

SIR JOHN HERSCHEL.

[ENGRAVED BY T. JOHNSON AFTER A PHOTOGRAPH BY MRS. CAMERON.]

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THE THREE HERSCHELS.

THERE is scarcely a name more familiar to English ears than the German name of Herschel. From 1781, when "Mr. William Herschel, organist of the Octagon Chapel at Bath," announced the discovery of the new planet Uranus, down to 1871, when Sir John died full of years and honors, this was easily the foremost name in English science. How familiar and authoritative the name of Herschel has been, we may easily see from a trifling sign. In 1836 our news from Europe was brought in fast sailing-vessels from England. This was the opportune time chosen by Mr. R. A. Locke to write his ingenious and popular "Moon Hoax," which described the wonderful discovery of inhabitants in the moon, with all the particularities of their life. It was necessary to fasten some famous name to this discovery, and there could be no hesitation in the choice of such a name. Speaking from recollection (for copies of it are now rare), I believe that only two names occur in this once celebrated "Hoax": that of the astronomer, Sir John Herschel, who was reputed to have made the discoveries, and that of Lieutenant Drummond, whose newly discovered lime-light was utilized to increase the light of the moon sufficiently to enable extraordinary magnifying powers to be used!

The first half of the "Hoax" was published, and the arrival of the next packet was awaited with breathless anxiety, that the marvelous discoveries might be confirmed. In due time a second part was furnished with still more startling details, and the name of Herschel carried conviction everywhere. This trivial illustration serves to emphasize the main fact, that, during the ninety years just past, every intelligent person in England and America, and the most intelligent persons in Europe, knew that a Herschel—some Herschel—

was doing something likely to be of immense interest and importance to all, and certain to be of value in the special science of astronomy. Exactly what that something might be was not so well known, but the faith in its existence never failed.

Caroline Herschel herself had this feeling. She writes to her nephew in 1829: "I fear you must often be exposed to great dangers by creeping about in holes and corners among craters of volcanoes, but you know best, and I hope you found something."

In recalling this almost universal sense that the Herschels were perpetually doing something, we are reminded how very little we know, and how very little the three generations concerned have known, of what these Herschels were *being* all the while. Their works were widely and popularly known; their lives, their characters, their personalities were known only to their own friends and companions.

The "Memoir" of Caroline Herschel (1876) has given a charming insight into Sir William's life and her own; but this is only a glimpse at best. It is for this reason that the beautiful portraits in this number of THE CENTURY are of such interest.

Here we have the men themselves, with the results of a whole life and character imprinted on their faces; and here too is Caroline, the faithful assistant and helper of her brother during all his years of "minding the heavens," and his ardent admirer for the eighty years of her long life.

If we wish to know what manner of man the burgomaster or the goldsmith of the seventeenth century was, what readier way than to study the portraits by Rembrandt and De Vos? Or how could we picture a Spanish lawyer of that time more fully than through the wonderful portrait by Moroni in the

National Gallery at London? In the same way these pictures of the three Herschels represent three wonderful lives. The most that need be done here is to endeavor to exhibit their true setting and background.

William Herschel deserted from the band of the King's Guard at Hanover and fled to England in 1757. He was then nineteen years old. All his equipment was some "good linen and clothing," a knowledge of French, English, and Latin, skill in playing the oboe, the organ, and the violin, and "an uncommon precipitancy" in doing what there was to be done. He had no friends of any note, and we hardly know how his life was passed for the three years to 1760. At this time he made his first step onward, and in 1765 he had become organist at Halifax, and a year later organist of the Octagon Chapel at fashionable Bath. He was conductor of the theater orchestra also, and in the intervals between the acts he made a complete "review of the heavens," examining "all the stars of Harris's maps and the telescopic ones near them as far as the eighth magnitude." This review, and all his subsequent work, were done with telescopes made by his own hands.

Just at this time he was the busiest man in England. He had sent for his brother Alexander (a musician of ability) and for his sister Caroline from their home in Hanover. The oratorios of the Messiah, Judas Maccabæus, and Samson were given under Herschel's direction, with an orchestra of nearly one hundred pieces. His sister Caroline was the leading soloist; Alexander was a 'cellist. He was giving music lessons at every hour of the day to fashionable pupils, and he was making his telescopes, his eye-pieces, his apparatus, "not taking his hands from it for sixteen hours together," his sister being obliged, "by way of keeping him alive, to feed him by putting the victuals by bits into his mouth" while he was at work. This was for the daylight hours. At night, "between the acts of the theater" and long into the morning, he was employing his own telescopes in seeing "for himself" every one of the objects his maps and books portrayed. As he says, "My situation permitted me not to consult large libraries; nor indeed was it very material, for as I intended to view the heavens myself, Nature, that great volume, appeared to me to contain the best catalogue."

These exhausting labors could not have lasted long. They were too wasteful of his physical vigor. But when he was forty-three years old, in 1781, he had the great good fortune to discover a new planet. This was the most startling discovery since Galileo's telescope had shown that "Venus, the Mother of

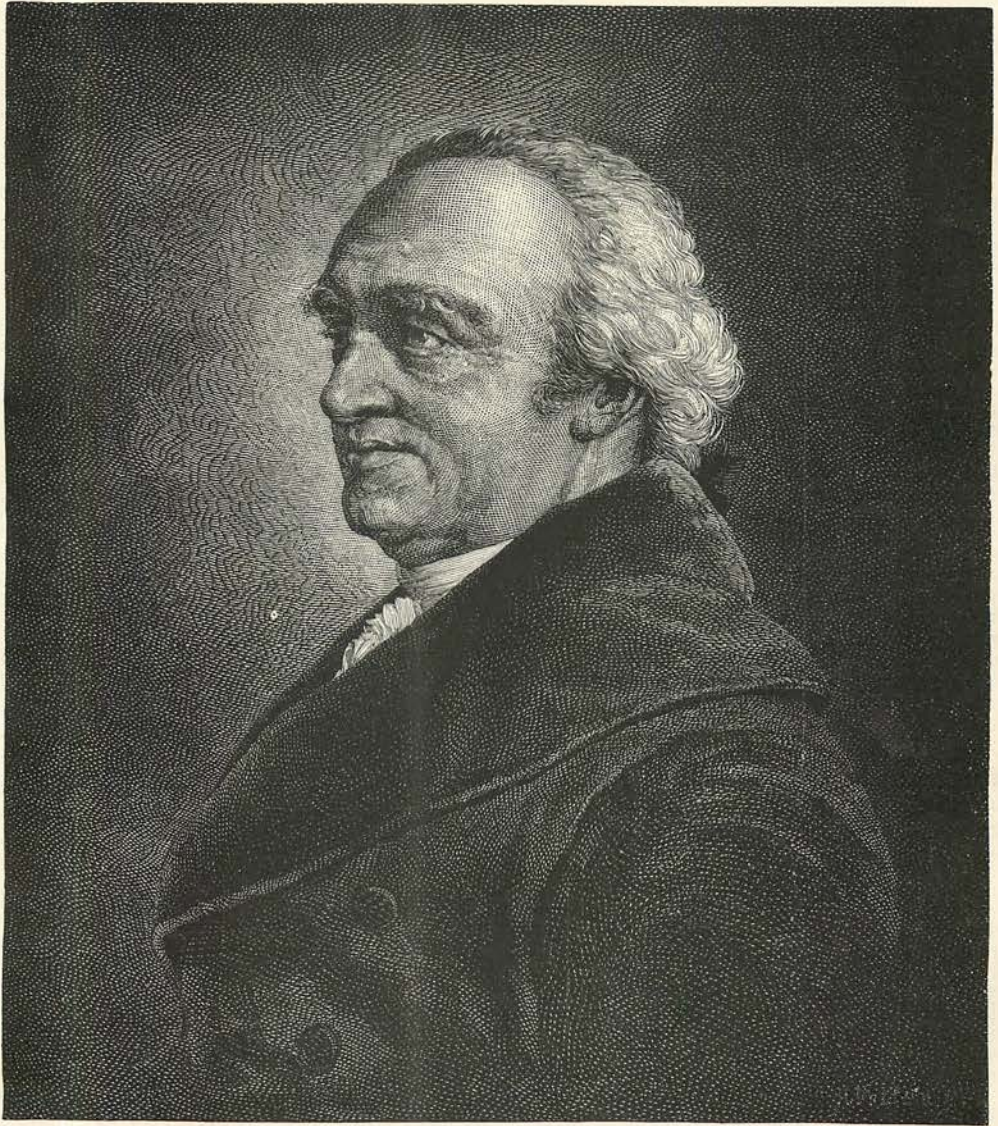
Love, emulated the phases of Cynthia," or that the sun was no longer to be considered as pure fire and immaculate.

Herschel became at one bound the best known man in Europe. The King made him royal astronomer. He had the medals of the learned societies. Oxford made him Doctor of Laws. Best of all, his discovery purchased his freedom to work in his own way. I never see the planet Uranus without remembering that it gave forty years of Herschel's life to the world, and furnished the opportunity to two of the greatest minds of our own generation. A consideration of its perturbations led Adams and Le Verrier to the discovery of Neptune.

The portrait of the Herschel of this period hangs in the British National Gallery. A copy of it is prefixed to Caroline Herschel's "Memoirs." The face is eager, ardent, intense; it has that "earnestness to explain" which was characteristic. But it is the face of Herschel the observer, the discoverer, not of Herschel the philosopher and the sage. This early portrait belongs to his friends, to his contemporaries, to those who have some personal relation with him. For us, to whom the first half of his life was nothing but a preparation, and to whom the discovery of Uranus appears little more than an opportunity achieved, the portrait given here is our ideal Herschel.

What did he do for the world in the last half of his long life? It is almost impossible to answer this without seeming to fall into exaggeration. Almost every notion of astronomy that is popularly held comes either from Herschel or from his great predecessors, Ptolemy and Galileo. The mere observing activity of his life was amazing. Double stars, planets, satellites, nebulae, the moon, the sun—all of these he observed with an assiduity that shames us, his successors. But it is not as a mere observer that we must regard him. Up to his time the sky as a whole had never been examined. Special parts, special stars, had alone been studied. He formed the plan of examining its every part. In the course of his "sweeps," new objects in profusion were found. But the main end was not to discover these; it was to unfold the laws of their distribution, of their connection with each other; to find out, in Herschel's favorite phrase, "the construction of the heavens."

It is usually impossible to condense philosophical writing, so as to present at once the argument and the results in a few pregnant words. There are two cases in Herschel's writings in which this is practicable, and they relate to the most far-reaching questions and to the grandest results. The first below gives us an instantaneous view of Nature. It is the progress of evolution halted



WILLIAM HERSCHEL.

[ENGRAVED BY HENRY VELTEN AFTER A DRAWING BY H. GREVEDON.]

for a moment by a master's hand so that the world may gaze at it :

"Not only were *round* nebulae and clusters formed by central powers, but likewise every cluster of stars or nebula that shows a gradual condensation, or increasing brightness towards a center.

"This theory of central power is fully established on grounds of observation which cannot be overturned.

"Clusters can be found of 10' diameter with a certain degree of compression and stars of a certain magnitude, and smaller clusters of 4', 3', 2' diameter, with smaller stars and greater compression, and so on through resolvable nebulae by imperceptible steps, to the smallest and faintest and most distant nebulae.

"Other clusters there are, which lead to the belief that either they are more compressed or are composed of larger stars. Spherical clusters are probably not more different in size among themselves than different individuals of plants of the same species. As it has been shown that the spherical figure of a cluster of stars is owing to central powers, it follows that those clusters which, *ceteris paribus*, are the most complete in this figure, must have been the longest exposed to the action of these causes.

"The maturity of a sidereal system may thus be judged from the disposition of the component parts. Planetary nebulae may be looked on as very aged.

"This method of viewing the heavens seems to throw them into a new kind of light. They are now seen to resemble a luxuriant garden which contains the greatest variety of productions in different flourishing beds; and one advantage we may at least reap from it is that we can, as it were, extend the range of our experience to an immense duration. For is it not almost the same thing whether we live successively to witness the germination, blooming, foliage, fecundity, fading, withering, and corruption of a plant, or whether a vast number of specimens, selected from every stage through which the plant passes in the course of its existence, be brought at once to our view?"

The second instance, which follows, tells us the ultimate destiny of the Milky Way — of the Galaxy in which our sun is but one unimportant star, and in which the solar system is as nothing :

"Since the stars of the Milky Way are permanently exposed to the action of a power whereby they are irresistibly drawn into groups, we may be certain that from mere clustering stars they will be gradually compressed through successive stages of accumulation till they come up to what may be called the ripening period of the globular form, and total insulation; from which it is evident that the Milky Way must be finally broken up and cease to be a stratum of scattered stars.

"The state into which the incessant action of the clustering power has brought it at present, is a kind of chronometer that may be used to measure the time of its past and future existence; and although we do not know the rate of going of this mysterious chronometer, it is nevertheless certain that since the breaking up of the Milky Way affords a proof that it cannot last forever, it equally bears witness that its past duration cannot be admitted to be infinite."

There is a majesty in these sentences which is close to the limit of human powers.

"— To him the fates were known
Of orbs dim hovering on the skirts of space."

The simple story of his sister's life is as noble in its way as the more exalted history of his own. He was her favorite brother in the little household at Hanover. When he had become the successful son of the family in England, she was sent for to sing in oratorios, to aid in grinding the mirrors for his telescopes, to record his observations at night, to reduce them into order the next day. "I became in time," she writes, "as useful a member of the workshop as a boy might be to his master during the first year of his apprenticeship. As I was to take part in the oratorios, I had for a whole twelvemonth two lessons per week from Miss Fleming, the celebrated dancing-mistress, to drill me for a gentlewoman (God knows how she succeeded)."

She calls herself and thinks of herself as "a mere tool which my brother had the trouble of sharpening." There was a true temper to the tool. She acquired the necessary knowledge to perform what simple calculations were necessary, and during his whole lifetime kept his multitude of observations in perfect order. She learned the details of observing with such success, that she independently discovered eight comets. As an assistant to him she rendered her highest service. Her devotion was spaniel-like. I cannot find that of herself she had any inclination to astronomy. Certainly, her work was distasteful to her at first. But her devotion to her brother and his interests was simply boundless and unquestioning—even unreflecting. This devotion appears to have been accompanied by a kind of feline jealousy, which was one of the sources of her misery. At Sir William's death she transferred her allegiance to his son. Everything that was done by the object of her love was perfect, and every other action was a possible attack. Her own life lasted more than a quarter of a century after her brother's death. Her only interest was in receiving the "*Astronomische Nachrichten*" and in recalling the incidents of her real life which ended with his activity. She was honored by various scientific societies in various ways. Each tribute was received with true humility, and gave her no real pride, but much real satisfaction. She lived for years in the radiance of genius. She shared its labors and its privileges. She became jealous for all its rights, and could not conceive of any improvements in its methods. The reflecting telescopes of Lord Rosse never were the same as "the forty-foot," her brother's masterpiece. Her individuality was strong and obstinate. Wherever her brother was concerned she abolished self, and replaced her nature with his. All this needs to be said and

seen. Her devotion was not primarily to science, but to an individual. Even the successes which she gained she regarded as a tribute to her brother, not as the reward of her own efforts.

The beauty of her character was not in the least intellectual, though she was possessed of a natural sprightliness and wit. In the appreciative introduction to her "Memoirs" her character is exactly described :

"Great men and great causes have always some helper of whom the outside world knows but little. These helpers and sustainers have the same quality in common — absolute devotion and unwavering faith in the individual or the cause. Seeking nothing for themselves, thinking nothing of themselves, they have all an intense power of sympathy, a noble love of giving themselves for the service of others. Of this noble company of unknown helpers Caroline Herschel was one."

Her devotion was to an individual, and she gave her entire effort and her entire sympathy, and such inspiration as entire sympathy may give. Her face expresses this exactly ; here is no Dorothy Wordsworth, but a patient, persistent, faithful soul, which will give up its life for an ideal which is not even fully conceived, but which is held with entire tenacity during every moment of a long life. In another world her first training might be the development of an individuality to which she allowed no scope in this.

In 1792 John Herschel, the only child of the philosopher, was born. There is an amazing difference between the conditions of his early life and that of his father. The contrast is complete. For penury he had luxury ; for obscurity, celebrity. He was trained in the midst of the famous telescopes of the most famous observatory of the world. His father and his aunt were still engaged in observations, though the period of greatest activity was past. The whole atmosphere of the household was filled with high philosophy.

From his home he went to Eton, and thence to Cambridge, where he was graduated with the highest honor. He was the senior wrangler of his year, and his first published work was in the direction of pure mathematics. At Cambridge he formed lasting friendships with the men who were to be the intellectual heads of England. His ability, his charming disposition, and his name made him friends everywhere. His first inclination was to the law, but it was not long before science claimed all his energies. He was a highly skillful chemist, and his early tastes were certainly in the direction of chemistry, or at least of chemical physics. It was filial feeling, he himself declares, that led him to astronomy. His admirable training in mathe-

tics, and the unparalleled advantages which the possession of his father's telescopes and methods gave him, soon led him to genuine successes in his inherited profession, and there is no sign of any flagging interest in astronomy in all his subsequent life. The multitude of his observations, their great importance, and the zeal with which they were prosecuted, constitute him one of the most distinguished observers of the century. Before 1833 he had reexamined most of his father's discoveries and made many of his own. Between 1833 and 1838 he labored at the Cape of Good Hope, where he investigated the southern sky in the same manner. He accomplished the magnificent task of examining the whole sky, from pole to pole, in a uniform way. Our accurate knowledge of the southern sky dates from his work, in the same way that our knowledge of the structure of the northern heavens dates from his father's labors.

The construction of the whole heavens can thus be studied from observations made with a single telescope and by a single observer. All our opinions as to the constitution of the stellar system are grounded in the conceptions of the elder Herschel and best known through the masterly extension and exposition of them by his son.

It is no small virtue to have furnished the basis for the thoughts of the whole intelligent world. This, Sir John Herschel has done in more than one direction. His "Discourse on the Study of Natural Philosophy" and his "Outlines of Astronomy" will always remain as classic expositions of our certain knowledge and as eloquent suggestions for future progress. The chemical principles on which photography rests are his discovery, and it was undoubtedly only his intense occupation in other directions that prevented his anticipating the invention of Daguerre by many years. His public usefulness was very great. As a member of the Royal Society, as one of the founders of the Royal Astronomical Society, as a member of nearly every scientific society in the world, his authority was to England what Humboldt's authority was to Germany. It was always used in the wisest and most temperate way, with patience and moderation and high purpose. By inheritance, by education, and by the effect of his own scientific career, he was forcibly led to take wide and philosophical views. Add to this that he was possessed of poetic and literary abilities of a high order, and there may be a sufficient explanation for the gentleness, the elevation, the strength of his life, which was the ideal life of the man of science — the philosopher. Every opportunity of life was open to him, and of each one he made a full and a wise use. The portrait which accompanies



CAROLINE LUCRETIA HERSCHEL.

[ENGRAVED BY T. JOHNSON AFTER A PHOTOGRAPH BY E. WILLIAMS, FROM A PAINTING IN POSSESSION OF THE FAMILY.]

this paper seems to show him in the possession of these gifts and full of the elevation which comes from an undisturbed dwelling amidst high thoughts.

The Royal Society of London had no more glorious name than that of Herschel for nearly a hundred years, and to-day two of his sons are counted among its honored members. The Royal Astronomical Society was, as has been said, founded largely through his efforts. His father was its first president; he himself was its first secretary. It is impossible that the venerable Sir William should not have been impressed with the strange and wonderful change which had brought him to occupy that chair, and had given him a son as coadjutor who was worthy to succeed to his honors.

There is no private history which better illustrates the progress which the world has made in flexibility — in prompt acceptance of accomplished facts. We have learned what is useful to us, and we have learned the great les-

son of accepting these gifts wherever and whenever we find them, and of giving honor and opportunity to our greatest men. There is an opposite to this virtue, however. We forget too quickly and too lightly. Would it be believed that the Royal Society of London has no portrait of Sir William Herschel, who, next to Newton, was its greatest astronomer? Or, that there is now no way of studying his magnificent memoirs, except by consulting the thirty-nine quarto volumes of the Philosophical Transactions in which they are scattered?

The world at large has accepted the results of all these labors, and does not concern itself with the details. The ideas of the two Herschels have gone into the great common stock of knowledge, along with those of Ptolemy, Galileo, Kepler, Newton, Kant, Laplace. Their names are immortal in the surest way, for their beliefs are held by millions of their fellow-men.

Edward S. Holden.

IN AND OUT OF THE NEW ORLEANS EXPOSITION.

(SECOND PAPER.)



THE common way of going from the city to the Exposition is the one-mule car. There were plans for steam transit at first, and something may come of them before the fair closes; but the only charter granted

fell into the hands of some speculative persons, who had no money to build a road themselves and demanded fifty thousand dollars for their privilege. As I wrote in February, the fair-time being already one-third gone, the only alternative to mule transit is the steamboats on the river, which are too far away for most visitors to make use of. The mule-car is not a bad conveyance, however. True, the track is rough and the seats are hard, but the little animal clatters along at a lively pace over the plank roadway in the middle of the street, pulling his load with ease, for the ground is so level that the water in the deep ditches seems in doubt which way to run, and usually ends by standing still and hiding itself under a covering of green slime. In a few minutes the car gets beyond the business district, and thence on to the Exposition gates it runs through green and fragrant suburbs, where the date-palm, the magnolia, and the orange shade delicious little inclosures, half garden and half lawn, which look as if their beauty was quite unpre-

meditated, and came from nature's own generous moods. Handsome mansions, with pillared fronts, alternate with pretty one-story cottages, and a little farther out are the red and green houses of the negroes with their projecting hood-like roofs. There is no crowding of population into tenement houses in New Orleans. The poorest laborer that rolls cotton-bales on the levee can afford a three-room cottage for his family, where there is plenty of light, air, and shade. In hut and mansion life goes on with open doors all the year round, and even in December and January, when fires are kept up, the children play on the thresholds, and you get glimpses of the interiors as the car jogs past. The winter in New Orleans does not seem to be the death of the year, but only a brief sleep filled with dreams of the summer's luxuriance of leaf and blossom. Most of the trees, such as the live-oaks, the water-oaks, the oranges, and the magnolias, do not shed their foliage, and the roses seem not to know when to leave off blooming. I found the rainy season in January, of which there was so much complaint in newspaper correspondence, not altogether disagreeable. The frequent warm showers, and the spring-like feeling in the air, made the weather seem like an English May.

In the street-cars there is less reserve than in such vehicles in Northern cities. Strangers open conversation with you from mere expansiveness and friendliness of feeling. There is a deal of chatting about the city,