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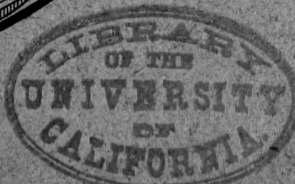
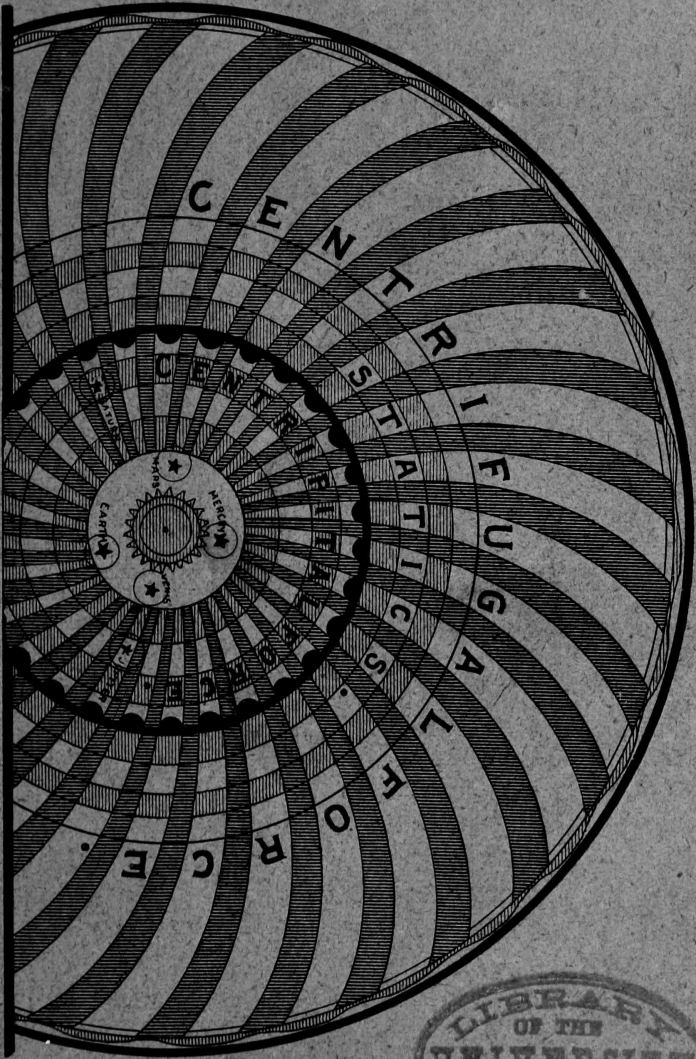
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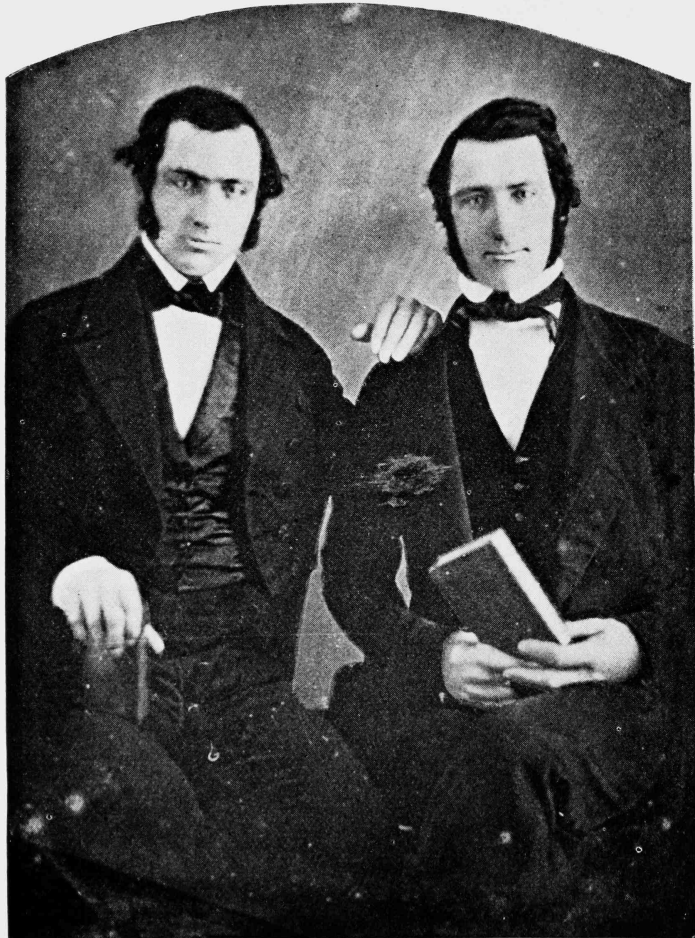
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SUN'S POLAR CIRCLE.
 ONE OF THE
 CENTRIFUGAL
 CIRCLES.







THE TWIN BROTHERS.

REV. JOSEPH H. AND WM. W. SMITH.

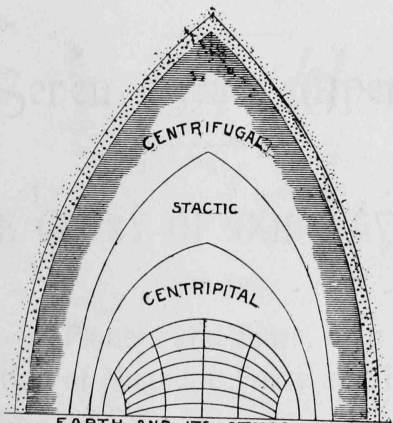
While on the Coast of Brazil, they discovered Two Unknown
Silent Forces: The Source of Magnetic Power,
and the Repulsive Force found
in all Nature.

Written for the World's Columbian Exposition

MADE IN
AMERICA

Astronomy of the Bible

Series of Lectures



EARTH AND ITS ATMOSPHERE

BY W. W. SWANWICK

Written for the World's Columbian Exposition.

Magnetic Astronomy of the Bible.

Seven Seals Opened.

THE GLORY OF GOD REVEALED

IN THE

Sun, Moon, Planets and Stars, by a New Appli-
cation of Magnetic Force and Power,

BY

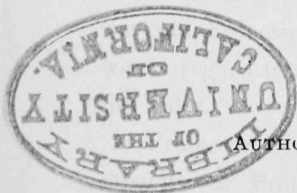
WM. W. SMITH,

AUTHOR OF "CELESTIAL DYNAMICS."

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PREFACE.

Inasmuch as these astronomical discoveries are claimed to be new and original, I considered it advisable and expedient on my part to quote some of the different opinions of learned professors and scientists on the various subjects I have endeavored to place before the people in this, my publication ; wherein, my readers will observe as clearly substantiating and establishing the truth of these my researches.

PROFESSOR NORTON.

Those of Professor Norton, of the "State Normal School of San Jose, California." He saw and read an article which I wrote, and I had the same published in the San Francisco *Chronicle*, in the year 1871. That was in regard to my "New Repulsive Force as applied to the Tides."

"Professor Norton at that time was acting in the capacity of Professor of Physics in the State Normal School at San Jose, California," and was present at the Congregational Association which was then convening at Redwood City, California, in the year 1874.

Prof. Norton delivered a lecture at 11 o'clock A. M. The subject was, "Two Parallel Lines Between Science

and the Bible.” And it proved to be very interesting, and was listened to with rapt attention all by throughout.

The writer had never seen the Professor until he appeared at his desk to deliver the lecture above stated.

In that lecture Professor Norton emphasized very boldly the fact that the lines of *science and the Bible* were running more and more in *parallel lines* with each other; and that the *schools, churches and science* also demand it. And the *demands* are being supplied in many ways.

And in proof of this declaration, he said a new force,—*yes, a repulsive force,—had been discovered* in all nature, and this new force he predicted to be one of the best as well as the *chief leading points to parallel lines* between the *Bible and science*.

And this *new force* itself must harmonize and bring the minds of conflicting parties to think alike and run together *in the name of the Lord*.

In the course of his lecture he made this assertion: “When a man up in the country is bold enough to step outside of the scientific works of the times, and asserting a *fact* in regard to the tides goes on and proves that *fact*, I say unhesitatingly that he stands high above them all on that fact in science.

“Yes, that discoverer up in the country stands upon a high and lofty eminence, around which the philosophers and sophists of past ages have marched *around and around*. Where no man except *Moses* has stood; and God told him to pull off his shoes. But *Moses* was so

wrought upon that it was enough to obey and see the divine side of the burning bush, and to pull off his shoes and await God's commands."

At the close of the lecture, the writer obtained an introduction to the Prof. Our greetings were very pleasant, open, and frank. The writer congratulated him on his successful lecture; also, inquiring at what time and place he found that "New Repulsive Force?" The answer was that he read it in the San Francisco *Chronicle*. Had saved the paper in which he found the article relating to that scientific point, concerning the tides of the oceanic waves.

He considered it a perfect success. "Do you remember the name?" "No, but I remember the subject, and had hoped to meet and know him ere this, but as yet have not had the pleasure."

"He wrote the article in very plain Saxon style. I took it all in. I have read the English, French, and German; in fact, all works relating to the subject of the tides. But they copy and copy, one after another, not knowing any of the facts in the case."

At this point the writer said to the Prof., "I am that man of whom you have spoken so frankly. I wrote the *Key to the Tides*, and had it published in the San Francisco *Chronicle*."

We were standing in the aisle of the church at the time, in which the Prof. had lectured, and as the writer said, "I am the man from the country who wrote that

article," the Prof. stepped back a few steps, then forward again, extended his hand which I grasped, the Prof. saying, "I am happy to meet and greet you in so good a place as this *Association* here in Redwood City, where so many ministers and delegates have assembled. I remember the name of the man now, it was Smith, was it not?" "Oh, yes," said the writer, "they call me 'Old Parson Smith' up in our part of the country." "Oh, yes, yes, you are a preacher, and a delegate too?" "Yes, sir." "I am glad I came over to this Association, for I am happily disappointed in the way you have handled my *Key to the Tides*.

"And you being a reader, as well as a teacher and professional scientist, I, of course, expected that you or some other strong man would only come up and lean, as did Samson, against the main pillar of my castle, and down would come the whole structure." Then the Prof. said, "*No, no*, Mr. Smith, the fact of its being outside of books is the best part of the article on the tides.

"But few writers are bold enough to announce a fact, and make it plain to the common mind, as you have done. Had you found it in a book and copied it, then it would not have been yours. But now you stand up here on a high point of the world's history, and that point has been marched around and around, in all the centuries, passed by the men of science, and none have found that important spot. You, Mr. Smith, are the first man to climb up

to that high and elevated spot, to look and see what you have seen.

“And for what you have written you will stand there forever. Your name will be handed down along the future ages as a discoverer of that *physical force called repulsion.*”

We thanked him for his unexpected prophesy, and then remarked to him that we were at work upon another important problem. “Why, what is that?” he asked. “What is the source of the magnetic current, so-called?” At this point we were called to lunch. The Professor remarked at that announcement: “We have food that the world knows not of.” “Yes, we said; and can you render us some assistance in our researches for the source of the magnetic current?” “No, Mr. Smith; I want you to go home with me when this Association closes.” We did not accompany him home, so our conversation ended for that time. We met occasionally, but only for a short time, but his kindly encouragement was always remembered by the writer.

PROFESSOR J. A. BENTON.

Professor Benton arrived in San Francisco, Cal., the same day we did, and our acquaintance has been long, and our fellowship has strengthened as the years went by. He adopted our new *discovery in science*. And when we had written a synopsis of this book on Astronomy, we remarked to him: “It’s rather short to be understood.”

He replied: “Your proof is enough, without any more

evidence of the facts of your discovery of a ‘*repulsive force found in all nature.*’” He was present at the Association when Professor Norton lectured.

He taught our “*Physical View*” in the Theological Seminary in Oakland, Cal. He sent his students to me for my publication on “*Celestial Dynamics.*” While at Mount Hamilton he came to see me, and I handed him some of my work on *our new discovery* to read: he read it. Then again we remarked that it was rather short to be understood. He then said: “Mr. Smith, *your proof is enough*, without anything further as proof of your *discovery of the repulsive forces in astronomy*, and your application of the science of magnetism to the science of astronomy is of great importance to that science, as Professor Norton has taught us in his lectures.”

PROFESSOR LE CONTE.

We met Prof. Le Conte at the State University some time after the publication of our “*Celestial Dynamics,*” and we delivered a copy for him to read. This was in the year of 1873 or 1874.

And in 1884 we were on a visit to Mt. Hamilton, to test some of the facts of our findings. Here we again met Prof. Le Conte at the “*Smith Creek Hotel,*” near the Lick Observatory. And we took this opportunity to send the Prof. samples of our writing by a young man who was a good reader, and I requested him to read the paper to the Prof., and obtain his opinion on the subject.

The young man found the Prof. at leisure, and asked the privilege of reading to him some of the writings of Wm. W. Smith, of Antioch, Cal. The Professor gave his consent, and the young man read them. At the close he asked the Prof., "What do you think about it?"

Prof. Le Conte replied, "It is all new to me. I am like a boy who, at the first sight of his a b c's, says, 'I don't know anything about them.' I only know that Mr. Smith wrote something on the tides years ago. But I want to see him before he goes away."

At that time he was waiting upon an invalid wife, so I sent up to him a manuscript of some length that I had with me, by the young man who had previously read the *synopsis of our findings*, asking him if he would please take this more elaborate document up to Prof. Le Conte, and ask him to read it at his leisure, only taking care that I should obtain it ere I left for Antioch. The Prof. received the papers, and informed us that his wife was much better.

Fully a week had elapsed ere I met Prof. Le Conte again, and then, by invitation on his part, to meet him in the parlors of the "Smith Creek Hotel," where he was staying. Our greetings were very cordial. He immediately referred to the manuscript I had sent him to read, saying, "Mr. Smith, I have carefully perused your manuscript over and over again, and the more I read the better understanding I have of the subject: and now, as you are in the direct line of truth, I say, go on and on, and if

I can in any way assist you in my power, I shall most gladly do so.

“And further, I see that you are applying a new force to the science of astronomy, and you must lead in it; for we are all of us like a crowd of boys and girls in their first alphabetical lesson, in this, your new application of the *electro-magnetic force to celestial mechanics*. So you must simplify it, and make it so plain that all will know what you are now doing.

“For magnetism, as it is applied to astronomy, is not known. So you must repeat it over and over, ever bearing in mind that the truth will grow, if you teach and simplify it as you go, for you have the world for your pupils and students.”

We expressed our sincere thanks for his kind, as well as timely advice. And it has proven a great source of advantage to us in many ways since then; and we would remark especially, in breaking open many of the mysteries in astronomy.

As will be seen in the opening of the *seven mysteries*, which can be found in the *fourth chapter of this book*.

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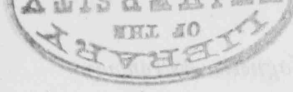
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By M. W. Shinn.



CHAPTER I.

A PERPETUAL MOTION

The sun will appear in a new aspect when we apply to it a power and a name of a perpetual motion to move all the sphere in Celestial Mechanics, and when we shall *prove* that it is the central engine to move universal gravitation, and to control all the planets, from Mercury to yonder Neptune. *On our end of the Sun's pole*, and another set of spheres upon the other pole of the sun, as we conceive that there is such a set to balance the wheels of time as the sun rotates.

The second solar wheels, or spheres to the wheels, to balance the whole mighty moving *driving balance wheel* of perpetual motion, is seen in the nebulous light of the Magellan Clouds in the south.

They may be similar in power and light to our Jupiter and Saturn, and the other spheres not of sufficient light to be seen by us; or, as we may call our northern end of the sun's imaginary axis. But that of the south end, or Magellan Cloud, of the sun's axis, as a "rotating wheel of time," there are probably the same amount of grav-

itating weight as at the north and positive end of this “balance wheel” of the sun’s mighty axis.

This wheel rotates by the positive and negative electromagnetic forces once in 25 days.

HOW IT WAS FOUND.

We found this power by three important sea voyages, as will appear in the advanced sheets of this book,—the first from Boston to San Francisco, the second to Puget Sound, and Victoria, British Columbia,—and by a strict observation of the tides on the North-west Coast on the land and the barometer; the third by a six months’ voyage in the employ of the United States Navy, between San Francisco and Panama.

THE BAROMETER.

The barometer came to our assistance, though silent, but like a “*still, small voice.*” Yet, when its indications were written, and all its “ups and downs” collected and brought to bear on the subject, it answered the purposes of three of the best of witnesses, for its language could not be disputed as to the moon’s repulsive power.

OBSERVATIONS SOUTH.

Our stay at or near the Tropics of Capricorn was an important month for us, for we were — as it were — at home on a vessel in which we confided and on which we lived with our families, and nothing to perplex or divert the mind from that one subject and study — the philoso-

phy of the tides. My brother Rev. J. H. Smith, and family, and the writer, were wonderfully struck with the simplicities of the moon as a distributor of the oceanic waters and the electro-magnetic forces.

OUR FIRST SEA VOYAGE.

NEW DISCOVERY IN MAGNETISM.

I see by one of our school books, written in Boston by Alfred P. Gage, in which he says: "The cause of the earth's magnetism is *not* known." In Johnston's "Natural Philosophy," he says: "Various theories have at different times been proposed to account for the phenomena of magnetism, but with little success." Pages 332-532.

Pages 369-577, Johnston's "Natural Philosophy."

ORIGIN OF ATMOSPHERIC ELECTRICITY.

"It has not yet been satisfactorily determined by what means the electricity of the atmosphere is developed."

A SEVENTY-FIVE YEARS' SEARCH.

"*Eureka.*"

Between Mount Washington, N. H., and Mount Hamilton, by observations on the land, and careful observations on the seas, from Portsmouth, N. H., on the Atlantic, to the State of Washington, on the Pacific,—all this ground has been travelled o'er, in search of the source of the *tides* and the source of the *magnetic currents* so called.



The ship's instruments were our companions early and late, especially the barometer. At 12 o'clock, while beneath Tropic of Cancer, the moon came directly in the zenith. At these times of the voyage we employed our time faithfully, to learn whether any marked disturbances were made apparent on the barometer. It is worthy of note that about the time the moon was in the zenith, the barometer showed signs of a magnetic pressure, of greater or less power on that instrument.

This was while the sun was south of the earth's equator; and as we sailed directly beneath the sun's centrifugal force, the barometer gave signs of more pressure than at any other time. Both sun and moon showed a marked pressure on the seas beneath Tropic of Cancer.

We turn to our observations on the Atlantic.

It had got to be hot weather at this point in one voyage, on the Seas of Earth as a *planet*, so we often sat up nights to study the new constellations that had come into view by our sailing south.

The North Polar Star had gone down behind us, while the Southern Cross was daily rising, as we approached the Brazilian coast of South America. Our captain had been talking of entering the port of Rio Janeiro. But a gale overtook us, and carried us past that port to the entrance of the Bay of St. Catherines, which is about 25 deg. south of the earth's equator, and we had bespoken this spot as one of the best places south of the equator for a continuance of our observations of the barometer.

OBSERVATION ON THE SEA AT ST. CATHERINES.

First.—That there is the same manner to the tide south of the equator as there is on the north.

Second.—That the time of tide is at the same time both south and north of the equator.

Third.—That beneath the moon's nadir it is *low tide* all the time, as the earth rotates beneath the moon's magnetic power.

OTHER OBSERVATIONS BY BAROMETERS.

Observations made on board ships, and at U. S. Stations, and in Great Britain, prove our theory of the tides correct.

Professor Robert Grant, in his work upon astronomy, has a case in point: that Captain La Faver, while stationed upon the Island of St. Helena, observed that the barometer and the tides were depressed when the island was beneath the nadir of the moon.

“And also that the time of high water is such, by observation, that all confidence is lost in the present theory of attraction.”

We find by consulting the log books of Captain Kustel, in sailing for several years from San Francisco to Tahiti, his barometer indicated an atmospheric pressure always at full moon by his barometer.

And we learn from Captain Kustel, and other sailing masters, that the tides near the equator are very small.

One of the best evidences to prove the fact of repul-

sion are the observations at the U. S. Stations, and those of Mr. Thomas Tennent in San Francisco, which are that when the moon is *north* the tides are *low*, and when the moon is *south* the tides are *high*. All can see this depression of the tides, when the moon is high in the north, and also her south position after the change forces the tides north again,—proving the fact of repulsion.

THE MAGELLAN CLOUDS.

Captain Verana, officers, and fellow passengers, all admitted that the Magellan Clouds have been the chief wonder of this northwest coast, “*and of a truth they are an astronomical wonder,*” and they have been from the days when Captain Magellan first discovered them.

To us they belong to the Nebular System. There being two of them make them more interesting; and the fact that they belong not only to the Nebular, but also to the *Binary System*, so called in astronomy.

With our present view of light and heat, and the fact that the earth has its magnetic circle of light, called in astronomy the “*Milky Way*,” I am of the opinion that those two clouds, or lights, are nothing more or less than the light similar to that of the earth’s “*Milky Way*,” which is a secondary thought about the planets that *light* and *heat* are not in the sun.

The planets Mercury, Venus, Earth, and Mars are located not far from one of the sun’s poles, while the Magellan Clouds are located in what we might term the *Sun’s South Pole*.”

EQUIPOISE OF THE SUN.

This location of polar planets is new in astronomy, and is to us a matter of *positive fact*, from observation and the observations of others.

And the fact that a well and equal balanced machine is important for its perpetuity. In passing along the Northwest Coast, to the Tropics of Capricorn, to the earth's equator, and to the Tropic of Cancer, and then to San Francisco, Calif., observations were kept up of the effects of the moon on the barometer, and we find that it is a *repulsive force*, and not an *attractive force*.

And this was one conviction on it, that if the moon in passing over us, and if it would disturb the small two-inch ball of mercury, then what would it be its effect upon the open Pacific Ocean? We answer, Much indeed; and no wonder that the tides flow. But not by *attraction*, as Decaits has it; no, no, but by *repulsion*.

MAGNETIC STORMS.

Keeping up my observations for many years past since our first observation, we find that there are *magnetic storms*, as well as wind and rain storms.

Those magnetic storms have been encountered by all the sailors and mariners from Noah to Columbus, to Queen Elizabeth's Dr. Wm. B. Gilbert, about 1700, and from Queen Elizabeth to Queen Victoria, and down to 1885, they have come and gone, east, west, north and south. And why these storms? We answer, that these storms

of magnetic intensity occur as do the large tides, the terrific rain storms, the intensity of cold and heat. They are all, as well as the magnetic intensity and power, and derived from the *sun*, as the center, and from the conjunctions of the planets that pass each other in their revolutions around the sun's pole.

So we have these masters: Dr. Wm. B. Gilbert, Muynes, Guiott, Humboldt, Lafrey, Sir John Ross, Sabina. And the observation of the writer on the sea and on the land. All go to prove the Sun to be the source of the magnetic power, instead of being in the earth, as taught by Dr. Gilbert, in the year 1700.

MAGNETIC EQUATOR.

The magnetic equator is found to be 22 deg. to 25 deg. south of the earth's equator. Observations made by Hansteen in 1838 and 1839, and by Lafrey as late as 1844, each spending ten years.

Their observations, and those of Sir John Ross in six years' observations, all go to prove that the magnetic equator is south of the *earth's equator* $22\frac{1}{2}$ degrees.

VARIED INTENSITY.

And the English writers say that according to *Sabina*, the intensity of the earth's magnetism, like the variations of the dip, is found to suffer periodical changes. And *Sabina* continues that, "Besides these regular variations of the earth, other irregular variations have been observed. These have been termed magnetic storms.

“Ezekiel 1st and 2nd Chapters.”

These two chapters are an astronomical vision. The first chapter gives to us what “Ezekiel” saw, as near as he could then describe it. But he failed to give a full account or a full description of the glory and brightness of the effulgence of “*God’s glory.*” So the angel makes another call upon him, which will be seen in “Ezekiel, 10 Chap.” In the first chapter he uses about one hundred words in descriptive language, to give to us his account of what he saw in his vision of the four cherubs.

And by a careful comparison of them with our drawings of the “Solar System,” seventy-five per cent of his words will apply to *our views* or conception of the *Sun*, and the four first planets or spheres, *i. e.*, *Mercury, Venus, Earth* and *Mars*. But it appears that Ezekiel had in some measure failed to describe some of the “Glory of God” in the Sun or the fiery aspect of Mars, as one of the cherubs in his vision. So the angel comes to him the second time.

In this second *vision* Ezekiel has about the same things shown, in which are also the burning coals of fire as it appeared to him. Also the same wheels within a wheel. “Four Cherubs.”

These four cherubs in miniature form passed before his mind. But the Sun in his glory had been so common a thing to the *Seer’s* mind that it was left for the closing scene of his frightful vision. But the four cherubs or the

four living creatures, also the four wheels within a wheel as they appear to him, were peculiar in themselves.

These *two chapters* of Ezekiel are among the mysteries of the sights and sayings of the Holy Prophets. But it is our opinion that the design of the Spirit was to show Ezekiel a full and grand panoramic view of God's creative power and glory, as seen in the Sun and its system of spheres.

And it would appear that in spirit he was taken through and over what he called the circles that appear to him to be "Dreadful in Height."

But the *human side of the slave* (as he was in Egypt) breaks down at the sight of these mighty spheres in their effulgence. Coming led with the *orb* of day, and the first four nearest planets to the sun, *i. e.*, Mercury, Venus, Earth and Mars. But Ezekiel calls them *live creatures, with wheels full of eyes*, and all under the appellation of cherubims.

At that time when Ezekiel wrote, it is supposed they had no knowledge of the science of "electro-magnetic power, or its application to terrestrial mechanics." But here *we* apply that power to the "Celestial Glories of God," which he saw in his vision. When he, upon his face, as will be seen in Ezekiel, 1st Chap., 28th verse. But we note still further; Ezekiel, 10th Chap., 10th verse.

And as for the appearance, they four had one likeness,

“as if a wheel had been in the midst of a wheel”; and in the 13th verse he says: “As for the wheels, it was cried unto them in my hearing, Oh wheel.”

This we interpret to mean that the four wheels, the four cherubs, and all concerned in the cherubims, are addressed by the Spirit.

The Spirit addressed the four under the appellation of “one wheel,” not four, nor four cherubs or cherubims, as Ezekiel calls them. No, not so. For the spirit had the mind of the *seer* out on that dreadful circle where he saw one wheel, *i. e.*, the centripetal and centrifugal forces of the solar system, as he looked from what appeared to be the *static* atmosphere of the mighty *Sun*.

“And as for the wheels,” it was cried in my hearing, “Oh wheel!” and we interpret this to be on the solar system; or oh, what a mighty sheen is this one wheel, the sun and these cherubs or spheres.

There are eight spheres (or cherubs, as the prophet calls them) in our Solar System. But Ezekiel, in his excited state, failed to count them all.

As is noticed in the first account; Ezekiel 10th Chap. And in the second trance state the spirit may have taken him out “to Jupiter,” and then shown him the four outer spheres this last time.

For we find it to be over a year since his first and second one. In the first the prophet saw from the ground in a whirlwind. In his second he says: “I looked, and be-

hold in the firmament above the heads of the cherubim." This above the first would show that the last four cherubs were above the first four.

And also that the spirit designed to show a line of distinction between the first four and the second four cherubs. But the translators may have failed to make a line of distinction between the first four and the last four, ("Cherubs or Cherubims,)" or as we would call them, "globes or spheres." The apparent wheels are the planetary atmosphere.

Now if our conception is right, we have the eight spheres complete in our Solar System.

CHAPTER II.

OUR SECOND VOYAGE AT SEA.

July, 1862. The question of the hour was, What is the source of the magnetic current, and what is the cause of the ebb and flow of the tides?

This question we were in hopes to answer by our second voyage. Our second voyage was in February, 1862, in the midst of our Civil War, and when men were in great demand, especially in California. The ship of war of the U. S. navy, Lancaster, was lying off San Francisco wharf, for a new supply of men for the cruise along the Northwest Coast.

We, to recruit our finances, had to go to the city of San Francisco to work, building a house at \$1.00 a day. But there was something forbid us in the thought of work, save in the United States employment to "save the Union." And the writer found that by enlisting under the United States flag he could do two or three things to help preserve his native country, and at the same time acquaint himself with the better understanding of the tides and other points in his scientific pursuits, and leave a better fighting man in the Federal cause.

So I got a boatman to take me off to the ship Lancaster, then with her provisions and outfit all aboard. And the proud Lancaster sailed that very evening for the south ports of Mexico.

We first made Cape St. Lucas, that is situated at its center point beneath the Tropic of Cancer. The Sun at the time, July 6, 1862, was near the meridian, and the Moon at its full was nearly direct overhead at Cape St. Lucas.

Or, we should say, that when the moon was at the meridian, it was *low tide*.

But when the moon had passed on west, then the reacting tides would be large tides.

And when the moon fell off, as she does each month to Capricorn, then the lunar tide would be the large tide.

As we have said, the tides were small at Cape St. Lucas, but increased to quite a large tide at Guaymas, Mexico.

The sea thus rushing up the Gulf of California from the tropic was very warm at Guaymas, but by ascending up to the mouth of the Colorado River the water became fresh and colder.

A QUESTION.

When the officers saw and understood the writer's trade and calling, the question was asked the writer by the officers: "Mr. Smith, why did you ship on board the Lancaster?"

ANSWER.

“To serve my country first of all, and to advance my knowledge in the Science of *Astronomy*, *Navigation* and the best methods for manning and equipping a ship, and also for equipping an army for the defense of the U. S. A. Second: To solve two scientific questions,—the Sources of the Tides and the Magnetic Current.

And when the officers understood the writer's object for enlisting, they gave him every act of civility he desired, and that the ship could afford,—even *Liberty on Shore*, etc. The Lieutenant gave me an introduction to the Commodore, Captain and the Paymaster, the doctors and heads of all departments.

When it was ascertained that the writer was an architect and a practiced “ship joiner.”

Commodore Bell soon called to his Orderly, saying: “Orderly, go find Mr. Smith, and bring him to my cabin.”

The Orderly came briskly up, and said: “Mr. Smith, you are demanded at the office of my Commodore. Come, go with me.”

“Yes, sir,” I answered, and followed the Orderly.

The Orderly gave me an introduction as Mr. Smith, the carpenter.

The Commodore bade me be seated.

“Mr. Smith, they tell me you are a carpenter.”

“Yes,” I answered, “that is my trade, sir.”

“ We are going into a warm climate, and want some blinds for the stern windows.”

Taking me to the spot, he showed me the two stern windows of the ship, and remarked, “ While this ship lay at the Navyyard on Mare Island, I sought to have *blinds* to these two windows, but the carpenter informed me that they could not be done, so we left the navyyard without any blinds “ *to my cabin.*” The gentleman in the ward-room informs me that you are an adept in your business, for you have done them some fine work. What do you think, Mr. Smith; can you make and fit some blinds to those windows? You see the window sterns; do you think it possible?”

I answered, “ Yes, sir, if you have the material on board.”

“ I can make the blinds if allowed to do so by the carpenter’s mate, who is my boss, as I am in that department of the ship now, sir.”

“ Well, we have the lumber and the paint, and the ‘ *very man* ’ we want. Orderly, go to the ward room and order the carpenter, Mr. Hough, to come to my office.”

The carpenter soon appeared dressed,—dressed in his uniform.

“ Carpenter, this is Mr. Smith, of your department.”

“ Yes: yes, sir.”

“ Mr. Smith informs me he can make and fit blinds for these two windows.”

“All right,” said the carpenter. “But wait, Mr. Hough. You told me in Vallejo that it could not be done. Now, Mr. Hough, give Mr. Smith the lumber and his *time*, and he will be his own *boss*.”

“The Commodore offered me his fruits and wines. I begged to be excused from taking any of his wine, but accepted some of his fruit.”

“You, Mr. Smith, are a brave man. You, sir, will pardon me for tempting you to *drink!*”

“The blinds, Mr. Smith, you can do, and if you need help the carpenter will give you a man.”

“*Take your time!*”

The yeoman's time was now out, and the Lieutenant called me to his room and said, “The Admiral has appointed you to the yeoman's office, but we are sorry to lose you from the carpenters' department so soon after your good work.”

The Lieutenant conducted me to the ship's store, and put me in charge of the store and all the goods. He then remarked, “You, Mr. Smith, are possessor, in the name of the United States, of all things on board this ship.”

THE SOURCE OF MAGNETIC CURRENT AND THE TIDES.

At this point in my voyage and my upward tendency, and more than all, my acquaintance and confidence of the officers of that Noble Flag-Ship.

The scientific instruments, charts, and books of the ship were all within my reach now.

I was supplied with a clerk, so as to relieve me from my hardest work. The times and the seasons of the tides were all left therefore to my judgment; and if I wanted a boat, I had one, and a man or two.

I continued my observations on the shore of the harbor at Guaymas, but we could observe the same depression. All showed that the moon repulsed the waters up the Gulf of California.

We soon left Guaymas and entered the Harbor of Acapulco.

The object of our cruise was to watch the war vessels of France and the Southern Confederacy on this coast of the Pacific.

We had not been long in the little snug harbor, when a sloop of war dropped her kedge anchor at the stern of the ship, U. S. S. Lancaster. This occurred in the night.

The sloop proved to be a French man-of-war. Then all were awake to know what was up.

The pretense was that the war sloop came in to obtain new supplies of meats and fruits. The Captain of the French corvet threatened to fire on the city in the morning, if supplies were not forthcoming.

Admiral Bell heard the complaint of the Frenchman and finally rose to his feet. "You will fire on the city if they do not supply you with provisions, will you"? "Yes, sir; we will!" answered the Frenchman.

"We will be all ready, and sir, take notice! *When*

you fire on this town you will only fire 'one gun,' for the U. S. ship will blow your ship out of water, or sink you in this harbor."!!!

The next morning came, and the French war-sloop had drawn her small kedge anchor in the night: she now took the light land breezes and put out to sea. In this gem of a port — Acapulco — the tides and the barometer showed the same repulsive force of the moon, and also that of the sun on the open sea, which flows up within one mile of the city into the harbor.

And we were well supplied with fruits by the *good women* of that city. Our ship took in her kedge anchors, and we also steamed S. E. to the Isthmus of Panama, to watch the French ship-of-war.

The second tide we would say, that in the physical geography or in different works of the astronomy of the tides there is no just cause assigned for the ebb and flow for the second daily tide. It is a *reaction tide*, as we have discovered them to be while we were anchored in Panama Bay.

MAGNETIC TIDES.

While in Panama, in what is called the *Panama Bay*, we call an open roadstead.

We laid off in this bay some two months, and we were compelled to keep a long distance from the city on account of the wide mud-flats that lay between the ship's anchorage and the city. Over this we had to walk at low tide, or go in a skiff at high tide. Panama Bay being about

midway between the earth's Equator and the Tropic of Cancer, the tides were very high at that point of the seashore.

And the physical geography of the lines of the shore on the Northwest Coast are such as to cause a large tidal wave at this spot, *i. e.*, Panama Bay, for the good reason that the force of the moon comes into this bay from the northwest at new moon. So the reacting tides at that point are large.

And this explains and answers the question often propounded: "Why are the tides of the Pacific higher than those of the Atlantic?"

We answer, that it is the physical configuration of the seashore that throws up the sea very high on the Pacific side.

We have learned four lessons in Panama Bay. First, that the first tide is a Lunar Tide.

Second, that the second tide is a reacting tide.

Third, that the *tides* are *magnetic tides*.

Fourth, that the tides are caused by the *moon's repulsive force*.

We obtained our discharge from the Lancaster, and returned to California by steamer.

To complete our new design in the art of war, and also to complete our observation, and to write out as near as possible our observed facts in the Order of Natural Laws, so that our books, if possible, may contain facts as to the *tides*, and as to the source of the magnetic *current*, so-called.

CHAPTER III.

THE FOUR THEORIES.

THE FIRST THEORY OF THE ULTIMATE FORCE.

BY SIR ISAAC NEWTON.

The theory of Sir Isaac Newton has been handled rather roughly for a few years past.

Some of it has come to me from a source least expected. I was not anxious to find a flaw in his theory, or in the theory of any other man. But in seeking for the good and the true in Astronomical Science, I stumbled upon the following strictures on the Newtonian Theory of Universal Gravitation.

We copy from *Recreations in Astronomy*, by Professor Warren, dated N. Y., 1878, on the *Ultimate Force*, which is as follows :

“ We have discovered some of the laws of force we call gravitation. But what do we know of its essence? Of how it appears to act we know a little. What it is we are profoundly ignorant.

“ Few men ever discuss this question. All theories are sublimely ridiculous, and fail to pass the most primary tests.

“How matter can act where it is not and on that with which it has no connection is inconceivable.”

So much for universal Gravitation by one of our contemporary writers. But before we leave this branch of our subject, we will quote from one more Professor in Astronomy, in regard to the Newtonian force of Gravitation.

Professor Kavanaugh, of Mt. Stirlin, Kentucky, says :

“There is found in all Nature three imponderable elements,—light, heat and electricity,—over which gravitation has no influence whatever.

“Hence, we hold electricity as rightfully enthroned and crowned as God’s great motor monarch to control the movements of the Universe.”

Davey says that the Specific Gravity of a mineral is weight compared with that of some substance taken as a standard.

And, further, he says that for solids and liquids both, distilled water at 60 degrees Fah. is generally used as the standard.

And if a mineral weighs twice as much as water, its specific gravity is 2, if three times, it is 3, etc.

Specific Gravity is, therefore, its weight and its measurement.

We have always had the greatest reverence for the theories of others, especially so with the theory of Sir Isaac Newton.

THE SECOND THEORY.

BY DECARTES.

THE FRENCH, OR DECARTES THEORY.

Decartes' theory was that the whole Solar System was governed by whirlpools in the Ethereal Piners of the Solar System, some of which were larger than others, and that by some law, not defined, the whole were preserved and kept in space by some unseen power.

This philosopher supposed the sun to be immersed in a vast mass of fluid, extending indefinitely in every direction.

The sun by its rotation set the parts of the fluids next to it in rotation; these communicated their motions to the parts still farther out; and so on, until the whole mass was set in rotation like a whirlpool.

The planets were carried around in this ethereal whirlpool. The more distant planets moved more slowly, because the ether was less affected by the rotation of the sun.

On the great vortex of the Solar System were smaller ones, each planet being the center of one; and thus the satellites, floating in the ether, were carried round their primaries.

Photography in its relations to astronomy is full of promise. It has already produced some wonderful re-

sults. But no one believes that we are any further than the threshold, as it were, in the application of the art to astronomical sciences.

For instance: the results now obtained with the aid of photography in a 15-inch telescope are no better than may be obtained by observation through a 2-inch telescope.

The photographic plate is so much more sensitive to the action of chemical rays of light than the naked eye, as evidenced by the photographing of invisible spectra, and of stars invisible to human vision, that there is reason to hope the time will come when a photographic film will have been discovered so sensitive and so reliable as to reveal on its surface, after exposure to the heavens, that which is invisible through the largest telescope and with the highest power.

We shall then perhaps learn what really exists on the surface of the moon.

It would be too much to assume that the limit of human ingenuity has been reached, and that further conquests in the field of chemistry and mechanical science, as related to astronomy, are out of the question.

The human mind is quite as expansive as ever, and new methods of obtaining desired results are being revealed in astronomy as well as in other sciences. And while the great telescope on Mount Hamilton has just entered upon its work of revealing the hidden mysteries of stellar space,

the question of building other telescopes of still greater power is being discussed to further advance the science.

THE THIRD THEORY OF THE ULTIMATE FORCE.

BY JUDGE RICHARDSON, OF NEW YORK.

Mr. Richardson issued a pamphlet in 1832, and his theory in electricity was adopted by Professor Kavenough, of Mt. Stirlin, Kentucky, in 1843.

In 1838, T. S. Mackintosh, of England, issued a book on the Electrical Theory, and it was reissued in Boston, Mass.

Hear what Professor Kavenough has to say of his adopted theory of electricity.

There are found in all nature three imponderable elements,—Light, Heat, and Electricity,—over which gravitation has no influence whatever.

These three elements are produced from the sun, and combined as a kind of trinity in every solar ray. This element electricity is above and independent of gravitation; it is infinite in the area of its action, its functions vastly diversified; hence we hold it as the rightfully enthroned and crowned as God's Motor Monarch.

But our notes upon electricity differ materially from those of Professor Kavenough.

Ours are as follows:

Electricity is one of the most willing and winsome elements of all the silent forces of nature.

Its power to distribute itself is one of its best qualities in our science, and in the arts; but if confined and cut off from a good and ready conductor, it will explode with a great noise, whether it is on the earth or in the sky or clouds.

It is fond of a ride, and will jump on the farmer's wagon, hang to the wheels in their rotary motion in the grass and dust of the highways, and especially on shaky tule lands.

Again, electricity is at home wherever motion, moisture, or heat are found. But we find that it is inactive where those three conditions are lacking.

But to our proof as to electricity being shy:

- 1st. It is shy of glass.
- 2d. It is shy of dry atmosphere.
- 3d. It seeks to ride upon the outside.
- 4th. The source of electricity is in the sun, as it is the central engine of the whole solar system, as per see.

But as we conceive electricity to be the outer manifestations of the positive magnetic supply, and in the proof of magnetism, we have also the proof of the electric supply to be sun power.

Electricity is free as water, and what water is to the terrestrial mechanics, so is electricity to the *celestial* mechanics.

FOURTH THEORY OF THE ULTIMATE FORCE.

BY W. W. SMITH, ANTIOCH, CALIFORNIA.

My first lesson in astronomy was at the age of eleven years, *i. e.* 1822 ; the writer was placed out in a family where one of the men was an able mathematician and astronomer.

It was the question of the day : “ What is the source of the *tides* of the ocean ? ”

I was placed out to learn the carpenter’s trade at about the age of sixteen, in the town of Merideth, New Hampshire.

At this place was the residence of Dudley Levitt, the New England almanac maker. Mr. Levitt and his two daughters were astronomers, and I attended the same church, and as it may appear sat at the feet of three astronomers at the age of 17. But to be a practical carpenter was the height of my ambition then ; and to be that, I must attain geometry and practical drawing, so as to be master of my trade ; and these studies would also assist me in the science of astronomy. My success in geometry and drawing was such that at the age of nineteen years I became the draftsman for most of the work in the town and country around. After this, I entered a college course of study in New Bedford, Mass. In this course we studied Greek, Latin, Algebra and “ *Astronomy.* ”

But when the “*gold fever*” broke out in New England Rev. J. H. Smith and myself, twin brothers, determined to take our families and come to California, and to make the voyage around Cape Horn with our wives and children.

We also concluded to take our books and charts, so as to advance our studies in the science of astronomy. When we should have passed the Earth’s equator, then we would open up to our view the stars of the southern “*Pole Regina*” and its constellations.

January 11, 1849, we sailed out of Boston, Mass., and in just sixty days we entered one of the Brazilian ports, St. Catherine’s. Here, among orange groves and fruits too numerous to mention, we spent about thirty days.

This gave us a good opportunity to test the theory of Decartes, on the “*Tides*” of the South Atlantic Ocean, as well as those of the North where we had lived.

In our observations on the south side of the Earth’s equator, we came to the *conclusion* that the theory of “*Attraction*” being the cause of the ebb and flow of the tides must be a mistake.

For our observations in the open South Atlantic Sea showed a marked difference between *our* observation and those of Decartes Theory of Attraction.

This is our first witness. Having this one witness against the theory of attraction, we commenced a closer observation of the “barometer,” as we then were about on the Tropic of Capricorn.

We soon found that as our own ship passed beneath the moon's nadir the barometer showed an atmospheric or "*Magnetic Pressure*" on the ocean.

After arriving in California, we often visited the sea-shore east of the Golden Gate, and all our observations showed that when the moon was at meridian, it was *High* water at any given place along the northwest coast of South America or California.

Being thus instantaneous, it was suggested that the tides were *magnetic tides*; and by consulting the tidal lines of physical geography and our St. Catherine's observation, we found that beneath the moon's nadir it was small *Low Tide* all the time, and that from thirty to forty-five degrees north it was *High Water* all the time. It was the same south of the moon's nadir.

As the speed of this pressure is about one thousand miles an hour, and of such breadth, it must cause a mighty sea where it meets any opposition which runs against it, like our American or the Piscataqua River of N. H., or the Bay of Fundy.

Another fact was learned in our observations, that when the moon was low south at *Capricorn*, then were our *large tides*, and when the moon was north at *Cancer*, then we had our *Low Tide* at Golden Gate, San Francisco. But the *reacting* tides became our *Large Tides* when the moon was high in the north. This was sufficient to banish from our minds the theory of attraction.

So we began to write some upon the subject of the earth's silent forces. Our first effort was on the subject of the *Tides* of the ocean, which article was published in the San Francisco *Chronicle* about 1874.

THE SOURCE OF MAGNETIC POWER AND THE IMPORTANCE OF THIS SUBJECT.

The importance of a true knowledge of the source of the magnetic current, so called, is such that we desire to emphasize its importance. The importance will be seen, when we consider that the safety and the progress of the naval and the maritime ships of the world are governed by this force.

MAGNETIC FORCE.

The sailor should be educated in this matter, so as to be in readiness at the best time and the best opportunity to work in port, and when at sea to know and to admonish when to make sail, clear top, or reef his sails when he crosses from sea to sea or shore to shore.

THE SOURCE OF MAGNETIC FORCE.

The source of magnetic force is not in the earth or in the sea, or anything terrestrial, but it is in the celestial spheres.

The sun is the source to the distribution of the magnetic force, and we find that the most of the planets sustain a symmetrical proportion in the distributing magnetic elements in the earth's atmosphere above us, as well as the earth beneath us.

But the seas are most deeply affected by the moon.

Those planets which lay between the Sun and Saturn, those from Mercury to Jupiter, are known to affect the magnetic conditions of the earth, through the thermal conditions of our atmosphere, and through the atmosphere of the earth they affect the meteorological conditions of the *Tides* of the ocean, and its mighty waves that thunder on our seashore. At this point we extract a few lines from one of our late cotemporary writers, in his book on the subject of the Newtonian Theory of Attraction.

RECREATIONS IN ASTRONOMY.

“We have discovered some of the laws of force we call gravitation.” But what do we know of its essence?

How it appears to act we know a little ; what it is we are profoundly ignorant. Few men ever discuss this question.

All theories are sublimely ridiculous, and fail to pass the most primary tests.

How matter can act where it is not and on that with which it has no connection, is inconceivable.

Newton said that any one could not admit for a moment the possibility of a sun exercising thereupon an attractive power.

In view of this Prof. Warren has written, it is evident that his mind is disgusted with the Newton theory of universal gravitation, called universal in astronomy ; and that he had also discovered the want of such proof as it

should have had, to have placed Newton's theory among the positive in astronomy.

But now we hasten in presenting the following new positive side of astronomy.

But let us notice the loss sustained in the Newtonian theory.

A LOST LINK.

We venture the remark, that for the want of a better acquaintance with the Laws of Magnetic Motion more than one-half of Sir Isaac Newton's Universal Gravitation has been lost to the science of astronomy.

For gravitation is explained to be *Universal Attraction*. So in this way a link is lost in the chain of gravity, to which is attached the Key that is to unlock the gates to the fields of Science beyond.

This link is found with the Key attached to it, and with this Key it is proposed that the gates beyond are to be unlocked, and that they are to stand open for the rich, the poor, the bond and the free of the juvenile portion of the world.

The Link is Magnetic Repulsion.

REPULSION.

In the science of magnetism there is a standing rule, viz, that two positive magnets repel each other, and that one positive magnet and one negative attract each other.

CERTAIN CONDITIONS.

Thus it will be observed that certain magnetic conditions are brought into the account of attraction, when considered and understood magnetically; and certain magnetic conditions must also be brought into the account of *Repulsion*.

Now if this be so, how can we say "that every atom in nature attracts every other atom in nature"? Let us see.

MAGNETIC ATTRACTION AND REPULSION.

If magnetic conditions are thus to be brought into account, and one thing in nature is positive in its condition, another in the same positive condition, then they *repel* each other.

Now if this be so, where is "Universal Attraction"? One may say, it is gone. We say "No, sir; it is written with the pen of a diamond in the hearts of the people. It is incorporated into the laws of Astronomy and into our common school books as a fact, and how can it go?" Let conscience answer. This question is for the ages, Truth or Fiction, which?

But we are digressing from the path of our purpose in the matter of the presentation of the simple powers that are manifest in all nature,—among which is *one* not accounted for *in the science* of Astronomy.

This repulsion force is accompanied by that of electricity, and perhaps is rightly termed *electro-magnetic* con-

ditions of things, like the telegraph wires and their conditions. From 1871 to 1884 the writer was in a great quandary about a name. He had a force,—had found a power,—but had no name for it. What are the sun and moon and planetary force to be called?

For a better answer we call it *Repulsion*, as proposed by Prof. Norton; and now after thirteen years we find this *repulsive* force to be a good, and perhaps the best name for it.

Newton's force is the *Centripetal* Force.

Smith's force is the *Centrifugal* Force.

But let us pass on to notice the positive in Celestial Mechanics.

POSITIVE POLAR ECCENTRICITIES.

Why does the South Pole drop so low and the North Pole rise so high?

This question is one of the philosophical questions of the centuries past, and many presumptions have been proposed. But up to 1871 it stood in the physical sciences as one of the most profound questions. Why, oh why, these Polar Eccentricities?

WE ANSWER.

In answer to this absorbing and philosophical question, we would say that it is a Physical Pressure on that part of the earth's surface, and so far south of its Equator that it holds the South Pole as with an iron positive Magnetic Power. That power is the Sun's Power.

THE SUN'S POWER.

A New Power Discovered in the Sun.

In presenting this New Discovery, we are aware that we shall antagonize the accepted theories of preceding teachers, the early conception theories of scientific inquirers, and the published statements in the text books in the schools. To assail and to attempt to overthrow this triple wall, so to speak, may seem presumptuous; but we feel assured that our New Discovery is more than a *theory*—it is to us an established *fact*.

And if we show that it is a *fact*, then it is more than a *Theory*. Yes, a *Theorem*.

THE SOURCE OF MAGNETIC FORCE.

The source of magnetic power or force has been taught to be of earthly or terrestrial birth.

It is nearly 300 years since Dr. Wm. Gilbert announced the theory that the earth was a great *magnet*.

That announcement was received with great joy by the different nations of the earth. Most of the European governments summoned their scientific explorers, and after equipping and fitting out their ships, sent them forth to explore the *Magnetic World* on the seas.

In these explorations they were required to find these two things, viz:

First.—To find the *Magnetic Equator* of this Magnetic Power.

Second.—To find the *Meridian* of this Earthly magnetic force.

They have accomplished much in reference to both of these points, especially the first, on the sea, as to the spot where its power is most manifest.

THE EQUATOR OF MAGNETIC FORCE.

They supposed that the equator, or the spot on the earth where the greatest manifestations of the magnetic forces were most apparent, would be on or about the *Earth's Equator*.

But they were all disappointed in their explorations, for they had to sail south of the earth's equator 1,350 miles to find the *magnetic equator*.

This discovery that the power they were seeking was so far south seemed to bother them a great deal, and dampen their ardor.

And to correct and determine the locality of this *magnetic force*, or its equator, there have been numerous ships and men going and coming for this express purpose for 200 years.

By common consent it is now well established that the line of this Magnetic Force is about 25 degrees south; whereas, if the earth were the Source of Supply, it would be found on the earth's equator.

THE MERIDIAN.

The meridian of this power is not as yet so well determined. For some say that there is one, others two, and

others that there are an infinite number of bars of iron running north and south. And it is a matter of fact that for years the true sources of Magnetic Force have been questioned, and the theory of Dr. Gilbert has been set aside by some experts as without foundation.

The fact is, there has not been sufficient material found on the earth to warrant the belief in Dr. Gilbert's theory that the earth was the *cause* or supply of this force.

The superabundance of this force, being found so far south in mid ocean, precludes the supposition that beneath these seas there are beds of ore which attract the compass north or south. Again, attempts have been made to find the necessary ores of iron running through the earth beneath the meridians, but they have sought in vain. So they have settled down to the conclusion that the meridian of this force, as well as the source itself, are among the mysteries in the sciences.

When we consider the necessity of properly determining the meridian of this power, for the safe guidance of ships across the trackless ocean, this question assumes a world-wide importance: Where is the source and meridian of Magnetic Power?

It seems to us that the theory of Dr. Gilbert, if true, should be proved by this time, or else abandoned as false. But it is so incorporated in the books that doubtless some will regard it as sacrilege for any one to look for more tangible solutions of the question.

But the importance of the question demands a correct answer, whether these Magnetic Forces are of Terrestrial or Celestial Origin.

But right here another question forces itself upon us.

How is it that so much magnetic power is found in the lodestone and iron ore?

We answer : the lodestone, and the iron ores, and other metals, are only the retainers of a small per cent of this mighty sea of Magnetic Power, as it sweeps north and south.

CONCLUSION.

Sir Isaac Newton made his announcements about 1670, yet no proofs have appeared as yet to place his theory among the positives in Celestial Mechanics.

And now, 1892, after waiting about 300 years, we find that there are three coincidental discoveries, that in a very remarkable manner culminate in one complete system of Astronomy.

First.

Newton discovered the Attractive Force.

Smith discovered the Repulsive Force.

Second.

Newton discovered the Centripetal Force.

Smith discovered the Centrifugal Force.

Third.

Newton discovered the Negative Force.

Smith discovered the Positive Force.

By these coincident Forces, we can explain the Newtonian theory of attraction, but by no other hypothesis.

These three links complete the positive magnetic chain; as we adopt the Positive "*Magnetic Force*," which is the ultimate force in Celestial Mechanics.

WM. W. SMITH.

The following are a few of the helpers in our work:

Dr. Gilbert, Dr. Rolison, Guyat, Moyer, Humboldt, Byot, Hensteen, Sir John Ross, Prof. Matthewson, Dr. Warren, Prof. Leviett and two daughters, Burritt, (the Learned Blacksmith), Prof. Newcomb, and others.

CHAPTER IV.

SEVEN SEALS OPENED OR SEVEN MYSTERIES REVEALED.

Thus all these are seven mysteries in Astronomy.

- 1st. The Zodiacal Light.
- 2d. The Milky Way.
- 3d. The Northern Lights.
- 4th. The Comets.
- 5th. Mechanism of the Tides.
- 6th. The Science of the Magnetic Current ; and
- 7th. The Source of Electricity.

We shall notice these *points* separately as we pass on.

FIRST AND SECOND MYSTERIES.

MILKY WAY AND ZODIACAL LIGHT. ASTRONOMICAL OBSERVATIONS IN CALIFORNIA.

Professor Newcomb says in view of all known observations of the Zodiacal Light and the Milky Way: "It would indicate a lenticular shaped atmosphere of inconceivable rarity, surrounding the sun and extending out near the plane of the elliptic, beyond the orbit of the

earth." But further researches must be made before a conclusive result can be reached. And as to what this matter is, he says: "It is impossible to make a positive answer to this question." Thus it will be seen that the latest and most "popular" work on astronomy is frank to acknowledge that the Zodiacal Light is a mystery.

Professor Mathison says: "After all the observations that have been made and the theories that have been advanced, it must be admitted that the subject of the Milky Way and the Zodiacal Light is but imperfectly understood."

"This peculiar light," says Johnson, in his Encyclopedia, "is among the mysteries in astronomy to be revealed by future generations."

The clearness of the atmosphere in California and the great number of clear nights, together with its mildness of climate, give to its students in Astronomy the best of opportunities for its study.

The design of the writer is to give to the public—and especially to the young—the result of his researches of over 60 years of the laws of Nature and of God.

And where his theories may in some cases diverge from those of others, he has given a philosophical reason for this divergence, and also proof to sustain his theorem, so as to present only the positive.

First, the milky way. It has been a sealed book to us and the world up to the 22nd. of March, 1882. At that date the writer made the discovery that the milky way is

the light of the sun on the planetary atmosphere while the sun is below the earth.

The proof will be apparent to any one who will take the time to be on the lookout at 12 o'clock at night on the 22d of March, for at that date the sun holds a central position at midnight at the *Earth's Nadir*. And also on the 22d of September.

On the 22d of March is the best time for observation. Let the student stand face to the west; then you will see the milky way at your right, running around north and east beneath the *North Polar Star*. Then turn again westward, and you will see another line of light running southward.

These two distinct lines of light extending around from the west each way, are sunlight on the sun's atmosphere. Some suppose it to be a ring around the sun.

So we find the *Zodiacal Light* and the *Milky Way* are one and the same thing; sunlight on its own atmosphere.

March 22, 1882, gave us a good opportunity to test our *theorem* of the *Milky Way*, and also of the *Zodiacal Light*.

The writer had had his views upon the subject, and wanted a night without a moon and without a cloud around the whole horizon.

And at 12 o'clock at night, on March the 20th, 21st, and 22nd, 1882, the sun was on the equator, and also beneath the earth's nadir.

And my theory was, that if it was *Sun Light*, then at that time, 12 o'clock at night, the Milky Way around the whole horizon would be seen by those living near the earth's equator.

And the Milky Way will also be seen on the 21st and 22nd of September. It is also a point of time good for the observation of these two distinct lines of light running up to a point 45 degrees high to the feet of the constellation Gemini. The *south* one is called the *Zodiacal Light* and the north one is called the Milky Way.

THIRD MYSTERY.

THE NORTHERN LIGHTS.

Are they a mystery? We answer, Yes: and offer the proof. Professor Newcomb, page 310, makes this sweeping remark about the Northern Lights.

“We must include Aurora or Northern Lights among those things of which modern observations have opened up more difficulties than modern theorists have explained.”

And Dr. Warren, in his *Recreations*, page 144, says:

“The earth is not without its inexplicable surroundings. In the Aurora, the realm of this royal splendor is as yet an unconquered world, waiting for its Alexander.”

We would remark, that when the sun has passed below our horizon, and he shines upon the polar snows the dashing waters of the northern seas, and there against the mountains of icebergs, then the north lights appear

to our view at best advantage ; and we had supposed that they were reflections on earth's atmosphere. We explain the Aurora as being a secondary light.

The sun being in its centrifugal force positive, and that positive magnetic force striking the earth as it does, 25 degrees south of the earth's equator, where their power is parted in its motion north and south, one part is passed over and the other is passed below the earth, and they meet again north of us in plain sight.

And as the two divisions dash over the *Round Earth* they mingle and co-mingle with each other ; their mingling motion is pushing them forward north.

They thus repulse each other by the great law of magnetic bodies, and they snap and crack like a coachman's whip, and often they appear like two marching armies who march by the music of the spheres ; but of a faint *electric light*, because both pass on the same way ; and again, we should add, both of them are positive and magnetic.

FOURTH MYSTERY.

COMETS.

Of comets, Professor Newcomb says : " As the case now stands, we must regard the Spectrum of Comets as something not yet satisfactorily accounted for."

And Professor Warren says : " The unsolved problems are not all in the sun, but our acquaintance (with comets) is too limited to enable us to master the difficulties."

Professor Matterson says : “ After all that is supposed to be known respecting comets, it must be admitted that they are less understood than any other bodies belonging to our system.”

What regions do these bodies visit, and upon what errands do they come,—surpasses the limited powers of human understanding at present to determine.

By the foregoing quotations from this new work of Professor Newcomb, it is clearly seen in what light the Comets have been and now are considered by the best writers and thinkers about comets, and also cometary matters, up to 1882.

All is left in mystery.

Therefore an open field is before the observer, in the line of discovery of the nature and the causes that produce what are known as comets.

We consider that there are two kinds of *comets*.

The first is the effect of planetary repulsion.

“ *Attraction and Repulsion are planetary Laws* ” with us, and the most simple forms of speech to express the “ *Laws of Gravitation* in the positive and negative.”

It will be seen that repulsion is as important a power as attraction.

And that the power manifest in planetary repulsion is magnetic power on its positive side.

And now it occurs to inquire, *What is the manner of their power?*

Answer: First, flashing light; second, a steady stream of light always like what are called comets in the books.

The second manner of repulsion in that of a comet is a steady, continuous magnetic blaze, and it will continue as long as the cause remains near enough to be seen.

This cause is outside pressure of the larger planets against those near to the earth; and the whole is seen and demonstrated upon the outer atmosphere of the earth, and it may be upon the atmosphere of the other planets; and the whole thing be understood by two or three words, Magnetic Repulsion or *Planetary Atmospheric Repulsion*.

Those three words are expressive of what we understand the repulsive force of planets to be, and what the books and the scientific world call "Comets." And the Spectroscope defines them as they do the atmosphere.

And again, by these cometary lights and forms, as demonstrated before our eyes, is the first law of light and *magnetism*, which is to *give and give* and distribute bountifully Night and Day. Electricity in its flashes is the manifestation of the positive in magnetism.

A SECOND KIND OF COMETS.

The second kind of comets are those reflections of one planet upon the smooth surface of the outer atmosphere of the Earth, or any other planet's atmosphere.

The simple motion of the Earth upon its axis moves a certain portion of atmosphere in space. This we call planetary moving atmosphere.

And out in space beyond the centrifugal force it is called "Ether."

But all that we call atmosphere in space beyond the centrifugal forces, we call *Static* or still atmosphere. This outer line of Earth's atmosphere is a sea of glass mingled with fire,—or a looking glass in the sky.

For we believe there is no vacuum in all the universe. Professor Loomis has joined in with us in the vast extent of the Earth's atmosphere.

In 1871 we extended it so that the moon rolled around upon it, and Prof. Loomis came out in 1875, saying that it must be 25,000 *miles* out to the line where the centrifugal force was *dissipated*.

The nature of the atmosphere is such that it is thrown out by the Earth's rotary motion, which is 1000 miles per hour.

THE COMET OF 1882.

It was said of the Comet of 1882 that it would move off south, and soon be out of sight.

But no, not so. It did not move at all, but the background did move slowly, and as surely as did the earth toward Capricornus.

This background was the earth's shadow on the earth's lenticular form of atmosphere with its background, on which the planet Mars was first mirrored.

To us the comet is only a manifestation of two repulsive forces meeting in space: according to the first law of magnetism, they repulse each other.

FIFTH MYSTERY.

THE SOURCE OF THE EBB AND FLOW OF TIDES OF
THE OCEAN.

In 1871 we wrote our first article on the Tides of the Ocean, and in 1876 we published the same as a Centennial article; and in 1878 it was printed in pamphlet form as *Celestial Dynamics*.

And about this time (1875) the writer acquired a French book—revised and translated it into the English language—by Prof. Guilman, and gauged the findings and writings of Prof. La Place on the Tides of the Ocean.

Decarte says La Place thought he had discovered the true source of the tides of the ocean; but observations all go to show that he was mistaken, and that the tides were still among the mysteries of Astronomy.

And now, 1893, the Centennial Year of the Landing of Columbus, and the year of the World's Fair in Chicago, Illinois: and in honor of that landing, we dedicate this work to the Columbian Exhibit of 1893, the Columbian Fair.

STILL A MYSTERY.

Elihu Burritt, by H. Matherson, A. M.

They say, in conclusion, on the Tides:

“We have thus stated the principal facts connected with this complicated phenomenon, and the causes to which they are generally attributed.”

And yet it is not certain that the philosophy of the Tides is to this day fully understood.

Prof. Newcomb, 1882, page 93 :

He goes on to state the general phenomenon of the Tides of the Ocean, and then he says :

“ The cause of this ebb and flow of the sea, and its relation to the moon, was a mystery, until gravitation showed it to be due to the attraction of the moon on the waters of the ocean.”

Yet he says that no certainty can be known, only by observation.

Prof. Warren, on the Tides of 1879:

He makes the following open confession :

“ It must be conceded that the profoundest study has not mastered the whole philosophy of the *Tides*.”

Prof. Warren goes on to say :

“ *There are* certain facts that are apparent, but for an explanation of their theory, such men as La Place, Newton and Ayers have labored in vain to explain, or solve.”

Thus it will appear that there are plenty of worlds to conquer.

And if Prof. Norton was to arise and speak, he would say that “ that man up in the country is ahead of La Place, Newton and Ayers ; and more than this, he stands on a high elevated spot, around which all the scientific world have been marching in all the centuries past.

“ But they did not find it. *Mr. Smith*, of Antioch, Cal.,

is the first man to stand on that spot; and there he will stand forever.

“And more than this, his name will go down to posterity as the discoverer of *A repulsive physical force* that governs the tides and planets, moon and stars, in their courses.”

Prof. Norton, then of the State Normal School, San Jose, Cal., said what I have quoted above in a public assembly at Redwood City, Cal., in 1875.

SIXTH MYSTERY.

MAGNETIC CURRENT.

First.—Let us enquire, What is the source of the magnetic current?

The source of the magnetic supply demands our attention, as upon this point hinges the door that we propose to open, and to have it stand open to the enquiring world in all the ages to come.

The source of the magnetic supply has been and now is among the mysteries of philosophy, and of chemistry. It is claimed to be in magnetic stones, or lode stones, iron ores, etc., but finally the earth was called a great magnet.

Witness, this magnetic power has a rise and fall with the sun. Its maximum is at 12 o'clock at noon; and the minimum is 12 o'clock at night; this shows that it is sun power, and not in the earth as a magnet.

The rise and fall of this power as stated above should be proof sufficient in the findings of the facts in this case, that magnetic force is not in the earth as a magnet, but that it derives its power from the sun.

MAGNETIC POWER IS SUN POWER.

PROOF OF THE SUN'S REPULSIVE FORCE.

To begin with, there are three important questions before us, published in the London "Century" of October, 1883, as follows :

1. Why does the sun, instead of attracting, repel the tails of comets?

We answer, Because the sun has a repelling force.

2. Does not attraction reign exclusively in space?

We answer, No : for if it did the solar system would meet in chaos in the sun.

3. Must the science of celestial mechanics henceforth take account of a second force?

We answer, Yes : if it would be scientific it must adopt the positive to work with the Newtonian negative, for without the two (the positive and negative) the earth would not revolve.

FURTHER PROOF.

1. The magnetic force has a rise and a fall with the sun. The minimum of this force is at 12 o'clock night, and the maximum at 12 o'clock noon.

2. In the deep mining shafts in the earth, loosened stones and debris commence falling at about 12 o'clock night. This is at the time when the sun's centrifugal force is directly antipodal to 12 o'clock noon.

3. When the sun and moon are both on the same line, as they are at the moon's changes, they give to us the large tide of that month.

4. The plumb line from the top of the Washington monument indicates that the force of the sun is sufficient to throw the plumb bob and line west in the morning and east in the evening. The sun's positive magnetic force goes through and through the stone, brick and mortar, and all known substances, and throws the plumb bob and line as described in the report of the keeper of the monument.

5. Prof. Beck, in his "Chemistry," page 84, makes this assertion: "Magnetic force is exerted *in vacuo* as well as in open air," and without any sensible loss of force.

6. The history of all comets goes to show that there is a repulsive force in the sun, which repels their tails away from it.

7. The barometer shows a small fluctuation when the ships of the ocean are sailing beneath the nadir of the sun or moon—so record the log books of the ships, and the United States and European signal stations.

8. The sun's repulsive force is manifested in the

eccentricities of the south pole of the earth—being so low. This force strikes the earth so far south, that it holds it in position $22\frac{1}{2}$ degrees lower than the north pole.

We have other proofs, but the above are sufficient for this article.

SEVENTH MYSTERY.

ELECTRICITY.

Electricity is the outer manifestation of Magnetism. In our two former articles on “The Mechanism of the Tides” and “The Science of the Magnetic Current,” we had supposed that we left but little room to present “The Source of Earth’s Electricity.” But the subject has grown as we have sought to simplify it. Earth’s electricity is now a subject widely discussed, and is presumed to be understood by all classes of students and readers; but there are various opinions and speculations in regard to the “SOURCES,” and the height and depth of this important power found hid in all nature. Johnson, in his “Universal Encyclopædia,” just issued, remarks that “*all are familiar* with the existence of electrical disturbances in the atmosphere, but their CAUSE is rather a conjecture than *knowledge*.”

Beck, in his “Chemistry,” says the term “electricity,” applied to the *unknown* cause of a peculiar kind of at-

traction, is derived from the Greek word *electorn*, amber, because the electric property was first noticed in this substance, *i. e.*, amber. And he gives the following six divisions of the subject: 1, "Excitation." 2, "Attraction." 3, "Repulsion." 4, "Distribution." 5, "Transference." 6, "Induction." Most of the philosophers agree with Beck.

Theories of Electricity.—The theory first proposed is ascribed to Duffy, that there are two subtle fluids in all nature. The second theory is that proposed by Franklin, then Ampère of France, as having one fluid; but in practice the two are blended in one.

Electrical Conductors.—The metals are usually considered the best conductors, and after these we can reckon charcoal, salt water, and living animals. The most important non-conductors are gum lac, amber, sealing wax, sulphur, glass, silk, feathers, dry air, baked wood, and oils. Johnson gives various experiments too numerous to mention. When smooth glass is rubbed by any substance except cat's fur it becomes positive, and the rubber negative; but if it is rubbed with this substance, the glass becomes negative and the fur positive. Sealing-wax becomes negative when rubbed by any substance except a piece of rough glass or sulphur, both of which communicate to it the positive electricity. When paper and sealing-wax are rubbed together, the paper becomes positive and the wax negative, and when paper and smooth glass

are rubbed together, the positive fluid goes to the glass, and the negative to the paper.

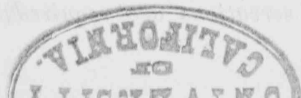
The Electric Fluid resides upon the surface of Bodies.—The electric fluid or fluids reside entirely upon the surface of bodies, as a hollow sphere of gold is capable of containing just as much electricity as if it were solid. Indeed, it seems to be retained merely by the pressure of the atmosphere, since if an insulated body be erected and placed under the receiver of the air-pump, it loses its electricity almost instantly when the air is exhausted.

Induction means a Power to distribute itself in all Nature.—When an electrified body is brought near another which is unelectrified, the natural electricity of the latter is distributed by the influence of that accumulated in the former, and the term *induction* is used to indicate the general phenomena that ensue.

Atmospheric Electricity.—The atmosphere, when in a dry state, is a non-conductor; consequently it is capable of retaining either of the electric fluids communicated to it; and different portions of it, or different strata, may be in different electrical states at the same time. This we know by experiment is often the case.

Usually, in fair weather the air near the surface is positive, and it increases as we ascend, while the surface of the earth beneath is negative.

In stormy weather the air near the surface is sometimes positive and sometimes negative; and not unfre-



quently sudden changes take place from one state to the other.

Professor Beck says :

Origin of Atmospheric Electricity.—It has not been satisfactorily determined by what means the electricity of the atmosphere is developed. Various causes have been assigned, as the evaporation that is constantly taking place at the surface, and the condensation of vapors in the upper regions of the atmosphere ; but recent investigations render it probable that it is occasioned by the friction of currents of air against each other, and against the earth, and also against particles of matter and other substances which are always floating in it. Consequently, vivid lightnings usually attend the eruptions of volcanoes, especially in those cases in which immense columns of black smoke, composed of dust and ashes, are belched forth into the air. This lightning is also often attended by thunder.

The clouds, which are only masses of aqueous vapor, partially condensed by the cold of the upper strata of the atmosphere, being tolerably good conductors, serve to collect the free electricity of the atmosphere, and therefore often become highly excited, and discharge their electricity from one to another, or to the earth, producing all the phenomena of thunder and lightning.

Buchan, in his *Meteorology*, remarks: For elucidation of the important question here raised *more magnetic observations are required*, so that synchronous magnetic

charts might be made for comparison of one portion of the world with another.

Earth and Atmosphere.—It has been found that the atmosphere always contains electricity, which is almost invariably positive. When the sky is cloudless the electricity is always positive, but the intensity varies with the height, being greatest in the highest and most isolated situations. Positive electricity is only found at a certain height above the ground; on flat ground it becomes *manifest* “*at a height of five feet.*” In relation to the air, the earth’s surface is always negative; the electricity of the air increases with the height. It is not found in houses, in streets, or under trees. The negative is found almost always during heavy rains. The electricity of the atmosphere is stronger in winter than summer, increasing from June to January, and decreasing from January to June. It is subject to a double maximum and minimum each day.

Source of Electricity.—Professor Buchan has given to us a number of sources, to wit:

1st.—Evaporation. When impure water is evaporated, none whatever being produced by evaporation of pure water.

2nd.—Vegetable. From the evaporation going on, by which the water is separated from the sap of the plant.

3rd.—Combustion. During fires, volcanoes, etc.

4th.—Friction. By the wind on terrestrial objects.

Conclusions by Professor Buchan upon Magnetism and Electricity.—But great difference of opinion exists

in regard to the electricity of the atmosphere, and many of the phenomena, especially those observed during storms, have not been explained. A sufficient number of trustworthy observations are greatly to be desired. And not till some instrument has been devised, of such description that the observations made with it in different places may be comparable with each other, and the price be at the same time no barrier to its general use as a meteorological instrument, can we hope to be in a position "adequately to investigate the subject"—namely, the source of earth's electricity.

We provide the "Instrument."—The instrument we present is the following, and the "*price is no barrier to its general use as a meteorological instrument.*"

The Sun is a Magnetic Instrument to supply the Source of Electricity.—The source of the electro-magnetic mountains is found to be situated south of the earth's equator 25 degrees. This is the plain traversed by the centripetal force of the sun's monthly libation in latitude, and this warm belt of the earth extends around the globe. This is a positive electric magnetic plain, warmed and fired up by the power of the sun, until it looks like a sea of glass mingled with fire.

The centrifugal force of the moon's nadir is on the earth's equator, so that this electro-magnetic belt is passed beneath the moon's nadir from east to west; and to the casual observer the gentle falling and rising of the waves all the long night is all that is felt or known. But let us

examine closely, by our barometer, and we find that the rotation of the earth and seas beneath the nadir of the moon has riven its equatorial belt into two mighty electrical plains; and that the demonstration has been such, that the lowering and lifting seas have so operated upon these two magnetic, positive electro-magnetic atmosphere rests upon them, it is like the lifting of two mighty bellows, that is, one pointed north and the other south. These waves of impulse are borne on the wings of the wave, a shore is reached, where the waves spend their fury along the sea-shore.

But not so with the electro-magnetic power: it gains power as the conductor (salt water) laps the sandy beach or the boulders all along the bounds of the sea, and has by moisture and the motion of the wave the electro-magnetic power to toss mid-air the electro-magnetic current, and by the moisture of the sea breezes it is wafted to the plains and mountains on to the poles of the earth north and south.

CONCLUSIONS.

1. That until now the source of electricity, science of the magnetic current, and the cause of the *ebb and flow* of the tides have not been accounted for correctly in the arts and sciences.

2. That the mechanism of the spheres are such—heat, moisture, motion, and friction—as to produce an *electro-magnetic* power that brings to us the tides, the magnetic currents, and earth's electricity.

3. That at midday, when the sun and moon are on the meridian at the same time, then is the maximum of electro-magnetic power, and also at that time the “*tides*” are “*large tides.*”

4. That upon the equatorial belt is found almost perpetual rain, thunder, and herculeaneous hurricanes, so that those unseen powers are sure to come to us north, and also forty-five degrees south of the equator, as rain upon the mountain will flow down upon the plain.

Connection between Electricity and Magnetism.—That there is an intimate connection between electricity and magnetism was established by Oersted’s experiment. It is further shown by the fact that compass-needles often have their poles reversed or their polarity weakened by lightning; that a spark has been drawn from a magnet; that a charge of electricity passed through a needle renders it magnetic; that an iron bar may be permanently magnetized with an electric current more efficiently than in any other way. These facts have led to the theory that electricity is not an independent agent, but simply one of the forms assumed under certain circumstances by that polarizing force which is most commonly exhibited in its action on the molecules of ordinary matter we call electricity.

We add that the books teach that the earth is a “distant magnet.” This is like the heaven of many minds, a distant heaven, when it is at home, where love is. So is the great and mighty power of earth’s electricity: it is

found at home, and has become obedient to man. When it is awakened by motion, and the reins so applied to it, we may harness it with electro-magnetic motive power, so as to whisper the news of peace and plenty found in the land of the working free; and also to thunder eternal war against tyranny and oppression. In the short space of an hour it becomes the means of news to a moving world. We are of the opinion of Franklin, that magnetism and electricity are one and the same thing, sleeping in all nature, both terrestrial and celestial; and that heat and cold, wet and dry, together with motion, when they are all combined and located aright, of a truth will set in motion the nimble lightning flash around the world in a few moments of time. Thus it will be seen that what electricity is to celestial mechanics, a manifestation of celestial power, the same as the steam is to an engine, and this power is "magnetic" sun power.

CHAPTER V.

THE SEASONS AND RAINFALLS.

“He appointeth the Moon for seasons; the Sun knoweth his going down.”—*Psalm* 104.

“And God said, Let there be lights in the firmament of Heaven to divide the day; and let them be for signs, and for seasons, and for days, and for years.”—*Genesis* 1: 14.

LIGHTS IN THE FIRMAMENT.

Thus lights in the firmament means in this connection those stars that are associated with the night, for the purpose of making night inviting, and to cheer those who are compelled to watch or travel after the sun has set; like the shepherds who watched their flocks on Judea's plain, that memorable, never-to-be-forgotten night, when they found Mary with the Son of God in the manger within the City of Jerusalem. As for *Daylight*, the reader will find that subject treated upon page 106 in this volume.

Thus it will be seen by these two texts of the Bible that we have the following leading divisions of time and place, that are appointed by a Master hand:

1st. The firmament and light.

2d. Days and years.

3d. Signs and for seasons.

1st. The firmament is as we suppose the first Heaven. Paul says that he went up to the "third Heaven." The first to us is that part of the upper aerial heavens that may be termed the centripetal, and also perhaps the static forces.

And again, the firmament is also that great and unbounded space that is filled with that life-giving substance called the earth's atmosphere; whose components are many.

But we propose to say that the atmosphere is capable of receiving and also of distributing the "Electro Magnetic Force" in all its forms.

"The Positive and the Negative."

"The Attractive and Repulsive."

"The Centripetal and the Centrifugal Forces."

All these three forces and their several divisions, as stated above, are Celestial and scientific parts of the firmament.

These three forces are in harmony, so that they balance each other nicely, in our atmosphere, except amid winds, clouds, and storms. When the upper clouds of the atmosphere also lower, gather much of the positive, then may be heard the rumbling of the "chariot wheels," or the thunder of *God's power*.

These times correspond with those mentioned in Job 26: 14 : “ But the thunder of his power, who can understand ? ” But these several forces are interlaced and yet combined with the earth’s atmosphere, so they become a kind of homeogenous whole all around the earth, making a complete atmospheric whole. This atmospheric whole is said to weigh $16\frac{1}{2}$ pounds to the square inch at the sea level. And all this extent and power is so clear and transparent that it cannot be seen by the human sight.

Prof. Olmstead is of the opinion that it is 25,000 miles out to the line where the centrifugal force of the earth’s atmosphere is dissipated. Earth and Venus are about the same size, and such mighty spheres as these two make, in their atmospheric motion, in passing each other, they produce a disturbance that is inconceivable in its power, insomuch that it is observed when it is winter north of Venus it is summer north of the Earth, and *vice versa*.

But right here let us say that the rains fall in spots in California, and in many valleys between this State and Mexico the atmospheric stratas become bridges, which completely bridge those valleys ; so much so that long drouth and famine, with death of stock, often occur.

But it is an open question : Do the planets of any kind affect the rainfall ? Some physicists say no ; others say yes. We take the affirmative side of the question, and say yes, yes, as a general rule they do ; but the exceptions are small, taken as a whole the year round.

But we will allow the planets to speak for themselves. The planet Mercury and also Venus we shall call upon as our two first witnesses. We have observed that when both of them were near together, and were north of Earth's equator, and the Moon changed about the same time, clouds appear, and a decided meteorological freak is felt in the valleys, and soon rain is falling in the back country first.

But even on the west side of the San Joaquin River we obtain much of our rains on those aspects of the planets. And one fact is worthy of note. That when Venus is lurking between us and the Sun, is our winter north of the Earth's equator. And then it is summer on the north of Venus, and *vice versa*.

So this would imply that Venus, by the assistance of little Mercury, *rules the season*. But wait! Don't let us prove too much, for we want to collect pay for the planets Mars, Jupiter, and Saturn.

THE DAYS AND YEARS.

Our school books give to us glowing accounts of the days. Also of the four divisions of the year, *i. e.*, Spring, Summer, Autumn and Winter. They rehearse how beautiful it all is.

But what caused it all. No one knows. Only in the winter it snows, and yet no one knows why it is so cold. But you, Miss Venus, you planet of love and beauty, you stand aside and let that smart, fitful Mars with his red

face come on the stand as a witness. But, please the Court, here is a fellow who has rather a bad name. Please question him about the rain in California? "Well, Mr. Mars, what do you know about the rain-fall in California?" Mars knits his brow, and at first shakes *his red head*. The Judge frowns, and Mars shifts his quid and looks over to Venus very wisely, then to Mercury, then California. "Well, if I *mus—must speak, I—I* excuse me, Judge, *I—I st—stutter some*. Well, I am a long time on my beat. It takes two years minus forty-two days to make—to make my circuit as they call it around the Sun."

Judge.—"Well, Well, tell us about the rain in California."

"Yes, Yes excuse me, I—I see—see California every day. And soon after I pass the Sun it rains in California and all around my beat; so that when I am east of the Sun it is always a rainy season that year. But when I am on the other side of the Sun the rains miss California sometimes, not always, for my neighbor Jupiter, he helps California out sometimes."

On March the 17th, 1871, we collected some of the amounts of rainfall at the two points of Jupiter,—that is, his conjunction and his opposition to the Sun, and the years of those points, with the amount of rainfall in those years.

YEARS OF JUPITER'S CONJUNCTION AND OPPOSITION.

1850	36 inches.
1856	14 “
1862	35 “
1868	23 “
1874	22 “
1880	24 “
1886	32 “
1891	24 “ probably

This year, 1892, Jupiter was in opposition to the Sun October 12th.

And Neptune, he was in opposition to the Sun Dec. 1st, 1892. This was made to 1893.

Thus it will be seen that Jupiter of 12 years, Neptune of 164, are both of a long period, and Mars a short period. All of them are east of the Sun at this time, December 9th, 1892.

CHAPTER VI.

THE PLANETS.

NUMBER AND NAMES OF PRINCIPAL PLANETS.

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.

Uranus and Neptune have been discovered during the last hundred years. And also, there are now known to be 85 small planets, called Asteroids, revolving between Mars and Jupiter.

MERCURY.

The planet Mercury is the nearest one to the Sun.

Its diameter is about 3,000 miles. Mercury revolves on an axis from west to east in 24 hours 5 minutes and 28 seconds. And it revolves about the Sun in a few minutes less than 88 days. And it is the most dense of all the planets, and is therefore rightly named. Mercury is very heavy.

Mercury can be seen best in March and April, August and September. The greatest distance it departs from the Sun varies from $16^{\circ} 12'$ to $28^{\circ} 20'$ alternately. It sometimes passes over the disk of the Sun, and that is called the Transit of Mercury.

VENUS.

Venus is the second planet from the Sun ; it shines as the brightest star in the firmament ; she is alternately Morning and Evening Star. And she revolves about the Sun from west to east in 224 $\frac{2}{3}$ days, at a distance said to be 66,000,000 miles from the Sun.

She turns around on her axis in 23 hours and 21 minutes. Her orbit is within that of the Earth.

The diameter of Venus is about 7,500 miles ; Mercury and Venus are called interior planets, because their orbits are between the Earth and the Sun.

Venus, like Mercury, is sometimes in transit with the Sun. And as her node months are in December and June, it follows that all her transits must occur in these months. Dr. Herschel estimates Venus to be 8,649 miles, making her bulk one-sixth larger than the Earth. Some astronomers have asserted that they had discovered that Venus had a moon. I think the Earth is in connection with Venus as a binary system ; our Moon answers for the two.

THE EARTH.

The Earth is the place where we live, and its atmosphere is the house we live in, and, as our readers know as much as we do by the school books, we shall only give them some account of what we have observed and learnt that is not found in the books of our youthful readers.

In a careful measurement of the Earth it is found to be a trifle flattened at the two poles, called a spheroid. Around the equator north and south it is 7,927, and east and west 7,899 miles. This is only 28 miles as the difference of the two measurements.

The Earth as a planet occupies a favorable position in the solar system. It pleased the All-Wise Creator to place the Earth in one of the most central spots for observation to be found.

It moves around the Sun in 365 days 5 hours 48 minutes and 4 seconds ; and its distance is estimated to be 91,500,000 miles from the Sun.

MARS.

Mars is the first of the exterior planets, its orbit lying out beyond that of the earth, while those of Mercury and Venus are within. Its diameter is 4,300 miles ; his time around the Sun 686 days, 23 hours, 30 minutes and 41 seconds ; and his distance is computed to be 140,000,000 of miles from the Sun. Mars is of a ruddy color, and is 2 years of our time lacking 54 days in his orbit.

From what we know of Mars by his being almost a year west and then east of the Sun, we conclude that the effects of the earth's storms, etc., as we shall speak of him in this respect in our article upon the Seasons.

Mars was called the God of War by Rome and Greece ; so that they could have some excuse for redressing presumed or real wrongs, or flogging an enemy.

THINGS THAT ARE SEEN WITH OUR EYES.

The Sun is the largest of the things that are *seen*; and its power is also the most potent of all other power. Herschel concluded that the "*Sun*" was an opaque body like the earth; and some other astronomers also coincide with his conclusions.

Burritt and Mattherson say that the Sun is a vast globe in the center of the solar system, dispensing light and heat to all the planets, and governing all their motions.

The diameter of the Sun is estimated to be 853,000 miles, and its centrifugal positive magnetic force is 30 times its diameter of solid surface. The atmospherical, and its centripetal, and also its positive magnetic force is as much a part of the Sun as its molecular form. So says Prof. Warren, D.D., and others.

The Sun in its molecular form contains a volume of nearly thirteen hundred thousand globes the size of the earth; and it is now estimated to be 91,500,000 miles distance from the earth, and dark spots are seen passing across its disc.

The Sun-spots were first seen by Galileo in 1611, and also by Schener. Harriot and Fabreons observed them about the same time, and in 1625 upwards of fifty spots were seen at once upon the face of the Sun.

In 1799 Dr. Herschel observed one spot on the Sun supposed to be about 30,000 miles in breadth. From

these spots Sir W. Herschel supposed the Sun a solid dark body, surrounded by a vast atmosphere almost always filled with clouds, and occasionally opening and disclosing its "*opaque body.*"

The opinion of Laplace was different. He supposed the solar orb to be a mass of fire, and the violent effervescence and explosion supposed to be seen on its surface to be occasioned by the eruptions of elastic fluids from its interior; and the spots to be open craters and quakes like those of earth.

The similarity of the Sun to other globes of the system, in its solidity, atmosphere, surface, diversified with mountains and valleys, and its "*Rotation,*" about 26 days has led to the conjecture that the Sun is inhabited, like the Earth.

"*Such* was the opinion of Dr. Herschel, who observed it with the most powerful telescopes of his time, for a period of fifteen years. *Such*, too, was the opinion of Dr. Elliott, who attributes to the Sun the most delightful scenery. Hence, inhabited by mortals."

The opinion of such men as these, and believing as we do in the economy of Nature to prepare for all intelligences past, present and to come; so we conclude with these experts with their telescope, looking into the mystery of the Sun, it is inhabited, and Love, God and Heaven are there.

There are many, who with the French astronomer Laplace, believe that the Sun is a moving sea of flaming

fire, from the fact that its heat is so intense after passing through space, and heating up the Earth's equator, and the torrid zones upon either side of that line.

But the 91,500,000 miles distance to the Sun is the best proof against the Laplace theory of a hot Sun. For heat and light diminish sooner than the square of the distance, and the Sun would also diminish in time. But not so: the Sun is eternal, as are Love, Heaven and God; and light is caused by the repulsion of the sphere against the Sun's positive magnetic force.

The conclusions of Dr. Herschel and other astronomers confirm the mind of the writer, that Light is the product of magnetic motion, or we might say Light, Heat and Electricity are the products of our new discovered force, *Positive Magnetic Power*.

Rule 1.—The law of magnetic force has been tested and readjusted; and the conclusion that admits of this is the *Rule* or law that two magnetic *Positives Repel* each other, and produce light to the spheres by the free electricity that exists in the abounding atmosphere; and also it may be gathered up by magnetic movements.

This newly applied force of California birth is Positive Magnetic, and is the *Sun's Positive Magnetic Centrifugal Force*, pushing its efficient and its God-like power and adaptation to the wants of all Nature into the inanimate and also all animated nature, or to the most distant star or nebula. This magnetic force is apparent, as the stars send back to us the sparkling of their twinkling rays of

light, which is produced by their rotary motion in space against the Sun's *Centrifugal Force*.

THE ASTEROIDS OR TELESCOPIC PLANETS.

The first of these was discovered January 1st, 1801, by Piazzi at Palnur. The first was called Ceres; and three others have been known since 1807. More than one hundred of these small planets have been discovered since 1807.

We shall hasten on in this small but still important part of our history, to those that can be seen by the eye, without a telescope, as our object is to first show in astronomy the things that are seen, so the masses can see and know for themselves God's mighty works.

JUPITER.

Jupiter is next outside the Asteroids, and the largest of all the planets belonging to the solar system. When near the earth, it is in appearance nearly as large as Venus, although it is more than seven times her distance from the sun; and he is, therefore, traceable among the constellations of the Zodiac; and its time being about 12 years, it is seen in one constellation as its sheen for a whole year.

As we said, he makes his journey around the sun in 12 years, minus 41 days, at a mean distance of 475,000,000 miles from the sun. He revolves on his axis in 9 hours, 55 minutes and 50 seconds, so that his days and nights

are each about 5 hours. His rapid motion makes him flatter at the poles than are the earth's poles.

The true diameter is 85,390 miles, or eleven times greater than the earth; and as his inclination is but small, his days and nights are nearly the same length. He has five moons to distribute his magnetic *resources*.

There are a number of new and important points that present themselves to us that are not found in the Astronomical works. The first is, that there is an importance attached to the variety and number of moons to a planet like Saturn or Jupiter, and an All-Wise Builder has supplied that demand.

For around Saturn are found *eight*, and around Jupiter there are *five* discovered moons. And if we admit that our moon is a "dead world," we from analogy may suppose that these two planets have *sixteen dead worlds* attached to them; and the men who lecture on dead worlds omit to inform us when these dead appendages will drop off as so much fuel for the Sun, as some of them suppose that the Sun's fuel is so provided.

To us the dead world theory is one of the most bare and uncalled-for theories; for it detracts much from the Master Builder's wisdom; but it also adds to the folly of the minds of men who would detract from the divine mind by any such folly; for with God all is light and life and perfection of plan.

The several moons of Jupiter and Saturn are so many

magnetic distributors to balk the power of disease and death that would reign by stagnant water and inland seas, without the several moons to move the ocean, and cleanse the unhealthy shoals and pools of water.

SATURN.

Saturn is situated between the orbits of Jupiter and Uranus, and is distinctly visible to the naked eye. It is as large as a star of the first magnitude, but it is pale and dull, and is wanting in sparkling rays.

The mean daily motion among the stars is only about two *minutes*.

The mean distance of Saturn from the Sun is nearly double that of Jupiter, being about 872,000,000 miles. His diameter is about 70,000 miles; his volume, therefore, is seven hundred times greater than the Earth; he is twenty-nine and one-half years completing his circuit around the Sun, and his rotary axis motion is made in ten and one-half hours, making his day only five and one-half hours.

The surface of Saturn, like that of Jupiter, is diversified with belts and dark spots. Dr. Herschel saw five belts on his surface, three of which were dark and two bright. And it has a ring or zone around its equator that is brighter than the planet, and turns with it at the same time.

The dimensions of the rings of Saturn are about as follows :

Distance from the body of the planet to the first ring.....	18,350 miles.
Width of interior ring.....	16,500 “
Space between two rings.....	2,000 “
Width of outer ring....	10,000 “
Thickness of rings.....	100 “
	—————
	47,550

The periodical time of Saturn being nearly thirty years, his motion eastward among the stars is very slow, so that he is on one sign two and one-half years. It will be easy therefore, having once ascertained his position, to watch his slow progress east, year after year, as he performs his vast circuit around the Sun.

The diversified climate, and the gorgeous, shining rings of Saturn, are such that it is to us about the same as St. John describes in Revelations, 21st chapter.

THE MOONS OF SATURN.

Saturn has *eight* satellites, or *moons*, revolving around him, but they are only seen by the aid of a telescope. These moons all revolve eastward with the rings of the planets, and in the same plane with them.

The mean distance of the moons from the *planet's center* is from 123,000 to 3,366,000 miles, and their period from twenty-two hours to seventy-nine days, according to their distances; and the most distant is the largest, supposed

to be about the size of Mars; and the remainder grow smaller as they are nearer the planet.

From all that is known of Saturn it is positive that there is no planet in the solar system whose firmament is decked with such a variety of light and splendor; and its variety of seasons, large plains, vast seashores, and towering mountains are the best proofs of its magnificence. To us, it is heaven to be there, for there are seven times seven, or forty-nine, varieties of climate on Saturn.

URANUS.

Uranus is the next planet from the Sun, beyond the planet Saturn. It is of a blueish white, and as small as a star of the sixth magnitude, so that it is seldom seen, except on good, clear nights, and in the absence of the Moon. It has no rings, belts, or spots. His periodic time is 84 years and 27 days. He was discovered in 1781.

It is remarkable that this planet was observed as far back as 1690. It was seen three times by Flamstead, once by Bradly, once by Mayor, and eleven times by Lemonnier. But not one of them supposed it to be a planet. March 13th, 1781, Dr. Herschel discovered its motions. It is computed to be 1,750,000,000 miles from the Sun.

Its sidereal motion is performed in 84 years and one month. Its diameter is estimated to be 33,000 miles, and it is known to be attended by four moons; two of them were discovered by Sir William Herschel, and the others in 1847, by Lassell and O. Struver. 2, 4, 8, and $13\frac{1}{2}$ days is near the time of these moons above Uranus.

NEPTUNE.

Neptune is the most distant of all the primary planets yet discovered. It is computed to be about 37,000 miles in diameter, and at a mean distance of 2,746,000 miles from the Sun, and revolves around him in $164\frac{1}{2}$ years.

The motions of Jupiter and Saturn in their orbits first suggested that a large body must be out beyond Neptune; and Le Verrier, of Paris, undertook a search for it, and he soon ascertained the disturbing influence upon Uranus. He made his account, and Le Verrier wrote to his friend Dr. Galle, of Berlin, requiring him to direct his telescope to a certain point in the heavens.

He did so; and, to their joy, there he lay, within one degree of the spot pointed out by M. Le Verrier! This was on the 1st of September, 1846. But it was seen as far back as 1795, and catalogued among the fixed stars. Only one moon has as yet been discovered; it revolves around the planet in $5\frac{3}{4}$ days, at a distance of 220,000 miles, and retrogrades.

CHAPTER VII.

THE SUN A CENTER.

The sun is called a center in astronomy: he was called Sol by the Romans, and Ellious by the Greeks; and they both adopted a shield as his sign thus ☉

The sun is 1,400,000 times larger than our earth. He rotates on what is called his axis in about 25 days of our time.

Add to this his atmosphere, both the centripetal and the static, and then follow out his centrifugal, and it becomes immeasurable.

One of the Herschels studied the sun for 15 years, with one of the best telescopes of his time, and he concluded that the sun is opaque like our earth, and that it may be inhabited. There are not a few who hold with Herschel, and to whom we would add our name among the number, who would utilize the sun as a homogeneous maximum of worlds. But the greater part of the astronomers of the past and of the present call it a vast consuming fire. Taking Herschel's view of the sun, and allowing him all those silent and obvious forces and the advantageous conditions that crown our earthly abode, our mind revolts at

the low conceptions that are taken by the great majority of astronomers, that the sun is a consuming fire.

Time would fail us to give the names and the vast heat and light applied to the force of the sun. To us the sun is a vast "cosmos," in which the whole solar system is one combined whole, and so arranged that it is a perpetual and an eternal fact; and that its only changes are in the line of betterments, and in the sanguinary destruction of sin and folly.

So that, taking the sun as a whole, we must take Mercury, Venus, Mars, Jupiter and Saturn, &c., &c., to complete the compacted whole solar system.

THE ZODIAC OR THE PATH OF THE SUN.

The historian who wrote the book of Job has given us the Hebrew word for Zodiac, Mazzaroth. The word zodiac means sun's path.

The center of the sun's path is called the Ecliptic. *Around* the whole heavens, is 360 degrees. But as one name in English is better than all other names, we shall call it the apparent path of the sun; when we refer it to the Ecliptic, we will call it the center of the Path of the Sun.

The path of the sun is divided into twelve parts of thirty degrees each, completing the great circle of the heavens of 360 degrees. The Hebrews' name for those twelve signs of the zodiac were represented by the twelve sons of Jacob.

The Greek and Latin were men, beasts, birds and reptiles.

But to simplify the twelve signs we shall, for the present, use the names of the twelve months of the year. And from the center we shall extend the width out on either side to the polar circles, simplifying the English language, and breaking the spell of Egyptian Mythology and signs for a simple map of Stars.

The twelve signs of the path of the sun will complete the whole Great Circle of the 360 degrees.

There has been a class of men who have sought to weaken the history of Moses. But they have only opened a pit into which they and their followers have fallen, and their schemes and their follies are buried in the same ditch as their knowledge.

MYTHOLOGY OF THE ANCIENTS.

The morals, maxims and the historic events of the Ancients were the most of them communicated in fable or allegory.

The Greeks had some fable to account for the origin of almost every constellation or group of stars. And according to Ovid, Homer and Virgil, all the constellations relate to some personal exploit or expedition.

Newton supposes that all the ancient constellations relate to the Argonautic expedition, or the persons in some way connected with it; for one Mueus was the first Greek who made maps of celestial spheres, and to this day

we have the Golden Ram, the ensign of the ship of that expedition, and also the Bull with bronzed hoofs which Jason tamed as a feat of his valor.

Thus each sign of 30 degrees in the zodiac of the Greeks received a distinctive appellation, in accordance with the superstitions.

And according to Pausanius, the sun was worshipped at Clausis under the name of Preserver or Savior.

Most of their fables had an object lesson or a moral, but their endowment of the brutes with superhuman knowledge and power, and calling them gods, was an objectionable figure in their writings.

The wisdom of Joseph, Moses and Aaron is made apparent, therefore, in changing the Grecian Zodiac into the twelve Tribes of Israel. I have arranged the names as I have found them in the Bible, Chron. 2.

But I would choose the right hand column :

<i>Jewish Zodiac.</i>	<i>American Zodiac.</i>
1. Reuben,	1. Washington,
2. Simeon,	2. Adams,
3. Levi,	3. Jefferson,
4. Judah,	4. Madison,
5. Issachar,	5. Monroe,
6. Zebulon,	6. J. Q. Adams,
7. Dan,	7. Jackson,
8. Joseph,	8. Van Buren,
9. Benjamin,	9. Harrison,

- | | |
|---------------|-------------|
| 10. Naphtali, | 10. Polk, |
| 11. Gad, | 11. Taylor, |
| 12. Asher. | 12. Pierce. |

The twelve signs answer for the twelve months of the year commencing with the Vernal Equinox, or when the Sun shines directly on the earth's equator ; or when the days and the nights are of equal length, about the 22nd of March.

CHAPTER VIII.

MODERN ASTRONOMERS, OR NEW ENGLAND ALMANAC MAKERS.

DUDLEY LEVETT.

At the age of 17 the writer had an opportunity to learn the trade from a carpenter, whose residence was among the hills of New Hampshire, at a spot on one of the arms of the beautiful Lake Winnepisiogee, at Meredith Upper Village, near the home of that old and self-made astronomer, Dudley Levett.

Mr. Dudley Levett then lived on a farm about two miles from the village, and near where the writer attended church. At the meeting-house we met the philosopher and his two daughters, Sabbath after Sabbath. The figure and full round eyes of the father were such to attract my attention; he was tall and straight as a liberty pole, and his eyes were as bright and sparkling as the prancing horses in the march of a regiment on parade on the N. H. plains.

While in Meredith, in 1828, the writer first caught the inspiration of the good and the true, and the importance of the science of astronomy to qualify the young to enjoy

a walk on earth, and a sight of the celestial stars as they rise and set amid the vaulted starlit skies.

From 1828 to 1847, great are the changes.

I have before me the New England Farmers' Almanac for the above year, and I am happy to find in this number a short sketch of the almanac makers in New England.

Dudley Levett, the author of the New England Almanac, says, page 2 :

DR. FRANKLIN.

“Dr. Franklin began to publish *Poor Richard's Almanac* in the year 1732, and continued it about twenty-five years, and so great was its reputation that he sold ten thousand annually.”

DR. NATHANIEL AMES.

Dr. Ames, a physician of Dedham, Mass., published almanacs for many years.

He was about two years younger than Dr. Franklin, and died in 1765, aged 57 years. He was author of *Fisher Ames*, the distinguished statesman and orator.

His almanacs were in high repute.

DR. NATHANIEL LOW.

Dr. Low, a physician of Berwick, Maine, and Daniel Sewall, Esq., of New York, Clerk of the Court of York County, and Osgood Carleton, teacher of mathematics in Boston, published almanacs; Low and Sewall for many years.

WEATHERWISE AND BRICKENBRACK.

Weatherwise and Brickenbrack (fictitious names,) figured for a while among the Stars, but they vanished like other meteors. A few others, as now, might be named, and thrown into the column of scattering.

ROBERT B. THOMAS.

The next in course was Robert B. Thomas. He published the first Farmers' Almanac in New England for the year 1793, according to his numbers, and one of the same form and bearing the same name still continues. Mr. Thomas has since deceased, May, 1846, aged 86, having published 54 numbers of his almanacs.

DUDLEY LEVETT.

The first Almanac calculated by the writer was for 1797, at a press of Russell & Davis, at Concord, N. H., and there have been as many as two omissions I think within the first term, or fifteen years. Several of the first numbers were calculated principally for amusement and to exhibit to a few friends, little or no effort being made to circulate them widely among the popular almanac makers of the day.

He says: "The author was then a young man just emerging from boyhood, in pursuit of knowledge under difficulties, and unknown to the public."

The sale of Levett's Almanacs, however, has gradually

increased from this small beginning; so that it appears 60,000 copies, in two editions, were printed in 1846.

And beside the present number, calculations are made for several years to come.

The author's first "double almanac" published was for 1823, and printed in Concord by Hill & More. All before that were single almanacs.

A BRIEF SKETCH OF DUDLEY LEVETT'S LIFE AND
ALMANAC BY HIS DAUGHTER.

SOMERVILLE, MASS., May 2, 1884.

MR. SMITH, *Dear Sir*.—Your letter of April was received, and as you requested, I will give you a brief history of my *father*.

He was born May 23, 1772, in Exeter, N. H. His parents moved when he was quite young to Deerfield, N. H., where he lived until he was a young man.

He then went to Gilmanton, N. H., and engaged in teaching at the Corner, editing a paper, and pursuing the study of Greek and Latin languages, under a private teacher. He never went to school but three months in his life.

He married Miss Judith Glidden. They had eleven children, and I am the only one of whom is living.

He moved from Gilmanton to Meredith, where his time was occupied with agricultural pursuits, teaching,—and indulging in his favorite study, astronomy.

If I was at home I could tell you when his first almanac

was published, or what was its age. The present number is the eighty-eighth; consequently, the first number was published in 1796. He died very suddenly, September 15th, 1851, in his 80th year.

He had a work nearly completed and ready for the press, on "Practical Astronomy."

He said, a short time before his death, that he hoped he should live to complete it, as he thought it would be a valuable work. I have had six children; there are four living; my oldest son, an artist, has been in San Francisco for twenty years; for his health he moved to San Rafael.

My regards to your wife.

MRS. J. S. PRESCOTT.

"P. S. My husband was Joseph S. Prescott, who lived on Meredith Neck, about two miles from the village.

I have a sister who married Charles Prescott, who lived in the village. Levett's Almanacs are still published in Concord, N. H."

We acknowledge the receipt of two of the Levett Almanacs, 1847 and 1879. The one of 1879 is published by William B. Levett, nephew and student of Dudley Levett. Mr. William B. Levett winds up his salutations for 1879 with these words: "Be careful that you appreciate the inestimable worth of good character; and, above all, a Christian's reward, and you may be assured of the sacred promises of the Bible, and of the best wishes of William B. Levett."

ANCIENT HISTORIC ASTRONOMERS.

HUGGINS.

Charles Huggins was born in April 14th, 1628. As a mathematician, especially, and as a geometrician, he enjoyed the greatest favor; and his papers on the calendars and on the pendulum of a clock are considered master-pieces. His views on optics and medicine also attracted great attention.

He was the most earnest advocate of the undulatory hypothesis of light, which he developed in 1678.

The historian goes on to say that Huggins' theory of light was not generally adopted; by reason, probably, of the great authority of Newton, who embraced the emission hypothesis.

By the later labors of young Friend and others, the doctrine of Huggins was restored, and the news universally received.

It is said of Huggins that he discovered, not only the clock pendulum, but also the rotation of centrifugal force. But whether it was ever applied by him to astronomy or not, our limited history does not say.

His works were published in two collections: *Opera*, 1724, and *Opera Religiosa*, 1728.

At different times in his life he was much engaged in making improvements in the construction of the telescope. And in 1656 he discovered the first satellite of Saturn, and in 1659 the ring.

CHAPTER IX.

DO THE PLANETS AFFECT THE EARTH ?

AUGUST A TERRIBLE MONTH.

It is claimed by most students in meteorology that all the spheres like our earth are a complete, whole, and independent world of itself. But facts speak louder than words. So we quote from observations of August, 1880, as we have preserved them during their occurrence.

August opened with a conjunction of Mars with Uranus, and on the 4th, Mercury passed between the earth and the Sun. And on the day of the 8th, the day of the *foundering of the steamer Jeddah*, the Moon was in conjunction with Mars,—whom the ancients called the “God of War.”

AWFUL DISASTER.

“LONDON, August 10th, 1880.—A telegram from Aden reports that the steamer *Jeddah*, from Singapore, foundered off Guanice, on the 8th instant, with 253 Pilgrims for *Jeddah*. All on board perished, with the exception of the captain and his wife, the chief engineer, chief officer and C. Notion, who were picked up and brought to Aden by the steamer *Sernda*.”

And by referring to a telegram of the 20th of August, Corpus Christi, Texas, which says :

“Brownsville, Texas, near the mouth of the Rio Grande, was nearly destroyed by a fearful storm, which prevailed along the Texas coast on the 12th and 13th instant, and many lives have been lost. The telegraph wires along the coast from the south were prostrated and are still down.”

And a telegram from Chicho, August 20th, says the direct center of the hurricane along the Rio Grande river passed over Brownsville and Matamoras.

The streets of both cities were flooded on August 12th. On the morning of the 13th, Matamoras looked as though it had stood a week's bombardment. Brick buildings were torn out of the center of a long block. Frame buildings were completely broken, and the streets were filled with twisted remains of trees, and the roofs and fragments of houses.

And so the account goes on : all of which is appalling to see.

A TEXAS HURRICANE.

ST. LOUIS, August 20th.

Colonel Baker, Superintendent of the Western Union Telegraphic Company, has a dispatch from Corpus Christi, Texas, which says that it is reported there that Brownsville, Texas, near the mouth of the Rio Grande river was

nearly destroyed by a fearful storm which prevailed along the Texas Coast on the 12th and 13th inst., and many lives have been lost. The telegraph wires along the coast from Indianola south were prostrated, and are still down at Corpus Christi. The military telegraph line from Brownsville up the Rio Grande is badly torn; therefore no communication can be had with the stricken city.

CHICAGO, Aug. 20th.—The *Times* Galveston special says: The direct center of the hurricane along the Rio Grande passed over Brownsville and Matamoras. The streets of both cities were flooded on August 12th. On the morning of the 13th Matamoras looked as if it had stood a week's heavy bombardment. Brick buildings were torn out of the center of the long block, frame houses were completely wrecked, the streets were filled with the twisted remains of trees, the roofs and fragments of houses; the roof of the Theatre de la Forma was blown off; the top of the cathedral was torn off; the clock towers look as if they had been riddled with balls; not a flagstaff remains standing, and the public square is almost ruined. The Custom House is slightly damaged. Hardly a balcony remains in the city. Even small iron balconies were torn from buildings and hurled to a great distance. Many residences were wrecked entirely. A one-story brick building in the middle of a solidly built block was blown out as if a battery had played on it.

Trees were uprooted all over the city, and roads were rendered impassable on account of debris, and at least 300 buildings in the city were demolished or damaged. Brownsville came off a little better. Eleven buildings, occupied by the Quartermaster as storehouses, and others used as dwellings, were blown down. The infantry barracks were badly shattered, and much damage was done to the officers' quarters. At Point Isabel, the life-saving station was lifted from its foundation and torn to pieces, the lighthouse was swept away, and all the houses on the wharf were wrecked. A million dollars will hardly cover the losses.

Prof. Benton wrote in *The Pacific*, Aug. 25th, 1880 :

“Possibly all our readers did not observe the full moon of August, as it hung low in the horizon so long last Friday evening, and seemed loath to climb the ascent to midnight and the zenith. There is no finer moon in all the year, and we wanted to be looking at it through such an instrument as the Lick Telescope is to be, but is not yet. It gets on slowly, and some of us may not live to see the heavens through it; but the moon will be as young as ever in August of 1890, when the proposed instrument may bring its wonderful mechanism to bear on the satellite, and solve some problem concerning its state and destiny.

“Last Sunday the people around the Bay did not see the Sun at all, and the relative humidity of the air was

above 80 parts in a 100. Of course, thick clothing was in order. The sensitive were chilled, and the invalids sat by the fire. But how often people are, without a word of complaint, without the sunlight of God's presence, perhaps without taking notice of it. Is it good to be so sensitive to the lack of physical sunlight, and so insensible to the moral, which is so much finer?"

A SEVERE STORM.

NEW YORK, August 25th.—A very heavy storm passed over the city today, and the temperature has been considerably lower since. Rain began about fifteen minutes past one and at half-past two the gage indicated a rainfall of 1.41 inches. Telegraph wires were much interfered with, making work very slow; indeed, there was almost a cessation of telegraphing eastward for a period.

The sloop yacht *Intrepid*, from Newport for New York, was struck by a squall off Hart Island at 1:30 P. M., upset, and sank in twenty fathoms of water. Everything was lost, the crew barely escaping.

A boat capsized off Rockaway Point, and six men were drowned.

NEW YORK, August 25th.—A telegram tonight from Newport, L. I., states that the yacht *Dollie* was upset in the storm, and Captain Frederick Baker, of the Sixteenth Ward, Brooklyn, and party were drowned. One man, it was stated, was saved. There were six in the party.

NEW YORK, August 25th.—The heated term was broken this afternoon by a terrific thunder storm, which was very destructive of life and property in the country to the north and east. The air is quite chilly now, and fall overcoats are in request. The storm was very severe in the annexed district. An unknown man was struck by lightning and killed, on Pelham avenue, near the Southern Boulevard. Two frame houses on King's Bridge Road, at One Hundred and Seventy-fifth street, were struck by lightning and slightly injured.

BRIDGEPORT, CONN., August 25th.—A terrific thunder storm passed over this city this afternoon. Lightning struck a schooner, killing Charles F. Shryber, the steward. Lightning struck a number of places about the city and vicinity, including the St. Augustine Catholic Church.

WILKESBARRE, PA., August 25th.—A furious storm, with thunder and lightning, passed here today. Several buildings were struck, but no great damage was done. General Oliver's powder mill at Laurel Run was struck, and 100 pounds exploded, partially destroying the mixing room. A flood caused considerable loss in the city.

Thus let the student in astronomy know we let the planets speak for themselves!

CHAPTER IX.

THE LANGUAGE OF THE STARS.

“The Heavens declare the glory of God.”—Psalm 19.

David must have been in a happy state of mind when his poetic heart and fingers penned that first line of the 19th Psalm.

You know that he was a shepherd and a singer, but it so happened that his early opportunities were not of the highest type. Yet he excelled in winning ways and graces, that gave him an introduction into the society of the opulent, and even to one of the King's sons by the name of Jonathan.

The probabilities are that he had read the lectures of his great-great-grandfather Abraham, on the sciences of Astronomy and Mathematics then extant in the Jewish library; and he had also an insight into the mythology of the Grecians. Be that as it may, his opportunity to study the stars was good. His songs were so inviting that King Saul's son followed David into the sheep-fold, and thence to the plains of Judea.

We can almost hear David's musical voice, and also see him starting out with the King's son, who was large, but

David was small. The smaller, yet he led the way with his shepherd's crook in hand ; we suppose that the King's son had a crook and a bag also, so as to be prepared to pick up a lamb and take it along, as the flock moved out to richer pasturage.

David and Jonathan had spent the day very pleasantly, and both of them with the sheep-herds had come back to the fold that night happy, with the weak lambs of the fold they had brought in their arms — the sheep-fold was near one of the wells of Jacob. The sheep had been watered and sought rest.

As the two lads David and Jonathan were seated on the ground for supper, the King's son saw his rich, well-filled bag—with the best of all the King's butler had—so Jonathan had more than David of good things to eat, for David's shepherd's bag was rather scantily supplied, and was probably wrapped in fig leaves.

It was found that Jonathan's provisions were wrapped in a linen napkin, but Jonathan was moved to say to David that he must share and share alike in the best of the contents of the good things from the King's supply. David accepted Jonathan's offer, and the two made common property of the contents of the two bags. They ate their supper, and drank from "Jacob's well."

When the repast was concluded David began to sing, but Jonathan was so weary he was soon charmed to sleep, and lay at David's side in the new grass ; soon the stars began

to shine. The first to meet the eye of David was Ceres, then Aries, Taurus, Gemini and Orion.

In this quarter of the heavens is found the most splendid and glorious display of the heavenly host, all spread out before David's bright and youthful vision.

And David was inspired as he sang, and saw the stars and constellations so bright, coming up from the eastern skies; so he broke out in the language of this 19th Psalm, — "The Heavens declare the glory of God": and as he sang in the language of the Greek, in rhymes and chimes like the notes of many bells, so he sings on until the whole of the words of the 19th Psalm are sounded out on the night winds across the plains of Judea. By the change in the tone and voice of the singer, thus inspired as David was, he had completed the song and begun to repeat the first line, when Jonathan awakes and joins in the chorus:

"PSALM XIX.

God's Glory seen in the Creation.

The heavens declare the glory of God; and the firmament sheweth his handywork.

Day unto day uttereth speech, and night unto night sheweth knowledge.

There is no speech nor language, where their voice is not heard.

Their line is gone out through all the earth, and their words to the end of the world. In them hath he set a tabernacle for the sun,

Which *is* as a bridegroom coming out of his chamber, *and* rejoiceth as a strong man to run a race.

His going forth *is* from the end of the heaven, and his circuit unto the ends of it : and there is nothing hid from the heat thereof.

The law of the LORD *is* perfect, converting the soul ; the testimony of the LORD *is* sure, making wise the simple.

The statutes of the LORD *are* right, rejoicing the heart : the commandment of the LORD *is* pure, enlightening the eyes.

The fear of the LORD *is* clean, enduring for ever ; the judgments of the LORD *are* true *and* righteous altogether.

More to be desired *are* *they* than gold, yea, than much fine gold ; sweeter also than honey and the honeycomb.

Moreover, by them *is* thy servant warned : *and* in keeping of them *there is* great reward.

Who can understand *his* errors ? cleanse thou me from secret *faults*.

Keep back thy servant also from presumptuous *sins* ; let them not have dominion over me : then shall I be upright, and I shall be innocent from the great transgression.

Let the words of my mouth and the meditation of my heart be acceptable in thy sight, O LORD, my strength and my redeemer."

NEW HEAVEN AND NEW EARTH.

“And I saw a New Heaven and a New Earth.”—Rev. 21, 1.

This New Heaven and New Earth is synonymous with the words New Jerusalem. Heaven in some cases refers to the “Church” on the Earth, and may be a condition rather than a local place. But John the Revelator would seem to describe Heaven as with a Physical Geography, to wit: “A location place on some sphere.” Old Jerusalem was local, and the new Jerusalem we must also locate; if we would continue the figure or synonym, we must give it a physical location. To make our subject plain to all, we must admit that Heaven is located on some one of the spheres. Therefore “Heaven is a place.”

Yes, Heaven is where God, angels, and happy spirits dwell in peace. The word Jerusalem in the original was two words, *Ji-bu-si* and *Salem*, and the interpretation is this: “They shall have Peace.” No strife, no wars, no bloodshed! What would Earth have been if *wars* and *strife* had never stained its streams with blood, or if wars had not destroyed its best men?

Just before the time when John saw the New Heaven and the New Earth, he saw Gog and Magog at war on a large scale. This is local on the Earth. The word “Gog” means to cover up, deceptive, volcanic in mind, jealousy and deceit. “Magog” in the original is to dissolve, part asunder, separate in mind, to abuse our best friend, to kill or destroy.

In our civil war is portrayed all the evils, woes and carnage that are seen by the inspired Revelator ; but in the midst of our strife as a nation, a voice is heard—it is a commanding voice, and one of the greatest of human commanders (Gen. Grant)—to say, “ Let us have Peace ”!

This command is the signal to the United States and to the world for a new Jerusalem—“ They shall have peace.”

This peace is from God ; it came down from Heaven all along the ages of time, but now is being developed more and more by the light of science.

Yes, while shepherds watched their flocks by night, it was announced that Peace was to come through Christ—“ Peace on earth, good-will to men.”

This angelic peace is a triple peace to the women of earth, for it means Motherhood—Home—Sons—Daughters, and, native lands at peace—peace among the nations.

Notice some of the adornments, as a Bride adorned for her husband. (Rev. 21, 3.)

First. This bride is youthful! Where can be found the virgin soil that is found within the lines of the United States—yes, in California?

Second. God is to be there—God continually. If God be for us, who can stand against us? (Rev. 21, 4, 5, 6, 7, 8, 9 and 11th verses.)

Mark well the progress of the present age under the Bride—the Lamb’s Wife. The “ Woman’s Union.” Oh! what a mountain of holiness !!!

The *Christian Endeavor*. Mark well this youthful outpouring of the youth of our land, other lands as well. Oh! what an uplift of him of whom Moses and the Prophets did write—Jesus of Nazareth!!!

The gates of China have of late swung ope to the King of Israel, and the laws of Japan have changed so that they admit the subjects of the King of Kings, who go there with the wand of peace and the crook of the Great Shepherd of the sheep. The Bible is being printed in all the *written languages of the world*, and millions of dollars are now, even, lying in the lap of the Church for the education of young men and women, to go with their lives in their hands to carry the news of salvation to a lost world. More than this, the Spirit of Christ is moving upon the minds of the young to speak and to go from home and native land, to spread the news of salvation and the coming kingdom of the King of Kings and Lord of Lords. And the voice of—Come over and help us—is coming across the seas from every land—coming down from God out of Heaven. Where is Heaven? Answer. Physically in the center of the universe—on the largest of all the spheres. Therefore it is on what we call the Sun,—this is the NEW HEAVEN AND THE NEW EARTH.

The old Masters have taught that the orb of day was a "*consuming fire*," 95,000,000 miles away. But there are a few who have differed from the majority of Astronomers about the Sun. One of the Herschels studied the

Sun for fifteen years. He concluded that the sun is opaque like the Earth, and he says it *may be* “*inhabited.*”

In view of what we have read and do know of the Sun, he is the center of *God's power*, the center of *his habitation*, and from the Sun emanates *his power*, to rule the multiplicity of worlds.

Jerusalem is spoken of in the Bible in 125 places ; and as New Jerusalem in Rev. 3, 12, also 12, 2. As the New Jerusalem signifies much, and a few of the benign blessings we can only name at this time as vouchsafed to the Church of the Redeemer.

With new Jerusalem we have new songs, new Heaven, new Earth, new heart and new life, and above all, a new spirit.

All these new things and blessings are coming, yes, “Coming down from God out of Heaven” ; but we are apt to forget that so many good things come down from God out of Heaven, which is the *Church*.

LIGHT.

The subject of this theory will be found on another page.

“And I will give them one heart, and I will put a new spirit within you ; and I will take the stony heart out of their flesh, and will give them a heart of flesh.”—*Ezekiel* 11, 19.

“Cast away from you all your trangressions, whereby ye have trangressed ; and make you a new heart and a

new spirit; for why will ye die, O house of Israel.”—*Ezekiel* 18, 31.

“A new heart also will I give you, and a new spirit will I put within you; and I will take away the stony heart out of your flesh, and I will give you a heart of flesh.”—*Ezekiel* 36, 26.

Sing to him a New Song.—*Psalms* 33, 3.

New Name.—*Isaiah* 62, 2.

New Heavens.—*Isaiah* 65, 17.

New Commandment.—*St. John* 13, 34.

New Testament and New Creature.—*II Corinthians* 3, 6; 5, 17.

New Creature.—*Galatians* 6, 15.

New Man.—*Ephesians* 2, 15.

New Earth.—*II Peter* 3, 13.

New Name.—*Revelations* 2, 17.

New Jerusalem.—*Revelations* 3, 12.

GOD'S PLAN OR THE BIBLE AND SCIENCE.

“And the spirit of God moved upon the face of the waters.”—*Gen.* 1, 2.

The spirit of God “moved.” Thus God's motion is God's plan for light. Plan for what? Answer: God's plan as a Creator of light. Now, is it a fact that God has a plan, in which light may be produced? We answer yes. Let us see—with water and motion. He spreads Earth all around with Electro-Magnetic positive forces.

And Earth rolls out into space by God's power. The

Earth begins to revolve, and by this rotary motion in the firmament it meets the atmosphere of Venus in motion, which is the *second* positive Electro-Magnetic force. So motion gathers force in God's plan of intersection of worlds.

There is no loss of power in God's "celestial works." Why? Because in the simple study of physics the first lesson is, that two positives repelling they keep each other in motion without the loss of force from "Celestial Mechanics."

But let us not lose sight of the EFFECT in describing the POWER OF GOD. What is that effect? We answer, Light is the effect of motion, for without motion there is no intersection. So by motion two positives meeting in space produce light, by the immense quantity of positive matter that is intersected.

DAY LIGHT.

The old masters have taught us that light was, and is now, the product of a vast and unquenchable flame of fire, and that to keep up this consuming fire the sun attracts small worlds with its vast flames, and they too are consumed, and another, and so on, until all worlds are consumed, and the sun too is to consume itself: so says Proctor.

The above is a short synopsis of the theories of most of the books in astronomy on light and heat; so without adding or diminishing one fraction of the plan of our

predecessors on the subject of light, we pass on to notice God's plan by the statement of Moses in Genesis 1st, 2nd, and 3rd verses. Therefore we notice in the third verse: "And God said let there be light, and there was light. Fourth: "And God saw the light that it was good," and "God divided the light from the darkness." Fifth: And "God called the light day, and the darkness he called night," and the evening and the morning was the first day. Thus it appears to us that in that first "thousand years as one day," with the Lord, 2nd Peter, 3-8, "the Earth was formed," and light produced by God's right hand of power, *that* is magnetic force.

PARALLEL LINES BETWEEN THE BIBLE AND SCIENCE.

And God moved upon the face of the waters. And science has proved that electro-magnetic forces cannot be utilized without the aid of water; also motion as a power. Therefore these two words are the most prominent in the text before us as God's plan of "moving" things. Thus it will be seen that God, Moses and the lines of science are running more and more parallel with each other in the creation of power and of the production of light.

THE BINARY SYSTEM.

Doctor Dick proclaims that "suns revolve around suns" and "systems around systems." Professor Matherson has a catalogue of eighteen pairs of stars that revolve around each other, whose time varies from 40 to 6,000

years; the most of them are double; a few of them are triple stars, said to be of various colors. (See Mather-son, page 187.) Still another astronomer has counted some six thousand double stars. The word *Binary* means *two* or *double stars*. Thus the wisdom and the economy of God is seen in what astronomers call the Binary System of the Stars, which are in fact two worlds like ours, or spheres like those of Jupiter or Saturn, in pairs revolving around each other; but science is silent as to why this is so. God and Moses, however, point the way, if they do not speak it.

It is now apparent that it is more than a fable in Mythology, to attach the masculine and feminine gender to the rotating spheres. The skeptic may inquire, What is the use of these double stars? We answer: It is much in every way, one of which we will point out. First, to shade from the Sun the Torrid Zones, and to divide the years into summer and winter. This is the effect that takes place between Venus and our sphere—the Earth—for when it is winter north of Earth's equator on the Earth, it is summer on the north of Venus, and *vice versa*. And by these planets we have the definite seasons of the year, as Spring, Summer, Autumn and Winter on the Earth; and Venus, also, where we can see her northern snows, while on the Earth it is warm in midsummer. Again, they give to us and to each other the two rainy seasons, called the early and the later rains. But we re-

turn to the Binary System, of which we would remark that two planets rotating so close to each other, it brings their outer atmospheres so that they intersect, and the atmospheric strata being curved lines, are such that their intersection being positive in their outer conditions, so much so that they produce a mutual light between each other, called starlight.

Magnetic force pervades every stratum of the earth's atmosphere, and each stratum becomes a bridge over which this unseen magnetic power sweeps around our globe in a moment of time. This is what Moses means when he says: "God moved upon the waters." It is a vivid manifestation of God's power and glory to Moses as a writer, and to all mankind.

Yes, we see in lad and lass, in man and maiden, in them all, is magnetic grace displayed.

It moves the pen of sire and sage. It shines in books on every line and page. So much so that language, or even thoughts, human or divine, may be transmitted through space, in the twinkle of an eye; and there will be a mind to respond, providing the recipient occupied the same spiritual train of thought, and the mind is open like the rose of Sharon, or the Lily of the Valley.

MOTION.

Now, let us step out from Earth's cares, as much as possible, and walk to the west peak of Mt. Diablo, where the lines of surveyors meet. It happens to be

March 22, 1892, at 6 P. M.; and now, looking east, what do we see? Well, we see the glories of a California morning, and in a moment a bright golden ray of sunlight comes direct from the east, and it strikes at our feet. A child who had never seen it would inquire what is it. Oh! What is that so bright? Reply, that is a ray of light, bright, golden sunlight; and in less than a moment ten thousand such rays like that break upon the vision, and so bright it dazzles our sight.

And, now let us say, that in each ray of that light is borne to us, right on this spot, light, heat, and the glory of the electro-magnetic forces. But how gentle, warm, winning, and delightful! And ere long we conclude this is surely *light, life, and love*. Yes, this is the glory of God, and we mortals would say: "Stay thy hand, oh Lord, for this is holy ground." And as we recline, it appears to us that we *all* are in the arms of Him of whom Moses speaks as moving upon the face of the waters.

I truly am in raptures with the "Divine," as I view the landscape o'er.

MAN.

We desire to emphasize the fact that all mankind are in close connection with the magnetic world; and as we walk, run or jump, we gather up more and more of the magnetic forces. We are, in fact, moving magnets. All the trees and every vertical thing on Earth is a static magnet. At the ground the atmosphere is negative; six feet above the ground it is positive.

This is God's plan. But suppose that we could reverse this structure, and have the positive on the ground at our feet, and the cold negative at our heads, what then? We would answer: With the great weight on our feet, then heat, fever, corns, bunions and gout would be the rule; this would send us early to the "Old Arm Chair," and a walk in the garden would be a burden instead of a pleasure.

So give us God's plan with cold feet, rather than all the ills above recited; so that, with David, "ONE may chase a thousand, and TWO put ten thousand to flight." David must have had a good supply of magnetic force when he hurled a stone that brought Goliath of Gath to the ground. But the women had some magnetic force, also, when they sang, "David has killed his ten thousand."

THE ASTRONOMY OF CHRIST'S KINGDOM.

Prophesied by Isaiah 60, 1-11; 61, 1-22; 62, 1-12. Daniel 6, 27; 2, 44; 7, 18-27. Luke 1, 30-34. John 12, 32, 33, 34, 35; Rev. 11, 15.

Isaiah 60, 12. It was 698 years before Christ that this prophet spoke these words, *i. e.*:

"For the nation and kingdom that will not serve Thee shall perish. Yea, those nations shall be utterly wasted."

And in 603, that is 91 years from Isaiah's prophecy of the fall of nations, was the time when Daniel was called upon to explain the "Golden Image" of the King of Babylon—or the King's dream of the fate of the Medes

and Persians. See Dan. 2, 1 to 49. 44th verse. At this time Daniel said : " In the days of these kings shall the God of heaven set up a kingdom which shall never be destroyed ; and the kingdom shall not be left to other people, but it shall break in pieces and consume all these kingdoms, and it shall stand forever." About 48 years later, by comparing chronology, we find Daniel himself having a dream about a kingdom, for he says :

Daniel 7, 18.—" But the saints of the Most High shall take the kingdom and possess the kingdom for ever, even forever and ever." Again we read :

Daniel 7, 27.—" And the kingdom and dominion, and the greatness of the kingdom under the whole heaven, shall be given to the people of the saints of the Most High, whose kingdom is an everlasting kingdom, and all dominions shall serve and obey him." This power of the Gospel is to encircle the entire world.

After Daniel's visions and prayers, the Angel of the Lord was sent to comfort him in his old age ; and in the 12th Chapter of Daniel, verse 9, we read : " And he said, Go thy way, Daniel ; for the words are closed up and sealed till the time of the end." And in Daniel 12, 13, he said again :

" But go then thy way till the end be : for thou shalt rest and stand in thy lot at the end of the days."

We remark that it is plain Daniel was over-anxious about his people, and of the coming and the Kingdom of Christ ; and his age was such that we must admit, although

loved and honored by the Lord, yet he was called to order twice in the last two verses which we have quoted, to wit, the 9th and 13th verses of Daniel 12th. It is a fault with not only Daniel, but many of our day, that they become over-anxious and over-religious, and would have Christ come in *their* time and *their* way; and they have presumed that the time of coming is revealed, and they know so much of the time that the whole of their Christianity is "Advent," get ready, now Christ is at the door, etc.; and we poor wretches are often sent to hell because of this, as we do not see as they see and believe as they believe. But the 9th and 13th verses of the 12th Chapter of Daniel should be urged in favor of attending to our work and business in life, and not be over-anxious about the coming and the Kingdom of the Redeemer; and we should know that if prepared to live, and if we only dare to do right and serve God, we shall be exalted. So let us remember the lesson of the angel given to Daniel, 12th chapter, 9th and 13th verses.

It was prophesied by Isaiah as follows:

"CHAPTER LX.

Glorious access of the Gentiles.

Arise, shine; for thy light is come, and the glory of the Lord is risen upon thee.

For, behold, the darkness shall cover the earth, and gross darkness the people: but the Lord shall arise upon thee, and his glory shall be seen upon thee.



And the Gentiles shall come to thy light, and kings to the brightness of thy rising.

Lift up thine eyes round about, and see: all they gather themselves together, they come to thee: thy sons shall come from far, and thy daughters shall be nursed at *thy* side.

Then thou shalt see, and flow together, and thine heart shall fear, and be enlarged; because the abundance of the sea shall be converted unto thee, the forces of the Gentiles shall come unto thee."

“CHAPTER LXI.

The office of Christ.

The Spirit of the Lord God *is* upon me; because the Lord hath anointed me to preach good tidings unto the meek; he hath sent me to bind up the brokenhearted, to proclaim liberty to the captives, and the opening of the prison to *them that are* bound:

To proclaim the acceptable year of the Lord, and the day of vengeance of our God; to comfort all that mourn:

To appoint unto them that mourn in Zion, to give unto them beauty for ashes, the oil of joy for mourning, the garment of praise for the spirit of heaviness; that they might be called Trees of righteousness,—the planting of the Lord,—that he might be glorified."

In the 70 years of our Christian life we have seen and known of much that we looked upon as being over-righteous on the part of sects and denominations, divisions and

subdivisions of churches and families in our travels; but when we had the most of the Spirit of Christ, then we could forgive all wrongs, and love the whole race of mankind, as in the language of the prophet: "Preach the gospel to the poor."

The prophet Isaiah lived and wrote some 700 years before the birth of our Saviour. See Isaiah 65, 17, and 66, 22. "For behold, I create a new heaven and a new earth." "For as the new heavens and the new earth which I will make shall remain before me, saith the Lord."

In considering these two passages as they stand separate from their connections, they teach us two plain and straight-forward facts about TWO NEW THINGS. First, A new heaven; and second, a new earth. And if, as we suppose, the spirit of the prophet only intended to show to his people that it meant a new form of the earthly government, then some minds have overestimated the word of the Lord:

We find in connection with all the prophecies that they speak in a parabolic manner, and in this matter of the New Earth, may it not be designed to teach us of the mighty changes of the customs and the laws and the government of a state or a nation, or of the change in the affairs of the whole world?

The second new thing is a *New Heaven*.

Now, if we mistake not, in the Bible Heaven begins on the Earth, both in spirit and in practice, and if the prophet has overdrawn the picture and only means that his *New*

Heaven is but a free and independent church,—one that is founded upon a new plan or a new and a more divine and holy charity. Again, we may be misled as to this leading passage, and determination or meaning of the great Head of the Church. For Jesus hath said: “And without a parable spake he not unto them.”

These two chapters, the 65th and 66th of *Isaiah*, teach us of many things. First: Of the Gospel to the Gentiles. Second: That the New Wine is in the clusters, and it shall be preserved thus when God's people are wise. Third: The New Heaven, of which we have written above. Fourth: He speaks of Jerusalem, which is interpreted PEACE. This is a good thing in a church, where peace is to be found. Fifth: They shall build houses and inhabit them. Sixth: God will be served in sincerity and in truth. Seventh: The gathering of all nations to God and to Christ, and peace is to be perpetuated in Church and State.

CHAPTER X.

[From the Overland Monthly.]

THE UNIVERSITY OF CALIFORNIA. THE LICK ASTRONOMICAL DEPARTMENT.

The Lick Observatory is in a sense the crowning possession of the University. From the scholar's point of view it is eminent over the other departments, in being the single one that is mainly given up to original research. From the popular point of view it is magnificent in the possession of the largest telescope on earth. It gratifies the pride of the State keenly to know that pilgrims from foreign lands count it one of the things that must be seen in California. No Philistine doubt of the utility of pure science can stand against this pride; and a public that has seen the time when it was half-ready to pull the courses at Berkeley to pieces in contempt of "unpractical learning," has never asked, "What practical use in knowing of a fifth moon of Jupiter, or a shadowy duplicate streak across Mars?" Doubtless the fascination of the heavens—of mystery, exploration, and discovery—has had much to do, also, with the interest in the Observatory; the diligence and skill with which its results have been made known to the people has counted for much;

and none of the thousands who have visited the summit of Mount Hamilton can have failed to come away in some degree awed by the singularly visible form science takes on in that great dome in the heart of the wilderness, lifted up between the sky and the tumbled sea of mountain tops.

In spite of the pride in it at home, and its good name abroad, the Lick Observatory is not a rich institution. Mr. Lick's gift was \$700,000. It was at first believed that \$300,000 of this could be saved for endowment, but as the work of building and equipping on the mountain-top progressed it became evident that this would be impossible; and in fact, when all was done, the Observatory had cost about \$600,000, leaving about \$100,000 for endowment. The interest on this fund was supplemented by an appropriation from the general revenues of the University. This diversion of money from the main work of the University to a branch that had been expected to be dependent on its own revenues was not accomplished without opposition, but, I think, is generally acquiesced in now as necessary to any adequate use of the Observatory property. It is not, however, by any means a desirable way for the income of the Observatory to be permanently derived: there should be a separate endowment sufficient for all needs. Even with this help the full use of the resources of the Observatory cannot be had, for lack of a sufficient staff. The latest report gives the following comparison of the working force in several observatories:—

Lick Observatory.....	6
Greenwich Observatory.....	20
Harvard “.....	40
Paris “.....	17
astronomers, and many computers.	
Pulkowa Observatory.....	16
Rio Janeiro “.....	16
Washington “.....	19

Yet, the report adds, “At least as much is expected from the Lick Observatory as from any of these establishments.”

The income of the Harvard College Observatory was stated by its latest report at \$33,507 from funds, \$64,958 from all sources. The average appropriations for salaries and current maintenance of the Washington Observatory are stated at \$56,000. The Lick Observatory received last year as interest on its funds, \$5,100; from the University funds, \$21,000.

That it has under the circumstances held its own among the observatories of the world, as it has, seems to me a remarkable evidence of the diligence, precision, ability, and efficient adjustment of the work done by every one of the small group of astronomers. I find the Harvard Observatory and the Lick Observatory named together (in a pamphlet concerning the Washington Observatory, put forth by a number of American astronomers) as “the two chief observatories of America.” In turning over the

great foreign astronomical publications, I find the Lick Observatory mentioned with constant respect; its observations texts for the discussions of learned societies, and utilized in the work of the great observatories; its astronomers' names signed to frequent communications. Nor this by any means only in matters depending on "the mere brute power of a great telescope," (to plagiarize a clever phrase,) though of course the great telescope is its special distinction. I shall try to give later in this article some summary of the accomplishment of the Observatory so far, and I think it will be seen to be large in proportion to the means that have been available.

It is evident that the current expenses of the Observatory are all that its income could hope to cover. The sending out of a scientific expedition, the purchase of new expensive instruments, or any such outlay, can be accomplished only by means of gifts. And in fact a good deal of what has been done already has been due to the success of the director in interesting wealthy people in the work, and obtaining money for special purposes of this sort. In the four years of the existence of the Observatory nearly \$10,000 has been thus given; and now Mrs. Phœbe Hearst has given a fund which will yield at least \$2,000 a year, and will be in part applied to the maintenance of fellowships, thus increasing the staff to some extent; while it can be in part reserved for important special purposes.

No one seems to know how or when the idea of a great

telescope entered Mr. Lick's mind. It was there before he took any one into his confidence. He had never looked through a telescope; had never seen a real telescope, so far as any one knows. He was entirely ignorant of astronomy, and not even in an unlearned way an observer of the skies,—in early talks about his plans, for instance, he wished to be shown the moon in Professor Davidson's telescope out of his north windows. In some way, however, through chance readings, a sense of the glory of astronomical discovery had laid hold upon him, and the first persons with whom he talked of the disposition of his fortune found the plan of the telescope already firmly fixed in his mind.

James Lick was of "Pennsylvania Dutch" origin; he was brought up in the narrowest circumstances and with the narrowest intellectual opportunities; was in early manhood a mechanic in and near Pennsylvania, then spent most of his mature years in business in South America. He came to California in 1847 with a good deal of property, invested early in real estate, and at the age of seventy-seven found himself the owner of several millions, almost alone in the world, and failing in bodily powers; it was inevitable that he should ponder much on the disposition of his money. He had no belief whatever in personal immortality,—he was, in fact, a man of most marked disbeliefs in religious matters, recognizing Thomas Paine as his leader in thought,—but he had a great desire for

that immortality in men's memories that follows the few famous ones of earth, and he proposed so to dispose his millions as to win it. He did not at first altogether realize that in this aspiration he that saveth his life shall lose it; nor how impossible it is, in this stage of the world's progress, that a memorial should bring glory to a man's name unless at the same time it is of great service to mankind. His first will left as the main bequest a million dollars for statues of himself and his parents, to be erected on the heights overlooking the shores of the ocean and bay. Yet he was more than indifferent to having his portrait painted, and a passion for statuary for its own sake—abundantly shown in the minor bequests—probably entered into his desire to have his bodily presentment thus kept for all time.

In 1873 he began to take into his confidence a few acquaintances, and ask their judgment of his plans. Although he had lived a very isolated life, and had no near friends, he was in his way attached to the Pioneer Association and had made acquaintances there, and he had a liking for the Academy of Sciences and some sympathy with its pursuits.

In February, 1873, he quite unexpectedly offered the Academy a piece of land on Market Street, the site of its present building. Professor George Davidson, then president of the Academy, called to thank him, and Mr. Lick then told him of his purpose of leaving money for a

great telescope. It could not have been far from this time that he spoke of his intentions to Mr. D. J. Staples, whom he knew through the Pioneer Association, and showed him his will. Mr. Staples became from that time one of his principal advisers in matters concerning the trusts in general, as Professor Davidson was with regard to the telescope. There were others, however, with whom he talked, and it is quite impossible to trace the influences that finally shaped his benefactions; for he had a way of consulting one and another, and quietly comparing notes on their advice, without letting either one know what he was saying to the other; and in general, I should judge that where their advice agreed, he took it; where it did not, he followed his own way.

Mr. Staples felt it his duty to tell Mr. Lick frankly that his bequests for statues of himself and family would be utterly useless as a memorial; that the world would not be interested in them; and when Mr. Lick urged that such costly statues would be preserved for all time, as the statues of antiquity now remained the precious relics of a lost civilization, answered, almost at random: "More likely we shall get into a war with Russia or somebody, and they will come around here with warships and smash the statues to pieces in bombarding the city."

Mr. Lick was struck by this, and after a few moments' consideration asked, "What shall I do with the money, then?"

Mr. Staples thought it too important a question to answer hastily, and after talking with Mr. Ralston, the banker, he brought together at Mr. Ralston's home a small group of careful men,—among whom were Mayor Selby, President Gilman, and Doctor Stillman, to consider it; out of this conference came most of the suggestions that Mr. Lick later adopted. There were points in the will that Mr. Lick's advisers felt sure would injure its validity, and he consented to draw a second will, and finally a deed of trust. These things, however, concern rather the story of the trusts in general than that of the telescope.

The first will had contained a bequest for this; and whatever other provisions were changed, this was never questioned by any one, nor changed except as, under the influence of Professor Davidson, the amount was increased. Mr. Lick had no knowledge whatever of any of the auxiliaries needed by a telescope, or of the purposes of astronomy beyond bare discovery; and all this was left to Professor Davidson to outline to him in the few months of their conferences. Out of the very interesting verbal narrative that Professor Davidson has given me of this episode, he is willing to have in print at present only so much as is contained in the following memorandum, which he wishes me to leave in his own words:—

I am not willing, at this time, to write the narrative of my relations with James Lick from February, 1873, to

August, 1874, but I give very briefly the following items of interest:

James Lick originally intended to erect the Observatory at Fourth and Market streets. His ideas of what he wanted and what he should do were of the very vaguest character. It required months of careful approaches and the proper presentation of facts to change his views on location. He next had a notion of locating it on the mountains overlooking his mill-site, near Santa Clara, and thought it would be a Mecca,—but only in the sense of a show.

Gradually I guided his judgment to place it on a great elevation in the Sierra Nevadas, by placing before him the results of my experimental work at great elevations, as well as the experience of other high-altitude observers. At the same time, by my presentation of facts and figures of the cost and maintenance of other observatories, he named the sum of \$1,200,000 in one of his wills, as the sum to be set aside for founding the James Lick Observatory, and for its support.

In making him acquainted with the size and performance of the telescopes of the larger observatories, I naturally mentioned the great reflector of Lord Rosse. That seemed to fire his ambition, and at the next interview he insisted on a refractor of six feet in diameter. It required long and patient explanations to get him down to forty inches, which was the diameter we finally adopted.

In October, 1873, I obtained his permission to make known to the California Academy of Sciences the main facts of his intention to place the largest refracting telescope that could be constructed at an elevation of 10,000 feet in the Sierra Nevadas. I have not the announce-

ment within reach, but it was published in the *Alta California* late in October, I think the 21st. A short time before that I had confidentially made the facts of Lick's intentions known to Leland Stanford and his wife.

An eminent astronomer had nearly frustrated the whole project, by urging Mr. Lick to adopt a reflecting telescope instead of a refractor ; but he had a remarkably clear mechanical mind, and I had very little trouble in satisfying him of the weakness of the suggestion.

Before I went to Washington for consultation with other observers for the Transit of Venus expeditions of 1874, Mr. Lick held to the decision of the refractor at a great elevation, and details had been decided upon, although he had several times changed his will in other matters. Before departing I showed him that by the Code of California he could not then devise by will to any corporate body, and urged him to make a Deed of Trust.

Upon my return I found he had made the Deed of Trust, and that some of the Pioneers had prevailed upon him to locate the observatory on the north shore of Lake Tahoe ; and had prevailed upon him to reduce the \$1,200,000 to \$700,000.

When he again changed his views, and determined to locate the observatory on the vastly inferior site of Mount Hamilton, I declined further conference with him.

The whole of my intercourse with him was full of curious and interesting, and sometimes dramatic, incidents, that have never been sought by any one professing to write the history of the Lick Observatory.

The trust deed was dated July, 1874 ; for over a year and a half Mr. Lick had been continuously occupied in

consultations and plans as to the exact disposal of the money. He now began to occupy himself with the carrying out of his favorite purpose, the erection of the telescope. The deed did not bind him positively to the Tahoe site, and his mind lingered about nearer ones, for he had from the first been reluctant to have the observatory so far from routes of travel; he wished it to be as much visited, as constantly before the eyes of people, as possible. He found advisers who favored various nearer sites,—chiefly on the ground of the severity of the winters at Tahoe; and during the summer of 1875 he had his agent, Mr. Fraser, examine and report on a number of these sites, Mt. Hamilton among them. Mr. Lick had been a citizen of Santa Clara County until 1873, and had property there, and when Mr. Fraser reported that Mount Hamilton was the most accessible and the most convenient for building, and when the county agreed to construct a road to the summit, he decided finally to place the Observatory there.

It is something over 4,200 feet high, and as it was the first great astronomical establishment to be placed at any considerable height, it was talked of all over the scientific world for this, as well as for the great telescope. An article in the *Edinburgh Review* gives Mr. Lick great credit for having “felt instinctively,” though without astronomical knowledge, what the astronomers were just coming to perceive,—that the great need of their science

was high altitude observations; and for having been "from the first determined" upon taking the pioneer step in this direction. In fact, it had taken a great deal of pressure, not from Professor Davidson only, for Mr. Staples and doubtless others said much to him on this point, to prevent the location of the Observatory between Pioneer Hall and the Academy of Sciences Building, under the fogs of the peninsula, and amid the jarring of drays. Professor Davidson, however, had set his heart upon so much more—an elevation of not less than 9,000 feet,—that he could not reconcile himself to what he felt the loss of an unprecedented scientific opportunity. And in fact the Lick Observatory may soon be surpassed in its advantage of altitude by others, as it is already by several observing stations. I do not know that it follows that it will be surpassed in the excellence of its "seeing," for I find that astronomers do not agree as to the supreme value of high observing stations: for stellar observations, it is said, rarity of air is not so important as steadiness, which does not necessarily depend on height; at medium heights, also, the freedom from fogs on the one hand and storms on the other may be expected to be greatest, and the number of clear nights in the year the highest. These are points, however, for astronomers to settle. Certainly Mount Hamilton has been praised over and over as the best site in the world so far occupied by any great observatory. Professor Burnham's visit in 1879, while it

was still a wilderness, his sojourn on the mountain in a temporary dome, and his enthusiastic report on the conditions, are within every one's memory. In the three fall months of his stay forty-two nights were "first-class,"—a higher proportion perhaps than at any other time of the year; but observers in Washington have been known to have but thirty-eight very good nights in a year.

While Mr. Lick was settling the question of the site, the trustees began to consider that of plans. They consulted Professor Newcomb, of the United States Naval Observatory at Washington, and during the October of 1874 he and Professor Holden, at that time one of the astronomers of the Washington Observatory, drew the general plans that have since been followed. At the same time, Professor Holden was asked by D. O. Mills, the president of the trustees, to take the directorship of the observatory, and accepted. The whole work of building and equipment was of a sort to require supervision from an astronomer, besides an amount of personal attention which it was hardly possible for Mr. Mills to give. Professor Holden was a young man for such a place,—twenty-eight years old,—but he was a man of whom a great deal was expected, energetic and brilliant, and of good training. He had been a year one of the astronomers in the Washington Observatory and Professor of Mathematics in the Navy, before that for two years a lieutenant in the Engineer Corps and instructor at West

Point, where he had graduated with distinction, after taking a scientific degree at the Washington University of St. Louis. But he was not destined to enter upon the duties of director till many years later ; for in 1875, some dissatisfaction having arisen between Mr. Lick and certain of his trustees, he sought to recall and remake the trust deed, succeeded in doing so through the legal services of Mr. Felton, and in September, 1875, made a new trust deed, in which he reserved the right to change the trustees. The only other change made by this deed was, that the observatory was to be turned over ultimately to the University instead of the Academy of Sciences. I have been told of a personal incident that Mr. Lick gave as a reason for this change ; it is not unlikely that Mr. Felton's influence also, which was always for the University, had something to do with it.

Under the new deed Mr. Lick appointed a board, of which Captain Floyd was the president ; and a year later replaced it by a third, retaining Captain Floyd as president, however. A month later, October 1, 1876, Mr. Lick died, at the age of eighty. He had ended after all by leaving no provision for his own tomb ; but he is said to have spoken of wishing to be buried at the Observatory ; and in 1887 his remains were carried to the mountain, and placed in a mausoleum under the pier of the great telescope.

In the same year, 1876, Captain Floyd being in Lon-

don met Professor Holden, who had been sent by the government to examine and report upon the South Kensington Loan Collection of Scientific Instruments, especially improvements in astronomic and geodetic instruments. This acquaintance resulted in Professor Holden's becoming the scientific adviser of the board through the whole process of construction; he completed the specifications for the buildings according to the original plan, took part in the vast correspondence that was carried on with astronomers and opticians all over the world, and later attended to the purchase of most of the instruments. For three years nothing but planning and corresponding could be done, for the trust was kept at a standstill by the danger of a litigation that might have ended in the loss of the whole. Claims were, however, happily compromised, and in 1880 work was begun on the mountain.

To place buildings so substantial and extensive on a bare peak twenty-six miles by mountain road from the nearest town, was, of course, no slight undertaking, as 72,000 tons of rock had to be removed to get a level space large enough for the building, and two summers were consumed in this task. Santa Clara County had promptly and efficiently fulfilled its promise, and one of the finest of mountain roads,—firm, even, and so beautifully graded that there is not a place in it where the stage-horses need break their trot,—awaited the beginning of work on the observatory. In five years all the

buildings were ready, except the great dome, which had to wait till the telescope was ready.

Mr. Lick's deed had provided for "a telescope superior to and more powerful than any telescope yet made, with all the machinery appertaining thereto, and appropriately connected therewith, . . . and also a suitable observatory." When these words were written, the largest refracting telescope in the world was the 26-inch one of the Naval Observatory, made by Alvan Clark & Sons, and erected in 1873. But while the Lick trusts were at a standstill three more large glasses were made, the largest one 30 inches, made by the Clarks for the Imperial Observatory at Pulkowa, Russia. 36 inches was the largest lens the Lick trustees could get the Clarks to contract for; so at that size the order was given, \$50,000 being the contract price. Everyone will remember the somewhat dramatic story of this glass: how Feil & Co. of Paris undertook to cast it for the Clarks, and sent the flint-glass over safely in 1882, but cracked the crown-glass in packing; how the elder Feil having retired, the sons tried in vain for a couple of years to get the great glass block safely cast, and at last went into bankruptcy; how the elder Feil came to the rescue, took charge of the business again, and near the end of 1885 shipped to the Clarks a perfect block. Professor Newcomb, who visited Europe to investigate this matter of glass disks, made an interesting report on the process of making,

which I have seen quoted. The difficulty is to get the glass of perfectly even texture throughout, and this can never be hoped for on the first annealing ; veins must be cut out, the block reheated, pressed together, and again annealed, each trial consuming months.

The Clarks then took a year for the “figuring,”—the delicately precise shaping of the lenses to the most perfect collection of light, so delicate that the last stages are done with the thumb and the palm of the hand.

The mounting was made by Messrs. Warner and Swazey, of Cleveland, and the great dome by the Union Iron Works of San Francisco. Of the mechanical excellences of the work much has been said in many journals ; and although some adjustments were necessary before everything worked smoothly, I believe the work has all proved to be on the whole wonderfully perfect and wise. The great telescope, with its accessories, cost about \$200,000.

Professor Holden made three visits, the first in 1881, to attend to the setting up of the meridian circle, and observe the transit of Mercury ; and in 1882 Professor Todd, of Amherst Observatory, observed the transit of Venus here, and obtained excellent results. In 1885 Professor Holden came to the State as president of the University and director of the Observatory, and for the next three years made vacation headquarters at the mountain, and was able to be in constant communication with the trustees in San Francisco.

In 1888 the Observatory was formally turned over to the University regents, and its staff of astronomers was appointed. Professor Holden, as a matter of course, was retained as director; he had been called to the University with that understanding. The fourteen years that had passed since his relation to the Observatory began had been so occupied as to give him, in unusual degree, an "all-round" acquaintance with the practical and theoretic questions of his science. He had remained five years in the Washington Observatory, and had been successively in partial charge of each department of astronomical work, and in each had been employed not only in observing, but in calculating and in the study of results; and had made, as librarian, bibliographer, and writer, an unusual acquaintance with the literature of the science. He had in 1881 been called to the directorship of the still unfinished Washburn Observatory, at Madison, Wisconsin, and had organized it efficiently and given it a good standing. In 1878 he had been in charge of the United States Eclipse Expedition to Central City, Colorado; in 1883 of the United States Eclipse Expedition to the South Pacific Ocean; and in 1884 of the Division of Meteorology of the Northern Transcontinental Survey. Without having obtained brilliant distinction in any one department of his science, he was an astronomer of recognized merit in all, as evidenced then or soon after by honorary degrees from several universities, and

membership in a long list of scientific societies in America and Europe; one of these at least, that of associate membership in the Royal Astronomical Society of England, an honor enjoyed by scarcely a dozen American astronomers, and a practical guarantee of standing. "The first requisite for the director of a great observatory" (I quote a private letter from an astronomer) "is to have a very clear notion of just what kind of work ought to be done, how it should be done, and then to give all the aid in his power to the investigator. In all these particulars Professor Holden seems to be just the right man in the right place." In carrying on the external relations of the Observatory, also,—relating it to other observatories, in this country and abroad, seeing to it that knowledge of its work is thoroughly and to the best advantage disseminated,—Professor Holden has been a successful director; aided in this by a really fine literary power and a wide general cultivation. Of difficulties just now discussed by the papers, concerning the adjustment of internal relations, I do not think it suitable to say anything here. It is unfortunate that any one should have tried to adjust them through the press; Mr. Alvan Clark might as well have tried to figure the great lens with a Corliss engine. This much should be said: whatever difficulties have occurred have been aggravated, first, by the want of a permanent president in the University, which raises questions of authority; and second, by the inherent difficulties

of settling novel questions of administration in a novel situation. This is the first great, permanent observatory thrown so on its own resources, far from university or city surroundings, and without the relief of contact with other than the one line of thought. Nor is the situation of a remote military post analogous, for definite military precedents there settle everything,—a system impossible in a branch of a modern university, manned by scientific men, of independent thought and distinction.

The appointment of his colleagues was left to Professor Holden. He selected J. E. Keeler, now director of the observatory at Alleghany, Pennsylvania, S. W. Burnham, E. E. Barnard, and J. M. Schaeberle. Besides these, the only full astronomers, holding rank as professors in the University, have been Henry Crew, now of Northwestern University, and W. W. Campbell, appointed last year. Of those astronomers who are not now on the staff I must not pause to speak, except in the case of Professor Burnham, who has been connected with the Observatory until very lately. His somewhat unique position among American astronomers deserves mention. He is not only one of the self-created men of science who have not been so very rare in America (the story has been told in print and is not unfamiliar), but he is an instance in what I think must be a rare degree of the attainment of eminence through concentration of effort on a single line. Professor Burnham is not only a specialist in being an observer

merely, unfamiliar with the other sides of astronomical science, but as an observer he is almost exclusively a specialist in double stars; and in discovering and measuring these he has no rival. While he was at Mount Hamilton, this branch of observation naturally became very prominent, and the great telescope was given up to it for more than a third of the time.

Professor Barnard also is a self-taught astronomer, and while not a specialist in so intense a sense as Professor Burnham, he is primarily an observer. His keen vision, great power of eager and yet patient and laborious attention, and doubtless other elements in his work that astronomers could define, give him in especial the name of "genius" among his colleagues. Just now the most brilliant and generally interesting feat the great glass has yet accomplished, the discovery of the fifth moon of Jupiter, has brought Professor Barnard the more into note. Before this, however, he had made some remarkable observations on comets, following them to unprecedented distances and detecting their approach before anyone else. In 1891 he discovered all the five comets of the year, including two new ones; in all, he has discovered nineteen comets in ten years. Besides these most striking observations, "Professor Barnard has made a very large number" (I quote a newspaper account by Professor Holden) "upon the physical appearance of the planets Venus, Jupiter, and Saturn, upon the zodiacal light, etc., upon

meteors, lunar eclipses, double stars, occultations of stars, etc., and he has discovered a considerable number of new nebulae, also."

Professor Schaeberle is an astronomer of full university preparation, trained thoroughly and soundly on all sides of his science, and in those allied sciences that university preparation includes. A graduate of Michigan University in 1876, he was instructor in practical astronomy in the observatory there, refusing calls elsewhere, till he came to Mount Hamilton in 1888. He has discovered two comets, made a long series of meridian circle observations and very extensive calculations concerning asteroids and comet orbits, and has done much work in physical and mathematical astronomy. His theory of the causes of the sun's corona was the text of a recent discussion in the Royal Astronomical Society of England, and if finally accepted will be to those who value the interpretation of the universe more than the collection of its facts the most solid and important contribution to science yet made by the Observatory. Professor Schaeberle has just put forth tentatively a theory which seems to account for the "canals" of Mars and their duplication with a rational simplicity: if we regard the bright portions of the planets as water, and the dark as land, instead of *vice versa*, as at present, he points out, the "canals" may not improbably be mountain chains, some of them parallel chains, as on the earth.

Professor Campbell has been in the observatory only a year, but has forwarded his work much by introducing the photography of spectra with the great telescope. He has also studied the orbits of comets, and published last year a text book of astronomy for university use, which, I am told, has been well received. He is a Michigan University graduate of 1886; was professor of mathematics in the University of Colorado, then succeeded Professor Schaeberle as instructor in astronomy at Michigan University.

The present distribution of work among these astronomers is given by the official report as follows: The great telescope is used for photography two nights in the week, by Holden and Colton (assistant astronomer and secretary); two for spectroscope observations by Campbell and Townley (Hearst Fellow); two by Barnard and Schaeberle for miscellaneous observations; Saturday night is given up to visitors. The 12-inch telescope, the 6½-inch telescope, the comet-seeker, and photographic telescope, are used by Barnard, and by others when not in use by him. The meridian circle is in charge of Professor Schaeberle; the time service, of Professor Campbell, but most of the work is done by Mr. Townley. The meteorological and earthquake instruments are in charge of Mr. Colton. Professor Holden, besides the general charge of the establishment and of forwarding each one's work, the work in photography, and until Mr. Townley was ap-



pointed as the first Hearst Fellow, in spectroscopy, has most of the work of librarian, the scientific correspondence, and the editorial charge of the publications of the Astronomical Society.

The Observatory, as turned over to the University, had a site of $1901\frac{1}{2}$ acres, since increased to $2581\frac{1}{2}$ acres; this is mainly made up of state and national grants, for most of the mountain top was fortunately public land. One object in getting so large a reservation was to guard against brush fires, by which the buildings at one time were threatened. The main building consists of two domes, connected by a hall 121 feet long, along the west side of which are study and work rooms. The great dome, 78 feet in diameter, occupies the south end of the leveled platform; it moves on the top of a tower, whose foundations are set deep in the rock. The moving parts weigh nearly 89 tons, but so perfect is the mechanism—operated by a small water-engine—that one may see the vast concave swing around at the pressure of a child's hand. The floor works up and down by a hydraulic arrangement devised by Sir Howard Grubb; this arrangement to a great extent takes the place of an observer's chair. The monster tube, fifty-seven feet long and four feet in diameter at the center, is mounted here on an iron pier thirty-eight feet high. It is provided with "finders" of six, four, and three inches in diameter. When it is used for photography, an additional single lens, 33 inches

in diameter, is placed in front of the two lenses that form the visual objective, and the instrument is turned into a great camera. The eye end is provided with mechanism by which the observer as he sits can do most of the handling necessary; with a micrometer, and a frame to which spectroscopes, photometers, or enlarging cameras, can be attached. The Observatory has besides the great equatorial a 12-inch one, which occupies the 25-foot dome at the north end of the platform, a 6½-inch one, and a 4-inch "comet-seeker." Behind the main building is the meridian circle house, which contains a fine Repsold meridian circle, and a 4-inch transit and zenith telescope. The Observatory is besides well equipped with spectroscopes, chronographs, clocks, meteorological instruments, and complete earthquake apparatus. These buildings, with a small photographic laboratory, take up the leveled space. On the side of the peak a large brick dwelling-house for astronomers finds place, reached by a bridge to its upper story; and below, on the saddle between two peaks (the mountain has three,) gathers quite a village of subsidiary cottages, workshops, etc. Beyond these is a small dome for photographic work, the gift, with its telescope, of Regent C. F. Crocker.

When the late Mr. Newall, of England, presented his 25-inch refractor to Cambridge, his son, who was to be its astronomer, made a tour of the great observatories of the world, and came all the way to California to study the

equipment of the Lick Observatory and the mounting of the great telescope. The Earl of Rosse visited and examined it in 1891; Professor Auwers, of the Royal Academy of Sciences of Berlin, and Professor Vogel, Director of the Potsdam Observatory, are to do so soon, on a tour of inspection with reference to a great telescope for the Prussian government. The satisfaction the astronomers feel in showing the Observatory and its equipment to these competent judges is unmistakable. It certainly seems, even to the guest ignorant of astronomy and astronomical instruments, a most intelligible satisfaction. The whole place is fascinating, exceedingly,—the road thither, winding up from one stage to another of mountain outlook, through the amazing medley of loops and turns by which it preserves its easy grade, mounting at last and circling the sides of the peak itself: the fine, firm, dignified building, before whose broad entrance one is finally set down; the shining orderliness and perfection of everything; the sense of being islanded above the world, the distance and seclusion, and yet the intimate nearness to the whole world of science; the cordial hospitality of every one there; the vast, dark dome by night,—“as big,” some one with me said, “as the sky looks to most people,”—with the great tube spanning the darkness, directed steadily and silently against the sky, like a powerful cannon, lying in wait to storm its immemorial secrets.

Mr Lick's deed prescribed that the Observatory should

be “made useful in promoting science.” Whether through the alliance with the University or by Professor Holden’s original plan, it has taken on also a function of diffusing knowledge and aiding education in the State. I do not know if any other great observatory in the world takes on itself any such function, at least to any such extent. In the first place, there is the surrendering of one night in the week to visitors. This does not mean that a few stray pilgrims make their way to the shrine in the wilderness. It means that stage after stage from San Jose rolls up,—twenty in a procession, sometimes,—and the little group of astronomers receives with unflinching courtesy the hundreds of passengers, and with a swiftness and deftness that is really wonderful, marshals them through the Observatory, explaining patiently its leading points, until far on in the night. 22,496 guests are recorded in four years,—some of them by day, to be sure, when the Observatory is always open. No other observatory in the world offers such privileges to visitors. The Astronomical Society of the Pacific is an efficient means of diffusing astronomical interest and knowledge. It seems to be an unusually vigorous and well-knit organization, publishes a bi-monthly journal, skillfully edited to be of interest to astronomers and unlearned members alike, has branches in Eastern States, and some five hundred members scattered all over the world. And in addition, through newspapers and magazines, full expla-

nations of the work and statements of the general results reached in the Observatory have been given forth as fast as they reached definable shape. No one that knows much of the time and skill such publication demands can look over the quantity that has been done without wonder and respect.

The Observatory has from the first planned for graduate students whenever the accommodations permitted, and nine in all have studied practical astronomy there ; of these, five were professors from other institutions, who came for further study of some special sort. It is the intention to make more and more of this graduate work, and already no student need leave California to get the highest training in astronomy. The Harvard and Washington observatories give no instruction, and there is no reason why the California University graduate school should not become the source to which observatories all over the country will look for their young astronomers. The director has been unusually diligent and successful—as any one may learn by an examination of the reports, periodicals, and other sources of first-hand information available—in bringing forward the younger men about him and making their successes known ; and I am told by competent and disinterested authority that the system of giving credit to individual observers in announcing the results of the Observatory work is very liberal at Mount Hamilton, as compared with that of other observatories.

The really promising young astronomers from the graduate school will profit by this system.

What has the Lick Observatory done thus far for "the promotion of science"? It is a question that a mere on-looker cannot possibly answer except by a re-summary of the summaries already put forth, and confirmed by the notices of astronomical periodicals:—

Solar Eclipses of Jan. and Dec., 1889.—At the January eclipse Professor Barnard, and the Amateur Photographic Association, more or less under his direction, took many fine photographs of the corona, which demonstrated the existence of an "extension" of the outer corona. The eclipse of December was observed by Professors Burnham and Schaeberle, who went to South America at the expense of Regent C. F. Crocker. The photographs of these two eclipses are recognized as among the best photographs of the corona ever made. Two books have been published by the Observatory containing the results of these two eclipses.

It was from their evidence that Professor Schaeberle was led to his theory of the corona, mentioned above. In April, 1893, the next total eclipse of the sun takes place; this theory, by which, if it is sound, the general features of the future corona can be *now* foretold, will then have a practical test. A party under Professor Schaeberle will go to Chile, to observe the eclipse.

Observations of the Planets and Satellites.—The planets have been steadily watched and studied, measures and drawings of them made, and enlarged photographs of Jupiter taken at regular intervals, thus recording all changes in the surface. These photographs, taken by Professors Holden and Campbell, are the subject of a paper before the Royal Astronomical Society, by A. Stanley Williams, who praises them all highly, and says of one that it is perhaps the finest and most interesting photograph of Jupiter ever obtained. Much time has been spent in examining the planets Mars, Uranus, and Neptune, in search of new satellites. Jupiter has been disadvantageously situated, but is now coming steadily into better position, and will be more and more studied. Last summer Professors Schaeberle and Campbell made some interesting discoveries as to the forms and motions of the moons; and in September came Professor Barnard's famous discovery of the small inner moon.

Double Stars.—In this department the Lick Observatory has easily led thus far, and Professor Burnham catalogued 198 new double stars there. His resignation will make the subject less prominent in future work.

Meridian Observations.—These series of observations, carried on by Professor Schaeberle with the meridian circle, are first to determine the positions of stars to join together the systems used in the nautical almanacs of the different nations; second, to determine the *refraction* of

the stars. A former series of similar observations is being reduced by computers in the East, at the expense of Miss Bruce of New York, and Professor Mendenhall of the United States Coast Survey.

Absorption of Photographic Rays.—Professor Schaeberle, from observations by Professor Campbell and himself, has determined the amount of this absorption by the air at different altitudes,—a datum necessary in fixing the photographic magnitudes of stars, and never before definitely determined. This memoir is about to be published by the University in book form.

Comets.—Professor Barnard's notable observations, which give the Lick Observatory the lead in this direction, have been mentioned above.

Star-Clusters and Nebulæ have been regularly studied and photographed, and in the case of the cluster in Hercules a novel peculiarity of structure has been ascertained. Professor Barnard has taken some important photographs, showing the real shapes of nebulæ. Professor Holden's paper on Helical Nebulæ has been translated into German, and received with much consideration.

Moon Photographs are regularly taken with the great telescope, and it is the intent to continue till a complete set has been obtained for every hour or so of the moon's age. Changes on the moon's surface can thus be detected. These photographs have been mechanically en-

larged on glass by Professors Burnham and Barnard, and they are now sent regularly to Prague, to Professor Weinek, who makes enlarged drawings of parts of the surface, which are printed in heliogravure, at the expense of Walter Law, of New York. These drawings are studied by Professor Weinek and Professor Holden with great care, and Professor Weinek has discovered many new features in this way. Doctor Otto Boedicker, astronomer of Lord Rosse's observatory, Doctor Ebert of Erlangen, and Doctor Franz of Koenigsberg, are also making special studies of them.

Milky Way.—The Milky Way also is to be studied by means of photographs, which Professor Barnard is now taking, attention having been directed to the promise of excellent results through some most successful ones that he had made. The comet lately discovered made its impression on one of these plates, and was thus first recognized as a stranger.

Spectroscopy.—Professor Keeler made some remarkable spectroscopic observations, by which he established (for the first time) the motions of nebulae in the line of sight. When Professor Campbell succeeded to the work, he adapted the spectroscope—intended for visual observations—to photographing spectra, and the results showed enormous advantages in this method. To this is largely due the unrivaled success of the Lick Observatory

in studying the new star in Auriga. The greatest number of lines in its spectrum reported from other observations is three; Professor Campbell has measured fourteen. During the time this star was very faint the photographic observations of the Lick Observatory were the only ones by which it could be followed. They alone showed its nebular character, and since its extraordinary change into a true nebula, they have been the only ones that kept account of its motions — showing that it has been moving away from us, and is now approaching, probably revolving in a vast orbit — and of its nature, indicating that planetary nebulæ owe their genesis to such new stars; both most important steps in our knowledge of stars.

A review of the publications of the Astronomical Society will show many minor or subsidiary inquiries going on at the Observatory. The secretary's report to the regents shows that from June, 1888, to September, 1892, there have been 462 papers published by the astronomers and students — more than two a week. Some of these have been brief scientific memoranda; many of them long and arduous papers.

Two things will be noticed in looking through this summary of the scientific work. First, the great importance of the photographic method. This is a new aid to astronomy, which the Lick Observatory has been one of the first to appreciate, and which it has unrivaled facilities for using. The power it gives to *record* a fleeting

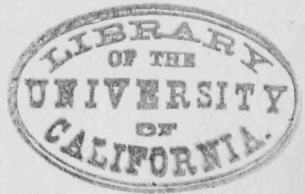
phenomenon, to sit down and study it at leisure, and to send it for confirmation to another observer, even the other side of the world, makes it of inestimable value. Second, the co-operative relation with other observatories. It has not been the general policy of observatories to give out their results promptly, and help each other in making use of them. The Lick Observatory, by a division of labor that to some extent makes it a gatherer of raw material, to be worked up in places where more help is available, has been of service to these other observatories, received great service from them, and hastened the advance of science ; a few months sufficing to have thoroughly studied, interpreted, discussed, and settled, some point that might have had to wait years, had each observatory depended on its own resources. As has been said, if the four distinguished foreign astronomers now engaged in special studies of the moon negatives were on the staff of the Lick Observatory, they could hardly utilize its advantages and help its work more.

In addition to all the purely scientific work, the Observatory regulates the time service for the Pacific States, sending out daily signals to all the railroad stations ; and several minor services of the sort have been rendered.

That the Lick Astronomical Department has done a surprising quantity of work in the four years cannot be questioned. One is disposed to think, after reviewing it, that too much has been done rather than too little. The

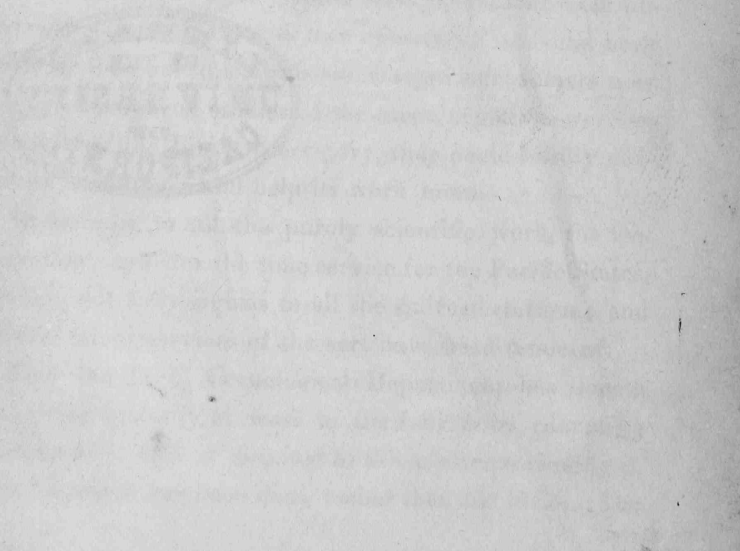
great ambition of all the astronomers to force the Lick Observatory instantly into the world's front rank, in spite of limited means and small staff, by a quantity of work that would demand attention, and of such sort as would bear the judgment of the first European scholars and societies,— this seems to me to have kept the work at a high pressure that has told somewhat on the men. We must be grateful, however, that the grade of the work has been kept high. It is most easy and tempting in a new institution to make concessions from an excellence that one's public will never miss ; and all the evidence shows that the Lick Observatory has not done this.

MILICENT W. SHINN.



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MINNIE W. BARKER





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