Mr. Chevreul should be seen going with steady gait (as he still continues to do) from his apartments to the Gobelins, where, entering his laboratory, he first gets from his preparator an account of the work done. Then, with the lens or microscope to his eye, we shall perhaps see him making observations on the residua of evaporations from fractional solutions, or at other times making observations in a glass on a slight turbidity that some reagent taken up by a glass rod has produced in a perfectly filtered liquid. And then one should hear his exclamations, his interrupted words, and semi-phrases, which are intelligible only to those who have long lived with him, and who alone can give a sense to those long rows of periods which separate his words. At the time of his last researches upon the view of colors in motion, he, with his preparators, passed long hours in the observation of particolor disks revolving with various velocities and producing effects of contrast that his eyes, ever astonished, never tired of beholding. All these researches, patiently pursued, have left a well-conceived, clear work, whose formulas are at times borrowed from algebra.

Mr. Chevreul owns a large library at the museum, which is daily being increased by rare and valuable books that his son (who likewise is a book-lover) discovers for him. The study that he occupied for many years at the museum was on the ground floor, and was cheerless and gloomy, but cool in summer, and looked out upon a garden bounded by a public alley. Here, too, books encumbered the tables and desks or were heaped up on an old hair-cloth sofa.

It has been only on Sundays in summer that he has been accustomed to go on foot from the Gobelins to Hay, where he owns a magnificent estate of several acres. Here he would rest by substituting active exercise for the sedentary work of the study or laboratory.

His wife, his devoted companion (*née* Braccini),

Reminiscences multiply in the presence of this great figure—the last remains of the galaxy of scientists who rendered the end of the last century and the beginning of this one illustrious, such as Guyton de Morveau, Lavoisier, Berthollet, Fourcroy, Gay-Lussac, Thenard, Dumas, Berzelius, Woehler, Liebig, Laurent, Pelouze, Ebelmen, Sainte-Claire Deville, Wurtz, Cuvier, Arago, Ampere, Biot, Fresnel, Cousin, Pouillet, Regnault, and others.

He has held the highest of positions in science, aside from his direction of the dyeing operations at the Gobelins for sixty years, which directed his studies to the extraction, fixation, and observation of colors. Having been examiner at the Polytechnic School for many years, all the celebrities in science have passed before him and have remained his admirers. He has always been the president of the Agricultural Society. After being director of the museum for a long time, he was about being replaced by Prince Bonaparte de Canino (as the administration wished to change the oligarchical regime of this celebrated establishment), when the death of the Prince, who had made him change apartments, caused him to again assume the direction, and it was not till 1883 that he gave way to Mr. Fremy.

All the learned bodies in the world have done themselves honor by including him among their foreign members—the Royal Society of London, the scientific societies of Copenhagen, Stockholm, Berlin, Moscow, Philadelphia, and other cities.

Of his numerous researches, those on fatty bodies of animal origin, and his theory of saponification, stand unexcelled. His considerations upon organic analysis, of 1824, were certainly most remarkable for the epoch, and have had a great influence over later researches. The contrast of colors was the *resume*, the co-ordination, and the explanation of the researches made by him and by the observers who had preceded him. From the

of the man in his maturity. The medallion by his compatriot David, dated 1839, communicates to his physiognomy the artistic fire of the master.

Mr. Chevreul is tall of stature and well formed; his hands are strong, but well proportioned; his feet are relatively small and well arched, and usually encased in low cut shoes; his head is magnificent, the cranium large and powerful and covered with bristling hair; his eyes are sharp and observing, and are crowned with thick eyebrows; his nose is aquiline, with wide nostrils; and his mouth is large, with quite thick lips. All the traits of his countenance well express the energetic and persevering will that characterizes his compatriots, and, as a whole, remind one of the powerful expression of the Cuviers and of Arago, whose contemporary he was. This vigorous and healthy constitution, which was so happily balanced at its origin, and has been so well preserved by a well-pondered regime, gives an example of the power of the will to convert a rich physical nature into intellectual force. There are but few men endowed with such a will power, and these are good examples for the present generation, which is so eager to reach the goal, and which too often neglects one of the first qualities that ought to accompany profitable work, and that is perseverance.—*Le Genie Civil*.

LOUIS FRANÇOIS CLEMENT BREGUET.

By M. DE JONQUIERES, in *Comptes Rendus*.

THERE are families in which science, art, talent, rising sometimes to the height of genius, are transmitted from generation to generation, and whose celebrity survives without decline. The Breguets belong to such a family. The first, Abraham Breguet, grandfather of him whose life and labors I am about to retrace, was a watchmaker's apprentice at Neuchâtel, when, at the age of fifteen, he became the head of his family. A few years afterward he had, by the force of his will and his talents, completed his neglected education, founded a house in France, to which he had removed in 1762, and established his superiority in the art of constructing chronometers of great precision.

The problem of determining the longitude occupied, with good reason, the attention of maritime nations. The moon was at first depended upon. But the complicated movements of this capricious satellite had then only revealed its easiest secrets; the lunar coordinates could not be foretold with sufficient exactness, and the observations of distances which navigators were accustomed to make, for want of something better, gave most frequently results too wide of the truth. Pending, therefore, the new progress of celestial mechanics and of astronomical tables, the encouragement of governments and the efforts of artificers were turned to the exact passage of time. In France, Leroy and Berthoud had entered with distinction into the lists, when Breguet, first their disciple and then their rival, appeared there in his turn. Without loss of time he gained there such a position, and established so decisively the supremacy of French chronometry, that, during the two years when he was obliged to take refuge beyond the Channel to escape the dangers with which political events threatened him on French soil, one of the masters of English watchmaking frankly and openly applied for his assistance, and asked for a participation in his secrets.

On his return to Paris he established himself in an ancient house on the Quai de l'Horloge, which has since remained the seat of the family. Here he ended his days in 1823, at the age of 66, having become a member of the Academy of Sciences and of the Board of Longitude.

After him, his son Antoine, as highly endowed, but apparently less persevering in the conduct of business, directed the renowned and prosperous establishment which he had inherited, for ten years only. One fine day he quitted it, bidding adieu to the world, if not to science. He had not let the business fall off, and its reputation had not declined, when his son Louis, who, under his orders, had directed the chronometric establishment, was suddenly called to the honor and the responsibility of its management.

If rude trials are necessary to temper characters, Louis Breguet in this respect lacked nothing to render him equal to his task. His father, imbued with certain philosophic systems then in vogue, had spared him none of the austerities of a training of a Spartan type, hoping, doubtless, to inoculate him with indomitable energy. The result showed that he had not made a false calculation. Close study from four o'clock in the morning to eleven at night, under the ever-watchful eye of his father, a profound study of his art, and the personal practice of all its details, had not merely rendered young Louis an horologist of the first order; the horizon of his ideas had expanded; and on his arrival at power, he conceived and realized in his workshops the systematic project of adding to the manufacture of chronometers of precision the construction of other instruments applied in the physical sciences which were then experiencing a mighty development. His grandfather, Abraham, had opened the way by creating entirely the metallic thermometer (known as Breguet's helix), which has remained one of the most sensitive and delicate thermometric instruments. Louis improved it by adding, in 1840, the indication needle invented by his grandfather for astronomical counters, which he subsequently employed for determining, in concert with M. Wertheim, the speed of sound in iron, and for realizing many other mechanical effects.

This success earned for him, in 1843, the honor of being nominated Member of the Board of Longitude and Corresponding Member of the University of Kasan, and was a fine stimulant for gaining new honors.

His first research in the field of pure theory had for its object electric induction, and was executed in concert with M. Masson, Professor at the Lycée Saint Louis. Their aim was to accumulate, without loss, the static or tension electricity springing from the reaction of the voltaic current. The two experimentalists were successful. They obtained all the luminous phenomena which had hitherto been produced solely by the glass-plate machine; and in this research, which is now too much overlooked, they established the principles of the induction machine, destined, in the skillful hands of the Ruhmkorff, to take an important place among physical instruments.

Louis Breguet thus found himself launched into the

MR. CHEVREUL IN HIS LABORATORY—HIS ONE HUNDREDTH YEAR.

mindful of all his desires and needs, knew how to foresee and satisfy them. His only son, whom he had intended for the magistracy, left him in consequence of the events that followed the overthrow of the constitutional government, and now lives at Dijon.

The illustrious centenarian, then, lives alone with science and his servants in an apartment in the second story of the museum, of which he was the director and professor of chemistry for many years.

Mr. Chevreul once delivered a course of lectures on applied chemistry at the Gobelins, but, unfortunately, his elevated thoughts could not come down to the level of a free public, which, after attending the first lessons, because of the master's renown, soon left the benches of the amphitheater empty, lacking sufficient education to understand or appreciate the depths of the professor's views.

To the details that we have given as to the daily life of Mr. Chevreul, we must add that he, without being, as far as we know, a member of the temperance society, nevertheless practices its precepts. Through the use of water exclusively as a beverage, he has preserved the digestive vigor of a stomach which was originally perfect. He thanked his father and mother for giving him good health by dedicating to their memory a work upon the *a posteriori* experimental method, which he published in 1869.

In 1871, the octogenarian, during the ill-omened days that Paris supported with courage, protested in the name of science and humanity against the abuse of force that was destroying the natural science collections which were accumulated in the museum, and which are the archives of the learned world without distinction of nationality. His patriotic words, carved upon marble, remain in the Garden of Plants as an indignant protest against that axiom that has been boldly formulated in the face of civilization, that "might takes the lead of right." Some eighty shells fell upon the museum, and one of them entered Mr. Chevreul's library a few minutes after he had left it. It is to be presumed that our old master's act of courage during those days of misery still remains in the memory of young students.

fecund laws of complementaries he deduced the results that proceed therefrom. Unfortunately, this important publication was issued in so small an edition as to prevent a diffusion of the principles that it contains, and that are of so great utility in the use and observation of colors.

The theory of the optical effects of silk fabrics, published in 1848, at the expense of the Lyons Chamber of Commerce, is a technical work.

His volume upon the *a posteriori* experimental method points out the path that scientists ought to follow in their studies. But it is not given to everybody to practice the patient method that has guided him in his work. For him, time was nothing, but the result was everything, provided that it was made sure by numerous repetitions of the same experiments or by new ones tending to the same end. It is for this reason that the works that he has produced remain truths, considering the means at his disposal.

His little work on the divining rod and table turning, of 1854, is a serious criticism of the craze then the fashion.

Numerous articles in the *Journal des Savants*, of which he has been one of the most enthusiastic editors, along with some special labors, complete the productions of this ardent worker.

The important Argenteuil prize awarded him by the Société d'Encouragement rewarded him for these remarkable and original works.

Up to 1855, he was a member of the jury of every French exhibition. Member of the Legion of Honor, commander in 1844, grand officer in 1865, grand cross in 1875, he has had all the grades that any scientist could desire. With this possessing a great fortune that his life as a scientist is daily increasing, his existence is passing peacefully, without a care, and with the satisfaction of seeing ovations cheering his last days. He has looked on the wonderful development of the industries without approaching; remaining on the pinnacle of science, he has lived rather as a Benedictine than as a layman.

Our engraving of the illustrious centenarian, although from nature, can give but an imperfect idea

applications of dynamic electricity, a science born in the nineteenth century, and which, nourished by the genius of Ampere, was developed with giant strides. He applied to it all his ingenious fertility in mechanical combinations, and became in France, both by the variety of instruments which issued from his hands and by the generous and disinterested initiation which practical men received in his workshops, one of the leading promoters of this marvelous agency.

In 1845 he devised and constructed the first apparatus for measuring the speed of a projectile at different points of its trajectory. The beautiful instrument since devised in an analogous order of researches by Marcel Deprez and Sebert should not cause us to forget the first original solution of so important and difficult a problem.

This incursion into military affairs is not the only one which Breguet tried with success. Twenty-five years later he devised, for the service of the engineers, an exploder for igniting so-called induction or tension primers at a distance. This device had the important advantage of lightness and portability as compared with other contrivances based upon the same principle. In a small bulk, its power is such that it can ignite primers at the distance of Paris to Bordeaux, which is 585 kilometers.

It is known to us, as well as elsewhere, by the name of Breguet's fist-stroke (*coup de poing Breguet*), an expressive appellation, since the spark is produced by an abrupt separation of two metallic surfaces previously in contact, whence there results a sudden accumulation of the *vis viva* of the electric current, and what is called the extra current of rupture.

About 1845, a great question was raised among physicists, that, namely, between the undulatory and the emissive theories of light. Arago projected the experiments which must settle this question irrevocably, and the mechanical execution of the difficult problem was confided to and successfully solved by Breguet.

In determining with precision the velocity of the luminous undulations, Breguet constructed an apparatus which rendered it possible to appreciate the $\frac{1}{1000}$ of a second of time.

When the electric telegraph, theoretically created by Ampere, and practically realized by Wheatstone, made its appearance in the world, Breguet threw himself with ardor into the applications of this astonishing discovery.

Designated in 1845 to take part in the commission which presided over the establishment of the first French electric telegraph from Paris to Rouen, he became its most important member. He applied the principle discovered in 1838 by Steinheil, according to which the second wire of communication was suppressed, and the earth left to effect the return of the current, a fruitful principle, which economizes motive power and the quantity of conductive material, and thus realized an important saving.

The treatise published on this occasion by Breguet, and his services in the Rouen commission, earned for him, in 1845, the Cross of the Legion of Honor.

To him are also due, both in conception and execution, the writing telegraph, the dial telegraph, and the movable telegraph. The second of these, adopted by the railway companies for the service of their lines, presents such a simplicity in manipulation and such security in working that a special professional training is almost superfluous.

The contact of Breguet with the railway service gave him the opportunity of solving numerous interesting problems of security in the movements of trains and the preservation of signals. As one of the most important improvements may be mentioned the lightning guard for preserving the electro-magnets of telegraphs against damage from lightning, and securing the officials against danger.

Another application of electricity, due also to Wheatstone, the transmission and distribution of the hour at a distance, became for Breguet a new subject of research and of signal success. After having installed a first system at Lyons in 1856, to work seventy-two dials by a current, inverted at each minute, transmitted from a central clock, he improved it in 1857, giving the current the less precarious task of sending periodically the time from ordinary clocks once daily, at noon or midnight. This is no longer, strictly speaking, the transmission of the hour, but its regulation.

Lastly, in 1876, he found himself engaged with the far more arduous problem proposed by Le Verrier of reproducing to a second the time of the standard clock at the National Observatory by sixteen clocks called horary centers, distributed in different parts of the metropolis. A synchronization so absolute presented great difficulties in the conditions of absolute certainty which its regular and normal work demands. The fundamental idea of a practical solution had been given by Foucault, and ingeniously applied by Verité, of Beauvais. Our colleague Wolf had realized it in the interior of the National Observatory. Breguet, by carrying it out on a much larger scale for the city of Paris, acquired a further title to the gratitude of savants, of horologists, and of the public.

From his workshops, where he was seconded by skillful coadjutors trained under his vigilant direction, there have proceeded:

The *sphygmograph*, with registering cylinder, of our colleague, M. Marey, whose imperturbable diagnosis pursues the secrets of fever to the slightest variations of the pulsations.

The *continuous and synchronic regulator* of Yvan Villarcéau, which, if applied to the equatorial, arrests for the observer the movements of the sun or the stars.

Bertin's *oscillometer*, the indications of which are not disturbed by the sea in its most capricious movements.

Bouguet de la Grye's *seismograph*, an ever wakeful sentinel, whose vigilant watch the most unforeseen and hidden movements of the earth's crust never escape.

The *chronograph* of Captain Fleuriais, who used it at Pekin and elsewhere (along with the fine instruments due to the talent of Brunner), for his varied and important astronomical observations.

But I pass on, for I cannot mention all.

All these researches and services rendered to science marked out Louis Breguet for a place in the Academy of Sciences. Arago, on the death of Gamby, urged him to offer himself as a candidate, so as to take the place which his grandfather had occupied. M.

Combes, his opponent, however, carried the day by two votes.

An opportunity of entering in the section of free academicians presented itself in 1873; Breguet was about to come forward as a candidate, but withdrew his claims in favor of M. De Lesseps. He was elected in this section the year following.

Four years subsequently he was raised to the grade of officer of the Legion of Honor.

Always ready to bestow his devoted and disinterested co-operation upon savants who requested it, he has left grateful remembrances among his colleagues. Although he had reached an advanced age, he was struck by death in a manner little foreseen by his family and his friends. Three days previously he had taken part, with his accustomed regularity, in one of our annual banquets. But under this appearance of vigor there was hidden, to others, though not to himself, the effort which he made to master the incurable pain which was daily exhausting the sources of his life. Struck in his dearest affections by the loss of a daughter, and soon after by that of his nephew, Naudet-Breguet, a savant no less beloved than distinguished, there remained to him a son, a former pupil of the Ecole Polytechnique, already known for honorable scientific researches, upon whom his most legitimate hopes were built. This successor of his name, the destined upholder of the glory of his house, was in turn carried off in the flower of his age, but already in the maturity of his talents. This catastrophe proved an irreparable blow to the heart of the father.

On October 27, 1883, suddenly, without the slightest warning, he expired, leaving the most enduring regret to the learned world, and to his widow and his surviving daughter a sorrow upon which respect forbids me to enlarge.

THE VOLCANIC ERUPTION IN NEW ZEALAND.

FURTHER details have been received of the volcanic eruption in the Hot Lake district of New Zealand, which has been the scene of a terrible and unexpected catastrophe, which occurred early on the morning of June 10, 1886. At Ohinemutu, on Lake Rotorua, the earth began to tremble at midnight. At ten minutes past 2 A. M. there was a heavy quake and a loud roaring noise, which startled the inhabitants, and caused them to flee from their houses. From this point it could be seen that Mount Tarawera, about fourteen miles distant, had suddenly become an active volcano, belching out fire and lava to a great height. At 4 A. M. a dense mass of ashes poured down, accompanied by suffocating smells. A large black cloud, which extended in a line from Mount Tarawera to the Pairoa Mountains, was filled with flame and electricity. The thunder-like roar from the crater, the sulphurous smells, and constant quaking of the earth, caused many of the inhabitants to leave their homes, and proceed to Tauranga, a distant township on the east coast. At 8 A. M. the aspect of affairs was as bad as it was all night, and hundreds of boiling springs had broken out around Lake Rotorua. At 11 A. M. the eruptions were going on continuously, and all the country down to Tauranga was in total darkness, with thick clouds of dust and sulphurous fumes in the air. At one o'clock the darkness had all cleared away, and the principal centers of eruption had subsided.

At Lake Taupo, about forty miles to the south of Tarawera, the spectacle presented was most extraordinary. At 2 A. M. the outbreak was heralded by terrific reports, which resembled the roar of artillery, while a pillar of flame shooting hundreds of feet into the air was observed in the locality of the eruption. A great black cloud hung over this pillar, while flashes of electricity shot out from the cloud in every direction, shedding an unearthly bluish light. Loud reports, accompanied by heavy shocks of earthquake, followed in quick succession, and kept on until six o'clock, when the daylight and clouds of ashes rendered the sight invisible.

At Tauranga, forty-seven miles distant to the north-east, loud reports of heavy earthquakes began at 2:15 A. M., and very severe shocks were experienced at 3 A. M., while in the direction of the outbreak the country was illuminated for hours with flames and lightning. In the neighborhood of Maketu, fifty miles to the east of the principal center of eruption, atmospheric disturbances caused darkness till 10 A. M., and the shocks of earthquake were accompanied with strong lightning and earth currents; while at Hamilton, eighty miles to the west, the volcanic discharges are said to have resembled the firing of great guns at sea.

The devastation caused by the eruption is very widespread, and it is believed that all the natives round Rotomahana and Tarawera Lakes must have died. About a hundred Maoris are known to have perished. Mr. Haszard, the schoolmaster at Wairoa, and his four children and niece, and an English tourist named Bambridge, are the only Europeans known to be killed. The country for fifty miles around the vicinity of the disturbance has been covered by the discharge of stones and ashes, and large craters have risen up. Mount Tarawera is elevated 300 feet higher than before. Lake Rotomahana has subsided, and has been transformed into an expanse of seething mud, and the renowned terraces are reported to be destroyed. Large areas are covered with volcanic dust and mud. During the disturbance the wind blew from the east, heavy snow fell on the ranges, and there was intense cold.

The wide area forming the scene of the eruption has been the chief center of volcanic activity in New Zealand since the country has been known to Europeans, and, in fact, since the earliest period of Maori tradition. The region forms of itself a distinct volcanic zone remarkable for its picturesque hot lakes, boiling geysers, and numerous thermal springs. For many years it has been the resort of tourists from all parts of the world, and who reached it by way of Tauranga, a picturesque town on the east coast of the North Island, with a fine harbor opening into the Bay of Plenty. It is in this bay, about 30 miles from the mainland, that the first indication of volcanic activity presents itself in the form of Whakari or White Island, a cone-shaped mountain which rises abruptly from the sea to an altitude of 860 feet. The crater, about 1½ miles in circumference, is in a condition of a very active *solfatara*, whose numerous geysers and boiling springs

evolve at all times dense volumes of steam and sulphurous gases.

From Tauranga the traveler proceeds in a southerly direction through a fern-clad country interspersed with broad belts of primeval forest, presenting the most luxuriant and varied vegetation. In a distance little short of 40 miles the land rises gradually to an altitude of 800 feet, when the great table-land of the Lake Region is reached. Here, in a depression which appears to have formed at some remote period the area of an immense lake-basin, is situated the township of Ohinemutu, where there are several good hotels and a small white population. Just beneath the township the blue surface of Lake Rotorua, with the picturesque Island of Mokoia in its center, spreads itself out in a circle of nearly 25 miles. The area in the immediate vicinity of the lake, where the action of the thermal springs is most active, extends from Whakarewera on the one side to Te Koutu on the other, and inland to Tikitere and Arikiki Kapa, celebrated for its big holes of black boiling mud. Hot springs occur on its southern shore, while still further to the east of it again are the warm lakes known as Rotorua and Rotoehu. The native settlement is situated on a long peninsula stretching out into the waters of Lake Rotorua. Every part of this strip of land is dotted and riddled with thermal springs, some of which shoot out of the ground from small apertures, while others assume the forms of large steaming pools. They are of all degrees of temperature, from tepid heat to boiling point. Here the *whares* or huts of the natives are clustered promiscuously about the springs, and in situations where a few inches below the surface the soil is sufficiently hot to cook an egg in a few minutes.

It is this region which may be said to contribute the first link in the chain of active thermal action, extending from Whakari in the Bay of Plenty, through the Lake Country, to the active volcano of Tongariro, in the center of the island, a distance in a direct line of about 130 miles.

At a distance of about nine miles still southerly from Lake Rotorua lies Lake Tarawera, with its cluster of minor lakes, which constitute the second and most important connection in the volcanic belt. It was here the recent volcanic disturbance first declared itself in the sudden activity of Mount Tarawera, an extinct volcanic cone which had remained quiescent since time immemorial.

No place in the world could boast of scenery so unique and thermal phenomena so marvelous as could Tarawera and its surroundings. It was reached from Tauranga by a delightful route fringed by fern-clad mountains, and through the Sikitapu Forest, one of the grandest gardens of primeval vegetation in New Zealand, but which is now uprooted by the force of the subterranean devastation. At the southern exit of the forest the traveler was charmed by Sikitapu, the Blue Lake, and Rotokakahi, the Green Lake, whose calm, picturesque beauty formed one of the grandest sights of this singularly gifted region. A few yards from this point nestled the native settlement of Wairoa, now covered with ten feet of ashes. Here were two hotels for the accommodation of tourists, who came from places far and wide to visit the wonders of the Terraces. From time out of mind it had been one of the principal homes of the great Arara tribe, who claim to be the pioneers of the race in New Zealand.

Down a wild gorge from Wairoa, Lake Tarawera lies embosomed in a circle of tall forest-clad mountains, whose pointed peaks and serrated ridges betoken at once their Plutonic origin, while on the southern shore of the lake rises Mount Tarawera, in the form of a colossal truncated cone, with pointed peaks like a spiked crown. It was out of this giant mountain *tapu*, and sacred in Maori song and legend, that the recent subterranean fires first shot forth, enveloping the whole mountain in a sheet of flame.

A glance at this mountain and the surrounding region was sufficient to show that at some remote period it must have been—as now—the chief center of a widely extended volcanic action. The mountain itself formed one of the principal volcanic cones to be found dotted over the country. A range of volcanic hills sloped down on its western side to Lake Rotomahana, which was connected with Lake Tarawera by a small warm stream known as Te Arikiki. Before the eruption occurred, the shores of the former lake formed the principal point of thermal activity in the district, and there can be little doubt that beneath its surface the forces which culminated in the outbreak of Mount Tarawera were evolved.

Lake Rotomahana, now said to be nothing more than a hole of seething mud and vaporuous gases, formed in reality the wonderland of the region. Like Lake Tarawera, it was situated at an elevation of a little over 1,000 feet above the level of the sea. It was one of the smallest of the group of lakes, being about a mile long by a quarter of a mile wide. It was, however, grandly picturesque, not only by reason of its unequalled features presented by the terraces, but likewise on account of its steaming shores, with their countless hot springs, boiling geysers, steaming caldrons, and seething mud pools, as well as by the bold, rugged scenery which surrounded it on every side. The name Rotomahana in the native language means literally "hot lake." The mean temperature of the water was about 80° F., while in the vicinity of the hot springs it rose frequently to 212° F.

It was on either shore of this lake that the marvelous terraces now unfortunately reported to be destroyed were situated. The largest of these singular formations was Te Tarata, or the White Terrace, the outline of which assumed a semicircular form and spread out at its base as it sloped gently down to the margin of the lake; the broad, flat rounded steps of pure white silica rose tier above tier white and smooth as Parian marble, and above them terrace after terrace mounted upward, rounded and semicircular in form. All were formed out of a delicate tracery of silica, which appeared like lacework congealed into alabaster of the purest hue; crystal pools shaped as if to resemble the form of shells and leaves, and filled to their brims with water blue and shining as liquid turquoise charmed the eye, while around the edges bright crystals of silica formed incrustations which made them appear as if set with a margin of miniature pearls. At the summit of the terrace was a crater of 200 ft. in diameter, filled to overflowing with brilliant transparent water in the form of a boiling fountain,