Meantime the long-repressed soil vents itself in extravagant, contorted growths of sage-brush. Where the sage grows rank and covers the ground like a dwarfed forest the settler chooses his location. But the prospector usually comes before the settler; he takes the greater risks which go with the higher chances. He has found, or fought, his way into the mountains, whence rumors of rich strikes quickly breed the mining fever. Hard upon the news of the first "boom" comes the settler, sure of his market. He ventures into the nearest valley, taps the runaway river, makes a hole in its pocket, and a little of the wrested treasure leaks out and fertilizes his wild acres. The new crops are miracles of abundance: mining-camp markets, while they last, are the romance of farming; very soon the primitive irrigator can afford to enlarge his ditches and improve his "system." New locators crowd into the narrow valley; the ranches lock fences side by side. Small ventures in stock are cast, like bread upon the waters, far forth into the hills, which are the granaries of the arid belt.

The river and its green dependencies strike a new and shriller color-note, which quavers through the dun landscape like the note of a willow-whistle on warm spring days — clear, sweet, but languid with the oppression of the bare, unshaded fields around. It is the human note, familiar in its crudeness, but dearly welcome to the traveler after days of nothing but sky and sage-brush, sun and silence.

The new settlement is but an outpost of the frontier: if the mines hold out, if the railroads presently remember that it is there, its young fields need not wither nor its ditches be choked with dust. Twenty years, if it should survive, will have brought it beauty as well as comfort and security. The older ranches will show signs of prosperous tenantage in their tree-defended barns and long lines of ditches, dividing, with a still sheen, the varied greens of the springing crops. Each freshly plowed field that encroaches upon the aboriginal sage-brush is a new stitch taken in the pattern of civilization which runs, a slender, bright border, along the skirt of the desert's dusty garment.

Faces, too, will soften, and forms grow more lovely as the conditions of life improve. The men and women who took the brunt of the siege and capture of those first square miles of desert will carry in their countenances something of the record of that achievement. The second generation may seek to forget that its fathers and mothers "walked in" behind a plains' wagon; but in the third, the story will be proudly revived, with all the honors of tradition; and in the fourth generation from the sage-brush the ancestral irrigator will be no less a personage, in the eyes of his descendants, than the Pilgrim Father, the Dutch Patroon, or the Virginia Cavalier.

* * *

AN AMERICAN AMATEUR ASTRONOMER.[1]

FOR years Mr. S. W. Burnham occupied a seat alongside Judge Drummond of the United States Circuit Court in Chicago as stenographer, or shorthand reporter, to the court.

"What!" exclaimed the United States district attorney who practiced daily in Judge Drummond's court, "our Burnham the Chicago astronomer! Why, I have known him for these twelve years past, and knew there was a noted astronomer in the city by the name of Burnham, but never suspected our quiet, modest friend was the man. Why, I have never heard him utter a word about astronomy."

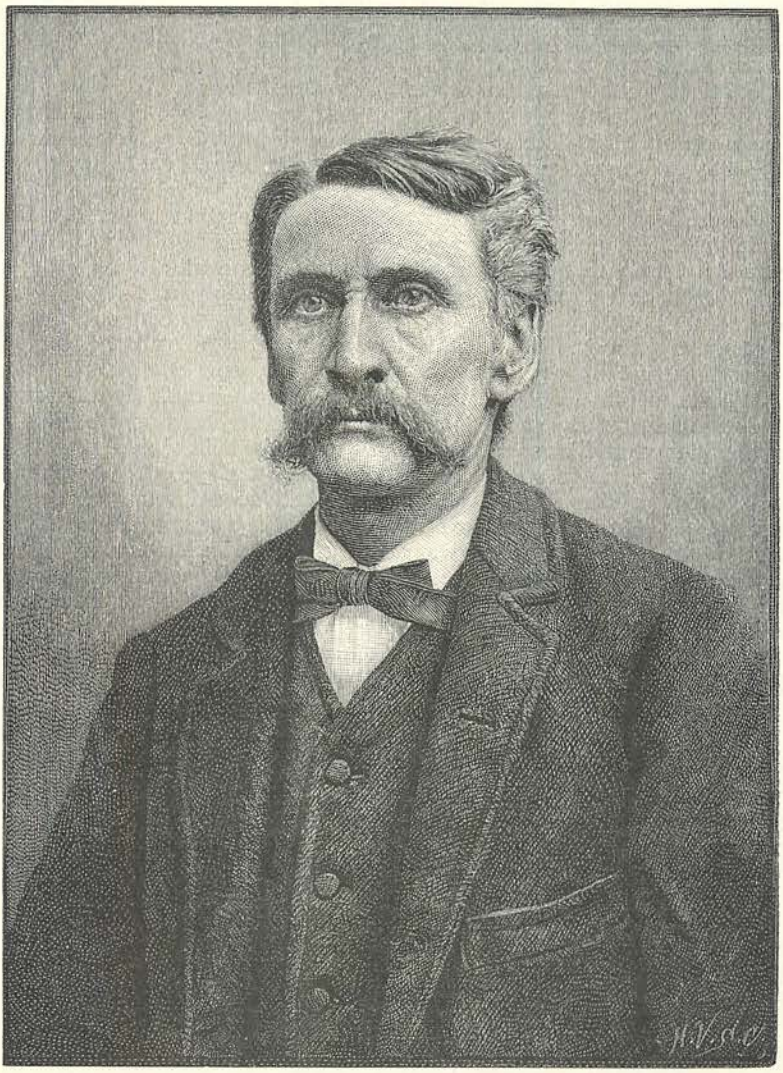
"Very likely," replied his friend, "and if you had known him for a hundred years it might have been the same; for, except to intimate friends and men of similar tastes, he never alludes to his scientific investigations."

It is of this amateur astronomer, whose name is better known in St. Petersburg, London, Berlin, Paris, and Rome than in the city in which he has spent the best twenty years of his life, that I now wish to write.

Sherburne Wesley Burnham was born about

[1] We make the following extract from the letter of a correspondent at Chicago: "Mr. S. W. Burnham is now chief assistant of Professor Edward S. Holden, Director of the Lick Observatory in California. For several years Mr. Burnham has been perfecting himself in the art of photography with the purpose of applying it to astronomical observations, and in this work he has been very successful. Astronomical photography of late years has come to be regarded as one of the most interesting departments of the science, and the great equatorial of the Lick Observatory has been fitted up with every needed photographic appliance."

Mr. Burnham has therefore been keeping up his scientific studies since this article was written in 1884. — EDITOR.



SHERBURNE WESLEY BURNHAM. (FROM A PHOTOGRAPH BY GENTILE & CO.)

the year 1840 at Thetford, Vermont, and at the Thetford Academy, then and, for aught I know to the contrary, still noted for its educational excellences, he received a good English education. As to his youthful predilections and pursuits, we only know that they were not especially in the direction of scientific subjects. Indeed, it was not until he had grown up and adopted stenography as a profession that Mr. Burnham had his attention directed to astronomy, and in a way sufficiently curious to warrant recital. During the late civil war Mr. Burnham was stationed with the army in New Orleans, holding the position of shorthand reporter at headquarters. One afternoon as he was strolling along the street his eye was attracted by the notice of a book auction. He entered as the auctioneer was crying Burritt's "Geography of the Heavens" — the well-known work by a brother of the more famous Elihu Burritt. The subject was one in which Mr. Burnham had at that time no special interest, but he bid for the book, which was knocked down to him. On examining it he found it contained charts of the sidereal heavens. In these he soon became interested, and took advantage of the first clear night to study the heavens for himself, and to trace out the various constellations and principal stars described on Mr. Burritt's charts. Further study of the work served to deepen his interest, and he bought a small, cheap telescope. This after some time, and before leaving New Orleans, he exchanged for a better instrument, which he took with him to Chicago, somewhere about the year 1866. He also became inter-

ested in microscopy, and carried on his study of both subjects simultaneously. Up to this time he had not read much about astronomy, and it was the coming into possession of the Rev. T. W. Webb's "Celestial Objects for Common Telescopes" that determined his future line of study and caused him to devote his entire energies to astronomical investigations during his leisure hours. Meanwhile he kept on reading the best books on physical and mathematical astronomy, and mastered the general features and principles of the science.

Engaged in these quiet studies and in his shorthand reporting, nothing important occurred until Messrs. Alvan Clark & Sons of Cambridge, Massachusetts, the most famous telescope makers in the world, went to Chicago to set up the great telescope in the Dearborn Observatory in the University of Chicago, of which instrument the Chicago Astronomical Society came into possession, and in this way: At the time of the organization of that society, in 1862, the Clarks had in their possession an object glass of 18½ inches, which they had made for the University of Mississippi, and which had been left on their hands in consequence of the breaking out of the war of the Rebellion. Steps were at once taken to secure what was then the largest, as it now is the sixth or seventh largest, object glass in the world. Negotiations for its purchase were pending with other parties, but by the prompt and decisive action of the Hon. Thomas Hoyne of Chicago the glass was secured and a contract made for a complete mounting at a cost of $18,000. This sum was raised by subscription, the subscribers thereby becoming members of the Astronomical Society. A massive tower, about ninety feet high and attached to the building of the university, was erected and the instrument put in position early in 1864. The tower alone cost $30,000, the entire expense of which was defrayed by one Chicago citizen, the Hon. J. Young Scammon, who has been president of the Astronomical Society of that city since its organization.

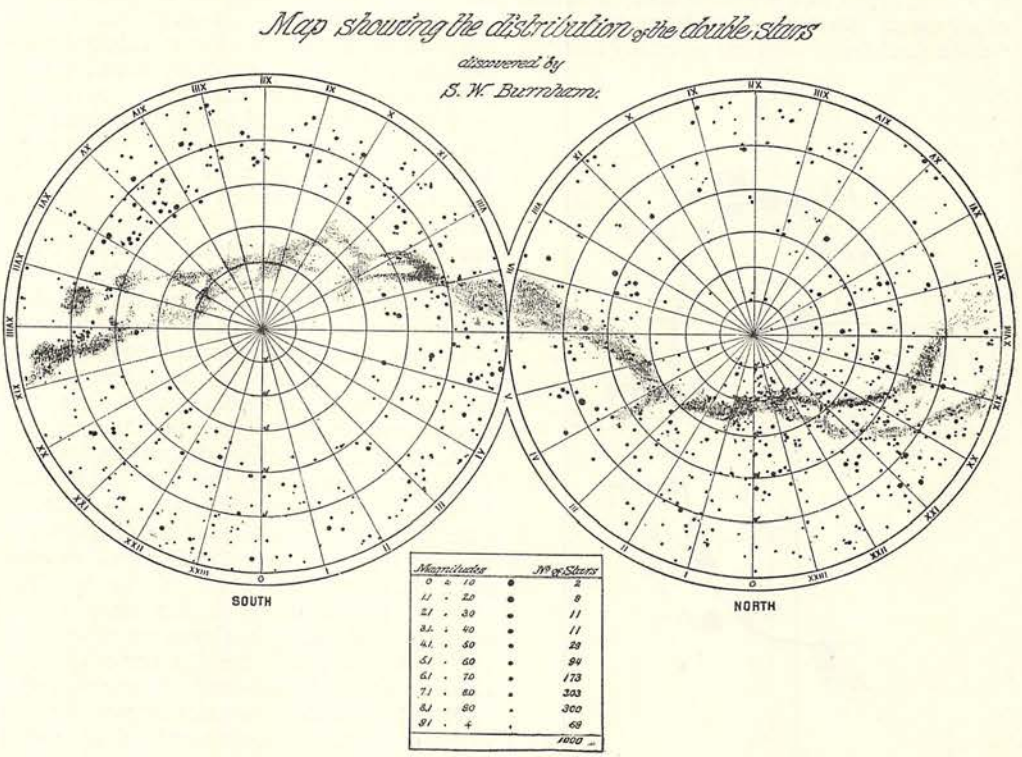
The setting up of this telescope in his immediate neighborhood suggested to Mr. Burnham the advisability of getting a larger one for himself. Accordingly when the Clarks were in Chicago on their way home from making observations of the total eclipse of the sun the path of which passed through Iowa and southern Illinois in January, 1869, he sought and made their acquaintance. It was in the Dearborn Observatory that they met, and after some conversation he asked them for what they would make him a telescope with six-inch object glass as good as could be made. The reply was $800. "Well," said Mr. Burnham, "I think I shall order one," which he did by mail a short time later, telling them to "go ahead, but to take all the time necessary to turn out their very best work."

And so they went ahead, taking the time they needed. The result was that our amateur astronomer became the happy possessor of the new instrument, which proved to be one of the finest the Clarks had ever made. But the problem still remained of having his telescope permanently mounted. In this—for he liked to do things as simply and cheaply as possible—he had recourse to mother wit. Procuring a large piece of timber he sunk it deep in the ground in the back yard of his little house on Vincennes Avenue, near Ellis Park, and about two blocks from the Dearborn Observatory. Around this timber he built what his friends used laughingly to call a "cheese-box," on the top of which he placed a dome that could be turned around easily at will. Most of the work he did with his own hands; and it was with this little telescope, thus rudely mounted, that the modest, quiet shorthand reporter made his first important discoveries of double stars—discoveries which a few years later attracted the attention and commanded the admiration of the leading scientific men in Europe.

All this time he went on with his regular work, was at his place in court every day, working the usual business hours. In the evening he went into his "cheese-box" and studied the heavens till daylight drove him to his bed. No wonder that when a visitor, perhaps from Europe, went in search of this sleepless, sharp-sighted astronomer to pay his respects and make a visit to his observatory he was told by the street children that Mr. Burnham was a "queer man, who lived nights in that cheese-box." His neighbors generally knew but little about him, and did not know what to make of the odd-looking structure in his back yard; and younger people associated the star-gazer with vague ideas of necromancy, fortune-telling, and magical incantations. But his observatory as yet was far from being complete. He had now an excellent telescope, equatorially mounted, but he had no micrometer, and lacked besides several other instruments necessary for the measurement of the stars he had discovered. Even if he had possessed them he did not know how to make the measurements. In this emergency he bethought him of the great Italian astronomer, Baron Dembowski, then the most distinguished star measurer living. To the baron Mr. Burnham sent a list of a few of his latest discoveries of close double stars, with a respectful suggestion to the great man that he might like to verify and measure them. This the baron was only too glad and proud to do; and more than that, it led to an intimacy and

a charming correspondence which terminated only with the baron's death in January, 1881.

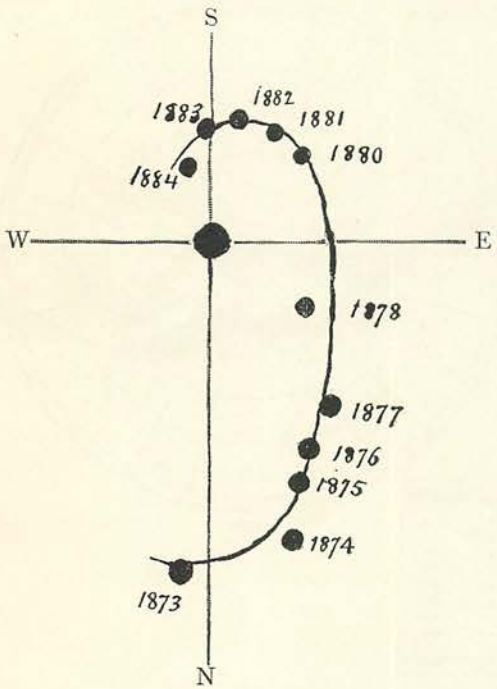
These measurements, by the way, it may be interesting to know, have since been published in Milan. About this time Mr. Webb of England, the author of the book which had so much interested Mr. Burnham, made his acquaintance and began to correspond with him frequently. The friendship had also a direct effect on Mr. Burnham's career, for Mr. Webb



was so much impressed with his friend's discoveries and attainments that in 1874 he nominated him as Fellow of the Royal Astronomical Society and secured his election. Mr. Burnham's reputation went on increasing rapidly in every country except his own, where the subject of double stars had never attracted much attention. Early in 1873 he sent his first catalogue, of eighty-one new double stars discovered by himself and subsequently measured by Baron Dembowski, to England for publication, and it was printed in the "Monthly Notices of the Royal Astronomical Society," in March, 1873. A second list, of 25 more new doubles, appeared in the same publication in May, 1873; a third, of 76, in December, 1873; a fourth, of 74, in June, 1874; and a fifth, of 71, in November, 1874. Here were three hundred new double stars, all of them close and difficult, brought to the notice of European astronomers in less than two years, and all of them discovered by means of a six-inch telescope in a back yard in Chicago. It caused a veritable sensation among European astronomers, for during the previous twenty years, all the observers in the world had not made such a contribution of new doubles to this department of astronomy.

Here, at the risk of boring some readers who may be proficient in astronomy, it may be as well to explain what is meant by a "double" star. All the stars we see in the heavens with the naked eye appear to be single — one sharp point of light. Some of them, however, are double, and when seen through a good telescope this sharp point of light turns into two sharp points, sometimes into three, and in a few instances into four. The last is called a quadruple star. One instance of a wide quadruple star any of my readers can see for himself, if he have a chance to look through a good telescope; but if he have only a good opera-glass, he can see it as a double. It is the star called Epsilon Lyræ; that is, the fifth star in size in the constellation Lyra. In the summer this constellation is very nearly overhead about 9 o'clock in the evening. It may be known by its great star Vega, the largest and brightest star in that part of the heavens. Two smaller stars near Vega make with it an equilateral

triangle. The northern of the two smaller stars is Epsilon Lyræ, a quadruple star. Mr. Burnham and a few other sharp-sighted people can see with the naked eyes that it is a double star, which with the help of an opera-glass almost anybody can do. Through a good telescope each of these doubles becomes itself a double, making four stars in the group—a beautiful sight to look upon. Astronomers, however, take little interest in such a star as this, because it is what they call a "wide double," and is so easily seen. What they are interested in are "close doubles," which are generally found to



OBSERVED POSITIONS OF THE COMPONENTS OF THE DOUBLE STAR β DELPHINI, PERIOD 26 YEARS.

have physical relations; that is, the smaller star revolves round the larger one as the planets go round the sun in our solar system. The closer the doubles the more likely they are to be physically related. The distance between the two pairs in Epsilon Lyræ is 3 minutes 27 seconds of arc, or 207 seconds, whereas in the 1000 new doubles discovered by Mr. Burnham 743 of them are, on an average, only $1\frac{58}{100}$ seconds apart, or 131 times as close as in Epsilon Lyræ, while many do not exceed one-fifth of that distance. Such close doubles as some of these not one person in a thousand would be likely to see, even if he looked through the best and largest telescope.

One of the most interesting double stars is Sirius, or the Dog Star, the brightest star in the heavens. During the winter months one may see Sirius in the southern sky, south and east of the beautiful constellation Orion, which everybody knows. In the course of some observations of this star the illustrious Bessel, one of the greatest astronomers of the century, suspected the existence of a satellite, the mass of which, acting on the central star, produced certain variations in its movements that had long excited the curiosity of observers. Of this satellite nothing was known, and Bessel's suggestion provoked search for it. Other astronomers studied on the same problem, and one of them, M. Peters, calculated for the orbit of the unknown companion a period of fifty years. Several European astronomers looked for it and could not find it. Such was the state of things until the 31st of January, 1862, when Mr. Alvan G. Clark, one of the makers of the unfinished Chicago telescope then at Cambridge, set it up rudely in the yard of his factory, and turning it upon Sirius discovered the companion which Bessel had foretold and whose position M. Peters had so nicely calculated. Although very difficult to see, being almost in the blaze of the bright star, this satellite or companion has been watched and measured very carefully ever since, and during the twenty-two years that have elapsed it has made a circuit of nearly one hundred and fifty degrees round the large star, and is likely to make a complete revolution in about the time predicted by the French astronomer. For making this discovery the French Academy gave Mr. Clark the Lalande gold medal. The shortest period of revolution now known among double stars is eleven years, and the star is Delta Equulei, the distance of its companion being only two-tenths of one second.

Mr. Burnham's discoveries attracted much attention in Europe because the double stars he discovered were the closest and most difficult known to astronomers, and many of them have since been found to be in rapid motion like the companion of Sirius. To them it seemed amazing that such difficult doubles could have been discovered by a self-instructed amateur using so small an instrument as one of six inches aperture.

The result was that by this time Mr. Burnham's name was well known abroad, and he himself was in correspondence with many of the leading astronomers of Europe. Two years later M. Angot, one of the French astronomers sent to the islands of the Pacific Ocean to observe the transit of Venus, returned through the United States, under instructions from his government to visit and report on the appliances and work of American observatories. One of the places which he visited was Chicago, and the person in whom he was most interested was our amateur astronomer on Vin-

cennes Avenue. In Mr. Burnham's little observatory M. Angot was greatly interested, and said he had never seen one where such important results had been accomplished with such simple and inexpensive appliances. He found no sidereal clock, no transit instrument — nothing, in short, but a six-inch telescope mounted equatorially on a stout piece of timber sunk in the ground. The telescope was even without the usual clockwork to keep its motion in correspondence with the rotation of the earth. For this, of course, Mr. Burnham had a substitute, and a very ingenious one too, as M. Angot's description of it will show. It was simply a long, vertical tube filled with sand, with an orifice at the bottom through which the sand could escape, after the manner of an old-fashioned hour-glass. A lead plunger following the descent of the sand through the tube gave the proper motion to the telescope, and held it as firmly on a star as could be done by clockwork. He describes also Mr. Burnham's ingenious mode of construction and reading off his circles, by which much saving of time is secured. The discoveries and work done with this little telescope tested at the time the sight of the best observers in Europe and the resources of much larger and better equipped instruments. Otto Struve, the distinguished Russian astronomer, in a letter addressed to Mr. Burnham in 1876 said he had devoted forty years of his life to the zealous observation and study of double stars. "But when," he went on to say, "I think of what you have done in so short a time, I am almost ashamed of my own labors." How great these labors of Struve were may be judged from Mr. Burnham's own words, as given in his "Double Star Observations," in the "Memoirs of the Royal Astronomical Society," Vol. XLIV.: "Omit the observations [meaning measures, not discoveries] of Dembowski and Otto Struve and our knowledge of nine-tenths of the double stars would not be materially advanced in the last thirty years." This was written in 1879, and Mr. Burnham's own measures and discoveries since would render the insertion of his own name necessary to preserve at the present time the truth of the statement.

As soon as Mr. Burnham was allowed access to the great 18½ inch telescope of the Dearborn Observatory, he applied himself to the measurement of double stars, and became as noted an expert in this difficult work as Baron Dembowski or Otto Struve, as his publications in the "Memoirs of the Royal Astronomical Society" sufficiently attest. He never having had instruction from any practical astronomer, his methods of work were original and showed great ingenuity and inventive genius. The form of the micrometer in general use not suiting him, he invented one which has been almost universally adopted, and which the Clarks now attach to all their best telescopes.

In 1877 M. Flammarion of Paris, France, sent to Mr. Burnham a mass of printed proofs and a letter, stating that he had completed and had put in type his "Catalogue of Double Stars which had shown Orbital or other Motion." "But," he continued, "before I publish it I beg to submit the proofs to you for correction and revision — you, whom the scientific world now places at the head of this department of sidereal astronomy." The proofs were corrected and a large number of new measures and new systems in motion were added, which called forth enthusiastic acknowledgments and compliments from the great French astronomer. These facts are mentioned to show in what estimation this man, of whom his own countrymen now know so little, was held by the greatest of European astronomers so far back as 1877. Not only this, but besides his election as Fellow of the Royal Astronomical Society of England he has been made a member of the German Astronomical Society and has received from Yale University the honorary degree of M. A. When a dispute in astronomy involving acuteness of vision has arisen in Europe, which could be determined only by a series of the closest and most delicate observations, Mr. R. A. Proctor has repeatedly called in Mr. Burnham as umpire, and his modest statement has always settled the question.

At the date of which we are writing, 1876 and 1877, Mr. Burnham had been for four years a regular contributor to "Monthly Notices of the Royal Astronomical Society" of London, "Astronomische Nachrichten" of Germany, and other European journals, and had published nine catalogues, embracing nearly five hundred of his own new double stars. When at this time it was suggested to give him the use of the great telescope in the Dearborn Observatory — absolutely unused till then — the president of the Chicago Astronomical Society asked, "Who *is* Mr. Burnham?" On September 20, 1876, however, he was appointed acting director of the observatory, which honorary position he held until April 11, 1877, when, through local personal jealousies into which we need not enter, this order was rescinded, the doors of the observatory were closed upon him, the locks even were changed, and he returned to his back yard and his "cheese-box." It was too late, however, to consign such a man to obscurity. His name had begun to be known in this country, and a war-cry was sounded in the leading daily papers of New York, Boston, Cincinnati, and

Chicago; the "American Journal of Science," at New Haven, took up the matter, and in a short time the directors of the observatory were very glad to stop these indignant protests and restore to Mr. Burnham the use of the great equatorial. Since then, happy in the cordial and active coöperation of the present genial director, Professor George W. Hough, he has gone steadily on with his observations, until his friends can say he has discovered more double stars,— over one thousand,— and measured them, than any other man, living or dead. To Volume XLIV. of the "Memoirs of the Royal Astronomical Society" he contributed 167 quarto pages of double-star observations, taken during 1877–78, and comprising his tenth catalogue, of 251 new double stars, with measures, and micrometrical measures of 500 double stars. In Volume XLVII. of the same great work (1882–83) will be found 160 more pages of similar observations made by him, comprising his thirteenth catalogue, of 151 new double stars, with measures, and micrometrical measures of 707 double stars. But his great work is yet to be published — a complete catalogue of all the double stars ever discovered, with their right ascension and declination, the names of the several discoverers, and all the measures taken by them. This all-important work and tabulated record of all that is known of double stars the United States Government, through the Naval Observatory at Washington, undertook to publish some years ago; but in the press of its regular publications gave up the task after printing some fifty or sixty pages. It is a matter for satisfaction, however, to learn that in all probability the Smithsonian Institution at Washington will complete the work, in which case Mr. Burnham will bring his catalogue down to the date of publication.

This immense catalogue in manuscript, which the author has made for his own use, has greatly contributed to his own success in this department of astronomy. It is the only work of the kind ever made, and double-star observers all over the world send to Mr. Burnham to have their observations verified and to ascertain whether the stars are new. The research and literary labor spent upon it have been simply enormous. His astronomical library of some two thousand volumes contains nearly every star catalogue which has been printed, and the works of every observer in this specialty, some of them in manuscript. Though not in the possession of large means, he buys every book he needs to make his catalogue complete. The rapidity and facility with which he does his literary work are as marked as that with which he uses the telescope.

In 1879 the trustees of the Lick Observatory in California selected Mount Hamilton, situated about seventy-five miles south-east of San Francisco, as the site of the observatory, and wrote to Professor Simon Newcomb of the Naval Observatory in Washington requesting him to make a series of observations on Mount Hamilton for the purpose of testing the atmospheric and other conditions of the locality for an observatory. Professor Newcomb replied that the most competent person in the country for making this examination was Mr. Burnham of Chicago, and recommended him for that duty. Mr. Burnham accepted the appointment and took his six-inch telescope, made by the Clarks, with him to California, and resided on Mount Hamilton for six weeks and made the observations needed. His full and interesting report on the subject was printed by the trustees in 1880. In October, 1881, with Professor Holden, he went out to Mount Hamilton again, by request of the trustees, to observe the transit of Mercury. On both of these occasions he discovered a large number of double stars, chiefly in the southern sky, which at northern observatories are too low to be well seen.

In connection with the observation of double stars it may be remarked that the extreme acuteness of vision which enables one to prosecute such research with the highest success is a very rare gift; and the discovery of close doubles is its severest test. To measure a star — that is, to ascertain by means of the micrometer the distance and position angle of the companion with reference to the principal star — is one thing, and to find new and close doubles is a very different thing. Baron Dembowski, the most noted measurer of double stars, who received for this work the highest gold medal from the Royal Astronomical Society of London in 1879, had no success as a discoverer, and confessed his inability to find new doubles. When, however, a new double had been found by another observer, and the distance and position angle of the companion approximately estimated, he could readily find and accurately measure it. When Mr. Asaph Hall, in 1877, had found the two satellites of Mars and described their positions, it was not difficult for any astronomer who had access to a large Clark telescope to find them and see all that Mr. Hall had seen. The whole difficulty was in seeing them for the first time. Besides the ability to see a difficult object, there is required an intelligence and an experimental knowledge of the subject, which are as rare as the visual faculty itself. Some of the lower orders of animals have more acute vision than human beings; but they do not know all they see, or understand relations to other facts. They have plenty of sight, but are lacking *insight*. Mr. Burnham's extraordinary powers in both these respects have made him the most

successful discoverer of close double stars who ever lived.

The five great names in this department of astronomy are the two Herschels, Sir William and Sir John (father and son), the two Struves, Wilhelm and Otto (father and son again), and S. W. Burnham. In science a double star always retains the name of its discoverer and his catalogue number; and, for brevity, a Greek letter is used to express his name, or, in the case of the younger Herschel and the younger Struve, two Greek letters. The Greek letter Beta is the designation of Burnham. In a star list, "Β 999" means Burnham's double star, numbered 999 in his catalogue; "Σ 318," Wilhelm Struve's star, number 318; and "ΟΣ 413," Otto Struve's star, number 413. Each star is described in the catalogues of their discoverers by right ascension, declination, magnitude, position angle, and distance, so that no astronomer in the future can lay claim to it. Mr. Burnham knows his thousand stars by name,— that is, by number,— and can speak of the peculiarities of each without referring to his catalogue.

The known doubles are regularly and carefully observed by many astronomers, and their measures, each with a recorded date, will after a time show whether the supposed companion has physical relations with the principal star. If there be no change in the position angle or distance, they are strangers to each other. If there be a change, the rate of orbital motion may be estimated when enough measures are collected. It is possible that two or more stars very distant from each other may fall in nearly the same line of sight, and have the appearance of a double or a triple star. In case, however, of very close doubles, the chance of such a coincidence — one in many thousands — is so remote that there is almost a certainty that such doubles have physical relations and belong to the same system. Measures extending over a series of years will determine the fact.

Perhaps our readers may wish to know something of the personal characteristics of our amateur astronomer, and would inquire whether such incessant day and night work affects unfavorably his health and social habits. Does it make him a recluse? Is he a martyr to science? Has he time for social intercourse, and a taste for any of the recreations and amusements which interest other persons? In reply it may be said briefly that few persons have such uniformly good and robust health as he; few love better the social intercourse of their friends, or are more sportive and entertaining in their conversation. Few play so many games, or play them so rapidly and so well as he. He carries with him no indications of a recluse or a martyr. Why should he? — for his scientific pursuits come within the scope of his amusements. With strangers he has but little conversation, and rather avoids making new acquaintances. He never speaks of astronomy except the subject be introduced by others, and he never poses as a scientific man. Hence persons who have known him intimately for years have never suspected that he was anything more than a bright, agreeable companion, and a good shorthand reporter. He loves nature; and nothing delights him more than to tramp and camp for weeks in the woods of Michigan, around Lake Superior, or among the Rocky Mountains, with a few genial friends, his trusty rifle,— for he is a noted rifle-shot,— and his photographic outfit. In the matter of instantaneous photography he has few rivals, and with his portable camera he has traveled through Europe shooting pictures from steamboats and railroad trains. A competitive prize was offered in England for the best instantaneous photograph. In a spirit of fun he sent some pictures, and a first prize was awarded him. The subject was a cat in the act of springing upon a bird. In late years he has studied photography in its application to astronomy. Few men have a more interesting family, a happier temperament, or get more enjoyment from life than our Amateur Astronomer.

John Fraser.

[SINCE writing the above, Professor Fraser has died. The article has been revised for the press by a friend of the author, who coöperated with him in the preparation of the original paper.— EDITOR.]