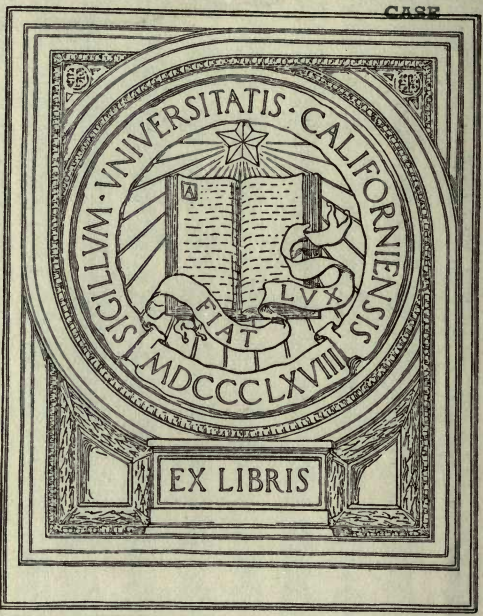

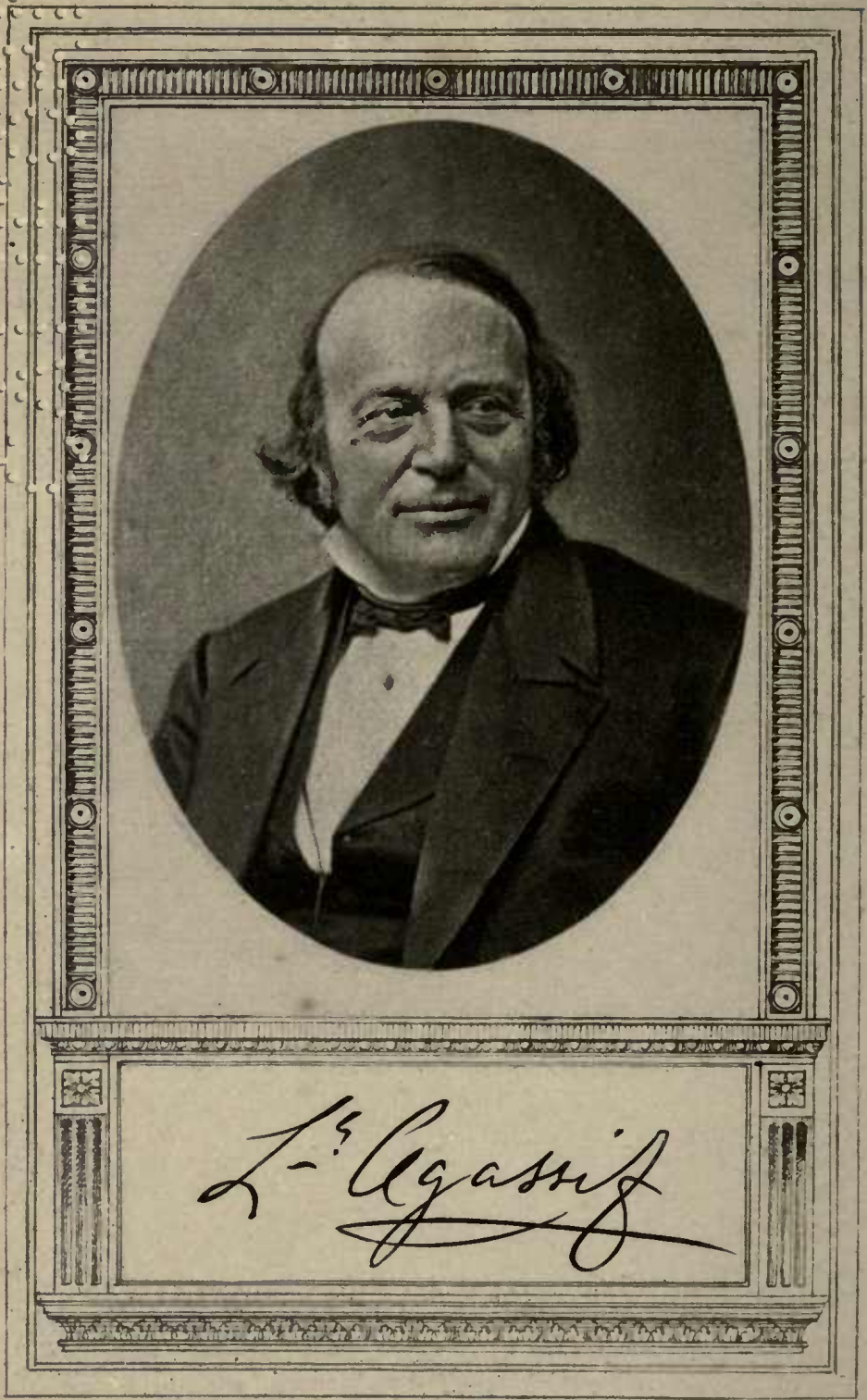

L. Agassiz

THE Beacon Biographies OF Eminent Americans

Edited by

M. A. DeWolfe Howe

The Summit of Beacon Hill, 1808.

PUBLISHED BY
Small Maynard & Company
6 Beacon Street
BOSTON

LOUIS AGASSIZ

BY

ALICE BACHE GOULD

BOSTON
SMALL, MAYNARD & COMPANY
MDCCCCI

Press of
George H. Ellis, Boston

The frontispiece is from a photograph representing Agassiz in middle life, taken by A. Sonrel (exact date unknown), and kindly furnished by Mrs. Agassiz. The present engraving is by John Andrew & Son, Boston.

To

Q. H.

Parvum parvo.

PREFACE.

Lowell says of Agassiz that "a good leash of mother-tongues had he." Agassiz indeed used French, German, and English almost indifferently; and his biographers have used them almost equally. Everything needed for this small volume has, however, been reduced to a dead level of English.

It may be said as truly that Agassiz was strongly conscious of two nationalities. A short account of his life has already been included in a series dealing with Eminent Swiss: he is here presented as an Eminent American; and he was truly both, and found the two loyalties compatible.

The most valuable legacies of scientific men are left to the whole world, with no restraint of place and little of time. But there are a few gifts which they leave, as other men leave them, to one country or to one community. And whatever in Agassiz's gift was necessarily thus restricted we find to-day in America, not in Europe. In

Cambridge stands his Museum; at twenty places on our coasts are the summer schools which have succeeded to his Penikese; and in the American world is the transmitted enthusiasm which passes from teacher to scholar,—the fire that may light up a whole generation which has forgotten the source where it was kindled. Agassiz himself lies buried in Mount Auburn; and, if another legacy may yet be named, his children have been left to Massachusetts, and not to Switzerland, as Boston and America have grateful cause to know.

In order to avoid foot-notes on a small page, many quotations scattered through this volume have been left without any indication of their source. Nine-tenths of them are from Mrs. Agassiz's Life of her husband. A very liberal use (by permission) has been made of Mrs. Agassiz's admirable book and easy translations. The present writer's thanks to Mrs. Agassiz, who has moreover read the narrative portions of this book in proof, are very gratefully recorded.

It should be stated that Mrs. Agassiz in no way authorises the interpretation of Agassiz's scientific creed, which will be found in the only chapter which is not narrative. Messrs. Houghton, Mifflin & Co. have kindly permitted the reprinting of Longfellow's poem, "On the Fiftieth Anniversary of Agassiz."

A. B. G.

BOSTON, November, 1900.

CHRONOLOGY.

1807

May 28. Jean Louis Rodolphe Agassiz was born at Motier, Switzerland.

1817–24

At school in Bienne and in Lausanne.

1824–26

With his brother at the Medical School in Zürich.

1826

Entered the University of Heidelberg. Met Alexander Braun and Karl Schimper.

1827

Migrated to the University of Munich.

1829

Took degree of Doctor of Philosophy, and edited *Brazilian Fishes* (in Latin).

1830

April. Took degree of Doctor of Medicine.

Visited Vienna; returned to Munich.

December. Went home to Switzerland.

1831

At home in Switzerland.

December. Went to Paris. Met Cuvier and Humboldt.

1832

Student in Paris.

February. Received from Cuvier material for his work on *Fossil Fishes.*

November. Went to Neuchâtel as professor in the College.

December. Declined call to Heidelberg.

1833

Purchase of his collection for the city of Neuchâtel.

Began publication of *Fossil Fishes.*

October. Married Cécile Braun.

1834–5

First and second visits to England.

1836

Declined call to Geneva.

1837

Addressed Helvetic Society on a Glacial Period.

1838

Declined call to Lausanne.

1840

Published *Studies of the Glaciers*, in French (later in German).

Hôtel des Neuchâtelois established on the glacier of the Aar.

Third visit to England; appeared as advocate of an Ice Age.

1843

Completed *Fossil Fishes.*

1844

Published "Monograph on Fishes of the Old Red Sandstone," as appendix to *Fossil Fishes.*

1845

Published *Anatomy of the Salmonidae* (in French) as part of the *Freshwater Fishes.*

1846

March. Left Neuchâtel.

Published *Catalogue of Echinoderms* (in French); *Index to Zoölogical Names* (in Latin); finished work on *Bibliography of Zoölogy* (in Latin).

1846

Visited England for fourth time.
September. Sailed for America.
December. Gave his first lectures in Boston for the Lowell Institute.

1847

Published (in Europe) *Glacial System* (in French).

1848

Revolution in Neuchâtel.
Foundation of Lawrence Scientific School of Harvard University.
Accepted professorship at Harvard.
Published *Principles of Zoölogy* (with Dr. A. A. Gould).
Expedition to Lake Superior.
His wife died in Carlsruhe.

1850

Married Elizabeth Cabot Cary.
Sent by Coast Survey to study Florida reefs.
Became Professor at the Charleston (S.C.) Medical College.

1852

Received the *Prix Cuvier* for his *Fossil Fishes.*

1853

Resigned professorship at Charleston.

1854

Declined call to University of Zürich.

1855

Establishment of the Agassiz School for Young Ladies (1855–63).
Prospectus issued for *Contributions to the Natural History of the United States.*

1857

May 28. Celebration of fiftieth birthday.
Completion of *Essay on Classification* (Vol. I. of *Contributions*).
Declined call to Paris (as again in 1859 and 1861).
Published Vol. II. of *Contributions.*

1859

Corner-stone laid for the Museum of Comparative Zoölogy.
Spent the summer in Europe.

1860

Dedication of the Museum.

Published Vol. III. of *Contributions.*

1861

Became a naturalised citizen of the United States.

Received the Copley Medal of the Royal Society.

1862

Published Vol. IV. of *Contributions* (the last volume which was completed).

1865–66

Expedition to Brazil.

1868

Became non-resident professor at Cornell.

1869

Spoke at Humboldt Centennial.

Suffered from an acute illness of the brain.

1871–72

Voyage of the *Hassler.*

1873

Summer school at Penikese.

December 14. Louis Agassiz died at Cambridge, Massachusetts.

LOUIS AGASSIZ

JEAN LOUIS RODOLPHE AGASSIZ.

I.

JEAN LOUIS RODOLPHE AGASSIZ was born at Motier in 1807. His father was pastor of the little Swiss village on the Lake of Morât, and was also a teacher of marked ability, so that the passionate love of teaching which always distinguished Louis Agassiz may have been in some sort an inheritance. The enthusiasm both for work and for play which was so marked in the man was marked also in the child. From his early childhood the boy delighted in birds and beasts, fishes and insects, first in the way of an equal and intimate friend and then of a budding naturalist. He was always tramping the fields and scouring the banks of the lake in search of new creatures; and he has left it on record that the only punishment he remembers receiving from his father was in conse-

quence of his going fishing in an unsafe boat. Apparently nothing followed on the day when he led his little brother to skate across the Lake of Morât, on ice which was anything but safe, and when Mme. Agassiz, looking anxiously from the parsonage window to see what had become of the children, caught sight of them through her telescope at the critical moment when Louis was bridging a fissure with his own body, in order that Auguste might creep across a crack too wide for him to jump. This exploit, and the expedition in the unsafe boat, reassure a reader who might be frightened by the eager plans for extra lessons which the school-boy at Bienne laid before his parents, and which are accompanied by prayers for money to buy grammars and geographies. He ends his petition with: "I should like to stay at Bienne till the month of July, and afterward serve my apprenticeship in commerce at Neuchâtel for a year and a

half. Then I should like to pass four years at a university in Germany, and finally finish my studies in Paris, where I would stay about five years. Then, at the age of twenty-five, I could begin to write."

The apprenticeship in commerce disappears from the future plans of the boy and his parents alike, as it becomes evident that his passion for study is not a passing taste. Many country-bred children have pursued and petted and collected without having anything come of it; and so have many school-boys prickled with delight over poetry and romance who are content to spend their manhood in chasing a sixpence from column to column. The parent, whose fourteen-year-old son announces his intention of becoming an author, is apt to ignore the announcement; but M. and Mme. Agassiz appear to have been thoroughly wise in bringing up their brilliant son, and to have changed their plans slowly but

steadily as his mind developed. The family profession on Mme. Agassiz's side was that of medicine. Louis's grandfather and uncle could probably assist him in founding a practice; and, as soon as the boy's age and attainments made it wise to trust the constancy of his scientific tastes, his parents gave full consent that he should study to become a physician. With this in view, his school course at Bienne was supplemented by two years more at Lausanne; and he was then sent at seventeen years old to the Medical School at Zürich. Here for the first time he found scientific books; and he and his brother Auguste used to copy by hand the treatises on Natural History which they were much too poor to buy.

Agassiz himself said later that the inability to buy books, which then seemed so great a misfortune, may have been a blessing in disguise, because it saved him from dependence on written

authority. When at last he had access to scientific books, he had already learned that the thing itself was better worth study than was its description; and, indeed, he knew the Swiss fishes so well that he wondered to find so little in print about those instincts, habits, attitudes, and motions with which he was familiar. Alexander Braun, later his fellow-student at Heidelberg, wrote home from there that Agassiz was familiar with every beast, knew the birds from far-off by their song, and could give a name to every fish in the water.

In the spring of 1826, when nineteen years old, Agassiz left Zürich for Heidelberg; and here his true university life began. He and his brother parted, Auguste returning to the commercial apprenticeship which the older brother refused, and Louis going out to make new friends, whose first friendship came from an intellectual sympathy and from like intellectual aims, not from blood re-

lationship or old association. His letters to Auguste have a delightful elder-brotherly tone through all their frank affection. With Auguste he can safely allow himself the luxury of a lecture, whether it be four pages on the elephant of the Lena or a disquisition on the rejected commercial career at Neuchâtel. "I earnestly advise you to while away your leisure hours with study," he writes, when twenty years old, to his brother of eighteen. "Read much, but only good and useful books. . . . Remember that statistical and political knowledge alone distinguishes the true merchant from the mere huckster in coffee and candles. . . . A merchant familiar with the products of a country, its resources, its commercial and political relations with other countries, is much less likely to enter into speculations based on false ideas, and therefore of doubtful issue. Write me about what you are reading and about your plans

and projects, for I can hardly believe that any one can live without forming them : I, at least, could not."

II.

THE four years spent at Heidelberg and Munich are among the most picturesque in Agassiz's life. In his letters and in those of his friend Alexander Braun, we are fortunate enough to have the impressions and hopes of the ambitious young fellows and the very spirit of the place and time fixed forever. No narrative can paint as vividly as these unconscious letters. It was a true German student life, with its migrations from university to university, its vacation tramps, its ardent intellectual enthusiasms, not without the *obbligato* accompaniment of clinking rapiers and beer-mugs. Duels and love-making are dimly guessed through the cloud of tobacco smoke — "so thick you might have cut it with a knife" — that floats about the three brilliant companions, Braun, Schimper, and Agassiz, whose room at Munich was known as "The Little Academy."

Life at the university marks Agassiz's entrance upon an intellectual citizenship, and the beginning of his influence on other men. The fervour of his scientific friendships was doubtless connected with his passionate love of teaching, both being at root a love of sharing intellectual pleasures. Most men want intellectual exchange and sympathy much oftener than they get it; but there is a power of getting what one wants, an ability to stimulate mental response and to charm the best out of each companion, and this is the teacher's gift — much the same in its essence as the gift of leadership in any kind. This trait was one which Agassiz had in its highest development. It was not only to his equals, but to children and workingmen that he loved to pour out his ideas. What is so contagious as enjoyment? What so inspiring as enthusiasm? His wife tells us that in later life he would talk of glacial phenomena

to the driver of a country stage-coach among the mountains or to some workman splitting rock at the roadside with as much earnestness as if he had been discussing problems with a brother geologist. He would take the common fisherman into his scientific confidence, telling him the intimate secrets of fish structure or fish embryology till the man in his turn grew enthusiastic, and began to pour out information from the stores of his own rough and untaught observation.

So it was, too, in Agassiz's youth. He not only made friends everywhere, but he made them on an intellectual basis which would have pleased Emerson himself; and then he poured out a hearty affection and emotional wealth that transformed the relation. Earliest and strongest of his friendships, and most important for his after-life, was that with Alexander Braun, whose parents' house at Carlsruhe soon was to

Agassiz as a second home, and whose sister Cécile afterward became Agassiz's wife. Tiedemann, the professor of anatomy at Heidelberg, "who must have had a quick eye for affinities in the moral as well as in the physical world," had separately advised each of the young men to seek the acquaintance of the other. At the first anatomical lecture the two students happened to sit together; and each, observing the careful and intelligent note-taking of the other, was convinced that this must be the student who had been recommended to him. Thus, by a mutual impulse, when they rose to go, each called the other by name. Tiedemann's little plot stood revealed, and never was a match-maker more brilliantly successful. It was an intimacy at first sight which lasted for life. The two boys left the room together, and from that moment their work was carried on in concert. Karl Schimper, a third young fellow of even greater abil-

ity and even more catholic tastes, completed a triple alliance which was soon known among the students as the "Cloverleaf." Two of its three members rose to eminence and left human knowledge other than they found it; but Schimper lacked the moral force to keep himself in hand, and his life was but a series of irreparable mistakes.

Agassiz's studentship at Heidelberg lasted just a year, from May, 1826, to May, 1827. He fell ill of a fever, and, instead of returning for the summer semester, was obliged to stay at home to regain his strength in Switzerland. In the mean time Braun made his plans to exchange Heidelberg for the new University of Munich, and Agassiz agreed to accompany him. The Cloverleaf was re-established in Munich; for Schimper soon followed the other two friends, coming in answer to their earnest invitation to live partly at their expense. Complete community of goods, material

and intellectual, seems to have been the rule; and there was no thought of the tragic consequence which was to come ten years later, when Schimper should accuse first Braun and then Agassiz of stealing his theories. Always petulant and without self-control, Schimper was incapable of carrying anything to a finish; and he has left only a few scattered botanical papers and two thin volumes of poetry. But the expectations which his friends entertained of him were boundless, and must have been justified by his early brilliancy, though the world has long since forgotten his ineffectual fire. Braun, on the other hand, if less world-famous than Agassiz, is no less honoured among German botanists. As late as 1864, Schimper wrote that he was about to publish a botanical work. Braun has indorsed the letter, "May God grant it!"

After a hard day's work in hearing lectures, the Cloverleaf three, along with

a few other students, used by way of recreation to turn and lecture to one another. "When our lectures are over, we meet in the evening at Braun's room or mine, with three or four intimate acquaintances, and talk of scientific matters, each one in his turn presenting a subject which is first developed by him and then discussed by all. These exercises are very instructive. As my share, I have begun to give a course of natural history, or rather of pure zoölogy. Braun talks to us of botany ; and another of our company, Mahir, . . . teaches us mathematics and physics in his turn. . . . Schimper will be our professor of philosophy. Thus we shall form a little university, instructing one another, and at the same time learning what we teach more thoroughly, because we shall be obliged to demonstrate it. Each session lasts two or three hours, during which the professor in charge retails his merchandise without aid of notes or book.

You can imagine how useful this must be in preparing us to speak in public and with coherence. The experience is the more important, since we all desire nothing so much as sooner or later to become professors in very truth, after having played at professor in the university."

The change from Heidelberg to Munich worked very well. A far more stimulating intellectual life awaited the eager young fellows among the group of distinguished professors whom Ludwig, the art-loving Bavarian king, had gathered for his new University of Munich. We in America are accustomed to see Minerva spring in full panoply from the fertile brain of some millionaire,—a Danae rather than a Jove. But in the older world it is rare to find a university made in a day and successfully created by fiat, and thus the brilliant opening of the University of Munich has especial interest. The names of Schelling and

Oken are perhaps the most famous upon its list of teachers, at least for the general reader. Döllinger, Martius, Zuccarini, Schubert, Wagler, and many others follow for the student of natural science. "I cannot review my Munich life without deep gratitude," wrote Agassiz himself, long afterward. "The city teemed with resources for the student in arts, letters, philosophy, and science. It was distinguished at that time for activity in public as well as in academic life. The king seemed liberal; he was the friend of poets and artists, and aimed at concentrating all the glories of Germany in his new university. I thus enjoyed for a few years the example of the most brilliant intellects and that stimulus which is given by competition between men equally eminent in different spheres of human knowledge. Under such circumstances a man either subsides into the position of a follower in the ranks that gather around a mas-

ter or he aspires to be a master himself."

In another place he writes of Munich (we omit some portions): "That university had opened under the most brilliant auspices. Almost every name on the list of professors was also prominent in some department of science or literature. They were not men who taught from text-books, or even read lectures made from extracts of original works. They were themselves original investigators, daily contributing to the sum of human knowledge. And they were not only our teachers, but our friends. The best spirit prevailed among the professors and students. We were often the companions of their walks, often present at their discussions; and when we met for conversation or to give lectures among ourselves, as we constantly did, our professors were often among our listeners, cheering and stimulating us in all our efforts after independent research.

"My room was our meeting-place,—bedroom, study, museum, library, lecture-room, fencing-room, all in one. Students and professors alike used to call it the Little Academy. Here Schimper and Braun for the first time discussed the laws of phyllotaxis, that marvellous rhythmical arrangement of the leaves in plants. Among their listeners were Professors Martius and Zuccarini; and even Robert Brown, while in Munich, during a journey through Germany, sought the acquaintance of these young botanists. It was in our Little Academy that Döllinger, the great master in physiology and embryology, . . . taught us the use of the microscope in embryological investigation." Other students not of the Cloverleaf were prominent in the Little Academy; and as for the subjects discussed, they ranged from the Anatomy of the Lamper-eel to the Structure of the Bavarian Alps; and from the Natural

History of the Mind to the Reasons why Comets have Tails. As various were the specimens which adorned the room. When a child, Agassiz must have bid fair to choke up the little parsonage with his collection of caterpillars and cocoons; and, in writing of his life in Zürich, he makes passing mention of "some forty birds flying about my study, with no other home than a large pine-tree in the corner." At Munich it was certainly the same. Braun speaks of Agassiz's little closet, "not for the use of men, but devoted to such Lenten fare as fish, otters, beavers, and birds." "When I knock on the wall against which stands the bed, then Agassiz comes over: there is only a thin partition between us. He has a living-room of irregular shape with a little bedroom and an entry where his fishes are lodged. While I am writing here, he sits on the other side attending to his fish, of which he has already bought several hundred,

and which are shut up in a wooden tub with a cover, and in various big glass jars. A live gudgeon with beautiful stripes is wriggling in his wash-bowl, and he has adorned his table with monkeys. We stay together in his room or mine by turns, so as not to need heat in two rooms, and not to burn twice as much for light."

The Little Academy could hold from fifteen to twenty persons — "conveniently." The walls were white and covered with diagrams, to which the draughtsmen employed by Agassiz to draw his fishes had added skeletons and caricatures. Braun, Schimper, and Agassiz alike brought home all the specimens they could collect in their excursions; and such material had to find a place, whether on the bed or on the floor. Books filled the chairs, so that no visitor could sit down; and sometimes there was little room to stand or move about. "In short, it was quite orig-

inal," writes one of the draughtsmen, who further sums up the effect as that of "a perfect German student's room." "I was some time there before I could discover the real names of his friends: each had a nickname,— Molluscus, Cyprinus, Rhubarb, etc." The unwonted luxury of several windows and of a little entrance-room for his collections seems to have caused much remark, but it was not for these striking features that Agassiz thought his lodging worth remembrance. "In that room I made all the skeletons represented on the plates of Wagler's *Natural System of Reptiles;* there I once received the great anatomist Meckel, sent to me by Döllinger to examine my anatomical preparations, and especially the many fish skeletons I had made from fresh-water fishes." Braun takes the same fact from another point of view, and writes home: "Under Agassiz's new style of housekeeping, the coffee is made in a machine which

is devoted during the day to the soaking of all sorts of creatures for skeletons, and in the evening again to the brewing of our tea."

These Munich students were, of course, the picked men of a brilliant university; but still they were not so different from the others as to make them self-conscious. Research was in the air: it was like the passion for business among older men in America. And so our wonder at the abilities of Agassiz and his companions shades into a wonder at the intellectual level and assumption of the twenty-year-old society in which they found themselves. It seems at first like a playing at naturalists: next we are struck with surprise at the excellent quality of the work done, tried not by any graded or conventionalised standards, but without handicap and by the absolute standard of the grown-up world. And most conspicuous of all is their exceeding pleasure in all their efforts.

The jollity of the Cloverleaf, the high spirits and full living of its three members, their vacations and their fencing-bouts and their many pleasures, save them from any possible imputation of priggishness. Life was fuller to them than to most; after the delight of an opera there is all the interest of a dissection; and the joy of a mountain climb is enhanced by an opportunity to get your companion's views on phyllotaxis — and so back to Munich in time for the lectures on the Philosophy of Revelation. How fortunate that Agassiz's remittance should come to hand just as Schimper needed it! How remarkably excellent is the Bavarian beer! How charming is divine philosophy! The Cloverleaf was gay enough, but its glee interfered with its scholarship no more than hard work spoiled its fun. Agassiz once challenged an entire student-corps to fight, one after the other, because of some slur upon Switzerland; but we should be

surprised to hear that he missed a lecture in consequence. The enemy will kindly consult the university schedule, when making engagements.

The incurable optimism which buoyed Agassiz through life was part of his physical outfit. Such capacity for happiness generally means capacity for pain, but with Agassiz it really seems as if one did not imply the other. He is but the more picturesque for his poverty, for which he took little thought except when it interfered with scientific ambitions. His life long, Agassiz could not believe that those who worked unselfishly for the advancement of human knowledge would not find their daily bread in some way provided; and his often-quoted answer to a business offer in his American days, "But, my dear sir, I cannot spend my time in making money!" would have been given as naturally when he had nothing as when he was in comfort. During part of his

student life he lived for a few cents a day, while his scanty allowance went for the support of two artists whom he kept busy drawing fishes, and for the help of Schimper, who was even poorer, and to whom daily meals during his university residence presented a problem.

Working hours stretched from seven in the morning to eight or nine at night, but with constant intermissions and very various sorts of occupation. "At seven o'clock we go to the hospital, at eight to the university, from nine to eleven generally to the Royal Library; from twelve to one are the lectures on Natural History from Oken; between one and two we go to some café or other for dinner; from two to three to the Botanic Garden, where we have lectures from Martius and Zuccarini in turn. At three we go to the university and hear Schubert on Natural History till four o'clock, then Oken on the Philosophy of Nature, and, lastly, Schelling on Philosophy. Then we often feel tired."

This is Braun's account. Agassiz's is almost word for word the same, and adds: "This is the course of my daily life, with the single exception that sometimes Braun and I pass an evening with some professor, discussing with all our might and main subjects of which we often know nothing. This does not, however, lessen the animation of the talk." And so again Braun: "There is a charming custom here of going to the professors' houses on certain evenings. It is all as informal as at a *Kneipe;* and the talk is on all imaginable things, both in science and in every-day affairs. At Martius' house they generally give us tea; at Oken's, beer; and to every man a pipe with his name written on it. When all have their little white pipes in their mouths, it is quite Dutch."

These boys seem to have the knack of finding thirty-six hours instead of twenty-four. One wonders whether nervous prostration had then been invented. In

Heidelberg they had succeeded in getting an extra course of lectures at seven in the morning, and were often obliged to pull their professor out of bed for the purpose. The fact that they did so, as Mrs. Agassiz remarks, shows at least the friendly relation existing between teacher and scholars. In Munich there was no need for any extra courses : more were already given than even the Cloverleaf could assimilate. Extra energy could all be expended on the lectures of the Little Academy, which enjoyed still one more advantage in being directly under Professor Döllinger's own rooms. This made easy an informal intercourse of better worth than even formal lectures.

Curiously enough, in Agassiz's published letters there is little mention of the philosopher Schelling, though Schelling undoubtedly exerted a profound influence on Agassiz's mode of thought. Braun, on the other hand, is constantly

bursting into enthusiasms like these, "The real master of all is Schelling"; "Schelling is again lecturing gloriously"; "One hour with Schelling is worth more than everything one can hear at Heidelberg all put together. . . . His first lecture on the value of philosophy, and the need of it in natural science, in law, art, religion, and politics, ought to have been heard by all the world; and, indeed, men of all sorts were present, as well as the students, even some from the Minister's Privy Council. The king was expected, but did not come. I have never heard a more beautiful and a more artistic discourse than this opening lecture. When he had finished, some one in the audience cried, '*Er lebe hoch*'; and thereupon there were three such ringing cheers that the whole house shook."

Both Braun and Agassiz were under strong home influences. The "sweetness of the old Swiss manse" lingered

always around Agassiz, whose intimacy with both father and mother is charming. "I have my evening service and talk silently with you, believing that at that hour you also do not forget your Louis, who thinks always of you," he writes from the university to his father; and the watchful solicitude of both parents, with the high ideal of character which they always take for granted as both his and theirs, should melt any reader. But, though their sympathy was constant and intelligent, they had little or no technical understanding of his work. For Braun, on the other hand, all the influences at home made as distinctly toward research as did anything at Munich. His father's profession, indeed, was not scientific — he was postmaster-general of the Duchy of Baden — but the elder Braun was more than an amateur. He owned some valuable collections, especially in mineralogy; and one whole wing of his house

in Carlsruhe was given up to laboratories and other rooms for his sons and their university friends. The situation of the house was beautiful; and the domestic life within it was affectionate, cheerful, and pious. A pleasanter place to pass a vacation could hardly be imagined; and, as Switzerland was too far for Agassiz's finances, he used to go to Carlsruhe as a matter of course. There, when the rush of term time was over, he could work in comparative leisure.

A letter from another of the student guests says: "Braun's sisters are simple, quiet girls, without any airs. Both are much interested in natural history, especially — as is proper for young ladies — in botany; the youngest also in butterflies." This ladylike curriculum must afterward have been somewhat enlarged. The elder sister, Cécile, was a skilful artist; and both before and after her marriage with Agassiz she gave him valuable help in preparing sketches for

the lithographer. Braun had two sisters and two intimate friends; the result was exactly what might have been expected.

From choice as well as from economy the young men used often to make part of the journey to Carlsruhe on foot; and in several vacations they made further expeditions to see such museums as were within reach or to visit any scientific men to whom they could get introductions, and to make themselves familiar with the best private collections in their part of Germany. Agassiz says that at the end of his student life he knew every animal, living and fossil, in the museums of Munich, Stuttgart, Tübingen, Erlangen, Würzburg, Carlsruhe, and Frankfort; had travelled on foot all over Southern Germany, and had explored extensive tracts of the Alps. The Frankfort Museum had recently been greatly enriched by foreign collections, and the collector was shortly to go again to Africa. Agassiz longed to accompany

him, but longed in vain. There was one pet plan of the Cloverleaf which remained a mere castle in the air. All three of the young men wanted to travel in distant countries. Was not the world the greatest of all museums, in which as yet they knew only one room?

Humboldt's travels had fired all the young naturalists of the day. Charles Darwin as well as Agassiz speaks of reading and re-reading Humboldt's *Narrative*, and of the longings it aroused. But Agassiz was not so fortunate as to find any *Beagle* which would have him at a gift, though he tried for at least three of the scientific expeditions which were fitting out while he was a student. His preparations for the chance that never came,—skinning and pickling animals, "even very large ones," practising with axe, hammer, and sabre, swimming, making forced marches, keeping himself always ready to start at a day's notice, and finally "training a young friend as

travelling companion''— all this delightful game at Robinson Crusoe was of no avail. He solemnly obtained his parents' consent, calling travel a step toward a professorship. How it struck his father at first we may see from part of a letter :

"My dear Louis, . . . our gratification lacks something. It would be more complete, had you not a mania for rushing full gallop into the future. I have often reproved you for this, and you would fare better, did you pay more attention to my reproof. If it be an incurable malady with you, at all events do not force your parents to share it. If it be absolutely essential to your happiness that you should break the ice of the two poles in order to find the hairs of a mammoth, or that you should dry your shirt in the sun of the tropics, at least wait till your trunk is packed and your passports are signed before you talk with us about it. Begin by reach-

ing your first aim, a physician's and surgeon's diploma. I will not for the present hear of anything else."

But there was one short interval when there seemed a real chance that Agassiz might find the opening he sought. In 1829 Humboldt himself was starting for the Ural and the Caspian; and on one happy evening, when the little white pipes were out at Professor Oken's, Oken promised to recommend the entire Cloverleaf in case Humboldt should be willing to enlarge his company. "With this," Braun wrote, "we went home in great glee. It was very late and a bright moonlight night. Agassiz rolled himself in the snow for joy; and we agreed that, however little hope there might be of our joining the expedition, still the fact that Humboldt would hear of us in this way was worth something, even if it were only that we might be able to say to him one of these days, 'We are the fellows whose company you

rejected.'" But it was very little later that Braun wrote home again, announcing what he calls "our return from the Ural Mountains."

We have tried to make Agassiz paint his own portrait; but we may add a description given by Mr. Dinkel, the draughtsman already quoted: "He was at that time scarcely twenty years old, and was already the most prominent among the students at Munich. They loved him, and had a high consideration for him. I had seen him at the Swiss students' club several times, and had observed him among the *jolly* students. He liked merry society, but he himself was in general reserved and never noisy. He picked out the gifted and highly learned students, and would not waste his time in ordinary conversation. Often, when he saw a number of students going off on some empty pleasure-trip, he said to me: 'There they go with the other fellows: their motto is, *Ich*

gehe mit den andern. I will go my own way, Mr. Dinkel,—and not alone: I will be a leader of others.'"

And at twenty-one years old the boy wrote to his father: "I wish it may be said of Louis Agassiz that he was the first naturalist of his time, a good citizen, and a good son, beloved of those who knew him. I feel within myself the strength of a whole generation to work toward this end, and I will reach it if the means are not wanting."

III.

THESE impressionable university years determined Agassiz's future life. He went to Heidelberg with a strong taste for natural history; he left Munich devoted heart and soul to science, to give his time and strength unreservedly to her service until the end. What would have happened, had he been constrained to stay and try commercial life at Neuchâtel, we can hardly guess.

At Heidelberg the boy had made his first scientific friendships. At Munich, while still a student, he accomplished his first scientific work, the editing of the *Brazilian Fishes*, for which material had been collected by Professor Spix. Professors Spix and Martius had been sent by the king of Bavaria on a scientific journey to Brazil; and the rich collections which they had amassed in the years 1817–21 had been brought back to Munich, where the scientific results were

slowly issuing from the press. Martius had the general charge of the botanical and Spix of the zoölogical departments; but Spix's death in 1826 left unfinished three zoölogical volumes, which were to deal with shells, insects, and fishes respectively. Martius, his surviving colleague, who as professor had seen much of the Cloverleaf, thought Louis Agassiz quite competent to act as editor of the volume on fishes, and offered him the work. It was such a chance as seldom comes to a boy of twenty-one; but it was a chance fairly earned by thorough and eager labour, and opportunities are among the things geniuses find and collect.

Besides Agassiz's delight in the thing itself, he had another reason for gratitude. Such public recognition and such a tangible result of his studies could not but affect his parents in Switzerland, whose attitude toward a purely scientific career was still sceptical. They seem to

have entertained very conservative views on the possibility of self-support for a man of no profession except professorship, although they never urged the lack of practical, wage-measured utility as a reproach against knowledge herself, but only as an excellent reason why their own particular penniless Louis should have a bread-winning profession (like that of medicine) as a preliminary. Nowhere in their letters is there a sordid ideal of success: they never overvalue wealth or undervalue intellectual pleasure, but they speak constantly of good citizenship, and of the shame of dependence on others. Louis was already betrothed to Cécile Braun, and he had no dollar of income — what was he to do?

His passionate desire to give himself wholly to science, his growing distaste for the daily work of a physician, and his pleading with his parents give us a vivid and pathetic picture, our feelings being saved by our knowledge of the

happy chapters to follow. To all he can say, they have but one answer: Let him first take his medical degree, and then discuss the next step. "He was perhaps apt to think that the best medical teaching would be found in connection with the best zoölogical museum"; and there is a delightful passage in one of his later letters to his father, when he already wrote himself M.D. "I do not believe it important that a young physician should familiarise himself with a great variety of curative methods," remarks this hopeful young doctor, "so I try to observe carefully the patient and his disease, rather than to remember the medicaments applied in special cases."

Agassiz wanted the appearance of his book to be a surprise to his parents, and he was much disappointed that the surprise failed through his having neglected to bind a friend to secrecy. In everything else the plan was perfectly successful. Praise of their son's brilliant abili-

ties, of his perseverance, of the esteem in which he was already held among scientific men,— this came to his parents in one way and another. The wonderful news of his forthcoming book was followed shortly by the book itself, brave with coloured plates and Latin descriptions. Added to all this was the affectionate obedience with which Louis pressed on to the degree of Doctor of Medicine. He took his degree brilliantly in 1830; and this, although he had not only accomplished the work on *Brazilian Fishes* in his student time, but had also taken by the way the degree of Doctor of Philosophy, which was a desirable addition to his name on the Brazilian title-page. The innocent exultation of son and parents, first over the book and later over the diploma, is best given in their own words: "Will it not seem strange when the largest and finest book in papa's library is one written by his Louis? Will it not be as

good as to see his prescription at the apothecary's?" "I hope yet to prove to you that, with a brevet of Doctor as a guarantee, Natural History may be a man's bread-winner as well as the delight of his life." "I hasten, my dear son, to announce the arrival of your beautiful work which reached me on Thursday, from Geneva. I have no terms in which to express the pleasure it has given me. . . . The old father who waits for you with open heart and arms sends you the most tender greeting." His mother adds: "I cannot thank you enough, my dear Louis, for the happiness you have given me in completing your medical examinations, and thus securing to yourself a career as safe as it is honourable. . . . You have for my sake gone through a long and arduous task. Were it in my power, I would gladly reward you; but I cannot even say that I love you the more for it, because that is impossible."

IV.

After the work on *Brazilian Fishes* was finished, and the degrees were taken, two years intervened before Agassiz obtained his professorship. There was a short visit to Vienna, a last semester at Munich, nine months at home in Switzerland, and nearly a year in Paris. In Vienna Agassiz found himself received as a known scientific man for whom no letters of recommendation were necessary, and this surprised as much as it pleased him. Some one called him *Ichthyologus primus saeculi*, and he saved the ponderous compliment to send home.

In the autumn of 1830 he left Munich for good, and the Little Academy was dismantled of all its trophies. Most of these, indeed, had already been sent home, with the suggestion that an uncle "perhaps would have the kindness to let some large shelves be put in the little upper room . . . where, far from being

an annoyance or causing any smell, my collection, if placed under glass or disposed of in some other suitable manner, would be an ornament." Then for a year at home he was wearying for intercourse with his intellectual equals and for access to the treasures of a university or a great city. The effect that Agassiz produced on those about him comes out in the way his friends and relatives urged their mites of contribution toward sending their young author to Paris, which was now the goal of his desire. Enough money was raised to make it possible, and from December, 1831, to September, 1832, Agassiz was in Paris.

The two most interesting things in this year are again his scientific friendships. Cuvier, who ranked first among living French zoölogists, and Alexander von Humboldt, the leader of all the scientific world, were both in Paris; and it seems to have needed little time to gain affectionate recognition from both.

They saw their own successor in the eager and penniless young author, and as charming and picturesque as the equal friendship of the Cloverleaf are the reverence and loyal affection of Agassiz's relation to these older men, and his gratitude for the generous help they offered him. It was an interesting time, hardly two years after the famous dispute between Cuvier and Geoffroy St. Hilaire; and the echoes of that discussion were still sounding. Humboldt used himself to attend one course of Cuvier's lectures, where Agassiz often secured the seat beside him, and heard his whispered comments on Cuvier's passionate advocacy of one set of doctrines.

But homesickness begins to show itself very clearly in Agassiz's letters home. Alexander Braun was also in Paris; but, as each advanced in his specialty, their work could not be so much in common. It is evident that Agassiz was somewhat frightened in Paris by the bigness and

coldness of the world and his own unimportance in it. In Munich he had been a leader, but in Munich every one was poor. In Paris there was wealth and position even among scientific men, and Agassiz's poverty was much more noticeable. He had about forty dollars a month; a draughtsman was to him the first of necessary expenses, and his work had become such that only the museums of a large city could supply the proper collections of fossil fishes. He lived in terror of being forced to give up work. He had no presentable coat for evening wear, and in writing home he confessed that his delay in sending some book to his brother meant that its price would have left him absolutely penniless.

Now that he stands at the parting of the ways between medicine and zoölogy, his attempts to make science pay its own expenses are interesting. The first step was to find a professorship, but this was by no means all. Teaching, how-

ever delightful, was not all he sought, and investigations cost money in the making and in the publishing too. The *Brazilian Fishes* had introduced him to a scientific publisher who might possibly be induced to purchase works which were properly laid before him. Agassiz's specialty was chosen — he was deeply interested in ichthyology — and for some years it had been his purpose to write a work upon Fresh-water Fishes. To this plan he had added a still larger and more ambitious project. This was the publication of a Natural History of Fossil Fishes. Palæontology was then so new a science that the systematic treatment of extinct forms along with living species had hardly begun. The fossil specimens were scattered through the museums of Europe, and great expense would be necessary in travelling and collating material. A more sober judgment would have shrunk from attempting the task; and the world may

congratulate itself that Agassiz's youth and genius conspired so often, first to blind his judgment of probable results, and then to bend the results themselves aside from all probability.

Two incidents stand out from his Parisian experiences, connected with two generous gifts from Cuvier and Humboldt, respectively. One was a wholly unexpected gift of money, generously and delicately offered by Humboldt, which came at the very darkest hour, when it had crossed even Agassiz's mind that he might be forced by fear of absolute starvation to abandon museums, draughtsmen, teachers, and all, and go home to live more cheaply as a physician or a tutor in Switzerland. It was only two hundred dollars, but the effect it produced was enormous. "My benefactor and friend — it is too much! . . . My parents will now readily consent that I should devote myself entirely to science." And then to his parents: "Oh! if my

mother would forget for one moment that this is the celebrated M. de Humboldt, and find courage to write him only a few lines, how grateful I should be to her! I think it would come better from her than from papa, who would do it more correctly, no doubt, but perhaps not quite as I should like. Humboldt is so good, so indulgent, that you should not hesitate, dear mother." . . .

The other gift was of a different sort, but of even greater generosity; and it was as thankfully and modestly received. Cuvier had planned a work on fishes in general, and had issued a circular asking for general help in collecting his material. A year or two before, it had been one of Agassiz's minor ambitions to send so intelligently made a collection of Swiss fishes as should bring the contributor's name to Cuvier's notice. Now his hopes had gone further,—he had the ear of the master and could ask advice for his own work.

One evening at M. Cuvier's house — the only house where Agassiz dared go without the evening dress which he could not afford to own — the old man sent his secretary for the portfolio containing all his notes and drawings of fossil fish, and gave it unreservedly to the student whom he had already made free of his private library and working-room.

The stay in Paris came to an end when a chair of natural history was offered Agassiz at Neuchâtel. The salary guaranteed him was about four hundred dollars; but he had strong reason to hope that his collections would be purchased for the city. These collections had reached a very considerable money value, and were extremely awkward possessions for a private person and a private house, so that this advantage would more than compensate him for a salary very small even on Agassiz's modest computation, and perfectly absurd according to our ideas to-day.

V.

AGASSIZ'S life falls into three bold divisions — his youth and studentship, his thirteen years as professor at Neuchâtel, and his later manhood in America. He went to Neuchâtel in the autumn of 1832, and remained there till 1845, declining calls to Heidelberg, Geneva, and Lausanne, as afterwards in America he declined invitations back to Europe. The ease with which he passed from one subject to another is a curious contrast to this conservative loyalty when once connected with an institution. His greatest scientific work as an investigator was done while at Neuchâtel. In America he occupied a unique position as the undoubted scientific leader of a continent, the "Great Professor," as we were fond of calling him; and his labours for the promotion and popularisation of science were so great that even his own researches are somewhat overshadowed by them.

Neuchâtel was at this time a Prussian principality which had entered into the Swiss Confederation. From the king of of Prussia, through Humboldt as minister, Agassiz more than once received generous assistance and encouragement. The college was not an important one; and the chair in natural history had been founded in order that Agassiz might occupy it; so that there was nothing waiting him in the way of material equipment. There was no scientific apparatus, no museum, no proper lecture-rooms; but there was a home pride in Agassiz, and a desire to meet his wishes and to keep him in Neuchâtel, if possible.

As a professor, his success was immediate. "He had, indeed, now entered upon the occupation which was to be from youth to old age the delight of his life. Teaching was a passion with him, and his power over his pupils might be measured by his own enthusiasm." His

courses began by a very successful public lecture on the Relations between Different Branches of Natural History. This was a characteristic choice of subject. Agassiz was fond of ignoring arbitrary divisions. "Facts in his hands fell into their orderly relation as parts of a connected whole, and were never presented merely as special or isolated phenomena." His influence was felt outside the lecture-room in many ways. Popular lectures were offered for those who were not students. Classes for children sprang up. His collections formed the nucleus of an unusually excellent city museum. The Neuchâtel Society of Natural Sciences, organised within a month of his arrival, was soon of real importance. Agassiz's boundless and almost incredible energy gave to the world work after work on various subjects. He attracted other men since famous on their own account, and his establishment was called a scientific factory always in

full blast. Désor was his assistant at Neuchâtel; and Vogt, the laughter-loving materialist, was also (so sarcastic is fate) trained by Agassiz. Vogt may really be said to exist in literature as well as in science through his much-refuted dictum that "the brain secretes thought as the liver secretes bile." The number of Agassiz's aids and pupils who became naturalists of repute speaks for itself, as does the number who chose to follow him to America. Let us add that the boy employed at Neuchâtel to run on errands and clean the boots became a scientific man, and that, when Agassiz left Neuchâtel, the town, after having been for thirteen years a centre of scientific activity, relapsed at once into its normal and placid unimportance.

As for the vacations, three journeys to England and many summers spent among, on, and even in the Alpine glaciers, give interesting reading. The scientific and personal interest are al-

ways intertwined, for with Agassiz his work was his life, and everything smacks of the investigator. His poverty is always conspicuous. He is continually trying to earn something, but always under a sort of protest at the disagreeable necessity. But, where the end was scientific, no expense staggered Louis Agassiz. "These things are needed for the work," was a sufficient answer. His first publisher having died, and the successors hesitating to assume responsibility for the *Fossil Fishes*, Agassiz decided to publish at his own expense; and, as plates could be more satisfactorily executed under his own eye, he promptly founded and made himself responsible for the maintenance of a lithographing and printing establishment in Neuchâtel. After this it is an anti-climax to refer to the guides and scientific apparatus taken to the glaciers or to the artists sent to England to sketch fossil fishes. With a yearly deficit distinctly larger than one's

largest income, most professors would be discouraged long before thirteen years were up; but Agassiz never was one to be carked by cares. Where there is one and only one chief object, there is at least no wearing contest for the right of way, and by so much is the man nearer success. Whether he could afford it or not, whether the money had been paid or not, whether the deluge was coming or not, the main object was accomplished. The apparatus was there, the books were written, the lithographs were given to the world; and other matters were trifling in comparison.

The careless poverty which was so picturesque in the student of Munich, breakfasting off a glass of beer in order to keep two draughtsmen busy among the fishes who shared his bedroom, is perhaps more open to criticism in the older professor of Neuchâtel, with a dignified position to maintain, and a wife and children besides. As soon as Agassiz's

collections were bought and paid for, he had married the sister of Alexander Braun. A son and two daughters were born to him; and the son Alexander afterward showed the same scientific ability as his father and uncle.

With Agassiz's more intimate personal life at this time the public has little concern. But there is one aspect of private life which closely concerns any biographer: we mean the way in which private circumstances and personal character affect work which is properly public. Agassiz's whole achievement was coloured by his character. This was first of all through the extraordinary indifference to expense which we have just remarked. In the next place, in looking at a list of his publications, we immediately notice how his works overlap one another. He generally published in parts, doling his results out to the public bit by bit; and, if a new subject presented itself as needing investiga-

tion, he would attack it without any regard to how many irons he had already in the fire. Regarding himself always as a servant of Science, he put his hand to whatever would serve her best at the moment, declining new work because it interfered with the old no more than a man in public office would decline to consider a public need on the plea that his time is fully occupied already. This resulted in a number of incomplete works, and in an immense number of short scientific papers on this subject and that.

That such a method hurts a man's own reputation is evident, but whether his total service to science is lessened is a matter for debate. And this seems to explain the fact that so great a naturalist was not more grieved by unfinished work. Agassiz was utterly without what has been called the lust of finishing. It was not that he lost interest in any subject under the sun, but that the over-

whelming interest of something new diverted him from his former pursuit, to which he always expected to return. And, as akin to this, we notice the variety of his work and his readiness to take up any new subject, without allowing himself to be bound to his specialty. Agassiz had a horror of intellectual red tape, and a lively interest in everything beneath the visiting moon. His work on glaciers was wholly different from the other things he had in hand, and yet his name is as intimately associated with the ice age as it is with fossil fishes. Science is one, as he was fond of repeating; yet he used to say also that no investigator could afford to be without a specialty, lest he miss a proper standard for exact and for comprehensive knowledge. One subject, he said, should be like a surveyor's arbitrary base line, to which all other lines are referred for comparison.

Next in the personal habits that af-

fected his work comes the habit of always working in partnership. This was no accident, but a deep-seated trait of character. As Lowell says of him, "He basked and bourgeoned in copartnery"; and we have already remarked that this fell in with his love of teaching. Of an affectionate intellect, he was always the head of a troop of assistants, sometimes paid and sometimes voluntary. Money evidently seemed to Agassiz as minor a question where another man was concerned as he had always made it for himself; and this unstable business basis became the source of serious anxiety for him and deep dissatisfaction for his fellow-workers. One embittered assistant, who has sketched the scientific factory at Neuchâtel, remarks that the arrangement between Agassiz and his aids was that, if they needed money at a time when he had any, he should give them some, and that in any case several of them were to be provided for at his

table. The opportunity that Agassiz offered these young men was precisely that which he himself would most have longed for in his younger time, and he interpreted other men's desires in the light of his own character. What would not he have given for such a chance to do original work under the immediate eye of a master, in constant partnership with a celebrated investigator?

VI.

Of the scientific writings which Agassiz poured out from Neuchâtel, the greatest and most important was his immense work on *Fossil Fishes*. From 1833 to 1843 this was issued, plates and text not always keeping pace, and monographs on special fauna following as an appendix. It offered a wholly new classification of fishes, making the nature of their scales of prime importance, and thus facilitating the identification of fossil fragments. Of course, this in itself is only a minor aim; but Agassiz's fine "zoölogical tact" made him recognise those differences which accompany other differences throughout the whole creature, and indicate the really natural classification. How profound was his knowledge of the subject is illustrated by the anecdote of his constructing from a single scale a fish such as might belong to strata where no

fish were then known. He was asked to perform the feat at a meeting of the British Association, without being told that a fossil had been found. As he finished his drawing of what the fish must have been, some one drew back a curtain which had concealed the specimen; and a round of applause broke the decorum of the meeting.

The generalisations which Agassiz drew from his study of fishes made him, in spite of himself, one of the greatest contributors to the coming theory of evolution by descent, "the *bête noire* of his later days." One of the greatest gains of all modern science, the law that the development of the individual animal shows in brief the development of the race, depends more upon Agassiz than upon any other one worker. This law he followed in detail, and proved beyond question for the class of fishes; and this he recognised as the greatest result of his research. Long afterward he said: "I

have devoted my whole life to the study of Nature, and yet a single sentence may express all that I have done. I have shown that there is a correspondence between the succession of fishes in geological times and the different stages of their growth in the egg — this is all." To-day this is taken as due to inheritance, and as one of the strongest reasons for believing in the change of species by descent. So, again, with Agassiz's "synthetic or prophetic types," uniting characteristics which were afterward separated and confined each to its own group — as, for instance, the early creatures, who were half like the reptiles and half like the fishes — modern interpretation would, of course, call these the ancestors of both. To express the law of succession and development of fishes during all geologic epochs was his aim, as it is that of every evolutionist; and in the modern theory, Agassiz's results have become the

head of the corner, although for explanation he passed directly, instead of indirectly, to the Creator, declaring that such laws were "incontestable proofs of the existence of a superior intelligence, whose power alone could have established such an order of things."

The execution of the *Fossil Fishes*, especially the lithographing of the plates, was of remarkable excellence. No expense had been spared, and the result was accomplished. We have dwelt upon this work because it was both the most important and the most finished of his books — finished indeed as far as such a thing could be finished, when every year was producing new specimens, and making Agassiz plan new appendices. But this was only one of a score of important contributions to science. His *Fresh-water Fishes*, issued in much the same style, was kept in progress at the same time; and here the monograph on the Salmonidæ stands com-

plete. In the laboratory at Neuchâtel were carried on some of the earliest experiments in artificial fish-breeding — a subject which has now grown to vast commercial importance. The fossil echinoderms of the Jura had not been adequately treated; and, therefore, Agassiz could not resist writing an extensive monograph on the subject, which soon interested him in living echinoderms. It occurred to him that the inner shape of shells was very little known, and that castings to give at least the outline of the inhabitant would be of special value for the extinct mollusks who have left us shells and nothing else. No sooner was it thought than done. Experiments on metallic alloys which can fill without shattering, the preparation of shells to act as moulds, and then the careful casting of models — all were carried on under Agassiz's eye and at his expense; but in this particular case there were actually some pecuniary returns, as various mu-

seums wished for a set of such models, and were willing to pay for them. Had any scientific man or museum professed inability to pay, whether for models or for books, Agassiz would have provided what was wanted, as a matter of course. Humboldt remonstrated on his lavish distribution of complimentary copies of his books; but it is always the same story. Agassiz had *one* object: that was the advancement of science. If he could avoid falling bankrupt by the way, it was of course more agreeable; but a man must not think too constantly of himself.

His unfortunate translation into French and German of an English book on Conchology — unfortunate because it apparently did not occur to him that the author regarded the thing as a money-bringing investment — stands almost alone in that sort of work. Of a new kind, again, are the *Nomenclator Zoölogicus* and the *Bibliographia Zoölogiae*, an index

of species and of writings, prepared because such lists were wanted, though such compilation and work among books instead of beasts was singularly out of Agassiz's vein. The geology of the Jura, too, and the construction of relief maps of part of Switzerland, were subjects pursued in the "scientific factory," though by Agassiz's assistants more than by himself. But far more important than any of this work except the *Fossil Fishes* were the investigations which we have left to the last — those studies of the glaciers which have given a whole new chapter to the history of the earth.

VII.

AGASSIZ'S great service to geology proper (apart from palæontology or the study of fossils) is that — thanks to him and his coworkers — ice has been introduced as a great geologic agent, almost as important as fire and water. "The peasant had told his strange story of boulders carried on the back of the ice, of the alternate retreat and advance of glaciers, now shrinking to narrower limits, now plunging forward into adjoining fields by some unexplained power." The Alpine herdsman and the guide knew the moraines and dikes, the polished or furrowed rocks of their own valley; but educated men were not familiar with these things, and did not recognise them when the ice was not there to draw attention to its own doings. The idea that such phenomena were nót restricted to regions where glaciers now are found, but that traces of glacial

action could be seen over enormous tracts of the earth's surface, perhaps including regions in the tropics, and that in countries now temperate there might be discovered not only the remains of tropical fauna and flora, but also distinct indications of a period of arctic cold — this was as new as startling. Geologists looked at each other with a wild surmise. The possibility had been glanced at before, not by mere irresponsible theorisers, but by such a master in theoretical suggestion as Goethe. But neither a lucky guess nor a learned hypothesis can take rank in science with a theory supported by accumulated evidence from observation.

In 1836 Agassiz spent the summer with his friend, Jean de Charpentier, and brought the daring of youth and genius to help the strange, new ideas that Charpentier hardly ventured to suggest above a whisper. A new world for research was flashed before his eyes.

The boulders and scored rocks in the valley of Bex were so many Rosetta stones, and he took up the challenge of Nature again without hesitation. The fish might wait a little longer. If his winters were given to them, he could still put in his summers upon the glacier. In 1837, when the Helvetic Society of Natural History met at Neuchâtel, he delivered the address on a glacial period, which marks the admission of a new subject to general scientific attention. So very great an innovation could not but meet with a demand for very strong evidence, along with doubt, sometimes scornful, until years of research should accumulate the evidence. Humboldt, much as he respected Agassiz's judgment, was sceptical. Von Buch, the leading German geologist, "raged," and invoked the shade of De Saussure. "*O sancte De Saussure, ora pro nobis!*" Caricature was easy; and there was plenty of it. But Agassiz was supported by a firm

conviction that he was on the right track, and to-day the world acknowledges that he was right and it was wrong.

The six summers from 1838 to 1843 he spent in the Alps, following far and wide the hieroglyphics written by past glaciers, and then turning his attention to the constitution and action of glaciers as they are to-day. A permanent station was established on the glacier of the Aar. A large, overhanging boulder of the medial moraine just below the junction of two glaciers was transformed into a rude hut, and christened the *Hôtel des Neuchâtelois;* and its name was soon known throughout Europe. Here, in cold and privation and enthusiastic happiness, Agassiz and his crew spent their vacations. Long afterwards it was a saying in Cambridge that no overcoat was necessary when passing Agassiz's house, such a genial warmth of good will glowed from its very windows. And

so it must have been in Switzerland, where laughter and jollity, following on science, are what travellers report from the Hôtel des Neuchâtelois. Though of world-wide reputation, the professor enjoyed Alpine risk and adventure like a boy. He was barely thirty when he gave his first glacial discourse; and he wore his weight of learning lightly, like a snowflake. It was not necessary for glacial investigation that he should scale the maiden peak of the Jungfrau; but up it he went, and stood upon the two-foot summit, balancing with his life in his hand. Whether it had ever been ascended before, is a question; certainly, it had not been attempted for many years.

In the same summer he took a risk in the opposite direction, and had himself lowered deep into a crevasse, in order to observe the "banded," or "ribboned," structure of the glacier. That he came back alive from this "descent

into hell," as his horrified mother terms it, is matter for surprise. He was so absorbed in watching the structure of the icy walls between which he was gliding that he did not notice the water beneath him until, at a depth of one hundred and twenty-five feet, he was suddenly plunged into an ice-cold stream. His hasty signal being misunderstood at the surface, he was lowered further and completely submerged. Whether at that supreme moment he got one last reading of the thermometer he does not say, but that day he read no more; and the huge stalactites of ice far above him, against which the rope was chafing, and the fall of a single one of which would certainly crush the intruder to death, did cause some momentary anxiety even to the optimistic Agassiz in his shivering upward flight.

Plans were made for a great glacial treatise in three volumes, each volume to be worked out in detail by one man.

The erratic boulders which were scattered over Switzerland were to be sorted, mapped, traced back, every one, to the quarry whence it came; and the same was to be attempted on a less complete scale for other regions outside Switzerland. Agassiz's own volume was to be a study of the glacier itself, as in action to-day; and many experiments on the grinding, crawling mass were made with boring-holes, coloured liquids introduced into the ice, and rows of stakes set across the glacier to show by their deflection the rate of flow and place of swiftest current in the unwieldy river, whose complicated motions in its irregular channel were often exactly opposed to expectation. But nothing accomplished on the physical side could compare in importance with what was ascertained on the historical side. Agassiz could soon recognise traces of glacial action as a hunter knows the marks of his game. In his first visits to

England in 1834 and 1835 he was received as an ichthyologist; but when he went again, in 1840 and in 1846, it was to find everywhere traces of extinct glaciers, to explain in a word phenomena that had puzzled everybody, and to convince some of the English geologists out of hand. The theory of an ice age grew: the sheet of ice asserted to have passed over some parts of Europe assumed more and more startling dimensions, while ridicule and opposition diminished in inverse ratio. To-day no one doubts the main facts: the explanation is yet to be given.

So far as we know, Agassiz formed no opinion about the possible causes of a glacial period. It is one of those large questions unencumbered by data which invite irresponsible theorising. Periodic changes in the elongation of the earth's orbit or in the inclination of its axis might cause a cosmic summer and winter (in which case the ice age

will, of course, return), or there may have been abrupt changes in the constitution of the earth herself and a change in the geographical situation of the pole. Not much is known of the geology of the arctic regions, and it is not even absolutely sure whether the glacial period was one of simultaneous cold over the whole earth. Geologists are not at one as to whether several distinct periods or only one period with interruptions can be traced. Geologically speaking, the time was extremely recent — it has been put within the existence of mankind. Such a sheet of ice as that which covered the North American continent would distinctly alter the level of the ocean; and for this an immense accumulation of snow is necessary, while meteorology is still so far from being an exact science that her best men shrink from saying what would be the effect of great changes in the distribution of land and water, and

of the mountain ranges against which clouds discharge themselves.

To sum up, many causes have been suggested which might have produced unusual cold; but whether any one of them did so or did not is an unsolved question. Geology, meteorology, and astronomy alike are under examination.

VIII.

It was in 1842 that Agassiz began to think of going to America, where he did go four years later. He had hoped to accompany the Prince of Canino (one of several scientific men produced by the house of Bonaparte); but, as it turned out, the prince was prevented, and Agassiz went alone in 1846. The plan had three aspects as finances progressed from bad to worse. At first it was a vacation scheme, at Agassiz's own expense and for his pleasure; then the prince offered to pay the expenses; and, finally, it became a forlorn hope for the raising of funds to discharge Agassiz's increasing debt. The time was not yet when a celebrated man could gain a fortune in a summer by exhibiting himself upon American platforms; but still lecturers were better paid here than in Europe, and Agassiz believed that he might regain his pecuniary credit, with-

out hurting his scientific work. We note an occasion when his hopeful expectations were actually surpassed by the event. The King of Prussia (always through Humboldt) came to his help again with a timely offer of some three thousand dollars to be spent in travel for scientific purposes; and the Lowell Institute, to which America has been indebted for so many visits from eminent men, never did a better thing than when it brought Agassiz to Boston.

He promised to return to Neuchâtel — still, he speaks of preparation for "a journey of several years' duration," and he spent his last winter in the unusual task of finishing and setting in order everything with which he was concerned. The *Bibliographia* and *Nomenclator* upon which he worked that last year seem like the indices to a finished first volume of his life. During some months at Paris the *Echinoderms* was put into final shape, so that an assistant could attend to its

publication. His volume on the Glaciers was already out, so that, although the work was never finished, we find the paradoxical situation of Agassiz's part complete, and that of his coadjutors wanting. In spite of his repeating that he should return to Neuchâtel, it seems as if the guiding genius of his life had warned him that this was no mere episode. He left his wife and children for the time with Alexander Braun in Carlsruhe, but he had not been long in America when the news reached him of his wife's death. The stars in their courses marked the completion of a period; and in public and private life alike, in intellect and in affection, another life begins as his ship passes across the ocean to a brave new world.

IX.

In October, 1846, Agassiz arrived in Boston, and at once sought out Mr. John A. Lowell, trustee of the Institute for which he was to give his first course of lectures, entitled "The Plan of Creation."

"Never was Agassiz's power as a teacher or the charm of his personal presence more evident than in his first course of Lowell Lectures. He was unfamiliar with the language. . . . He would often have been painfully embarrassed but for his own simplicity of character. Thinking only of his subject and never of himself, when a critical pause came, he patiently waited for the missing word, and rarely failed to find a phrase which was expressive, if not technically correct. . . . His foreign accent rather added a charm to his address; and the pauses in which he seemed to ask the forbearance of the

audience, while he sought to translate his thought for them, enlisted their sympathy. Their courtesy never failed him. . . . When his English was at fault, he could nevertheless explain his meaning by illustrations so graphic that the spoken word was hardly missed. . . . It was always pleasant to watch the effect of his drawings on the audience. When showing, for instance, the correspondence of the articulate type, as a whole, with the metamorphoses of the higher insects, he would lead his listeners along the successive phases of development, talking as he drew and drawing as he talked, till suddenly the winged creature stood declared upon the blackboard, almost as if it had burst then and there from the chrysalis, and the growing interest of his hearers culminated in a burst of delighted applause."

Boston itself, the most belectured city in the world, had never known a course of lectures so suggestive and interesting.

A second course on "Glaciers" was promptly secured by private subscription, and Agassiz then came into great demand as a popular lecturer in all the Eastern cities. Boston, New York, Albany, Philadelphia, Charleston, are only a few of the places where he was heard. He always chose very broad subjects for popular lectures, making the untrained public free of great generalisations with such velvet ease that only other scholars saw the iron scholarship beneath and knew the volumes of debate summed up in one judicious sentence. By stripping away all superfluous details, he made the central interest show for itself, and could stimulate the most sluggish minds to curiosity by glimpses at all that was yet to be discovered.

"Persuasion fondled in his look and tone,"

says the ode which we have already quoted.

"Then how the heat through every fibre ran,
Felt in the gathering presence of the man,
While the apt word and gesture came unbid!"

It was his own unfeigned delight in what he had to tell that carried captive every meeting he addressed.

Several of Agassiz's fellow-workers had either accompanied or followed him to America, and in a short time he had rallied friends enough to re-establish the "scientific factory" in East Boston instead of Neuchâtel. Afterward its site was changed to Cambridge. An atmosphere of enthusiasm, of happiness in opportunity and delight in achievement, enveloped Agassiz as much in one part of the world as in another; but, as for the domestic details of this new Neuchâtel, without one mollifying drop of woman's influence, with no assuaging worldliness, and no guardian to mix a little nitrogen

with the ozone — imagination gives it up. Such feminine eye-witnesses as we have consulted turn with a shiver from the recollection; and the more humorous reminiscences which have found their way into print present a confused picture of snapping turtles lurking under the stairs, of a little fox and other surprises in the garden, and of a general need for wary walking. Agassiz's orderly arrangement of the animal kingdom was certainly, in his own favourite phrase, "ideal, not material." It is said that a lady asked him at a dinner to explain the difference between a frog and a toad. The Great Professor, beaming with pleasure at not being taken unawares, dived first into his right pocket and then into his left, produced two living specimens, and then and there made the matter plain to her. Even after his second marriage these habits prevailed; and one of the favourite Cambridge anecdotes concerning him

tells of his wife's calling in terror from her dressing-room, "There's a snake in my shoe!" and of Agassiz's prompt answer, horrified in his turn, "One snake! but where zen are ze other six?"

For several years there is mention, growing less and less frequent, of his expected return to Europe. Perhaps it would have been hard for Agassiz himself to say just when he recognised that he had given up returning, and had cast in his lot, for better, for worse, with the United States. One biographer evidently thinks the determination was made at first sight of Niagara Falls. In 1848 the wave of revolution which broke against half the thrones of Europe swept Neuchâtel away from Prussia, and Agassiz was honourably discharged from the royal service. Almost at the same time the Lawrence Scientific School was founded in Harvard University, and the chair of zoölogy and geology was ac-

cepted by Agassiz. His private life was forming again in America. His son of fourteen years came out to him in 1849, and in 1850 Agassiz's second marriage (to Elizabeth Cabot Cary) made him an American at heart, and brought his daughters to a new home in Cambridge. His wife from the first affected his scientific as well as his private life; for she was to him secretary and assistant, and even collaborator. She kept the scientific journal of his two expeditions to South America, and since her husband's death has crowned her labours in his behalf by a *Life of Agassiz* which makes others feel their writings an impertinence.

X.

BUSINESS and pleasure alike sent Agassiz to travel over all the eastern half of the United States. To all the principal cities he went as a lecturer. Early in his stay he led a scientific expedition to Lake Superior. In 1853 he passed up the Mississippi from the Gulf to St. Louis. For some years Charleston was familiar to him, from his holding a second professorship there in the Medical School. He knew well all the New England states; and, if all the gigantic boulders to which the country folk have given his name were gazetted, his paths would stand recorded almost as well as the course of one of his own glaciers. The steamers of the Coast Survey carried him from the coral reefs of Florida to the ice-scored coasts of Maine. But, in spite of his additional professorship at Charleston (later also at Cornell) and his innumerable engagements to lecture, he

was always a Harvard professor; and in spite of his wanderings he stands identified with Boston at the time when Boston touched her highest mark. This was the time of the famous Saturday Club, when Agassiz, Emerson, Felton, Hawthorne, Holmes, Longfellow, Motley, and their peers met round one table; when Bache and Henry were well-known figures in Cambridge; the time which made Lowell, afterward a darling guest of London, look back across the ocean from St. James's, and say that he had never known such society as in Boston and Cambridge. Neither before nor since has Boston been so much of a capital city. She was much smaller then than now, and her average man stood higher. Public life was still in good odour. Her merchants had gained their wealth at a time when the struggle for wealth went by personal prowess rather than by the machine gun; and they often knew the quarter-deck as well

as the counting-house, and the library as well as either. The Civil War was still but a distant growling, and yet threatening enough to stimulate the grim Puritan blood, which seems to do best under indignation. The land was pullulent with poets, artists, and sages, of whom no inconsiderable number really came to some accomplishment.

The better part of this activity was literary, not scientific. But men of letters always recognised Agassiz as one of their own kind, and he found his niche in any intellectual society. It is to Agassiz the man, the brilliant and bewitching companion, the charming and affectionate friend, the lover of fun as well as of wit and wisdom, and to Agassiz the inspired teacher of breathless audiences, more than to Agassiz the learned ichthyologist and geologist, that we find constant reference. Emerson and Longfellow, Holmes and Lowell, are the names with which his is asso-

ciated by the general reader. The mentions of Agassiz in verse and the poems directly addressed to him or to his memory are enough to give him a place in literature — a feature in a scientific biography for which we can think of no parallel. Darwin's work is far more familiar to the outside world, and the ideas for which Darwin stands sponsor are running amuck through poetry and prose; but where are the personal tributes to him which can be called enduring literature?

We do not mean by this to imply that the verses written to Agassiz are in any case great poems; but they are certainly on that level where the world keeps them for their own sake, not merely of the kind that pupils and kindred shall not willingly let die. Any one who does not know Lowell's long ode to Agassiz should read it forthwith for the sake of the character-painting. Longfellow's "Fiftieth Birthday of Agassiz"

is probably known to every reader. When it was read before the Saturday Club, Agassiz broke down over the last verse with the reference to his mother. His special thanks to Longfellow for another set of verses, written in French to accompany a gift of wine, were given because his mother could understand the French; and they are too pretty to omit: "I was on my way to your house, when, from thinking of my mother, great tears began to fill my eyes; and, fearing to be taken for an idiot, I returned home. . . . I can let my good mother *read* my wine, if I cannot let her taste it."

Longfellow and Agassiz had a very tender feeling for each other, and Longfellow wrote him from abroad of "the delight with which I found your memory so beloved in England. At Cambridge, Professor Sedgwick said: 'Give my love to Agassiz. Give him the blessing of an old man.' In London, Sir Roderick

Murchison said, 'I have known a great many men that I liked; but I *love* Agassiz.' In the Isle of Wight, Darwin said: 'What a set of men you have in Cambridge! Both our universities put together cannot furnish the like. Why, there is Agassiz,—he counts for three.'"

The published recollections of Agassiz constantly repeat that only those who knew him personally can appreciate his power or understand the charm he exercised. "Never," said Emerson, "could his work be separated from himself." "He was the largest in personality of all the men I ever knew," says another writer. And still another speaks of a kind of human presence worth more than any scholastic artifices, widening the mind as if by enchantment. Such a human presence at Harvard was Louis Agassiz. "Can one ever forget that beaming face as he used to come strolling across the yard, with lighted cigar, in serene obliviousness of the university

statutes?" An individuality so forceful that casual acquaintances knew him for a great man went with magnificent physical strength, and with a childlike innocence and belief in the goodness of everybody and the kindness of fate. He was always happy, always interested, always eager to share his last piece of good luck with his neighbours. An unconquered joy was strong within him, and he walked in paths of pleasantness,

"He that was friends with earth, and all her sweet
Took with both hands unsparingly."

No description omits his quick tears and his ringing laughter. Agassiz once said that he had never known a dull hour in his life; and he thought it an incredible joke that any person could seek to kill time in a world so full of interest. "Only give me these spare hours of yours," he exclaimed. "I can fill them full enough!"

A composite portrait stands out clearly from the mere words or phrases that various writers have fitted to Agassiz, if we string them along in ungrammatical sequence : *His genial countenance, his great face beaming with pleasure, the eyes whose sunshine runs before the lips; a firm benignity of face, and winning ways; his phrases all the more taking for the broken English; an inexhaustible buoyancy and huge good fellowship; robust and dominating; cheerful, kindly, engaging, frank, irresistible; ingenuous, glad, great-hearted, and bewitching; the jovial giant, the acknowledged master; a man to be thankful for, with unsleeping observation and perfectly communicative; the unlettered woodsman ran to meet his service; no one could stand before his smile; and he flooded every company with the wealth of his own opulent nature,—*

"Brimful of lusty blood as ever ran,
And taking life as simply as a tree!"

The face forms on the canvas, even under such disconnected touches — the face of an eminently lovable man, full of the primal force of personality, abounding in good will and bearing malice to nobody. One wonders that such a man ever made an enemy. When he did, jealousy was at the root of the matter nine times in ten, helped on by Agassiz's habit of putting to the best scientific use everything on which he could lay his hand, whether the property was material or intellectual.

One French scientific friend never called him anything but *ce cher Agassiz*, which reminds us of the farewell toasts at the club, before his voyages of exploration:

"To dear Agassiz" and —

"Heaven bless the Great Professor,
And the land his proud possessor!"

In his will he calls himself "Louis Agassiz, Teacher." To characterise

him as a teacher, we take again the plentiful phrases waiting us; and they all may be reduced to two things, his own enjoyment and his sympathy. He could write the primary divisions of the animal kingdom on the blackboard with delight, and turn to see whether his class had taken the idea, with the same interest when he did it for the thousandth time in America as when he faced his first audience in Neuchâtel. He had a most patient toleration of dull and ignorant persons; and, if a pupil wished to learn, that was more than enough. As a lecturer, he carried his audience captive. All caught a sparkle of his enthusiasm, and were fired by his ardour. There was contagion in him. He was himself a scientific force. He lacked rancour, spoke courteously of opponents, and took as much pleasure in the discoveries of others as in his own. And, finally, he was "magnetic" so often that we ought to raise

the word to a high power to make it take due place in our portrait. But his greatest power lay in his own profound conviction of the beauty and importance of the things with which he dealt. He was reported at the Lowell Institute as using "rapturous terms concerning glaciation in Maine." Here was a man after Sydney Smith's own heart. Who can imagine Agassiz speaking disrespectfully of the equator?

XI.

THE narrative of Agassiz's life flows evenly for some ten or fifteen years after his establishment in America. He was always poor; but his poverty grew less extreme, and lost all its bitterness as his debts disappeared. A modest salary was assured by his Harvard position; and outside the university his lectures not only were well paid, but, when reprinted in book form, they sold well, and he ventured on one or two popular text-books. The scheme which relieved him for good and all of anxiety concerning his daily bread was due to his wife. With the help of the older children she planned a day school for young ladies, which should enjoy the great advantage of Agassiz's name and roof as well as the inestimable advantage of his teaching. The plan worked to a charm, and helped him in more ways than one, as it substituted employment at his own home

for the fatiguing and sometimes feverishly hurried tours through the country, which interfered with research and reacted on his health. Long years of constant overwork began to tell on the magnificent constitution which had been his best tool; and during the last twenty years of his life he was interrupted by nervous illnesses, more and more frequent, almost always due to overwork of the brain.

A list of his published writings shows hundreds of technical scientific papers, reprints of popular lectures, reports to the government or to the Coast Survey, addresses on educational subjects — and all this besides a miscellaneous scientific correspondence which might have staggered a younger man.

The most ambitious work in original research planned during his American life is the *Contributions to the Natural History of the United States.* This was to embrace ten large volumes. An elabo-

rate prospectus was issued in 1855, and subscriptions poured in from all parts of the country. The enthusiasm shown by the public surprised even Agassiz, who found the cost of the work guaranteed beforehand, in happy contrast to the *Fossil Fishes*. It was largely from the unlearned average class of readers that money was promised him; and he strongly felt the obligation toward that class, and avoided technical words whenever this was possible. Warned by experience perhaps, he had planned that each volume should be complete in itself, so that anything which might prevent completion of the whole work should not injure the separate parts. This precaution was well justified, as only four of the ten volumes were ever written. The reason of course was that a thousand other things were crying out to be done, and that in particular he grew more and more absorbed in the great Museum which stands at Harvard to-day as the direct result of his labours.

Being interested above all things in comparative science and in structure even more than in function, Agassiz was of course a collector. He had been constantly collecting from the time he was old enough to paddle about the Swiss lakes in search of eels and chub. All was fish that came to his net — the more the better, since specimens could then be exchanged and also sacrificed without compunction when they were wanted for a demonstration. Any money which had not been twice spent on other things was lavished on the purchase, transportation, and care of specimens. Once we have seen that his collections did him good service outside their use for his investigations, since it was their sale which enabled him to marry, and on the money they brought he had lived for some time at Neuchâtel. The nominal ownership of the things, so long as they were properly arranged for use by scientific men, was of too little consequence for Agassiz

to spend a moment's regret on the matter. When he came to America, he had come comparatively unencumbered, making a fresh start in this as in other things; and his earliest letters are full of remorse that he had not brought with him anything and everything he could lay hands on, so that he might make exchanges for the new specimens he found on all sides. He used to come home laden with spoil from the fish market in every new place he visited; and, as his fame grew, it became the thing for any person who found something peculiar to forward it to the Great Professor, who was always grateful, always interested. The fishermen at Nahant, where he spent his summers, would go miles out of their way to bring him anything they thought "queer," and feel amply rewarded by his delighted greeting. He was once embarrassed by the unexpected arrival of a lively black bear, for whom his establishment offered but poor accommodation; and, while he

was at work upon the North American Testudinata, turtles rained in upon him from every point of the compass. Even the cases, jars, and alcohol necessary for such collections were of great value. A rickety old shanty on the river-bank was offered by Harvard for storage, and afterward a better wooden building on the college grounds, with four hundred dollars a year for the cost of keeping the specimens in good condition. This was good in so far as it saved Agassiz four hundred dollars a year, but the cost of preservation was far greater than this; and in 1850 twelve thousand dollars was raised by private subscription to purchase the collections and secure them for Cambridge. "This gave him back in part the sum he had already spent upon them, and which he was more than ready to spend again in their maintenance and increase."

So matters stood when one of the highest zoölogical positions in the world was

offered to Agassiz — the chair of palæontology at Paris. He had already declined a call to Zürich, and even this invitation to take the place so long held by Cuvier did not take him back to Europe. He was in love — "the word," says Mrs. Agassiz, "is none too strong" — with his work in America; and, though he recognised that the highest of scientific honours had been tendered him — especially when the French government offered to keep the post open long enough to allow the completion of work actually on hand — he deliberately declined it. It is said that he might have had combined salaries amounting to nearly fifteen thousand dollars, with the highest rank, social and scientific, and the directorship of the Jardin des Plantes, so anxious was France to secure him on any terms. Later on the offer was renewed, and only three months of residence yearly was asked from him. It is small wonder that his refusal brought a burst of enthu-

siasm from the American people, and that nothing which they could give seemed good enough for him. His absolute unconcern about personal wealth was a trait especially picturesque in America. Its sincerity was too patent for any scoffer to doubt it, and this gave him the more power over moneyed men. Though always poor himself, he had scientific use and control of very large sums of private and public money. Legislatures voted funds on his authority, millionaires brought him offerings, and students subscribed their savings for his plans. If we had his account-book, it certainly would read like a fairy-tale of science. Yet these funds were from hand to mouth: he never could be sure when a new plan presented itself that the necessary means would follow; and, as his health broke down, he had attacks of despondency which contradicted his very nature.

In 1858 the Museum which had long

existed in Agassiz's mind began really to take material shape. Mr. Francis C. Gray, during his life a friend and helper of Agassiz, left by will a sum of fifty thousand dollars for a Museum of Comparative Zoölogy. It was just after Agassiz's refusal of the invitation to Paris had roused public enthusiasm to its highest. Harvard University offered to give land for a site, the legislature voted other lands equivalent to a yearly income of several thousand dollars, private subscriptions promptly raised seventy thousand dollars for the cost of the building; architects asked to contribute their work; and Agassiz presented all the collections he had amassed since the former sale,—a gift estimated at well over ten thousand dollars. In June, 1859, the corner-stone was laid; and one of the greatest comparative museums of the world had fairly begun to be.

With dramatic propriety, Agassiz took the summer when his Museum was at

last building for a short visit to Europe —his first and only return. He had been in America thirteen years—as long as he had lived in Neuchâtel. He had left home famous indeed, but unsuccessful in all practical affairs: he came back laden with honours and free from debt. It was but a flying visit. All his time on the Continent was spent with his mother, with only two days for Alexander Braun and a week in scientific Paris. Then in the autumn of 1859 he returned to Cambridge, to find the Museum building well under way.

The administration of a great Museum had been for half his lifetime one of Agassiz's day-dreams. He had seen enough of the wasted opportunities and lack of organisation in many great museums. The art of managing collections to the best advantage is as modern as the sister profession of the librarian; and it is hardly a boast to say that both have been chiefly cisatlantic. As in

all Agassiz's work, much consideration was paid to the intelligent but unlearned public. Specimens were so put into different cases and rooms that the whole system of group and sub-group could be followed by a novice and verified by the help of a synopsis printed on the walls. A geographical classification of animals was carried out in another part of the building, where the characteristic fauna of each region was exhibited This feature was particularly emphasised; for Agassiz believed that the distribution and range of animals would furnish data for determining in how many various centres a species had originated. He found the distinct geographical limit of wild species very surprising. "I think," he said once, with his taking French accent, "that they had their legs only if they should not run away!"

The vulgar idea of a museum as merely a place for the storage of curiosities was contradicted in every room. A rare

animal is of no more intrinsic value for teaching zoölogy than a common one; and the uses of the Museum for instruction were always put first. As an institution, it was made an integral part of Harvard University; an adequate teaching staff was provided, and a Bulletin issued regularly. To-day the building is some three times as large as when Agassiz knew it, the larger part of the addition being at the expense of his son and successor; and, as we write, it is announced that the three children of Louis Agassiz have offered to complete the plan and unite the wings of the great building, which should stand a monument to the name of Agassiz as durable as the fossils within it. It was by Agassiz's own request made improper to call the Museum by his name, but this legal disability is entirely ignored by the public. Over the main entrance is the proper title — "University Museum of Comparative Zoölogy" — and just be-

yond the threshold Powers's marble bust of Agassiz smiles a benevolent welcome; and by a dedicatory tablet in the wall the newer portion of the building is offered to his father by Alexander, son of Louis Agassiz.

XII.

ALTHOUGH Agassiz had so definitely adopted America, he was not legally a citizen of the United States until in the darkest hour of the Civil War he took out his naturalisation papers — a small public act to indicate his feeling. He abhorred slavery, and yet he was a cause of offence to the Abolitionists because of his opinion that the negro and the white represented distinct species. Another opinion concerning the human race, that it could not possibly have descended from one couple and had sprung from several independent centres, had at one time brought him abuse, while at the same time he was abused for upholding the order of creation as given in Genesis and for his immediate recourse to the Deity when explanation was to seek. So, too, on the negro question, both sides accused him of time-serving. All matters of acclimatisation,

amalgamation, the probable fate and danger of the half-breed, etc., interested him greatly; but he kept their scientific and social aspects apart, and was surprised when those who reported his opinions failed to do the same. Why a belief that the ancestors of two men were created in different regions should carry with it the belief that one of them has a moral right to buy and sell the other is not evident to logic; but a country struggling for life and death is not in a mood for strict logic. When the war had actually begun, no one could longer doubt Agassiz's patriotism. His letters are full of the war and of his own intense feeling. His loyalty showed also in another shape — his constant urging that American scholars should feel their responsibility to the country as well as to the scientific world, should publish their results at home, and throw off the intellectual tyranny which had survived the political form.

Before peace had come, a wholly new scientific scheme took Agassiz out of the country for a time. In the winter of 1865 his health was such that a vacation and a change of scene were imperative. He proposed to spend some months quietly with his wife in Rio de Janeiro. Toward Brazil he was drawn by a life-long desire; for with the longing for wider knowledge of the globe and the still unquenched thirst for travel in strange regions there mingled a special personal wish to meet in their own waters those fishes of Spix to whom he owed his introduction to the scientific world. His plan for a complete rest was characteristically transformed in the twinkling of an eye by a chance meeting with Mr. Nathaniel Thayer, a wealthy and public-spirited Bostonian, who offered to make the journey a scientific expedition by paying the expenses of six assistants. "It was so simply said, and seemed to me so great a boon, that

at first I hardly believed I had heard him rightly. . . . Not only did he provide most liberally for assistants, but . . . he continued to advance whatever sums were needed." The expedition proved longer and more costly than was at first anticipated, "which," Agassiz hastily adds, "is usual in such cases." He wrote the news to his mother, saying, "You will shed tears of joy when you read this, but such tears are harmless." Then follow some of the wonderful favours already vouchsafed him. The steamship has invited the whole party to travel free of charge. The government has surprised him by desiring naval officers to aid his party. "I seem like the spoiled child of the country; and I hope God will give me strength to repay in devotion to her institutions and to her scientific and intellectual development, all that her citizens have done for me."

This overjoyed gratitude breathes also

from the pages of the joint journal kept by Mr. and Mrs. Agassiz — *A Journey in Brazil.* Such extraordinary kindness and goodness had never pursued anybody before. From the emperor who, on the very battlefield, ordered collections made of the fishes in the southern rivers along which his army marched, down to the humblest Indian who took an interest in the extraordinary tastes of his white visitors, the tale of universal good will is the same.

Agassiz thankfully compares all this with the difficulties encountered some forty years before by his old teacher Martius and with those braved by the still earlier expedition of Humboldt. Re-reading Humboldt's *Narrative* on the spot, he says, "I could not but contrast the cordial liberality which smoothed every difficulty in my path with the dangers, obstacles, and suffering which beset his." Off Santarem, where the dark waters of the Tapajoz

enter the yellow Amazon, Martius, whose little vessel found the crossing of the river always dangerous, had come near to losing his life by shipwreck; and after his safe return to Munich he sent a votive Christ to the little church which stands upon the beach. Thither Agassiz made a dutiful visit when his own special steamer, provided free of charge by the Brazilian government, touched at Santarem.

Laden with valuable collections for the Museum, with some eighteen hundred new species of fish added to the two hundred formerly known to inhabit the Amazon, with accumulated observations concerning the geographical distribution of fishes in the river-basin — a subject which always fascinated Agassiz — and with much testimony of greater or less value concerning former glaciers in the tropics, he returned home in the summer of 1866, and promptly fell to work again. He gave some public courses of lectures

the next winter, speaking first of all at the Lowell Institute upon the scientific results of the Brazilian journey. If he seemed stronger in health, it was through the mere revivifying force of such enjoyment. Not only to his eager intellect had the year brought satisfaction. His scientific delights were added to all the enjoyments of an ordinary traveller. Only one who has never felt it can speak lightly of the wonderful sensuous beauty of the tropical forests, ceiled as well as carpeted with flowers; the air swooning with heavy scents; the narrow boat-paths winding through tangled archipelagoes; the gunner's bag of birds looking like a bunch of flowers; the insects by day and by night like living jewels; the colour, angry and brave, that is the very soul of the tropics;

"And all the marvel of the golden skies."

XIII.

WHEN explanations of natural laws were needed, Agassiz had immediate recourse to the creative act or thought of the Deity. He believed that a careful student of the successive variations imposed on the great primary types of the animal kingdom might trace the workings of the divine mind in the same sense in which the processes of a human mind are traced through the various works uttered by a human artificer.

The mystical half of Agassiz's explanation is easily referred to the former influences of Munich. One cannot understand the nature-philosophy then in vogue without remembering the German school of philosophy proper. Kant, Fichte, Schelling, and Hegel had followed one another rapidly,—all at work upon the old question of the reality of the external world, and all with the belief in an *a priori* knowledge indepen-

dent of experience. To the pure idealist the world of the normal man has no more real existence than the visions of delirium. It is a series of mental phenomena, to be explained by the laws of mind; and the proper study of logician, chemist, and zoölogist, is man. Assertions about what can and cannot be in nature, when dated from the closet and not from the laboratory, have proved false because the intellect which dictated the rules was feeble, not because the method was intrinsically absurd.

The spirit which had informed that era was still dominant at Munich during the three years which stamped themselves so deeply upon Agassiz. Schelling and Oken were the two most famous professors — the philosopher who asserted his right to teach zoölogy and the zoölogist who insisted on introducing philosophy. Oken was an avowed naturalist; and, if he decided first, he at least hoped to find himself confirmed by the

facts, and thought it worth while to look for them. Agassiz had from the beginning the modern habit of hearing testimony first and giving judgment afterward. Even as a student, he disagreed with many of Oken's ideas; and as a teacher, he repeatedly and earnestly warned all students against listening to any witness but Nature herself. Much more must Agassiz have rejected Schelling's scientific ukases. It is not likely that Schelling influenced him on any purely zoölogical matter, but he evidently had much influence on Agassiz's idea of *what constitutes an explanation.* Had there never been any question about facts, zoölogical theories would still be interesting, because it must be interesting to get at what any thinking man considers a satisfactory stopping-place in explanation — whether he rests the world on a tortoise or insists on supporting the tortoise by a protozoön, or perhaps underwrites it all by the Word which was in the beginning.

Now Schelling's system of philosophy makes a close parallelism between the internal and external worlds, to which it allows an equal reality, making both, however, but parallel manifestations of some higher and more inclusive reality, which is the thinker and the thought. Natural facts are mere manifestations of mind. This is a favourite saying with Schelling as with Agassiz; but Agassiz is almost entirely concerned with the derivation of Nature from the mind of God, and pays less attention to the reciprocal relations between human thought and the things that cause it. "Everything organic is more or less of a symbol. A plant is a corporealised throb of the soul." This is Schelling's, and may well suggest Agassiz's maxim, —"A species is a thought of the Creator." But Schelling soon drifts toward poetry, and indeed his ideas are best known in English through his influence on Wordsworth and Coleridge. "The

spirit sleeps in the stone, dreams in the animal, and wakes in the man." "Nature is Spirit visible: Spirit is invisible Nature." All these sayings have one central notion, which may seem bold in prose, but in poetry is common to all times and all races. One can trace it all the way from the Orient to the Yankee poet who is most inclined to speak of the "meaning" of natural phenomena or natural objects.

"They are but sailing foam-bells
Along Thought's causing stream,
And take their shape and sun-colour
From him that sends the dream."

But Agassiz writes in sober prose; and the peculiar flavour in his writings comes from his taking the vocabulary of the mystic, and interpreting it as literally true.

The average man who gives the will of God as an explanation uses the words in rather a Pickwickian sense, as is strik-

ingly brought home to us when we find a scholar who has no more hesitation in introducing the Creator than in suggesting an earthquake or a glacial epoch or any other exceptional agent. A critic feels something like a man who, having acknowledged that daily bread is sent by God, should get no other explanation of a loaf found on the kitchen table. Shall we quarrel with the statement because of mental reservations concerning the baker?

Again, Agassiz is studying not the human but the divine mind, and the result is doubly startling. We are not apt to think of mysticism and anthropomorphism together, but with Agassiz we find them inextricably mixed. It is easy to put what we may choose to call Agassiz's real meaning into terms which his opponents would accept. But it is not easy to convince ourselves that he would have accepted any such interpretation, nor is it easy to juggle his distinct

and repeated statements into any shape which shall avoid his plain acceptance of a Deity as frankly anthropomorphic as ever child addressed in prayer or painter throned on clouds. The lack of a mental *pou sto* affects any one who would examine Him in whom we live and move and have our being, and all our efforts avail not a whit toward shifting the centre of gravity. This seems commonplace enough, but we are shocked into a new interest when we find a man apparently unconscious of the difficulty.

Phrases as startling as those below occur again and again in Agassiz's writings (the italics are not Agassiz's): —

"We disclose the *mental operations* of the Creator at every step." "It is impossible not to recognise the immediate action of thought, and even to *specialise the intellectual faculties it reveals.*" "*Premeditation*, ... consecutive thought, the operations of a mind acting in conformity *with a plan laid out beforehand*, and

sustained for a long period." "It is not a kind of work which is delegated . . . to a law working its way uniformly; but it is that kind of work which the engineer retains when he superintends and controls his machine while it is working." "When the largest amount and greatest variety of work is produced by a particular invention, we consider the result as indicative of superiority of genius or inventive capacity. Here in the animal kingdom we see it illustrated to an extent *which the best trained mind can hardly follow.*" "The limitation of closely allied species to different geological periods exhibits thought: it exhibits the *power of sustaining nice distinctions, notwithstanding the interposition of great disturbances by physical revolutions.*"

To some minds this seems but faint praise with which to characterise the Creator. It is difficult to-day to state Agassiz's beliefs at once shortly and

fairly; that is, without the use of question-begging epithets which shall suggest either irreverence or absurdity. It is very easy to sneer at them; and, if any one wants to see this done in a masterly manner, we refer him to Haeckel's *History of Creation* (the English translation revised by Professor E. Ray Lancaster, the translator mentioned briefly as "a young lady"). Here he will find a chapter on the doctrines of Cuvier and Agassiz, which, though uncivil almost to brutality in its tearing away any last veil of a decent mysticism, does yet give the theory as Agassiz's own words warrant it. The creator "plagued with ennui, amusing himself with planning and constructing most varied toys," and destroying them by a general revolution, "at last (but very late) struck with the happy thought of creating something like himself," is really Agassiz's deity, only described in words which have disrespectful instead of respectful associa-

tions. It is pleasant to note that even such sneering comment is instantly followed by expressions of admiration for Agassiz's scientific work in zoölogy. In one sense, this is certainly the most inclusive of all theories of development, since, in following out his thoughts from simpler to more complex beings, we are, as Haeckel says, "driven to the curious supposition that the Creator himself has developed, together with the organic nature which he created."

This method of inducing (or should we say deducing?) the creator from the created brings to mind Paley and Butler and perhaps the once famous Bridgewater Treatises. But after once confounding the infidel, the English theologians let well enough alone, while Agassiz goes on too far for safety. Yet, among the men who have created God in their own image, surely there has been none other so consistent. The same eager attention and logic which he brought to

the construction of the life history of an acaleph or the habits of a perished pterodactyl, he turns upon the evidences of a Creator and the finding out of his ways. Every one knows the story of Cuvier and the Devil, who threatened to devour him, and whom the intrepid naturalist classed to his face as an undoubtedly graminivorous animal, because of his horns and cloven hoofs. A like story told of Agassiz would not have concerned itself with the Devil — but perhaps it is just as well to drop the parallel.

There is of course no reason why Agassiz's opinions on religious matters should carry weight merely because he was a great naturalist. But he should speak with authority on the question whether the scientific facts then known warranted any theory of evolution by descent. And his opinion on the matter was definite and strongly held to the end of his life; namely, that no sufficient evidence was adduced for such a theory.

To-day one of the arguments for evolution by descent might run as follows: We have evidence enough to feel certain (1) that no higher form of life comes into existence without parents, and (2) that a given kind of animal or plant came into existence at a time for which we can roughly put upper and lower limits. Hence we conclude that the parents of the first plants or animals of any kind were of some other kind. But what good is such an argument to one who denies our major? The statement that an animal does not come into existence without some parent is based on observation. Let reasonable evidence once be brought that the rule is not universal, and the whole subject assumes a different aspect. Cuvier, and after him Agassiz, believed that such evidence could be brought, in the reappearance of plants and animals, after each cataclysm.

According to the geologists of seventy

years ago, a series of world-wide cataclysms or catastrophes had transformed the surface of the earth, doubtless destroying all living things and hence separating different creations. If this be true, while the succession of more various and complicated creatures always goes on from where it was left when flood and fire and earthquake turned the earth into a cemetery and the rocks into a museum, then there must be some creative force at work very different from ordinary creation through parent and child ; and, in Agassiz's own words, "This is not a matter to be argued : it is one to be investigated."

Agassiz declared that the word "evolution" might be applied to his own theory, the connection between species being, as he continually repeats, "ideal, not material," the thought of the Creator being gradually unrolled. It is hardly necessary to say that his work toward laying bare the laws of such evolution is as

valuable to-day, when no one doubts the change of species by descent, as it was when the weight of scientific opinion leaned the other way. "A theory connects facts as a string holds the pearls of a necklace: the theory itself may be as worthless as the string."

Agassiz's enthusiastic belief in the popularising of science makes it inappropriate to ignore the incompetent public whose discussions have overlaid the scientific debate. Theories of evolution have great simplicity of result along with great technicality in evidence, and they have in consequence a nimiety of champions and of opponents. Even to-day the man whose knowledge is limited to the statement that Darwin said every man was descended from a monkey, will often volunteer to throw the weight of his influence on one side or the other. The great illiterate reading public seems to think that scientific theory is a matter of grace to believe, and that nobody is

an evolutionist if he does not choose to be. And, as a Harvard tutor said of Agassiz, "To admit a miracle when one isn't necessary seems to be one of those works of supererogation which have survived the Protestant Reformation, and to count like the penances of old for merit." Things are now quieting down, and we have time to ask why the religious should rage and the people imagine a vain thing. The anthropocentric conception of the universe dies as hard as did the geocentric, and a blood relationship between men and apes is supposed to affect the question of immortality; but we note the paradox that Agassiz, who did not believe in the descent of men from brutes, did believe in the immortality of the brute, and was not more than half joking when he predicted the delight of good zoölogists in a happy hereafter when saurians and pterodactyls could be immediately compared with their modern successors, nor when he

once applauded a farmer for damning the souls of some oxen. It was like Agassiz to forget the discourteous wish in his pleasure at the courteous belief implied.

XIV.

In 1871 the Coast Survey proposed to send a vessel round the Horn to California, for the purpose of deep sea dredging; and Professor Peirce, then the head of the Survey, wrote to ask whether Agassiz's health would allow him to go in her. The iron constitution that had served so well was breaking at last, strained past all elasticity by a lifetime of persistent overwork. We have not chronicled the recurring illnesses that culminated in 1869, when there came a sharp and unmistakable attack that for a short time affected both speech and motion. Agassiz in discouragement and depression — Agassiz hopeless and rebellious — this sounds impossible; and to him it was indeed the impossible that had happened when his brain no longer obeyed his will. Longfellow's journal tells of attempts to comfort Agassiz, who could only repeat, "But I cannot work!" and then cover

his face with his hands, and weep. After the worst breakdown there were months of slow recovery, when the doctors had forbidden him either to work or to think. This last terrible condition seemed more than he could bear. "Nobody knows what tortures I endure in trying to stop thinking," he burst out to a pupil — and then again, with a sort of despairing cry, "Oh, my Museum! my Museum! always uppermost, by day and by night, in health and in sickness, always — *always!*"

In 1871, when the *Hassler* was fitted out, his strength had returned in part, and along with it his hopefulness. It was decided that the sea voyage would do him good rather than harm; and Agassiz's letter to Professor Peirce, accepting provisionally, sounds like himself: "I am overjoyed at the prospect your letter opens before me. Of course, I will go unless Brown-Séquard orders me positively to stay on *terra firma*. But

even then I should like to have a hand in arranging the party, as I feel that there never was, and is not likely soon again to be, such an opportunity for promoting the cause of science generally and that of natural history in particular."

The voyage lasted from December, 1871, to August, 1872. Mrs. Agassiz accompanied her husband again, acting as secretary; and a joint journal, partly personal, partly scientific, was kept by the two, but was never completely published. Long and interesting letters reporting progress to Professor Peirce were given to the public; but more interesting than any of these was the letter Agassiz wrote just before sailing, in which he desired to leave on record his expectations concerning the fauna of the deep sea. It was his opinion that the conditions of pressure, temperature, darkness, etc., which prevail at great depths would be accompanied by a fauna resembling that

of earlier geologic times. Unfortunately, the dredging apparatus of the *Hassler* was faulty, and the most important hauls were lost, so that the expedition cannot be called successful; and the prophecies remained to wait fulfilment or contradiction.

As regards glacial work, the results were better. The magnificent glaciers of the Straits of Magellan gave Agassiz "a kind of home feeling," and among them he passed "weeks of exquisite delight." The traces of past glaciers still more magnificent were as he had foretold them. The lover of travels will find in Mrs. Agassiz's journal both charming narrative and vivid word-painting, the pictures ranging in subject from the boat-load of degraded Fuegian savages clamouring for beads and biscuits, praying, shrieking, screaming, to the unheeding engines that bore all chance of more "tabac" away from them; to the calm and stately panorama of the Straits of

Magellan, with the wonderfully symmetrical Melimoya, white as purest marble to the summit, a Fusiyama of the south; and, again, to the lava cave in the Galapagos, which made a stately banquet hall, after the red and orange-coloured iguanas who generally used it had been either ousted or "collected." Agassiz travelled overland through Chili from Talcahuana to Santiago. His state of health was now always obtruding itself. For a long time he had used the remedy of the very strong and the very weak, and had believed by ignoring his troubles to persuade them out of existence. But now they could no longer be ignored. And when the vessel reached San Francisco, Agassiz rested for a month in California without an attempt to see the Great Trees, and then submitted to be brought home across the Rocky Mountains without seeking for so much as a glacial scratch by the way — two little facts which speak whole chapters.

XV.

ONCE more, and only once more, was Agassiz to respond to a new opportunity, and lead his followers to a new sort of service. When he reached home in 1872, there was waiting him a plan for a summer school of natural history, to be established on the seacoast and managed with special reference to those teachers who wished to turn pupil again, and could do so only in their vacation. Observation, not memorising; verification of every statement; constant appeal to nature — these were the things to be emphasised. Teaching directly from nature is now, if not practised, at least universally preached. But this was not true in the American schools of a generation ago, and Agassiz was untiring in his efforts for a fundamental reform. "Appeal to Nature," was his constant precept: "No one can warp her to suit his own views. She brings us back to

absolute truth as often as we wander." Once, when he was to give a lecture on articulates, before a school for girls, he arrived with a liberal supply of very active grasshoppers, distributed them one to each listener, and insisted that everything he said should be verified as far as was possible. Whenever an insect escaped, the lecture was held to await its recapture. This, Agassiz says, seemed to amuse the young ladies; but to him it was a question of principle.

A summer school for teachers was then as great an innovation as a marine laboratory, common though both things are to-day. Agassiz took up the scheme with characteristic ardour. "Means there were none, nor apparatus, nor building, nor even a site for one. There was only the ideal, and to that he brought the undying fervour of his intellectual faith." And again his faith was justified. An impassioned appeal to the legislature of Massachusetts, when

the members of that body were paying their annual visit to the Museum, seems to have left them cold. At least they did not go into executive session on the steps of the Museum and vote the money. Such practical performance was left for Mr. John Anderson, a rich merchant of New York, who read the appeal in the evening papers, and promptly offered Agassiz the island of Penikese (one of the smaller Elizabeth Islands), with the house and barn then standing upon it, and fifty thousand dollars. With such a windfall, Agassiz was not the man to postpone his school because the architects talked of "simple impossibility." This was in May. He announced the opening for July 8; on July 5 the dormitory had no floors and no roof to speak of.

"The next day was Sunday. Agassiz called the carpenters together. He told them that the scheme was neither for money nor for the making of money; no personal gain was involved in it. It

was for the best interests of education, and for that alone. Having explained the object and stated the emergency, he asked whether, under these circumstances the next day was properly for rest or for work. They all answered, 'for work.' They accordingly worked the following day from dawn till dark, and by nightfall the floors were laid."

One day more, and the necessary nails were driven just as the expected steamer touched the wharf. Agassiz was waiting with a welcome at the landing-place, his face aglow with pleasure and thankfulness. To the barn where the swallows' nests were still undisturbed between the rafters, and the birds kept flying in and out of the wide doors, the teachers and guests went for the opening address; and as Agassiz stood looking at his fifty chosen pupils, his finished buildings, his blue sea beyond them teeming with the life they were to study, in a burst of unashamed emotion he called on all present

to pray in silence for a blessing on their work together. Unvulgarised by repetition, such an impulse touched the more repressed natures with whom he had to do. "I would not have any man to pray for me now," he said; and many must have remembered the words, when a few months later, his students bore his coffin into the chapel of Harvard College.

On coming back from Penikese, Agassiz tried to do his work as usual. For some time his strength held out. All through October and November he was busy at the Museum, and was as always planning, writing, and lecturing. But his last appearance as a lecturer came on December 2, and the rest we give in Mrs. Agassiz's own words: —

"Those who accompanied him, and knew the mental and physical depression which had hung about him for weeks, could not see him take his place on the platform without anxiety. And yet, when he turned to the blackboard, and

with a single sweep of the chalk drew the faultless outline of an egg, it seemed impossible that anything could be amiss with the hand or the brain that were so steady and so clear.

"The end, nevertheless, was very near. Although he dined with friends the next day, and was present at a family festival that week, he spoke of a dimness of sight and of feeling 'strangely asleep.' On the 6th he returned early from the Museum, complaining of great weariness, and from that time he never left his room. Attended in his illness by his friends, Dr. Brown-Sequard and Dr. Morrill Wyman, and surrounded by his family, the closing week of his life was undisturbed by acute suffering and full of domestic happiness. Even the voices of his brother and sisters were not wholly silent, for the wires that thrill with so many human interests brought their message of greeting and farewell across the ocean to his bedside. The thoughts

and aims for which he had lived were often on his lips, but the affections were more vivid than the intellect in these last hours. The end came very peacefully, on the 14th of December, 1873. He lies buried at Mount Auburn. The boulder that makes his monument came from the glacier of the Aar, not far from the spot where his hut once stood; and the pine-trees which are fast growing up to shelter it were sent by loving hands from his old home in Switzerland. The land of his birth and the land of his adoption are united in his grave."

THE FIFTIETH BIRTHDAY OF AGASSIZ.

It was fifty years ago,
In the pleasant month of May,
In the beautiful Pays de Vaud,
A child in its cradle lay.

And Nature, the old nurse, took
The child upon her knee,
Saying, "Here is a story-book
Thy Father has written for thee."

"Come wander with me," she said,
"Into regions yet untrod;
And read what is still unread
In the manuscripts of God."

And he wandered away and away
With Nature, the dear old nurse,
Who sang to him night and day
The rhymes of the universe.

And whenever the way seemed long,
Or his heart began to fail,
She would sing a more wonderful song
Or tell a more marvellous tale.

So she keeps him still a child,
And will not let him go,
Though at times his heart beats wild
For the beautiful Pays de Vaud;

Though at times he hears in his dreams
The Ranz des Vaches of old,
And the rush of mountain streams
From glaciers clear and cold;

And the mother at home says, "Hark!
For his voice I listen and yearn;
It is growing late and dark,
And my boy does not return!"

May 28, 1857.

BIBLIOGRAPHY.

There are three longer Lives of Agassiz (in book form) and also a very large number of shorter accounts of his life in popular or scientific periodicals and in the Transactions of learned societies. A person who aims at exhaustive reading will have scores, if not hundreds, of such articles to deal with; and any selection from them is necessarily somewhat arbitrary. The short list given below in chronological order has been made with reference to the average reader of no special tastes, and nothing has been named which cannot be read in English. The three longer Lives were written in English; the shorter accounts are in many languages, French (naturally) coming next to English in order of frequency. Extensive bibliographies are given in Mr. Marcou's and Mr. Holder's books mentioned below. In this list the three longer Lives and three shorter com-

plete accounts are marked with an asterisk; the remaining six references are to picturesque sketches of Agassiz or of his work from various points of view.

I. *Proceedings of the California Academy of Sciences.* Volume V., December, 1872. "Agassiz's Work and Method." By Joseph Le Conte. Reprinted in Mr. Holder's book (see below). This is only one of several articles presented at a memorial meeting of the Academy.

II. *Every Saturday.* Volume XVI., 1874. "In the Laboratory with Agassiz." By Samuel H. Scudder. Also in *Scientific American*, April 18, 1874, and as appendix to Lowell's "Agassiz," in *American Poems*, edited by H. E. Scudder.

III. *Atlantic Monthly*, February, 1874. "Recollections of Agassiz." By Theodore Lyman.

*IV. *Biographical Memoirs of the National Academy of Sciences.* Volume II.,

1878. "Memoir of Louis Agassiz, 1807–1873." By Arnold Guyot. Also printed separately at Princeton, N.J., 1883.

*V. *Annual Report of the Smithsonian Institution for* 1878. (pp. 236–261. Washington.) "Louis Agassiz." By Ernest Favre. Translated (from the French) by M. A. Henry.

*VI. LOUIS AGASSIZ, HIS LIFE AND CORRESPONDENCE. Edited by Elizabeth Cary Agassiz. (Boston and New York: Houghton, Mifflin & Co., 2 vols., 1885; 1 vol., 1895.) This is the standard work on Agassiz; and the ordinary reader will want no other, and will certainly want this.

*VII. *London Quarterly Review.* Volume LXVI., July, 1886. "Louis Agassiz." Reprinted in *Littell's Living Age*, August 14, 1886. Anonymous. This is really a review of Mrs. Agassiz's book, but it is so well and sympathetically

written that it might also rank as a much abridged version of her work.

VIII. Recollections of Eminent Men. By E. P. Whipple. (Boston: Ticknor & Co., 1887.) This contains a chapter, "Louis Agassiz."

IX. *Popular Science Monthly*, April, 1892. "Agassiz at Penikese." By David Starr Jordan.

*X. The Life and Work of Louis Agassiz. By Charles F. Holder. (Leaders in Science Series. New York and London: G. P. Putnam's Sons, 1893.) This book is very similar in aim to the present volume. It is, however, somewhat larger and more inclusive, and is profusely illustrated, being the only Life which specially considers the tastes of younger readers.

*XI. Life, Letters, and Works of Louis Agassiz. By Jules Marcou. 2 volumes. (London and New York, 1896: Macmillan & Co.)

XII. *The American Naturalist* for March, 1898 (the fiftieth anniversary of Agassiz's entrance on the duties of his Harvard professorship), is given up to seven articles upon Agassiz.

To this catalogue of volumes and articles is added,

XIII. A Short List of Verses concerning Agassiz.

(*a*) "Agassiz." By James Russell Lowell. A long memorial ode.

(*b*) "The Fiftieth Birthday of Agassiz." By Henry Wadsworth Longfellow.

(*c*) "Noël." By Henry Wadsworth Longfellow. French verses sent to Agassiz, with a gift of wine, on Christmas Eve of 1864. Fifty copies of a translation by John E. Norcross were printed in Philadelphia in 1867 (Ringwalt & Brown).

(*d*) "Three Friends of Mine." By Henry Wadsworth Longfellow. A series of four sonnets in memory of Felton,

The BEACON BIOGRAPHIES.

The following volumes are issued: —

Louis Agassiz, by Alice Bache Gould.
Phillips Brooks, by the Editor.
John Brown, by Joseph Edgar Chamberlin.
Aaron Burr, by Henry Childs Merwin.
James Fenimore Cooper, by W. B. Shubrick Clymer.
Stephen Decatur, by Cyrus Townsend Brady.
Frederick Douglass, by Charles W. Chestnutt.
David G. Farragut, by James Barnes.
Alysses S. Grant, by Owen Wister.
Nathaniel Hawthorne, by Mrs. James T. Fields.
Father Hecker, by Henry D. Sedgwick.
Sam Houston, by Sarah Barnwell Elliott.
"Stonewall" Jackson, by Carl Hovey.
Thomas Jefferson, by Hon. Thomas E. Watson.
Robert E. Lee, by William P. Trent.
James Russell Lowell, by Edward Everett Hale, Jr.
Thomas Paine, by Ellery Sedgwick.
Daniel Webster, by Norman Hapgood.

The following are among those in preparation: —

John James Audubon, by John Burroughs.
Edwin Booth, by Charles Townsend Copeland.
Benjamin Franklin, by Lindsay Swift.
Ulexander Hamilton, by James Schouler.

Henry W. Longfellow, by GEORGE RICE CARPENTER.
S. F. B. Morse, by JOHN TROWBRIDGE.
J. G. Whittier, by RICHARD BURTON.

THE WESTMINSTER BIOGRAPHIES.

The WESTMINSTER BIOGRAPHIES are uniform in plan, size, and general make-up with the BEACON BIOGRAPHIES, the point of important difference lying in the fact that they deal with the lives of eminent Englishmen instead of with those of eminent Americans. They are bound in limp red cloth, are gilt-topped, and have a cover design and a vignette title-page by BERTRAM GROSVENOR GOODHUE.

The following volumes are issued:—

Robert Browning, by ARTHUR WAUGH.
Daniel Defoe, by WILFRED WHITTEN.
Adam Duncan, by H. W. WILSON.
John Wesley, by FRANK BANFIELD.

Many others are in preparation.

SMALL, MAYNARD & COMPANY, Publishers,

6 BEACON STREET, BOSTON.

THE UNIVERSITY OF CALIFORNIA LIBRARY