

It should be noted here that the splendid tourmaline crystals from Mount Mica were usually obtained in sections, many of which were restored. Most of the splendid illustrations reproduced in "The History of Mount Mica," by A. C. Hamlin (published privately in 1895), were drawn and colored from restored crystals. The crystals from Mount Mica were broken across by natural circumstances before they were encountered in mining and before they were removed from the matrix or clay in the pocket or cavities.

In the No. 7 pit of the B.B. Mine about

14,000 carats of gem variety tourmalines were removed from the pockets (Fig. 1). Of this amount there were 5,000 carats of the larger crystals (Fig. 2) and 3,000 carats of the smaller ones that will cut fine gems. About 4,000 carats, consisting of bluish indicolite, will produce cabochon gems and possibly some faceted stones. The remaining 2,000 carats, although of gem variety, are of questionable quality for any type of cutting and will be of value mostly for specimen material.

Many of the better crystals were terminated, although in all cases observed the terminal faces were etched and dull. The prism faces were characteristically striated parallel to the vertical axis. They also showed a general trigonal cross section, a form which is well adapted to the cutting of step- or square-cut gems.

The crystals do not, in general, show marked zoning. They are of a fine bluish-green color normal to the  $c$  axis with occasional slightly darker color zones, which are

barely noticeable when handling the gems unless one is especially looking for the slightest color variations. When viewed in the direction of the unique axis, the pleochroic color is a yellowish to brownish-green. Most of the crystals are sufficiently transparent in this direction to produce gems of this color.

Nevertheless, the bluish-green color perpendicular to the prism faces is by far the more pleasing color, and in these tourmalines it is of an excellent quality.

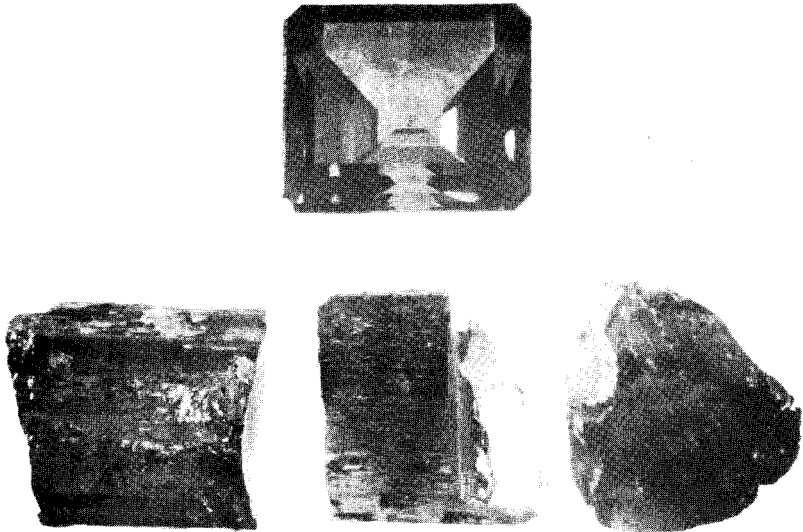
The largest crystal of gem quality weighed 137.47 carats and was of a very fine color. It was broken in two sections when found. From this crystal (Fig. 3) the following gems were obtained; two superb square-cut stones of 23.67 and 10.91 carats, a triangular stone of 6.77 carats, and a small navette of 1.78 carats. The terminal part of the crystal contained a large imperfection. Had it not been for this imperfection, larger stones could have been obtained

from the crystal.

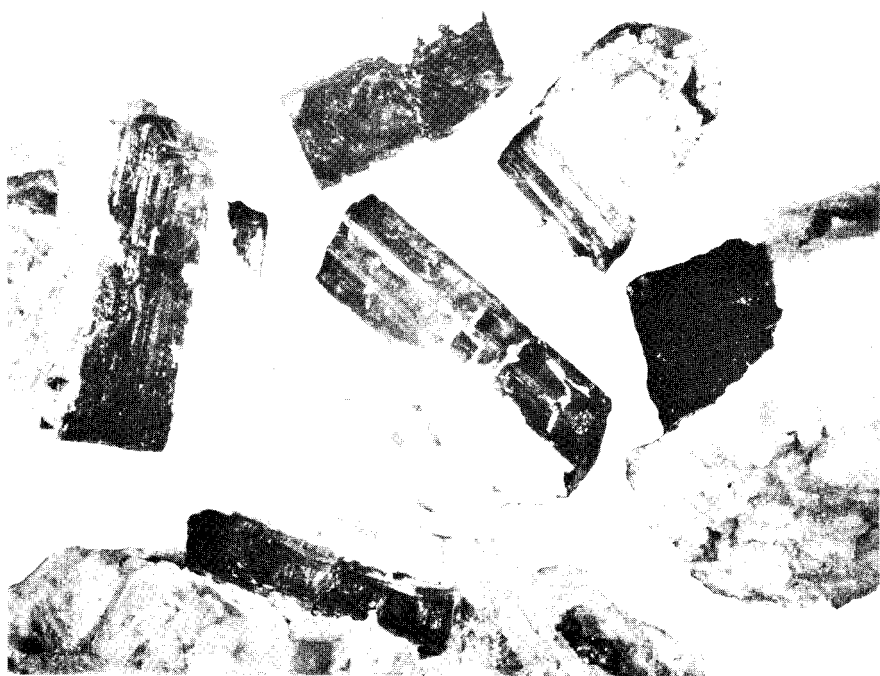
Relatively few pieces of the matrix with adhering gem crystals (Fig. 4) were obtained on account of the very friable nature of the pocket material from which the crystals separated very readily.

One large, odd-shaped, and very irregular crystal, not of gem quality, was found in the pocket. It weighs 147.7 grams (738.5 carats) and is a fine green color; However, it contains numerous minute inclusions and is very imperfectly crystallized. It is indeed unique as a tourmaline crystal composed of many individuals deeply striated and more or less in parallel growth, the small individuals are terminated in a common large trigonal pyramid with numerous small ditrigonal pyramids along the edges of the individual crystals along the periphery of the large unit.

As in many deposits of gem tourmaline, the habit of some crystals is to form a shell about cookeite or sometimes a layer of one



Sections of a Broken Crystal (137.47 Carats) and a Square-cut Tourmaline Fashioned from One of the Sections.



**Tourmaline Crystals in Matrix.**

color superimposed upon that of another. The amount of such material in the B.B. No. 7 pit, however, was surprisingly small. Only a relatively few pieces of the pink tourmaline were found and these are too small to provide cut gems. The pink tourmaline occurred as cores of other crystals and became separated from the outer (green) shell as the intermediate zone of material had been removed sometime during the late phase of activity of the pegmatite solutions.

Many of the tourmalines obtained by Stanley L. Perham and his associates are on display at Mr. Perham's mineral store at West Paris, Maine. As the demand for cut stones arises, he will have them cut in his lapidary shop in a room off the display and sales room. During the coming summer,

with the influx of the usual large number of tourists, one can be certain that, in addition to the many silent and appreciative observers of the splendid cut gems, there will also be heard from other more vocal individuals many "oh's" and "ah's" in response to the excitement and thrill created by the sight of the beautiful crystals which were formed by natural processes and left for strange beings to discover hundreds of millions of years later.

Among the many known gemstones, there are relatively few which equal or surpass the beauty of the Maine green or bluish-green tourmalines; hence it is not surprising that these fine stones captivate the imagination of the tourists and others who visit Maine, and hold them spellbound in amazement at their exquisite beauty.



# The Art of Gem Engraving

*by*

H. L. RICHARDSON

The art of gem engraving has endured a long and significant life from its inception before the dawn of accurately recorded history to the obscure cabinets in museums and rare private collections of a few discerning patrons of the present day.

There are both intaglio and cameo engraving types, each of which is usually done by specialized engravers. The intaglio engraving is less interesting to the ordinary lover of gems principally because it is less spectacular, even though it is more practical as a seal. It would seem that there is a prejudice against the essentially useful, as opposed to the simply ornamental. This is a failing quite common in the appreciation of art, born of a lack of close observation. This human weakness, which not only

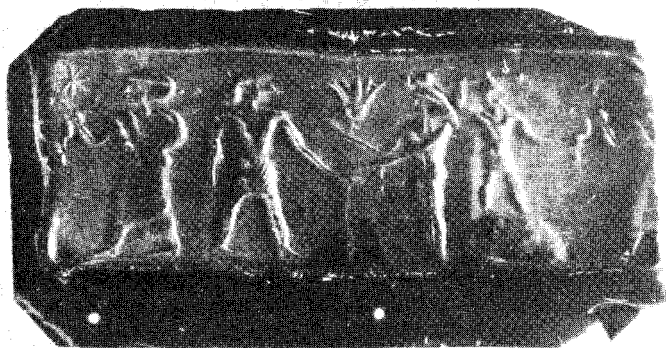
gem engraving but most of the arts have suffered, is at the root of all the neglect. Most of us are intrigued by antiquity, even when unaccompanied by any great understanding of its merits; and when it is an art of such great antiquity as the gem engraving, we start with a bias in its favor. We are thrilled by the thought that the earliest carved gems dating from approximately 3800 B.C. copied the form of the sacred scarabs of Ancient Egypt. Although they were of soft steatite, they were genuine intaglios. Later, carnelian and chalcedony were used commonly. We read in Exodus XXVIII of the holy vestments made for Aaron, with stones engraved with the names of the children of Israel.

The art of gem engraving answered the

need of man for a personal mark or signature, and antedates the invention of writing. Early engraved gems were used for sealing the possessions of the first men who appreciated the power of accumulated goods. His jars of honey, his wheat, his treasure rooms, and even his tombs were sealed with his personal seal. The messages and decrees of illiterate potentates were made inviolate by the carving on a little block of stone. As early as 3000 B.C. a personal seal was a legal necessity in the Mesopotamian Valley. The art of writing was practiced only by the scribes. Engraved seals were the pens and the keys of the rulers. Some early engraved gems were thought to possess magical powers and were worn as amulets against all evils. There also were family seals which were handed down from generation to generation, the forerunner of the modern family seal, engraved with the family crest or coat-of-arms. The designs engraved on these ancient seals depict every phase of life — their weapons, their fashions, their flora

and fauna, their gods and sacred symbols. Archeologists depend in part on their details in reconstructing ancient civilizations. In Egypt, where hieroglyphics were in common use, cylindrical seals were engraved with a record of their owners personality; later, scarab seals with a religious significance were used. In Greece and Rome, within historic times, gems were worn engraved with designs to show that the wearer was the adherent of a particular worship, the follower of a certain philosopher, or the attached subject of an emperor.

It is probable that the first infancy of the art was passed in Babylonia, where the oldest examples of engraved gems known have been found. In Babylonia, the cylindrical form of seal was first used. The technical skill of the artist was slight and the cylinders showed traces of the tools employed. However, from a comparatively early time, the engravers were able to work with considerable skill in hard stone. The cylinder seal was adopted by the Assyrians and was



Chalcedony Cylinder Seal in the Montreal Museum of Art, Montreal, Canada. Babylonian, Probably Engraved 3000 B.C.

Copy of an Ancient Engraving, Possibly Domitia with Profile on Shield. Engraved on Carnelian. Intaglio. Size 25 x 18 mm.

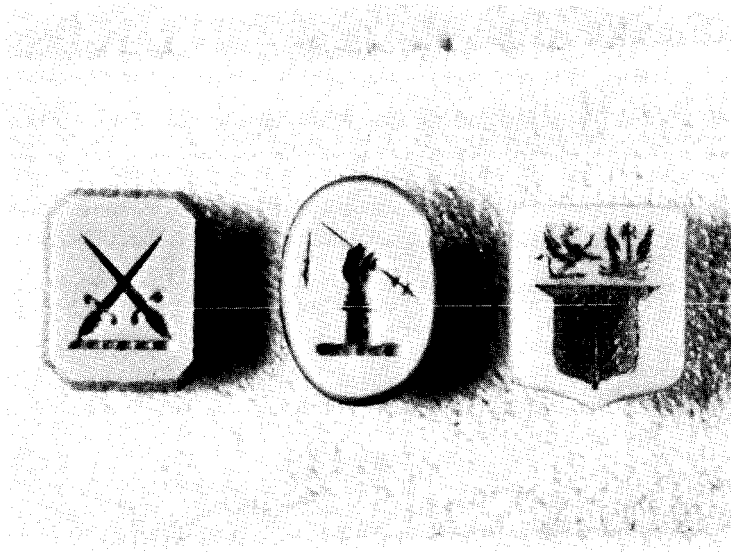


used until the Persian conquest of Babylon (538 B.C.). We must go back to the remotest periods for the origin of intaglio engraving in Egypt. Discoveries of the earliest dynasties at Abydos and Nagada revealed the fact that in Egypt, as in Babylon, the cylinder was the earliest form used for the purpose of a seal. The cylinder form is thought to have been used first in Babylonia, but a connection cannot be traced in the designs of the respective cylinders. The scarabs of Egypt are not considered as examples of fine engraving but have an importance in the history of art. They furnished the Phoenicians with a model which they were able to improve, as regards the intaglio, by a more free spirit of design, gathered partly from Egypt and partly from Assyria. It was about the time of the 4th dynasty in Egypt that the scarab design was first used and gradually took the place of the cylinder.

The excavations in Crete in the first years of the 20th century revealed a previously un-

known culture, which lasted on the lowest computation for more than two thousand years. The earliest engraved stones of Minoan Crete were three-sided prism seals made of soft steatite. These were engraved with pictorial designs, which evidently belonged to a rudimentary hieroglyphic system and are dated before 3000 B.C. The development of hieroglyphic system was accompanied by an increasing power of working in hard materials, and carnelian and chalcidony superseded soft steatite.

The records of gem engravers in Greece begin in the island of Samos, where Mnarchus, the father of Pythagoras, earned by his art more praise than wealth. From Samos also came Theodorus, who made for Polycrates the seal of emerald which was cast in vain into the sea to be lost. About 600 B.C. there was a law of Salons forbidding engravers to retain impressions of the seals they made. From the time of Theodorus to that of Pyrgoteles in the 4th century B.C. is a blank as to names, but not altogether as



Three Intaglios Engraved on White-top Sardonyx.



Arms of Diocese of Montreal, Canada. Engraved on Amethyst. Intaglio. Size 20 x 17mm.

to gems, the production of which must have been carried on from the constant necessity of seals for every variety of purpose. The references to them by Aristophanes, and the lists of them in the ancient inventories of treasures in the Parthenon, confirm the frequent usage during the period in question.

Engraved portrait gems have always been rare; the earliest known attempt was on the seal of Narim Sin, Emperor of Babylon, about 1500 B.C. The most famous portrait seal was that of Alexander the Great, carved by Pyrogoctes. Not only was it great with the greatness of the deified Alexander, but it was adopted much later by Augustus Caesar when he deified himself, and was used by all the succeeding Roman Emperors down to Diocletian. It has not been seen since the sacking of Rome. Portrait gems were fashionable during the 2nd century B.C. when, in betrothal ceremonies, portrait rings were exchanged. Claudius gave to each of his intimates a gold ring set with a stone on which was engraved his portrait, and these rings assured instant access to his presence.

Blob seals (that is, a carved symbol on a semiprecious stone with a flat surface on which characters were engraved) were more commonly used in the near and far East. Chinese seals have never changed from this form. But it was the early Greeks who combined the form of the blob and the cylinder, and by gradual steps evolved the finger ring with a small stone engraved on one side and set in a metal band. From these early signet rings emerged the custom of giving the bride the seal to carry on the household activities; hence our present wedding ring. The evolution of the significance of seal rings from these practical uses is in the investiture of offices, the Papal rings, Bishop rings, and legal and government seals of the present time.

In the following centuries the art of intaglio engraving became more mechanical. The designs have a very characteristic appearance due to the rough strokes of the

wheel. A collection of gems found in England in the possession of the Corporation of Bath shows the feeble character in particular of the gems current in the Province. Except in portraiture the subjects were, as a rule, only adaptations or variations of old types handed down from the Greeks.

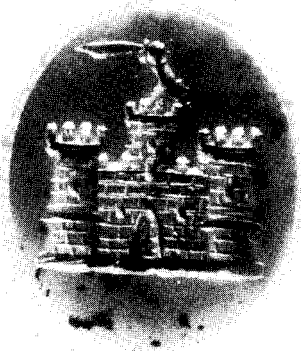
The art of cameo engraving attained its greatest splendor at the beginning of the Roman empire. It waned in the early part of the third century after the death of the Emperor Severus, but under the first Christian Emperor, Constantine, it enjoyed a brief period of revival.

In medieval times antique cameos were held in peculiar veneration because of a belief in their medicinal charms. One of the most famous cameos in the world is a portrait of Queen Elizabeth I, believed to have been engraved by the Italian artist, Vincenti, which she gave to the Earl of Essex as a pledge of friendship. When sentenced to be executed he sent this to the Queen, hoping that it would revive the memory and move her to pardon him. Through a mistake or treachery, the gem came into the hands of the Countess of Nottingham, an enemy of Essex, who refused to deliver it; as a result Essex was beheaded. On her deathbed, Elizabeth refused the plea of the Countess for forgiveness and said, "God may forgive you, but I will not."

The revival of the art in Western Europe dates from the pontificate of the Venetian, Paul II (1464-1471), himself an ardent lover and collector of gems.

The cameos of the early part of the 16th century rival in beauty of execution the finest classical works. The oriental sardonyx was not available for the purpose of the renaissance artists, who were obliged to use the German agate-onyx. The gem-engravers art again revived in the 18th century, and during this period the names of the best engravers were Natter, Pichley, Marchant, and Burch.

There is no clear proof of the ancients



Crest of "Kincaid."  
Engraved on Blood-  
stone. Seal Intaglio.  
Size 12 x 10mm.

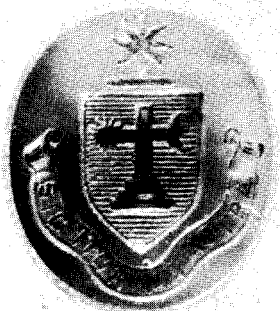
using a wheel mounted lathe-wise, but there are indications of drilling with a revolving tool, which was either a tubular drill making a ringlike depression, a pointed tool making a cuplike sinking, or a small wheel with a blunt edge making a channel-like cut. Possibly each of these tools was used in a manner similar to present day usage. Apparently the ancients used their tools mounted in the form of a bowdrill and fastened the stone down rigidly. An alternative method was to use a splinter of diamond set in a handle and used as a graver. Pliny speaks of a blunted tool moistened and supplied with emery of Naxos.

The engraving of cameos has now practically ceased to be pursued as an art. In Italy an extensive trade is carried on in the cutting of shell cameos, the principal shell used being the Bull's-mouth shell, found in East Indian seas, which has a sard-like underlayer.

From medieval times a large part of the gem-engravers art has been largely confined to heraldry, engraving family crests, coats-

of-arms, etc., on seals and signet rings.

In modern gem engraving the principal tool is a small wheel, which has been turned down to the size and shape for the particular cut required. Diamond is crushed into various grits to suit each particular tool, and is then worked into the head of the tool with oil while it is being revolved at a fairly high speed. The tool runs in a small lathe horizontally, and the work is held in the engravers hand. To commence any design the polished surface is very slightly greased and a fine powder is blown on the surface. The design is then drawn freehand with a fine metal point. A very thin wheel is fitted in the lathe and charged with a fine grade of diamond powder and oil. With the work held in the hand the engraver then very lightly traces the design which he has drawn with the point. This procedure marks the design on the polished surface of the stone and thus cannot be rubbed off when working. The masses can then be ground out with larger tools charged with a courser grade of diamond. Gradually



**Crest of the Family Jardine. Engraved on Carnelian. Intaglio. Motto: Sic Itur Au Astra (This is the Way to the Stars). Size 12 x 10mm.**

the finer parts of the subject are ground away, as the engraver carefully conforms to the modeling of the design and guards against slipping on the polished surface of the stone.

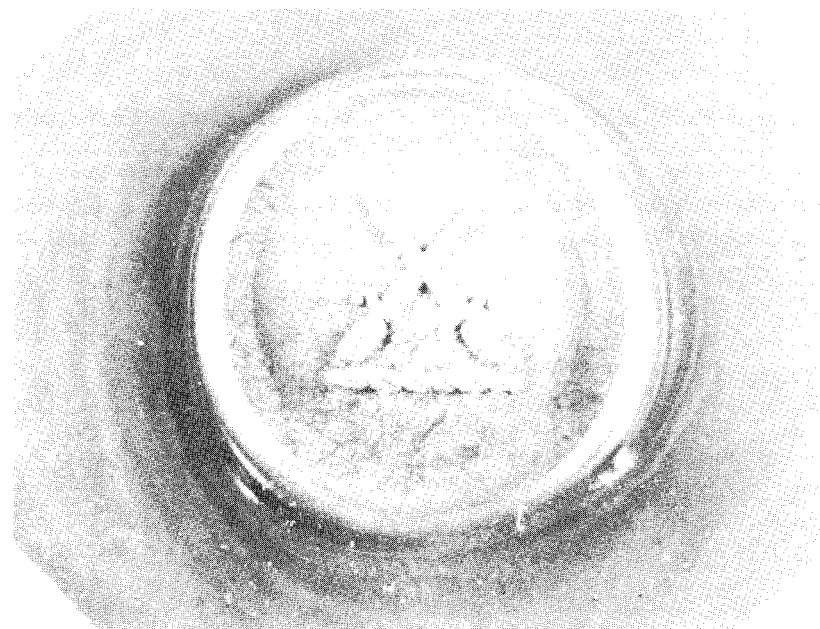
There have been instances of diamonds being engraved, one of which was done by Mr. Renton of London in 1884. Mr. Renton was required to engrave a monogram in Siamese characters on a thin, flat diamond. The cutting had to be deep enough to produce a fair impression in wax, and be completed in three months. To most persons outside the gem-cutting industry the difficulties of such an operation would not be apparent. The old adage, "diamond cuts diamond," would naturally suggest that if a diamond could be faceted and polished, it could be as readily engraved. But there is a great difference between the fine art of engraving and the comparatively rough processes of cutting and polishing. Patience and skill and long training are needed in cutting and polishing. But it must be remembered that the cutting of flat surfaces by means of a large revolving disc of metal charged with

diamond, where great pressure can be applied, is a far different proposition from the problem before the engraver. He is obliged to employ very delicate instruments, which will not stand great pressure and which are far smaller than the surface he is going to engrave. Therefore, he has his own peculiar difficulties. In the incision of a design upon any substance, we naturally employ a substance harder than the material to be engraved. This cannot be true when engraving a diamond, since there is no harder substance.

When first applying himself to the work, Mr. Renton used the usual method of gem engraving, but he found that his tool slipped on the hard surface and burnished the head of the tool, even though he was using diamond powder. After various efforts he finally overcame the difficulty. First, he coated the diamond with a film of varnish. When the varnish was nearly dry, he applied a coat of fine black lead, and then added a plating of copper. The design was then drawn on the copper, which the tools pierced easily down to the diamond. The



**Crest of Baron Van Haersolte, Van Den Doorn. Intaglio. Engraved on Citrine by the author. Size 14 x 12mm.**



Crest of "Hair." Engraved on Bloodstone with Polished Concave Table. Intaglio. Size 18mm.



Coat-of-Arms of "Carruthers." Engraved on Bloodstone. Intaglio. Motto: Promptus et Fidelis (Ready and Faithful). Size 14 x 12mm.

head of the tool was kept in position by the copper surrounding it, which also formed a channel and held the diamond paste between the cutting tool and the surface being engraved. With his lathe revolving at a high speed he was successful in accomplishing the most difficult task a gem engraver could be called on to attempt.

It is interesting to note some of the statistics concerning this. The stone weighed exactly 2.3125 carats before he started engraving it. The strokes of the design, computed as a continuous line, totalled 27.5mm. After engraving, the stone had lost .42 carats. In the process of engraving, 3.5 carats of diamond powder was consumed, and the work took 86 hours to accomplish.



# A Coat-of-Arms

*by*

H. L. RICHARDSON

I was asked the question, "What is a family Crest?" The question should have been, "What is a Coat-of-Arms?" The crest is only a part of a Coat-of-Arms, although it is very often used alone without the arms.

The attempt to answer the query must be qualified by the limitation of this article, since it must be short and not too technical. To answer it fully one must go into the complicated science of heraldry.

A Coat-of-Arms is a device or emblem intended to be represented on a shield in colors and is of a hereditary character. The origin of coat armour, as a science, is to be found in the personal devices, banners, etc., of historical personages. It is generally agreed that there was no such thing as a Coat-of-Arms, as we now use the term, in existence at the time of the Norman conquest. The date and the manner of the origin of heraldry has been a matter of speculation. There seems to be a blank until the beginning of the twelfth century. In the thirteenth century, Coats-of-Arms were in use throughout Europe, and there had sprung up the definite, completed science of heraldry governed by known and accepted rules. Most of the rules of that period are in use at the present day. There is no doubt that the Crusades influenced its rapid development.

There have been various sources of origin suggested for coat armour: the shield, the banner, the tabard, and possibly the use of seals. It is one of the quaint curiosities of heraldry that although a Coat-of-Arms, in order to qualify as such, must be depicted on a shield, the very name itself is derived from the linen surcoat, or tabard, which was worn over the armour and upon which garment the device in question was represented. Of course, there were hereditary titles long before the existence of Coats-of-Arms. It was in warfare that the necessity for armorial bearings arose. The necessities of a military camp composed of many small units, each controlled by the feudal lord from whose land the unit was recruited, imposed upon the leader the use of a pictured standard by which his followers could muster. The closed helmet and the armour hid identity so completely that the pictured shield and the embroidered surcoat were foregone necessities in battle. Since armorial bearings were necessary to a leader in warfare, and since the leaders were the land-owners, and such land holders were the upper class who asserted nobility of birth, it is obvious that armorial devices were the prerogative of the upper classes. This prerogative (i.e. coat armour) has remained in



Coat-of-Arms of Archbishop Owen, Primate of Canada. Engraved on Amethyst. Intaglio. Size 25 x 18mm.

most countries. It was the prerogative of the king to sanction the advance of a person to the landowning class, and the prerogative of the creation of noble station has remained with the sovereign. A Coat-of-Arms has always been what it is now: the sign of a nobility of blood dating from the creation of the arms, resting for its authority upon the prerogative of the crown.

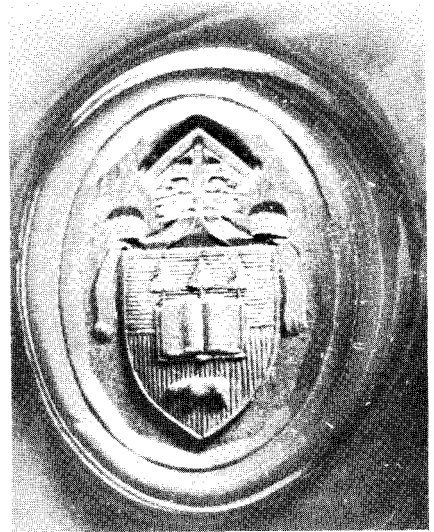
Coats-of-Arms were in existence long before we get any evidence of the use of the crest. The crest is the ornament which surmounts the helmet. The use of the crest was not general until the sixteenth century, and was never used in actual warfare. There is no doubt that it was only used in tournament. The crest was prized as a mark of high rank, which accounts for its importance for ceremonial purposes. Today the descendants of the old nobility still perpetuate the traditions of their families in various ways, one of which is to have the crest or Coat-of-Arms engraved on a stone-set ring, or painted in oil color, which can be handed

down from one generation to another.

The words Coats-of-Arms, strictly speaking, only relates to the devices depicted on the shield. The technical word for the entire device is the "achievement," a term which is very seldom met with in actual use. Ordinarily, the heraldic devices of a commoner consist of

1. The arms; i.e., the shield and the devices upon it
2. The helmet
3. The mantling, or lambrequin
4. The wreath
5. The crest
6. The motto

Such a Coat-of-Arms is similar to what most untitled commoners, who have the right to arms, are entitled to bear. An untitled commoner may also possess supporters and a standard, while a knight, commander, or companion of any order will possess the circle and badge of his order. A Knight Grand Cross or Knight Grand Commander of any order, or a Knight of the Garter,



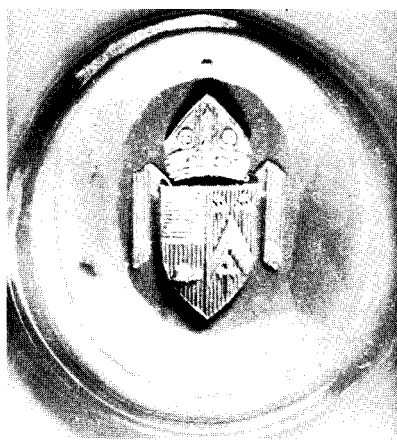
Coat-of-Arms of Diocese of Northwest Territories. Engraved on Amethyst. Intaglio. Size 20 x 15mm.

Thistle, or St. Patrick will add the collar of his order and a peer will finally be able to add his coronet of rank.

Without the shield there can be no Coat-of-Arms, since upon it everything else depends, and it is the shield which is of the greatest importance. A shield, or arms, must consist of a colored surface or background, this being termed the "field," and some device or design on it which forms the "charge" or "charges" if there be more than one. The shield is the emblem of the rank of gentility; it is the vehicle for the display of the particular device which is the token of the "technical" gentility of a particular family. It is the shield that is the important matter and with which the bulk of the rules of armory are concerned.

Everybody during the period of warfare in armor wore a helmet, so everybody who has a shield of arms has the right to some helmet. There are certain rules regarding the form and position of the helmet. These are that the royal helmet is of gold, is placed facing the front, and is open, but with the opening guarded by grilles or bars. The helmet of a peer is of silver, is in profile, open, and guarded by grilles of gold. The helmet of a knight or baronet is of steel facing the front with the visor open and without grilles or bars. The helmet of an esquire, or gentleman, is of steel, is in profile, and has the visor closed. Subject to these rules, the shape, style, and design are at the pleasure of the wearer.

The mantling is a cloth suspended from a point on the top of the helmet and hanging down the back of the wearer. Its purpose in real warfare was to save the armor from rust, to absorb the heat of the sun playing upon the metal, and above all to entangle the sword of an adversary and deaden the effect of a sword cut. The mantling, or lambrequin, being cut and jagged, is embodied in the pictorial or engraved Coat-of-Arms as ornament. There is no set pattern for the flowing curves and foliations on either side of the helmet and



Coat-of-Arms of the Bishop of the Artic. Engraved on Amethyst. Intaglio. Size 20 x 17mm.

shield, this being left to the imagination of the artist. There are also rules regarding color. Originally, the mantling was always of crimson cloth lined with white. Since the seventeenth century the red and white colors have given place to the colors of the arms, the outside being of the color and the inside, or lining, being of the metal. The royal mantling is always of gold lined with ermine.

The wreath is a skein of silk worn on the helmet to hide the joining of the helmet and crest, and is of the colors of the arms. When a crest is painted alone, or when it is engraved, it is always depicted on a wreath, whether it is on silver plate or a signet ring. When a coronet, or chapeau, is depicted, the crest is shown issuing from it and the wreath is omitted.

Mottoes had no place in the real armory of warfare, and they are not met with in the early developments of heraldry. They form no part of a grant of a Coat-of-Arms, but the recipient can select a motto and it is then embodied in his arms. The motto is not hereditary and can be changed or dropped. The motto is usually placed on a ribbon, and can be either under the arms or over it.

# STRONTIUM TITANATE

by

RICHARD T. LIDDICOAT, JR., and  
G. ROBERT CROWNINGSHIELD

Editor's note: *The National Lead Company provided strontium titanate both in boule and faceted form, as well as reports from their research laboratories on the properties of the material for this study and commentary.*

Although the development of strontium titanate was announced two years ago by the Research Department of the Titanium Division of the National Lead Company, it is only now about to be marketed under the name "Starilian." It is the latest product of the Verneuil type of furnace.

The new product is not the synthetic equivalent of any mineral yet found in Nature, for no oxide of strontium and titanium is known. However, being a titanium compound, it has, along with natural transparent titanium minerals such as sphene (titanite), rutile and benitoite, the high refractive index and dispersion for which these minerals are noted. The closest mineral in Nature to strontium titanate is perovskite, a calcium titanium oxide ( $\text{CaTiO}_3$ ). Like perovskite, strontium titanate ( $\text{SrTiO}_3$ ) crystallizes in the isometric (cubic) crystal system. Although the new man-made crystal has some of the drawbacks of titania (synthetic rutile) insofar as fitness for all-around jewelry use is concerned, it is clearer and a much more attractive gem material. This may be due principally to a somewhat greater transmission of visible light, but also to the fact that its single refraction imparts no "fuzziness."

The hardness of strontium titanate is

near 6.0 on Mohs' scale. Its Knoop Micro-indenter hardness is given as 595.

The dispersion at .108 (NF-NC) is high, although somewhat lower than synthetic rutile which is .155 to .205 (NF-NC). The figure for strontium is more than four times that of diamond for the same interval.

The refractive index for sodium light is approximately 2.409, while diamond is 2.417 and synthetic rutile is  $\omega$  2.613 /  $\epsilon$  2.909. The critical angle is  $24^\circ 32''$ , compared with  $24^\circ 26''$  for diamond and  $\omega$   $22^\circ 30''$  to  $\epsilon$   $20^\circ 6''$  for synthetic rutile. The specific gravity of approximately 5.13 is the highest of any available transparent gem material, being considerably higher even than zircon at 4.70. Strontium titanate breaks with a conchoidal fracture and no noticeable cleavage. Its melting point is  $2080^\circ\text{C}$ . The material is opaque to X rays. It displays no fluorescence either with X rays or ultraviolet light. No absorption lines have been noted using the spectroscope.

Its single refraction and high resistance to chemical attack have led the Institute to test the material as a refractometer hemisphere. It should be ideal for this purpose since it has a much higher index of refraction than heavy lead glass plus greater hardness and resistance to contact-liquid corrosion. Its high dispersion and single refraction also suggest its use as a spectroscope prism.

The material gives the lapidary considerable difficulty in polishing. Under the micro-

*(Continued page 158)*

# Stichtite

## An Ornamental Stone

by

ROBERT WEBSTER, F.G.A.

Among the many minerals which have been found in the Union of South Africa, stichtite is one of the least known. Recently at a geologists' meeting in London, Mr. E. P. Bottley, a mineral dealer, showed some pieces of rough material and some polished cabochons of stichtite from a source in Eastern Transvaal, and it has been the writer's privilege to examine some of this material. These notes are a record of the findings.

Stichtite is an alteration product of serpentine and owes its rose-red to lilac color to the presence of chromium. Chemically it is a hydrated carbonate-hydroxide of magnesium and chromium. The coloration is therefore idiochromatic and it is one of the few minerals giving an idiochromatic red color with chromium.

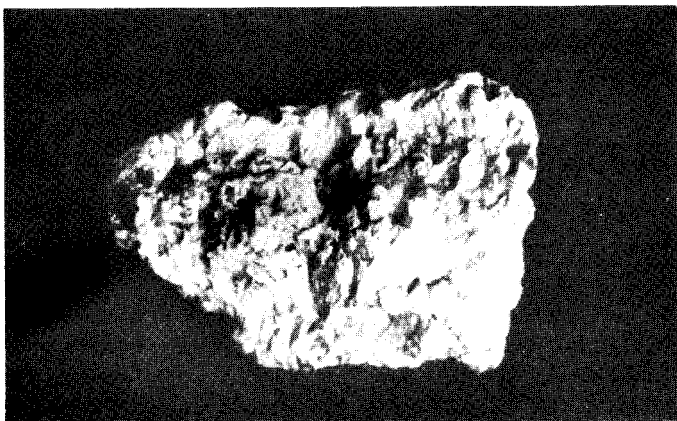
Stichtite was first identified as a new mineral from material found at Dundas, Tasmania, as blebs or veinlets in serpentine rock closely associated with chromite, barbertonite and antigorite. The name of the mineral is derived from Robert Sticht, late General Manager of the Mount Lyell Mining and Railway Company of Tasmania. Other sources of this mineral are at the Megantic Mine, Black Lake district of Canada; and

from Kaapsche Hoop, Barberton district, Transvaal, which is probably the source of the material examined. It is understood that the mineral has also been found in Algeria.

The properties of stichtite, taken from Dana's *System of Mineralogy* and Winchell's *Elements of Optical Mineralogy* are given as follows: rhombohedral crystallization with strong basal cleavage, with axial ratios (from X ray data given by Frondel<sup>1</sup>) as  $A_c = 6.18$ ,  $C_a = 46.38$ . The material is found massive in matted aggregates of plates or fibres, or in micaceous scales, the laminae being flexible but inelastic. The feel is greasy and the lustre waxlike or greasy, and in some cases may be pearly.

The hardness is given as  $1\frac{1}{2}$  to 2 (Mohs' scale) and the density as 2.16 (on moderately pure material from Quebec<sup>2</sup>). The refraction is uniaxial negative with indices  $o = 1.545 \pm 0.003$ , and  $e = 1.518 \pm 0.003$ ; the birefringence amounts to 0.027. The pleochroism exhibits shades of light and dark rose-red or lilac color — the extraordinary ray having the lighter color. These optical properties are determined by thin-section mineralogical methods.

The chemical composition of stichtite is



Stichtite Showing Contorted Fibrous Structure.

given as  $Mg_6 Cr_2 (OH)_{16} CO_3 \cdot 4H_2O$ , but the material is rarely pure, the chromium being replaced in part by iron. Indeed the complexity of the composition is amply revealed by the uncertainty which has been shown in the literature; Frondel remarks that the composition is inconclusive.

The first factual report on stichtite was made by Petterd<sup>3</sup> in 1910 on Tasmanian material. Petterd refers to it as being a foliated mineral of bright color; to have the chemical composition  $(Cr, Fe)_2 O_3 \cdot 6MgO \cdot CO_2 \cdot 13H_2O$ , and to occur with chromite as spots and veins in serpentine. In 1912 Hezner<sup>4</sup>, apparently through lack of knowledge of Petterd's work, investigated this same occurrence and named the mineral chrom-brugnatellite. Brugnatellite has the formula  $Mg_6 Fe (OH)_{13} CO_3 \cdot 4H_2O$ , which is similar to that of stichtite, except for the replacement of chromium by iron. Later, Twelvetrees<sup>5</sup> correlated the then existing literature on the subject. Poitevin and Graham<sup>2</sup> reported on the mineral from the Canadian Black Lake district. The third occurrence of stichtite, in the Barberton district of Transvaal, was first mentioned by Dunn<sup>6</sup> in 1918, and described by Hall<sup>7</sup> in 1922. It is inter-

esting to note that Dunn had found this material in 1883, long before the discovery of the Tasmanian material, but at the time it was doubtfully recorded as kaemmererite. Read and Dixon<sup>8</sup> reported (in 1933) an occurrence of stichtite at Cunningsburg in the Shetland Islands, but this material is now suggested as being probably identical with barbertonite. The occurrence in Algeria was mentioned orally to the writer who has not yet obtained further information.

The specimen from Transvaal examined had a good lilac color, was somewhat friable and showed a contorted fibrous structure. There were some patches of a green mineral in the hand specimen which may be antigorite. Cabochons were cut from this piece. These cabochons made unusual gems, which from a color point of view are not unlike polished lepidolite although lacking the glistening flakes seen in the lithia mica. The lustre is somewhat greasy and the hardness low. The density was not easily determined owing to the porosity of the material. Determinations varied between 2.15 and 2.22. A refractive index taken on one cabochon, using the distant vision method, gave a value ap-

*(Continued page 156)*

# Advantages in Recutting Star Stones

by

JOHN G. ELLISON

The average star stone imported into this country has at least one-third of its weight beneath the girdle, the main purpose of which is merely to increase the total carat weight of the stone. A cabochon of ideal proportions will have not more than one-sixth to one-fifth of its weight below the girdle.

There are a few rare cases in which it is not possible to recut to these proportions, notably those stones approaching transparency which would lose color or decrease in the clarity and strength of asterism.

When determining the value of a star stone, the most important factors to consider are the general appearance, strength, definition, and centering of the star.

Color, of course, is important, and follows the pattern of desirability shown by unasteriated corundum. An exception is black corundum, which is almost worthless unless it displays asterism.

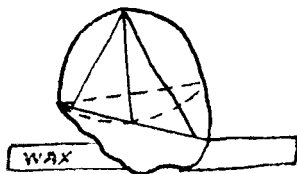
Purchasing star stones in the loose or unmounted state is rather hazardous, unless one has a fair acquaintance with estimation of the stone's resultant appearance in a mounting. Many star stones which appear to have well-centered stars when held loose or when deceptively mounted on wax (Figure 1), cannot be mounted with good centering of the star unless the stone is recut. This usually results in a reduction of the diameter of the stone with a corresponding weight loss.

In order to properly appraise the value of a star stone, it must be realized that only the upper part of the cabochon will be visible when mounted; therefore, in a sense, it is the only salable portion. This differs from transparent gemstones, in which every surface contributes to the beauty of the stone.

The first step in estimating the weight of the "salable portion" of a star stone, is to determine if the star is correctly centered, i.e., the apex of the star should be in the exact center of the stone and equidistant from the edges of the girdle when the plane of the girdle is approximately at right angles to the light source and the direction of observation.

Parcels of star stones, especially those originating from Ceylon, are usually noticeably deficient in stones with centered stars. Unless they are recut, jewelry set with them will not possess ultimate eye appeal, and it will therefore lack sales appeal. The price usually takes into account the off-centered

• Figure 1



star, so recutting may be accomplished at a profit.

In the case of a star stone improperly oriented, it will be assumed that the girdle must be raised on one or more sides in order to center the star. Since salable weight is the primary consideration, it is necessary to estimate where the new girdle will be placed on the stone to determine how much of the top portion will be retained after recutting.

A simple method of determining this is to hold the stone under an overhead light source (preferably a spotlight). The stone is then turned to a position where the star is exactly centered in relation to the stone as a whole. With the aid of white drawing ink, a mark is then placed on the stone at the apex of the star. The stone is then brought up to eye level, keeping the mark on the stone as an apex. It will now be seen that part of the girdle is appreciably low. The highest part of the girdle becomes the "base" since the rest of the girdle must be raised to its level in order for the star to become well centered. The "new" girdle line should be marked on the stone with white drawing ink. The portion above this "new" girdle line now becomes the salable portion of the stone.

Now that the salable portion has been separated from the remainder, the next step is to ascertain the actual per carat price by using the formula developed by James G. Small<sup>1</sup>. In the case of asteriated corundum it would be as follows:

length x width x depth x .0026 x 4.00 = weight of salable portion. The dimensions used here will be based on the new girdle line drawn around the stone and a depth (measured or estimated) from the apex of the stone to this new girdle plane.

To illustrate the importance of this step, consider two star stones of equal quality, both of which weigh exactly ten carats. The first has eight carats weight above the girdle and two carats weight below the girdle and is priced at \$25 per carat. The second has six carats of weight above the girdle and

four carats below the girdle and is priced at \$20 per carat. At first glance the second stone would appear to be \$5 per carat cheaper than the first stone. But when the total price for each stone is correlated into the total salable weight above the girdle shown by each stone, it is apparent that the supposedly cheaper stone actually costs \$2 per carat more for each carat of salable material.

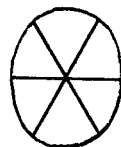
It is common practice in the trade today to consider star stones in the manner of transparent stones and to sell them on the basis of total weight, which is not logical but obviously not unprofitable.

Although it is true that star stones are normally purchased on a total-weight-of-stone basis, any removal of weight increases the per carat price of the resultant stone. However, if the stone has been purchased on the basis of its visible, or salable, weight, any removal of material from the unseen portion of the stone will not decrease its apparent value.



● Figure 2

● Figure 3



When a star stone has been properly cut or recut to suitable proportions, it possesses the following advantages (suitable proportions would consider that not more than one-fourth of the total weight below the girdle would be usable):

1. It is easier to secure a mounting to fit; or, if a mounting is to be cast for it, assures a better fit.
2. The star will be properly centered after recutting, which increases its visible value. There are two forms of well-centered stars: one is termed the 9-3 position (Figure 3) and the other is the 6-12 position (Figure 2). The 6-12 position is preferred but



at no increase in value.

3. The stone may be more easily and securely set. This decreases setting charges and is good assurance against loosening and subsequent loss of the stone.

4. The stone does not "bulge" through the bottom. At best, this condition would cause customer dissatisfaction; at worst it could cause the stone to loosen and be lost.

5. Proper recutting can often strengthen a badly flawed or shattered stone sufficiently to allow it to undergo the stress of setting without damage.

6. In some instances, asterism will be improved after cutting.

7. Removal of dark flaws from the bottom, which are visible through the body of the stone, increases the beauty and value



• Figure 4

• Figure 5



of the stone.

The principal objection of some stone dealers to recutting is that the stones will lose color. This is true in perhaps less than 10% of the cases, and is confined mainly to those nearly transparent stones which depend on reflection from the interior of the stone. In such cases the bottom of the stone may well be considered as part of the visible portion of the stone and therefore can be considered to be salable weight.

Weakness of portions of the "legs" of a star can but rarely be improved by recutting. But those stones with flat or irregular spots on the top (Figure 5), which cause the star to waver or appear weak, usually can be improved by reshaping to better roundness. Also, the type of star stone which has what is known as a "dancing"

star (Figure 4), caused by too flat a cabochon shape, can be improved by reshaping.

Star stones, which exhibit much twinning notably those from Siam, usually show small separations along the planes of twinning on the polished surfaces. Approximately half of these stones can be improved by repolishing.

Star stones of Siamese origin are normally found to have well-centered stars and little waste weight below the girdle. This contrast to Ceylon star stones is explained by the fact that rough Siam material is recovered in good crystal form, which is very adaptable to flat-backed cabochon cutting methods. Of course, the direction for asterism is also easily determined from the crystal form. (Ed. note: The inclusions, the reflections from which cause the asterism, are oriented at right angles to the C-axis in three directions at  $60^\circ$  to one another. If the base of the cabochon is cut at right angles to the C-axis, then the inclusions are properly oriented and the apex of the star will be properly centered.) In Ceylon the star stones are usually found as water-worn pebbles, which make it more difficult to center the star and further lends itself to the method of retaining as much of the original weight as possible.

The dark spots of color seen on the bottom of many star stones usually have no effect on the stones as a whole, mainly because stones having such color spots are but rarely transparent enough to allow light transmitted through the spots to affect the visible portions of the stone.

And last, but certainly not least, the cost of recutting star stones is negligible compared to the increased value of the stone. The cost can be recovered from reduced setting charges alone.

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# Lattice Structure in Precious Opal

*by*

G. F. LEECHMAN, F.G.A.

Research by Sir C. V. Raman into the cause of the color in precious opal<sup>1</sup> has been made available recently by the publication of photomicrographs of the structure which produces the colors, together with details of more advanced X-ray investigation and spectrographic work. The latter demonstrates very clearly the monochromatic nature of the light emitted; the X-ray work establishes the presence of cristobalite and suggests the presence of tridymite, while the photos show the film-pack structure demonstrated by the present writer.<sup>2</sup>

The remarkable point is that an apparent paradox is established: the presence of regular crystal structure in a substance which has heretofore been widely known as a typically amorphous mineral. This is a complete contradiction of terms. Common opal may be completely amorphous; precious opal is not. Rather, precious opal consists of an amorphous matrix of hyalite which contains

random blocs of crystal lattices formed of parallel laminae, presumably with the structure of cristobalite.

Previously, little attention had been paid to the idea of regular structures in colloid gels, and the subject is perhaps new to many gemologists. But it now appears that, given suitable conditions, other colloids, such as agar, gelatin, and soap, may develop incipient crystallization and that each may have its particular habitual form, as crystalline minerals have.

Gemologists can expect to hear more of colloids, and it may therefore be helpful to explain just what they are. Originally, they were described as substances which, on drying out from a solution (or sol), gave not a crystalline residue but an irregular mass or jelly (gel). This, however, is not all satisfactory. Many substances will produce crystals under some conditions but amorphous deposits under others; e.g., sugar, calcium carbonate, malachite. Indeed, most

crystalline salts may be produced in a colloid form (sodium chloride, iron carbonate, and pitchblende, for example). Currently, colloids are defined by particle size. Solutions which contain relatively large separate groups, or aggregates, of molecules cannot crystallize, so they form irregular gels. Solutions containing individual molecules offer an opportunity to these to build up into regular crystal forms; therefore, on evaporation, they can and do develop crystals.

In the case of most opal (a colloid form of silica) the molecules, when first produced by chemical reaction, consist of tetrahedra of silicon tetra-oxide ( $\text{SiO}_4$ ). These polymerize very rapidly (i.e., the single molecules join up by sharing oxygen atoms) and form chains ( $\text{Si}_2\text{O}_6$ ), several parallel chains forming rods. These can build up further but frequently fail to do so; rather they dry out as an amorphous gel of small, irregularly interwoven threads a condition which has been well described as "brush-heap structure." This forms common opal.

In the case of precious opal, the silica chains, threads, or rods have oriented themselves into lattices, films, or sheets. This is only possible under critically ideal conditions, but specimens may be obtained which show clearly the various stages in the development. These range from the finest, thinnest films, hanging like a tinted drape in the transparent hyalite, to thick sheets of parallel fibers reflecting strong spectrum

colors; and finally to packs of films, reminiscent of a deck of cards, which are equal, parallel, and regularly spaced. The effect of this film-pack structure is to produce very intense colored reflections and to regulate the wavelength of the light so that only a narrow band is visible in the spectroscope, as distinct from the broad bands of pleochroic light resulting from thin plates, as in cracks (iris quartz), or oil on water.

Dr. Raman's X-ray investigations support previous workers in America<sup>2</sup> and Australia<sup>1</sup>, who have found that cristobalite normally occurs in precious opal; but he goes further and demonstrates the presence of tridymite, which had not been previously established. Here again his photos are very convincing and show a great step forward.

The illustrations he offers, showing the film-pack structure, are most impressive. The writer has seen similar formations under the microscope but photographs were not possible, and it makes me very happy to see my arguments so well supported. In over two thousand specimens gathered during eighteen months in the field, two or three have shown the film-packs so well developed as to be plainly visible to the unaided eye—parallel edges of the laminae serrated on the fractured surface where the break has gone through the block which clearly prove the existence of the structure postulated. Now we have photo-micrographs as well.

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# Strontium Titanate

(Continued from page 148)

scope a high percentage of stones show rounded facet junctions and polishing wheel marks. A few of the stones examined in the Institute's laboratories showed gas bubbles, as would be expected from their Verneuil origin.

Under the name of Starilian Lapidaries, Inc., a company for merchandising this new gem material has been formed, guided by a well-known merchandise counselor. During the introductory period, while the product is gaining consumer acceptance, it is the plan of the company to sell distinctive platinum jewelry pieces directly through leading fashion houses only. It is the counselor's contention that jewelers have never successfully promoted any new man-made gem material. The stones will not be sold loose nor in rings. The reason given for this is that the producers are not aiming for a mass market. Distribution is expected to become nationwide gradually as the various media for publicizing a new material are made use of. It has been shown nationwide on television; it will be featured in leading fashion magazines and there are plans to have public showings in leading museums. Once public acceptance has been won, it is the plan of the company to include jewelers in its merchandising program.

If the merchandise counselor's opinion of the jeweler's promotional efforts on synthetics is interesting, his solution to the problem is little short of awesome. The effort to move "Starilian"-set platinum jewelry pieces through fashion channels will be watched with fascination by jewelers.

## Stichtite

(Continued from page 150)

proximately 1.53. No luminescence was observed under either long- or short-wave ultraviolet light, or under X rays. No dichro-

ism could be seen on examination of this massive material.

The absorption spectrum shown by light reflected from the surface, and by transmitted light through a fairly thin piece, gave a clear chromium-type spectrum with three lines in the red and orange, two of which were measurable and gave values at 6655Å, the third line being approximately midway between these two but too weak for measurement. The typical broad absorption of the yellow-green was present and also an absorption of the violet. The "window" of blue light was found to be centered at 5000Å.

When a fragment of the mineral was placed in a small test tube and dilute hydrochloric acid added, slight effervescence occurred and the acid liquid turned a greenish color which was more pronounced on heating. On the addition of a dilute solution of potassium ferrocyanide a deep blue coloration developed (Prussian blue), indicating much iron in the composition of the mineral.

The material is rather too soft for general use as a gemstone despite its quite attractive color, but it may have, provided large enough pieces can be secured, some application as an inlay, particularly as a "foil" to lighter colored ornamental minerals, such as "Mexican onyx," in the making of small ornamental boxes, clock cases and other small *objets d'art*.

*objets d'art*.

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# Book Review

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## HOW TO KNOW MINERALS AND ROCKS

by *Richard M. Pearl*,

*published by McGraw-Hill, New York.*

*1955. 186 pages. \$3.50.*

Richard M. Pearl, holder of the second geological diploma awarded by the Geological Institute of America in the early 30's is the author of a book just published by McGraw-Hill. Pearl is now Assistant Professor of Geology at Colorado College in Colorado Springs and the author of a number of books on geology as well as several in the field of gemology. The book was prepared as a basic field guide to well over 100 of the minerals and rocks considered most important by Professor Pearl. Most of the illustrations in the book are rather effective line drawings. The 46 colored illustrations included were taken from Ward's Colored Slides for Mineralogy and from the Harvard Mineral collection. The color reproduction is excellent in general although in some cases color reproduction leaves something to be desired. For example, malachite came out a light blue rather than green. In general Professor Pearl's choice of minerals and rocks and his description of them are excellent. However, since this book was planned as a field guide presumably for the American collector, the inclusion of the famous localities for some of the minerals other than on the North American continent is surprising. In general, however, this seems to provide an effective book for the collector, and one well worth adding to his library.

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### CORRECTION OF ARTICLE

"Weight Estimation of Pearls" in Winter 1954-1955 issue of GEMS & GEMOLOGY.

In converting momme to ounces an erroneous conversion factor of — 1 momme = .0132 ounces was given (page 124). The correct conversion factor is 1 momme = 0.132 ounces.

The error thus introduced makes the column headed "momme" on page 102-115 incorrect to the extent that the decimal point is misplaced. The decimal point should have been moved one digit farther to the left so that:

a pearl of 1.0 mm diameter weighs .0003 momme

a pearl of 1.1 mm diameter weighs .0004 momme

Additional conversion factors are:

1 momme = 10 fun = 3.75 grams = 18.75 carats = 75 pearl grains

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## PINK PEARL GIVEN

to

## SMITHSONIAN

A beautiful pink pearl from East Pakistan has been presented to the Smithsonian Institution by His Excellency Mohammed Ali, until recently Prime Minister of Pakistan, to become a permanent addition to the priceless gem collection of the United States National Museum. During the recent visit of the Prime Minister and his Begum to Washington he was personally escorted through the Smithsonian Institution by its Secretary, Dr. Leonard Carmichael. Stopping before the gem collection the Prime Minister noted that his native region was not represented among the pearls. Before returning to Karachi he removed the pearl from his own tie pin and sent it to Dr. Carmichael for the Smithsonian.

Gemologists of the National Museum state that this pearl is a very fine specimen of its kind, of an exquisite pink color and fine orient. The jewel has already been placed on display in the Smithsonian's Natural History Building.

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# Contributors in this Issue

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BENJAMIN M. SHAUB, Ph. D., was born in Shrewsbury Township, York County, Pennsylvania, in 1893, and spent his youth on a farm. After attending a radio telegraphy school at Lebanon, Pennsylvania, he was employed for six years as telegraph operator and station agent at various places on the Seneca Division of the Lehigh Valley Railroad. While working as the night operator at Ithaca, New York, he attended high school there and gained sufficient credits in three years to enter the Engineering College at Cornell University. However, World War I intervened and he enlisted in June after receiving his high school diploma. He spent nearly two years in the Navy Radio Schools at Brooklyn, New York, and Cambridge, Massachusetts, first as a student, then as an instructor. After the close of the war, he was released in March, 1919. The fol-

lowing summer was spent working in the harvest fields of Oklahoma, Kansas, and Nebraska. In September he entered the Mechanical Engineering class at Cornell. He had planned to spend five years studying for the degree: However, becoming an instructor in the Department of Machine Design in the fall of 1924 delayed his engineering degree until 1925. The next four years were spent in teaching machine design and doing graduate work in economic geology at Cornell. He received the degree of M.S. in 1928 and the Doctor's degree in June, 1929. After spending the remainder of the year in Africa doing field work, he returned to the Engineering College at Cornell to teach machine design during the spring term of 1930, and continued in the same position for the following year. In the autumn of 1931 he went to Smith College where he began teaching mineralogy and petrography. In 1933 he organized and taught the first course in gems and precious stones to be given in any of the women's colleges. He is at present an associate professor in the Department of Geology and Geography at Smith College. His summers have been spent in doing field work for mining companies and consulting engineers in Canada, Newfoundland, and the Eastern United States. The pegmatites and their associated minerals are of particular interest to him, and he has contributed numerous papers to various journals on these important mineral deposits. In addition, Dr. Shaub is interested in photography in its various phases. By the early 1930's he had accumulated an outstanding collection of color transparencies of minerals and gems, which were shown at AGS Conclaves before and after World War II. During his trips to inspect the recent discoveries in Maine, he obtained many natural color transparencies of tourmaline crystals. It is with regret that a color plate of them could not accompany his article. Dr. Shaub is a fellow and member of numerous scientific and professional societies in the United States and abroad. His article on the recent discovery of tourmaline in Maine appears in this issue.

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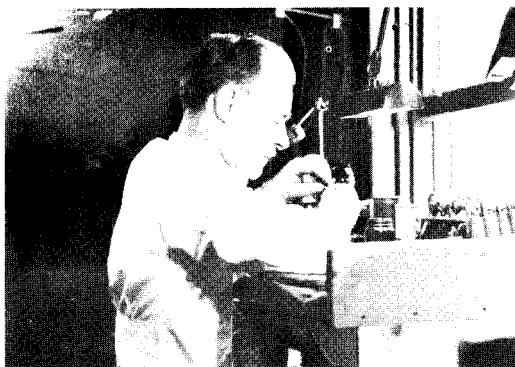
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# Contributors in this Issue

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H. L. RICHARDSON was born in London, in 1889. In 1904, at the early age of fifteen, he was apprenticed to the firm of Thomas Bean & Son, Brewer Street, London. During the ten years he worked for Mr. Bean he attended night school at the London County Council School of Arts & Crafts, taking training in drawing, modeling, diesinking, etc. In August, 1914, at the beginning of World War I, he gave up his work with Thomas Bean & Son and entered the British Army. After his re-



lease from the service, he returned to England, working at various places, eventually resuming association with Thomas Bean & Son. He found his skill was easily recovered and in a very short time he was again executing difficult types of engraving. In November, 1920, he accepted an appointment with Henry Birks & Sons, Ltd., Montreal, Canada. In the spring of 1923 he established a business of his own. In 1930 he began a study of lapidary craftsmanship, eventually incorporating it as a part of his services. In 1935 he studied gemology with Miss Elsie Ruff, F.G.A., receiving a certificate upon completion of the course. In 1954 ill health compelled Mr. Richardson to give up his business and move to a warmer climate. He is now residing at Las Cruces, New Mexico. His articles on *Gem Engraving* and *A Coat-of-Arms* appears in this issue.

G. FRANK LEECHMAN, F.G.A., a native of England now living in Australia, began his study of gemology while living in Cornwall, England. He was awarded the Fellowship diploma of the Gemmological Association of Great Britain, with Distinction, in 1937. In 1953 he received a Post Graduate Research Diploma for his study of Opal.



In 1948 he went to Australia chiefly because of his interest in Opals. He has authored many articles on Opal and other gem materials. His most recent work has been compiling an introductory bibliography on Opal as an aid to others who may be interested in the literature on the subject. His article, "*Thoughts on the Cause of Color in Precious Opal*" appeared in the Winter 1953-54 issue of *GEMS & GEMOLOGY*. Mr. Leechman is third officer on the S. S. Changte of the A.O. Line which travels the waters of the Far East. His article, "*Lattice Structure in Precious Opal*" appears in this issue.

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