NEW LANDS

Charles Fort

PART I

1

LANDS in the sky—

That they are nearby—

That they do not move.

I take for a principle that all being is the infinitely serial, and that whatever has been will, with differences of particulars, be again—

The last quarter of the fifteenth century—land to the west!

This first quarter of the twentieth century—we shall have revelations.

There will be data. There will be many. Behind this book, unpublished collectively, or held as constituting its reserve forces, there are other hundreds of data, but independently I take for a principle that all existence is a flux and a re-flux, by which periods of expansion follow periods of contraction; that few men can even think widely when times are narrow times, but that human constrictions cannot repress extensions of thoughts and lives and enterprise and dominion when times are wider times—so then that the pageantry of foreign coasts that was revealed behind blank horizons after the year 1492, cannot be, in the course of development, the only astounding denial of seeming vacancy—that the spirit, or the animation, and the stimulations and

the needs of the fifteenth century are all appearing again, and that requital may appear again—

Aftermath of war, as in the year 1492: demands for readjustments; crowded and restless populations, revolts against limitations, intolerable restrictions against emigrations. The young man is no longer urged, or is no longer much inclined, to go westward. He will, or must, go somewhere. If directions alone no longer invite him, he may hear invitation in dimensions. There are many persons, who have not investigated for themselves, who think that both poles of this earth have been discovered. There are too many women traveling luxuriously in "Darkest Africa." Eskimos of Disco, Greenland, are publishing a newspaper. There must be outlet, or there will be explosion—

Outlet and invitation and opportunity—

San Salvadors of the Sky—a Plymouth Rock that hangs in the heavens of Servia—a foreign coast from which storms have brought materials to the city of Birmingham, England.

Or the mentally freezing, or dying, will tighten their prohibitions, and the chill of their censorships will contract, to extinction, our lives, which, without sin, represent matter deprived of motion. Their ideal is Death, or approximate death, warmed over occasionally only enough to fringe with uniform, decorous icicles—from which there will be no escape, if, for the living and sinful and adventurous there be not San Salvadors somewhere else, a Plymouth Rock of reversed significance, coasts of sky-continents.

But every consciousness that we have of needs, and all hosts, departments, and sub-divisions of data that indicate the possible requital of needs are opposed—not by the orthodoxy of the common Puritans, but by the Puritans of Science, and their austere, disheartening, dried or frozen orthodoxy.

Islands of space—see *Sci. Amer.*, vol. this and p. that—accounts from the *Repts. of the Brit. Assoc. for the Ad. of Sci.—Nature*, etc.—except for an occasional lapse, our sources of data will not be sneered at. As to our interpretations, I consider them, myself, more as suggestions and gropings and stimuli. Islands of space and the rivers and the oceans of an extra-geography—

Stay and let salvation damn you—or straddle an auroral beam and paddle from Rigel to Betelgeuse. If there be no accepting that there are such rivers and oceans beyond this earth, stay and travel upon steamships with schedules that can be depended upon, food so well cooked and well served, comfort looked after so carefully—or some day board the thing that was seen over the city of Marseilles, Aug. 19, 1887, and ride on that, bearing down upon the moon, giving up for lost, escaping collision by the swirl of a current that was never heard of before.

There are, or there are not, nearby cities of foreign existences. They have, or they have not, been seen, by reflection, in the skies, of Sweden and Alaska. As one will. Whether acceptable, or too preposterous to be thought of, our data are of rabbles of living things that have been seen in the sky; also of processions of military beings—monsters that live in the sky and die in the sky, and spatter this earth with their red life-fluids—ships from other worlds that have been seen by millions of the inhabitants of this earth, exploring, night after night, in the sky of France, England, New England, and Canada—signals from the moon, which, according to notable indications, may not be so far from this earth as New York is from London—definitely reported and, in some instances, multitudinously witnessed, events that have been disregarded by our opposition—

A scientific priestcraft—

"Thou shalt not!" is crystallized in its frozen textbooks.

I have data upon data upon data of new lands that are not far away. I hold out expectations and the materials of new hopes and new despairs and new triumphs and new tragedies. I hold out my hands to point to the sky—there is a hierarchy that utters me manacles, I think—there is a dominant force that pronounces prisons that have dogmas for walls for such thoughts. It binds its formulas around all attempting extensions.

But sounds have been heard in the sky. They have been heard, and it is not possible to destroy the records of them. They have been heard. In their repetitions and regularities of series and intervals, we shall recognize perhaps interpretable language. Columns of clouds, different-colored by sunset, have vibrated to the artillery of other worlds like the strings of a cosmic harp, and I conceive of no buzzing of insects that can forever divert attention from such dramatic reverberations. Language has shone upon the dark parts of the moon: luminous exclamations that have fluttered in the lunar crater Copernicus; the eloquence of the starlike light in Aristarchus; hymns that have been chanted in lights and shades upon Linné; the wilder, luminous music in Plato—

But not a sound that has been heard in the sky, not a thing that has fallen from the sky, not a thing that "should not be," but that has nevertheless been seen in the sky can we, with any sense of freedom, investigate, until first we find out about the incubus that in the past has suffocated even speculation. I shall find out for myself: anybody who cares to may find out with me. A ship from a foreign world does, or does not, sail in the sky of this earth. It is in accordance with observations by hundreds of thousands of witnesses that this event has taken place, and, if the time be when aeronautics upon this earth is of small development, that is an important circumstance to consider—but there is suffocation upon the whole occurrence and every one of its circumstances.

Nobody can give good attention to the data, if diverting his mind is consciousness, altogether respectful, of the scientists who say that there are no other physical worlds except planets, millions of miles away, distances that conceivable vessels could not traverse. I should like to let loose, in an opening bombardment, the data of the little black stones of Birmingham, which, time after time, in a period of eleven years, fell obviously from a fixed point in the sky, but such a release, now, would be wasted. It will have to be prepared for. Now each one would say to himself that there are no such fixed points in the sky. Why not? Because astronomers say that there are not.

But there is something else that is implied. Implied is the general supposition that the science of astronomy represents all that is most accurate, most exacting, painstaking, semi-religious in human thought, and is therefore authoritative.

Anybody who has not been through what I've been through, in investigating this subject, would ask what are the bases and what is the consistency of the science of astronomy. The miserable, though at times amusing, confusions of thought that I find in this field of supposed research word my inquiry differently—what of dignity, or even of decency, is in it?

Phantom dogmas, with their tails clutching at vacancies, are coiled around our data.

Serpents of pseudo-thought are stifling history.

They are squeezing "Thou shalt not!" upon Development.

New Lands—and the horrors and lights, explosions and music of them; rabbles of hellhounds and the march of military angels. But they are Promised Lands, and first must we traverse a desert. There is ahead of us a waste of parallaxes and spectrograms and triangulations.

It may be weary going through a waste of astronomic determinations, but that depends—

If out of a dreary, academic zenith shower betrayals of frailty, folly, and falsification, they will be manna to our malices—

Or sterile demonstrations be warmed by our cheerful cynicisms into delicious little lies—blossoms and fruits of unexpected oases—

Rocks to strike with our suspicions—and the gush of exposures foaming with new implications.

Tyrants, dragons, giants—and, if all be dispatched with the skill and the might and the triumph over awful odds of the hero who himself tells his story—

I hear three yells from some hitherto undiscovered, grotesque critter at the very entrance of the desert.

2

"PREDICTION Confirmed!"

"Another Verification!"

"A Third Verification of Prediction!"

Three times, in spite of its long-established sobriety, the *Journal of the Franklin Institute,* vols. 106 and 107, reels with an astronomer's exhilarations. He might exult and indulge himself, and that would be no affair of ours, and, in fact, we'd like to see everybody happy, perhaps, but it is out of these three chanticleerities by Prof. Pliny Chase that we materialize our opinion that, so far as methods and strategies are concerned, no particular differences can be noted between astrologers and astronomers, and that both represent engulfment in Dark Ages. Lord Bacon pointed out that the astrologers had squirmed into prestige and emolument by shooting at marks, disregarding their misses, and recording their hits with unseemly advertisement. When, in August, 1878, Prof. Swift and Prof. Watson said that, during an eclipse of the sun, they had seen two luminous bodies that might be planets between Mercury and the sun, Prof. Chase announced that, five years before, he had made a prediction, and that it had been confirmed by the positions of these bodies. Three times, in capital letters, he screamed, or announced, according to one's sensitiveness, or prejudices, that the "new planets" were in the exact positions of his calculations. Prof. Chase wrote that, before his time, there had been two great instances of astronomic calculation confirmed: the discovery of Neptune and the discovery of "the asteroidal belt," a claim that is disingenuously worded. If by mathematical principles, or by any other definite principles, there has ever been one great, or little, instance of astronomic discovery by means of calculations, confusion must destroy us, in the introductory position that we take, or expose our irresponsibility, and vitiate all that follows: that our data are oppressed by a tyranny of false announcements; that there never has been an astronomic discovery other than the observational or the accidental.

In *The Story of the Heavens,* Sir Robert Ball's opinion of the discovery of Neptune is that it is a triumph unparalleled in the annals of science. He lavishes—the great astronomer Leverrier, buried for months in profound meditations—the dramatic moment—Leverrier rises from his calculations and

points to the sky—"Lo!" there a new planet is found.

My desire is not so much to agonize over the single fraudulencies or delusions, as to typify the means by which the science of Astronomy has established and maintained itself:

According to Leverrier, there was a planet external to Uranus; according to Hansen, there were two; according to Airy, "doubtful if there were one."

One planet was found—so calculated Leverrier, in his profound meditations. Suppose two had been found—confirmation of the brilliant computations by Hansen. None—the opinion of the great astronomer, Sir George Airy.

Leverrier calculated that the hypothetic planet was at a distance from the sun, within the limits of 35 and 37.9 times this earth's distance from the sun. The new planet was found in a position said to be 30 times this earth's distance from the sun. The discrepancy was so great that, in the United States, astronomers refused to accept that Neptune had been discovered by means of calculation: see such publications as the *American Journal of Science*, of the period.

Upon Aug. 29, 1849, Dr. Babinet read, to the French Academy, a paper in which he showed that, by the observations of three years, the revolution of Neptune would have to be placed at 165 years. Between the limits of 207 and 233 years was the period that Leverrier had calculated. Simultaneously, in England, Adams had calculated. Upon Sept. 2, 1846, after he had, for at least a month, been charting the stars in the region toward which Adams had pointed, Prof. Challis wrote to Sir George Airy that this work would occupy his time for three more months. This indicates the extent of the region toward which Adams had pointed.

The discovery of the asteroids, or in Prof. Chase's not very careful language, the discovery of the "asteroidal belt as deduced from Bode's Law":

We learn that Baron Von Zach had formed a society of twenty-four astronomers to search, in accordance with Bode's Law, for "a planet"—and not "a group," not "an asteroidal belt"—between Jupiter and Mars. The astronomers had organized, dividing the zodiac into twenty-four zones, assigning each zone to an astronomer. They searched. They found not one asteroid. Seven or eight hundred are now known.

Philosophical Magazine, 12-62:

That Piazzi, the discoverer of the first asteroid, had not been searching for a hypothetic body, as deduced from Bode's Law, but, upon an investigation of his own, had been charting stars in the constellation Taurus, night of Jan. 1, 1801. He noticed a light that he thought had moved, and, with his mind a

blank, so far as asteroids and brilliant deductions were concerned, announced that he had discovered a comet.

As an instance of the crafty way in which some astronomers now tell the story, see Sir Robert Ball's *Story of the Heavens*, p. 230:

The organization of the astronomers of Lilienthal, but never a hint that Piazzi was not one of them—"the search for a small planet was soon rewarded by a success that has rendered the evening of the first day of the nineteenth century memorable in astronomy." Ball tells of Piazzi's charting of the stars, and makes it appear that Piazzi had charted stars as a means of finding asteroids deductively, rewarded soon by success, whereas Piazzi had never heard of such a search, and did not know an asteroid when he saw one. "This laborious and accomplished astronomer had organized an ingenious system of exploring the heavens, which was eminently calculated to discriminate a planet among the starry host … at length he was rewarded by a success which amply compensated him for all his toil."

Prof. Chase—these two great instances not of mere discovery, but of discovery by means of calculation, according to him—now the subject of his supposition that he, too, could calculate triumphantly—the verification depended upon the accuracy of Prof. Swift and Prof. Watson in recording the positions of the bodies that they had announced—

Sidereal Messenger, 6-84:

Prof. Colbert, Superintendent of Dearborn Observatory, leader of the party of which Prof. Swift was a member, says that the observations by Swift and Watson agreed, because Swift had made his observations agree with Watson's. The accusation is not that Swift had falsely announced a discovery of two unknown bodies, but that his precise determining of positions had occurred after Watson's determinations had been published.

Popular Astronomy, 7-13:

Prof. Asaph Hall writes that, several days after the eclipse, Prof. Watson told him that he had seen "a" luminous body near the sun, and that his declaration that he had seen two unknown bodies was not made until after Swift had been heard from.

Perched upon two delusions, Prof. Chase crowed his false raptures. The unknown bodies, whether they ever had been in the orbit of his calculations or not, were never seen again.

So it is our expression that hosts of astronomers calculate, and calculation-mad, calculate and calculate and calculate, and that, when one of them does point within 600,000,000 miles (by conventional measurements) of something

that is found, he is the Leverrier of the text-books; that the others are the Prof. Chases not of the text-books.

As to most of us, the symbols of the infinitesimal calculus humble independent thinking into the conviction that used to be enforced by drops of blood from a statue. In the farrago and conflicts of daily lives, it is relief to feel such a *rapport* with finality, in a religious sense, or in a mathematical sense. So then, if the seeming of exactness in Astronomy be either infamously, or carelessly and laughingly, brought about by the connivances of which Swift and Watson were accused, and if the prestige of Astronomy be founded upon nothing but huge capital letters and exclamation points, or upon the disproportionality of balancing one Leverrier against hundreds of Chases, it may not be better that we should know this, if then to those of us who, in the religious sense, have nothing to depend upon, comes deprivation of even this last, lingering seeming of foundation, or seeming existence of exactness and realness, somewhere—

Except—that, if there be nearby lands in the sky and beings from foreign worlds that visit this earth, that is a great subject, and the trash that is clogging an epoch must be cleared away.

We have had a little sermon upon the insecurity of human triumphs, and, having brought it to a climax, now seems to be the time to stop; but there is still an involved "triumph" and I'd not like to have inefficiency, as well as probably everything else, charged against us—

The Discovery of Uranus.

We mention this stimulus to the text-book writers' ecstasies, because out of phenomena of the planet Uranus, the "Neptune-triumph" developed. For Richard Proctor's reasons for arguing that this discovery was not accidental, see *Old and New Astronomy*, p. 646. *Philosophical Transactions*, 71-492—a paper by Herschel—"An account of a comet discovered on March 13, 1781." A year went by, and not an astronomer in the world knew a new planet when he saw one: then Lexell did find out that the supposed comet was a planet.

Statues from which used to drip the life-blood of a parasitic cult—

Structures of parabolas from which bleed equations—

As we go along we shall develop the acceptance that astronomers might as well try to squeeze blood from images as to try to seduce symbols into conclusions, because applicable mathematics has no more to do with planetary inter-actions than have statues of saints. If this denial that the calculi have place in gravitational astronomy be accepted, the astronomers lose their supposed god; they become an unfocused priesthood; the stamina of their

arrogance wilts. We begin with the next to the simplest problem in celestial mechanics: that is, the formulation of the inter-actions of the sun and the moon and this earth. In the highest of mathematics, final, sacred mathematics, can this next to the simplest problem in so-called mathematical astronomy be solved?

It cannot be solved.

Every now and then, somebody announces that he has solved the Problem of the Three Bodies, but it is always an incomplete, or impressionistic, demonstration, compounded of abstractions, and ignoring the conditions of bodies in space. Over and over we shall find vacancy under supposed achievements; elaborate structures that are pretensions without foundation. Here we learn that astronomers cannot formulate the inter-actions of three bodies in space, but calculate anyway, and publish what they call the formula of a planet that is inter-acting with a thousand other bodies. They explain. It will be one of our most lasting impressions of astronomers: they explain and explain and explain. The astronomers explain that, though in finer terms, the mutual effects of three planets cannot be determined, so dominant is the power of the sun that all other effects are negligible.

Before the discovery of Uranus, there was no way by which the miracles of the astro-magicians could be tested. They said that their formulas worked out, and external inquiry was panic-stricken at the mention of a formula. But Uranus was discovered, and the magicians were called upon to calculate his path. They did calculate, and, if Uranus had moved in a regular path, I do not mean to say that astronomers or college boys have no mathematics by which to determine anything so simple.

They computed the orbit of Uranus.

He went somewhere else.

They explained. They computed some more. They went on explaining and computing, year in and year out, and the planet Uranus kept on going somewhere else. Then they conceived of a powerful perturbing force beyond Uranus—so then that at the distance of Uranus the sun is not so dominant—in which case the effects of Saturn upon Uranus and Uranus upon Saturn are not so negligible—on through complexes of inter-actions that infinitely intensify by cumulativeness into a black outlook for the whole brilliant system. The palæo-astronomers calculated, and for more than fifty years pointed variously at the sky. Finally two of them, of course agreeing upon the general background of Uranus, pointed within distances that are conventionally supposed to have been about six hundred millions of miles of Neptune, and now it is religiously, if not insolently, said that the discovery of Neptune was

not accidental—

That the test of that which is not accidental is ability to do it again—

That it is within the power of anybody, who does not know a hyperbola from a cosine, to find out whether the astronomers are led by a cloud of rubbish by day and a pillar of bosh by night

If, by the magic of his mathematics, any astronomer could have pointed to the position of Neptune, let him point to the planet past Neptune. According to the same reasoning by which a planet past Uranus was supposed to be, a Trans-Neptunian planet may be supposed to be. Neptune shows perturbations similar to those of Uranus.

According to Prof. Todd there is such a planet, and it revolves around the sun once in 375 years. There are two, according to Prof. Forbes, one revolving once in 1,000 years, and the other once in 5,000 years. See Macpherson's *A Century's Progress in Astronomy*. It exists, according to Dr. Eric Doolittle, and revolves once in 283 years (*Sci. Amer.*, 122-641). According to Mr. Hind it revolves once in 1,600 years (*Smithson. Miscell. Cols.*, 20-20).

So then we have found out some things, and, relatively to the oppressions that we felt from our opposition, they are reassuring. But also are they depressing. Because, if, in this existence of ours, there is no prestige higher than that of astronomic science, and, if that seeming of substantial renown has been achieved by a composition of bubbles, what of anything like soundness must there be to all lesser reputes and achievements?

Let three bodies inter-act. There is no calculus by which their inter-actions can be formulated. But there are a thousand inter-acting bodies in this solar system—or supposed solar system—and we find that the highest prestige in our existence is built upon the tangled assertions that there are magicians who can compute in a thousand quantities, though they cannot compute in three.

Then all other so-called human triumphs, or moderate successes, products of anybody's reasoning processes and labors—and what are they, if higher than them all, more academic, austere, rigorous, exact are the methods and the processes of the astronomers? What can be thought of our whole existence, its nature and its destiny?

That our existence, a thing within one solar system, or supposed solar system, is a stricken thing that is mewling through space, shocking able-minded, healthy systems with the sores on its sun, its ghastly moons, its civilizations that are all broken out with sciences; a celestial leper, holding out doddering expanses into which charitable systems drop golden comets? If it be the leprous thing that our findings seem to indicate, there is no encouragement for

us to go on. We cannot discover: we can only betray new symptoms. If I be a part of such a stricken thing, I know of nothing but sickness and sores and rags to reason with: my data will be pustules; my interpretations will be inflammations—

3

Southern plantations and the woolly heads of Negroes pounding the ground—cries in northern regions and round white faces turned to the sky—fiery globes in the sky—a study in black, white, and golden formations in one general glow. Upon the night of Nov. 13-14, 1833, occurred the most sensational celestial spectacle of the nineteenth century: for six hours fiery meteors gushed from the heavens, and were visible along the whole Atlantic coast of the United States.

One supposes that astronomers do not pound the ground with their heads, and presumably they do not screech, but they have feelings just the same. They itched. Here was something to formulate. When he hears of something new and unquestionable in the sky, an astronomer is diseased with ill-suppressed equations. Symbols persecute him for expression. His is the frenzy of someone who would stop automobiles, railroad trains, bicycles, all things, to measure them; run, with a yardstick, after sparrows, flies, all persons passing his door. This is supposed to be scientific, but it can be monomaniac. Very likely the distress and the necessity of Prof. Olmstead were keenest. He was the first to formulate. He "demonstrated" that these meteors, known as the Leonids, revolved around the sun once in six months.

They didn't.

Then Prof. Newton "demonstrated" that the "real" period was thirty-three and a quarter years. But this was done empirically, and that is not divine, nor even aristocratic, and the thing would have to be done rationally, or mathematically, by someone, because, if there be not mathematical treatment, in gravitational terms, of such phenomena, astronomers are in reduced circumstances. It was Dr. Adams, who, emboldened with his experience in not having to point anywhere near Neptune, but nevertheless being acclaimed by all patriotic Englishmen as the real discoverer of Neptune, mathematically "confirmed" Prof. Newton's "findings." Dr. Adams predicted that the Leonids would return in November, 1866, and in November, 1899, occupying several years, upon each occasion, in passing a point in this earth's orbit.

There were meteors upon the night of Nov. 13-14, 1866. They were plentiful.

They often are in the middle of November. They no more resembled the spectacle of 1833 than an ordinary shower resembles a cloudburst. But the "demonstration" required that there should be an equal display, or, according to some aspects, a greater display, upon the corresponding night of the next year. There was a display, the next year; but it was in the sky of the United States, and was not seen in England. Another occurrence nothing like that of 1833 was reported from the United States.

By conventional theory, this earth was in a vast, wide stream of meteors, the earth revolving so as to expose successive parts to bombardment. So keenly did Richard Proctor visualize the earth so immersed and so bombarded, that, when nothing was seen in England, he explained. He spent most of his life explaining. In the *Student*, 2-254, he wrote: "Had the morning of Nov. 14, 1867, been clear in England, we should have seen the commencement of the display, but not its more brilliant part."

We have had some experience with the "triumphs" of astronomers: we have some suspicions as to their greatly advertised accuracy. We shall find out for ourselves whether the morning of Nov. 14, 1867, was clear enough in England or not. We suspect that it was a charming morning, in England—

Monthly Notices, R. A. S. 28-32:

Report by E. J. Lowe, Highfield House, night of Nov. 13-14, 1867:

"Clear at 1.10 A.M.; high, thin cumuli, at 2 A.M., but sky not covered until 3.10 A.M., and the moon's place visible until 3.55 A.M.; sky not overcast until 5.50 A.M."

The determination of the orbital period of thirty-three years and a quarter, but with appearances of a period of thirty-three years, was arrived at by Prof. Newton by searching old records, finding that, in an intersection-period of thirty-three years, there had been extraordinary meteoric displays, from the year 902 A.D. to the year 1833 A.D. He reminds me of an investigator who searched old records for appearances of Halley's comet, and found something that he identified as Halley's comet, exactly on time, every seventy-five years, back to times of the Roman Empire. See the *Edinburgh Review*, vol. 66. It seems that he did not know that orthodoxy does not attribute exactly a seventy-five year period to Halley's comet. He got what he went looking for, anyway. I have no disposition for us to enjoy ourselves at Prof. Newton's expense, because, surely enough, his method, if regarded as only experimental, or tentative, is legitimate enough, though one does suspect him of very loose behavior in his picking and choosing. But Dr. Adams announced that, upon mathematical grounds, he had arrived at the same conclusion.

The test:

The next return of the Leonids was predicted for November, 1899.

Memoirs of the British Astronomical Association, 9-6:

"No meteoric event ever before aroused such widespread interest, or so grievously disappointed anticipation."

There were no Leonids in November, 1899.

It was explained. They would be seen next year.

There were no Leonids in November, 1900.

It was explained. They would be seen next year.

No Leonids.

Vaunt and inflation and parade of the symbols of the infinitesimal calculus; the pomp of vectors, and the hush that surrounds quaternions: but when an axis of co-ordinates loses its rectitude, bin the service of a questionable selection, disciplined symbols become a rabble. The Most High of Mathematics—and one of his proposed prophets points to the sky. Nowhere near where he points, something is found. He points to a date—nothing happens.

Prof. Serviss, in *Astronomy in a Nutshell*, explains. He explains that the Leonids did not appear when they "should" have appeared, because Jupiter and Saturn had altered their orbits.

Back in the times of the Crusades, and nothing was disturbing the Leonids—and if you're stronger for dates than I am, think of some more dates, and nothing was altering the orbit of the Leonids—discovery of America, and the Spanish Armada, in 1588, which, by some freak, I always remember, and no effects by Jupiter and Saturn—French Revolution and on to the year 1866, and still nothing the matter with the Leonids—but, once removed from "discovery" and "identification," and that's the end of their period, diverted by Jupiter and Saturn, old things that had been up in the sky at least as long as they had been. If we're going to accept the calculi at all, the calculus of probabilities must have a hearing. My own opinion, based upon reading many accounts of November meteors, is that decidedly the display of 1833 did not repeat in 1866: that a false priest sinned and that an equally false highpriest gave him sanction.

The tragedy goes comically on. I feel that, to all good Neo-astronomers, I can recommend the following serenity from an astronomer who was unperturbed by what happened to his science, in November, 1899, and some more Novembers

Bryant, *A History of Astronomy*, p. 252:

That the meteoric display of 1899 4 had failed to appear—"as had been predicted by Dr. Downing and Dr. Johnstone Stoney." One starts to enjoy this disguisement, thinking of virtually all the astronomers in the world who had predicted the return of the Leonids, and the finding, by Bryant, of two who had not, and his recording only the opinion of these two, coloring so as to look like another triumph—but we may thank our sorely stimulated suspiciousness for still richer enjoyment—

That even these two said no such saving thing—

Nature, Nov. 9, 1899:

Dr. Downing and Dr. Stoney, instead of predicting failure of the Leonids to appear, advise watch for them several hours later than had been calculated.

I conceive of the astronomers' fictitious paradise as malarchitectural with corrupted equations, and paved with rotten symbols. Seeming pure, white fountains of formal vanities—boasts that are gushing from decomposed triumphs. We shall find their furnishings shabby with tarnished comets. We turn expectantly to the subject of comets; or we turn cynically to the subject. We turn maliciously to the subject of comets. Nevertheless, threading the insecurities of our various feelings, is a motif that is the steady essence of Neo-astronomy:

That, in celestial phenomena, as well as in all other fields of research, the irregular, or the unformulable, or the uncapturable, is present in at least equal representation with the uniform: that, given any clear, definite, seemingly unvarying thing in the heavens, co-existently is something of wantonness or irresponsibility, bizarre and incredible, according to the standards of purists—that the science of Astronomy concerns itself with only one aspect of existence, because of course there can be no science of the obverse phenomena—which is good excuse for so enormously disregarding, if we must have the idea that there are real sciences, but which shows the hopelessness of positively attempting.

The story of the Comets, as not told in Mr. Chambers' book of that title, is almost unparalleled in the annals of humiliation. When a comet is predicted to return, that means faith in the Law of Gravitation. It is Newtonism that comets, as well as planets, obey the Law of Gravitation, and move in one of the conic sections. When a comet does not return when it "should," there is no refuge for an astronomer to say that planets perturbed it, because one will ask why he did not include such factors in his calculations, if these phenomena be subject to mathematical treatment. In his book, Mr. Chambers avoids, or indicates that he never heard of, a great deal that will receive cordiality from us, but he does publish a list of predicted comets that did not return. Writing,

in 1909, he mentions others for which he had hopes:

Brooks' First Periodic Comet (1886, IV)—"We must see what 6 the years 1909 and 1910 bring forth." This is pretty indefinite anticipation—however, nothing was brought forth, according to *Monthly Notices, R. A. S.*, 1909 and 1910: the Brooks' comet that is recorded is Brooks', 1889. Giacobini's Second Periodic Comet (1900, III)—not seen in 1907—"so we shall not have a chance of knowing more about it until 1914." No more known about it in 1914. Borelly's Comet (1905, II)—"Its expected return, in 1911 or 1912, will be awaited with interest." This is pretty indefinite awaiting: it is now said that this comet did return upon Sept. 19, 1911. Denning's Second Periodic Comet (1894, I)—expected, in 1909, but not seen up to Mr. Chambers' time of writing —no mention in Monthly Notices. Swift's Comet, of Nov. 20, 1894—"must be regarded as lost, unless it should be found in December, 1912." No mention of it in *Monthly Notices*.

Three comets were predicted to return in 1913—not one of them returned (*Monthly Notices*, 74-326).

Once upon a time, armed with some of the best and latest cynicisms, I was hunting for prey in the *Magazine of Science*, and came upon an account of a comet that was expected in the year 1848. I supposed that the thing had been positively predicted, and very likely failed to appear, and, for such common game, had no interest. But I came upon the spoor of disgrace, in the word "triumph"—"If it does come, it will afford another astronomical triumph" (*Mag. of Sci.*, 1848-107). The astronomers had predicted the return of a great comet in the year 1848. In *Monthly Notices*, April, 1847, Mr. Hind says that the result of his calculations had satisfied him that the identification had been complete, and that, in all probability, "the comet must be very near." Accepting Prof. Mädler's determinations, he predicted that the comet would return to position nearest the sun, about the end of February, 1848.

No comet.

The astronomers explained. I don't know what the mind of an astronomer looks like, but I think of a fizzle with excuses revolving around it. A writer in the *American Journal of Science*, 2-9-442, explains excellently. It seems that, when the comet failed to return, Mr. Barber, of Etwell, again went over the calculations. He found that, between the years 1556 and 1592, the familiar attractions of Jupiter and Saturn had diminished the comet's period by 263 days, but that something else had wrought an effect that he set down positively at 751 days, with a resulting retardation of 488 days. This is magic that would petrify, with chagrin, the arteries of the hemorrhagicalest statue that ever convinced the faithful—reaching back through three centuries of inter-actions, which, without divine insight, are unimaginable when occurring in three

seconds

But there was no comet.

The astronomers explained. They went on calculating, and ten years later were still calculating. See *Recreative Science*, 1860-139. It would be heroic were it not mania. What was the matter with Mr. Barber, of Etwell, and the intellectual tentacles that he had thrust through centuries is not made clear in most of the contemporaneous accounts; but, in the year 1857, Mr. Hind published a pamphlet and explained. It seems that researches by Littrow had given new verification to a path that had been computed for the comet, and that nothing had been the matter with Mr. Barber, of Etwell, except his insufficiency of data, which had been corrected. Mr. Hind predicted. He pointed to the future, but he pointed like someone closing a thumb and spreading four fingers. Mr. Hind said that, according to Halley's calculations, the comet would arrive in the summer of 1865. However, an acceleration of five years had been discovered, so that the time should be set down for the middle of August, 1860. However, according to Mr. Hind's calculated orbit, the comet might return in the summer of 1864. However, allowing for acceleration, "the comet is found to be due early in August, 1858."

Then Bomme calculated. He predicted that the comet would return upon Aug. 2, 1858.

There was no comet.

The astronomers went on calculating. They predicted that the comet would return upon Aug. 22, 1860.

No comet.

But I think that a touch of mercy is a luxury that we can afford; anyway, we'll have to be merciful or monotonous. For variety we shall switch from a comet that did not appear to one that did appear. Upon the night of June 30, 1861, a magnificent humiliator appeared in the heavens. One of the most brilliant luminosities of modern times appeared as suddenly as if it had dropped through the shell of our solar system—if it be a solar system. There were letters in the newspapers: correspondents wanted to know why this extraordinary object had not been seen coming, by astronomers. Mr. Hind explained. He wrote that the comet was a small object, and consequently had not been seen coming by astronomers. No one could deny the magnificence of the comet; nevertheless Mr. Hind declared that it was very small, looking so large because it was near this earth. This is not the later explanation: nowadays it is said that the comet had been in southern skies, where it had been observed. All contemporaneous astronomers agreed that the comet had come down from the north, and not one of them thought of explaining that it had

been invisible because it had been in the south. A luminosity, with a mist around it, altogether the apparent size of the moon, had burst into view. In *Recreative Science*, 3-143, Webb says that nothing like it had been seen since the year 1680. Nevertheless the orthodox pronouncement was that the object was small and would fade away as quickly as it had appeared. See the *Athenaeum*, July 6, 1861—"So small an object will soon get beyond our view." (Hind)

Popular Science Review, 1-513:

That, in April, 1862, the thing was still visible.

Something else that was seen under circumstances that cannot be considered triumphant—upon Nov. 28, 1872, Prof. Klinkerfues, of Göttingen, looking for Biela's comet, saw meteors in the path of the expected comet. He telegraphed to Pogson, of Madras, to look near the star *Theta Centauri*, and he would see the comet. I'd not say that this was in the field of magic, but it does seem consummate. A dramatic telegram like this electrifies the faithful—an astronomer in the north telling an astronomer far in the south where to look, so definitely naming one special little star in skies invisible in the north. Pogson looked where he was told to look and announced that he saw what he was told to see. But at meetings of the R. A. S., Jan. to and March 14, 1873, Captain Tupman pointed out that, even if Biela's comet had appeared, it would have been nowhere near this star.

Among our later emotions will be indignation against all astronomers who say that they know whether stars are approaching or receding. When we arrive at that subject it will be the preciseness of the astronomers that will perhaps inflame us beyond endurance. We note here the far smaller difficulty of determining whether a relatively nearby comet is coming or going. Upon Nov. 6, 1892, Edwin Holmes discovered a comet. In the *Jour. B. A. A.*, 3-182, Holmes writes that different astronomers had calculated its distance from twenty million miles to two hundred million miles, and had determined its diameter to be all the way from twenty-seven thousand miles to three hundred thousand miles. Prof. Young said that the comet was approaching; Prof. Parkhurst wrote merely that the impression was that the comet was approaching the earth; but Prof. Berberich (*Eng. Mec.*, 56-316) announced that, upon November 6, Holmes' comet had been 36,000,000 miles from this earth, and 6,000,000 miles away upon the 16th, and that the approach was so rapid that upon the 21st the comet would touch this earth.

The comet, which had been receding, kept on receding.

4

NEVERTHELESS I sometimes doubt that astronomers represent especial incompetence. They remind me too much of uplifters and grocers, philanthropists, expert accountants, makers of treaties, characters in international conferences, psychic researchers, biologists. The astronomers seem to me about as capitalists seem to socialists, and about as socialists seem to capitalists, or about as Presbyterians seem to Baptists; as Democrats seem to Republicans, or as artists of one school seem to artists of another school. If the basic fallacies, or the absence of base, in every specialization of thought can be seen by the units of its opposition, why then we see that all supposed foundations in our whole existence are myths, and that all discussion and supposed progress are the conflicts of phantoms and the overthrow of old delusions by new delusions. Nevertheless I am searching for some wider expression that will rationalize all of us—conceiving that what we call irrationality is our view of parts and functions out of relation to an underlying whole; an underlying something that is working out its development in terms of planets and acids and bugs, rivers and labor unions and cyclones, politicians and islands and astronomers. Perhaps we conceive of an underlying nexus in which all things, in our existence, are different manifestations—torn by its hurricanes and quaked by the struggles of Labor against Capital—and then, for the sake of balance, requiring relaxations. It has its rougher hoaxes, and some of the apes and some of the priests, and philosophers and wart hogs are nothing short of horse play; but the astronomers are the ironies of its less peasant-like moments—or the deliciousness of pretending to know whether a far-away star is approaching or receding, and at the same time exactly predicting when a nearby comet, which is receding, will complete its approach. This is cosmic playfulness; such pleasantries enable Existence to bear its catastrophes. Shattered comets and sickened nations and the hydrogenic anguishes of the sun—and there must be astronomers for the sake of relaxations.

It will be important to us that the astronomers shall not be less unfortunate in their pronouncements upon motions of the stars than they have turned out to be in other respects. Especially disagreeable to us is the doctrine that stars are variable because dark companies revolve around them; also we prefer to find that nothing fit for somewhat matured minds has been determined as to stars with light companions that encircle them, or revolve with them. If silence be the only true philosophy, and if every positive assertion be a myth, we should easily find requital for our negative preferences.

Prof. Otto Struve was one of the highest of astronomic authorities, and the faithful attribute triumphs to him. Upon March 19, 1873, Prof. Struve

announced that he had discovered a companion to the star Procyon. That was an interesting observation, but the mere observation was not the triumph. Some time before, Prof. Auwers, as credulous, if not jocular, as Newton and Leverrier and Adams, had computed the orbit of a hypothetic companion of Procyon's. Upon a chart of the stars, he had drawn a circle around Procyon. This orbit was calculated in gravitational terms, and a general theme of ours is that all such calculations are only ideal, and relate no more to stars and planets or anything else than do the spotless theories of uplifters to events that occur as spots in the one wide daub of existence. Specifically we wish to discredit this "triumph" of Struve's and Auwers', but in general we continue our expression that all uses of the calculus of celestial mechanics are false applications, and that this subject is for æsthetic enjoyment only, and has no place in the science of astronomy, if anybody can think that there is such a science. So, after great labor, or after considerable enjoyment, Auwers drew a circle around Procyon, and announced that that was the orbit of a companion-star. Exactly at the point in this circle where it "should" be, upon March 19, 1873, Struve saw the point of light which, it may be accepted, sooner or later someone would see. According to Agnes Clerke (*System of the Stars*, p. 173) over and over Struve watched the point of light, and convinced himself that it moved as it "should" move, exactly in the calculated orbit. In *Reminiscences of an Astronomer*, p, 138, Prof. Newcomb tells the story. According to him, an American astronomer then did more than confirm Struve's observations: he not only saw but exactly measured the supposed companion.

A defect was found between the lenses of Struve's telescope: it was found that this telescope showed a similar "companion," about 10" from every large star. It was found that the more than "confirmatory" determinations by the American astronomer had been upon "a long well-known star." (Newcomb)

Every astronomic triumph is a bright light accompanied by an imbecility, which may for a while make it variable with diminishments, and then be unnoticed. Priestcrafts are not merely tyrannies: they're necessities. There must be more reassuring ways of telling this story. The good priest J. E. Gore (*Studies in Astronomy*, p. 104) tells it safely—not a thing except that, in the year 1873, a companion of Procyon's was, by Struve, "strongly suspected." Positive assurances of the sciences—they are islands of seeming stability in a cosmic jelly. We shall eclipse the story of Algol with some modern disclosures. In all minds not convinced that earnest and devoted falsifiers are holding back Development, the story, if remembered at all, will soon renew its fictitious luster. We are centers of tremors in a quaking black jelly. A bright and shining delusion looks like beaconed security.

Sir Robert Ball, in the *Story of the Heavens*, says that the period in which Algol blinks his magnitudes is 2 days, 20 hours, 48 minutes, and 55 seconds.

He gives the details of Prof. Vogel's calculations upon a speck of light and an invisibility. It is a god-like command that out of the variations of light shall come the diameters of faint appearances and the distance and velocity of the unseeable—that the diameter of the point of light is 1,054,000 miles, and that the diameter of the imperceptibility is 825,000 miles, and that their centers are 3,220,000 miles apart: orbital velocity of Algol, 26 miles a second, and the orbital velocity of the companion, 55 miles a second—should be stated 26.3 miles and 55.4 miles a second (Proctor,*Old and New Astronomy*, p. 773).

We come to a classic imposition like this, and at first we feel helpless. We are told that this thing is so. It is as if we were modes of motion and must go on, but are obstructed by an absolute bar of ultimate steel, shining, in our way, with an infinite polish. But all appearances are illusions.

No one with a microscope doubts this; no one who has gone specially from ordinary beliefs into minuter examination of any subject doubts this, as to his own specific experience—so then, broadly, that all appearances are illusions, and that, by this recognition, we shall dissipate resistances, monsters, dragons, oppressors that we shall meet in our pilgrimage. This bar-like calculation is itself a mode of motion. The static cannot absolutely resist the dynamic, because in the act of resisting it becomes itself proportionately the dynamic. We learn that modifications rusted into the steel of our opposition. The period of Algol, which Vogel carried out to a minute's 55th second, was, after all, so incompetently determined that the whole imposition was nullified—

Astronomical Journal, 11-553:

That, according to Chandler, Algol and his companion do not revolve around each other merely, but revolve together around some second imperceptibility —regularly.

Bull. Soc. Astro. de France, October, 5950:

That M. Mora has shown that in Algol's variations there were irregularities that neither Vogel nor Chandler had accounted for.

The Companion of Sirius looms up to our recognition that the story must be nonsense, or worse than nonsense—or that two light comedies will now disappear behind something darker. The story of the Companion of Sirius is that Prof. Auwers, having observed, or in his mania for a pencil and something to scribble upon, having supposed he had observed, motions of the star Sirius, had deduced the existence of a companion, and had inevitably calculated its orbit. Early in the year 1862, Alvan Clark, Jr., turned his new telescope upon Sirius, and there, precisely where, according to Auwers' calculations, it should be, saw the companion. The story is told by Proctor, writing thirty years later: the finding of the companion, in the "precise position of the calculations";

Proctor's statement that, in the thirty years following, the companion had "conformed fairly well with the calculated orbit."

According to the *Annual Record of Science and Industry*, 1876-58, the companion, in half the time mentioned by Proctor, had not moved in the calculated orbit. In the *Astronomical Register*, 15-186, there are two diagrams by Flammarion: one is the orbit of the companion, as computed by Auwers; the other is the orbit, according to a mean of many observations. They do not conform fairly well. They do not conform at all.

I am now temporarily accepting that Flammarion and the other observing astronomers are right, and that the writers like Proctor, who do not say that they made observations of their own, are wrong, though I have data for thinking that there is no such companion-star. When Clark turned his telescope upon Sirius, the companion was found exactly where Auwers said it would be found. According to Flammarion and other astronomers, had he looked earlier or later it would not have been in this position. Then, in the name of the one calculus that astronomers seem never to have heard of, by what circumstances could that star have been precisely where it should be, when looked for, Jan. 31, 1862, if, upon all other occasions, it would not be where it should be?

Astronomical Register, 1-94:

A representation of Sirius—but with six small stars around him an account, by Dr. Dawes, of observations, by Goldschmidt, upon h e "companion" and five other small stars near Sirius. Dr. Dawes' accusation, or opinion, is that it scarcely seems possible that some of these other stars were not seen by Clark. If Alvan Clark saw six stars, at various distances from Sirius, and picked out the one that was at the required distance, as if that were the only one, he dignifies our serials with a touch of something other than comedy. For Goldschmidt's own announcement, see *Monthly Notices*, R. A. S., 23-181, 243.

5

Smugness and falseness and sequences of re-adjusting fatalities—and yet so great is the hypnotic power of astronomic science that it can outlive its "mortal" blows by the simple process of forgetting them, and, in general, simply by denying that it can make mistakes. Upon page 245, *Old and New Astronomy*, Richard Proctor says—"The ideas of astronomers in these questions of distance have not changed, and, in the present position of astronomy, based (in such respects) on absolute demonstration, they cannot

change."

Sounds that have roared in the sky, and their vibrations have shaken down villages—if these be the voices of Development, commanding that opinions shall change, we shall learn what will become of the Proctors and their "absolute demonstrations." Lights that have appeared in the sky—that they are gleams upon the armament of Marching Organization. "There can be only one explanation of meteors"—I think it is that they are shining spear-points of slayers of dogmas. I point to the sky over a little town in Perthshire, Scotland—there may be a new San Salvador—it may be a new Plymouth Rock. I point to the crater Aristarchus, of the moon—there, for more than a century, a lighthouse may have been signaling. Whether out of profound meditations, or farrago and bewilderment, I point, directly, or miscellaneously, and, if only a few of a multitude of data be accepted, unformulable perturbations rack an absolute sureness, and the coils of our little horizons relax their constrictions.

I indicate that, in these pages, which are banners in a cosmic procession, I do feel a sense of responsibility, but how to maintain any great seriousness I do not know, because still is our subject astronomical "triumphs."

Once upon a time there was a young man, aged eighteen, whose name was Jeremiah Horrox. He was no astronomer. He was interested in astronomic subjects, but it may be that we shall agree that a young man of eighteen, who had not been heard of by one astronomer of his time, was an outsider. There was a transit of Venus in December, 1639, but not a grown-up astronomer in the world expected it, because the not always great and infallible Kepler had predicted the next transit of Venus for the year 1761. According to Kepler, Venus would pass below the sun in December, 1639. But there was another calculation: it was by the great, but sometimes not so great, Lansberg: that, in December, 1639, Venus would pass over the upper part of the sun. Jeremiah Horrox was an outsider. He was able to reason that, if Venus could not pass below the sun, and also over the upper part of the sun, she might take a middle course. Venus did pass over the middle part of the sun's disc; and Horrox reported the occurrence, having watched it.

I suppose this was one of the most agreeable humiliations in the annals of busted inflations. One thinks sympathetically of the joy that went out from seventeenth-century Philistines. The story is told to this day by the Proctors and Balls and Newcombs: the way they tell this story of the boy who was able to conclude that something that could not occupy two extremes might be intermediate, and thereby see something that no professional observer of the time saw, is a triumph of absorption:

That the transit of Venus, in December, 1639, was observed by Jeremiah Horrox, "the great astronomer."

We shall make some discoveries as we go along, and some of them will be worse thought of than others, but there is a discovery here that may be of interest: the secret of immortality—that there is a mortal resistance to everything; but that the thing that an keep on incorporating, or assimilating within itself, its own mortal resistances, will live forever. By its absorptions, the science of astronomy perpetuates its inflations, but there have been instances of indigestion. See the *New York Herald*, Sept. 16, 1909. Here Flammarion, who probably no longer asserts any such thing, claims Dr. Cook's "discovery of the north pole" as an "astronomical conquest." Also there are other ways. One suspects that the treatment that Dr. Lescarbault received from Flammarion illustrates other ways.

In the year 1859, it seems that Dr. Lescarbault was something of an astronomer. It seems that as far back as that he may have known a planet when he saw one, because, in an interview, he convinced Leverrier that he did know a planet when he saw one. He had at least heard of the planet Venus, because in the year 1882 he published a paper upon indications that Venus has an atmosphere. Largely because of an observation, or an announcement, of his, occurred the climax of Leverrier's fiascos: prediction of an intra-Mercurial planet that did not appear when it "should" appear. My suspicion is that astronomers pardonably, but frailly, had it in for Lescarbault, and that in the year 1891 came an occurrence that one of them made an opportunity. Early in the year 1891, Dr. Lescarbault announced that, upon the night of Jan. II, 1891, he had seen a new star. At the next meeting of the French Academy, Flammarion rose, spoke briefly, and sat down without over-doing. He said that Lescarbault had "discovered" Saturn.

If a navigator of at least thirty years' experience should announce that he had discovered an island, and if that island should turn out to be Bermuda, he would pair with Lescarbault—as Flammarion made Lescarbault appear. Even though I am a writer upon astronomical subjects, myself, I think that even I should know Saturn, if I should see him, at least in such a period as the year 1891, when the rings were visible. It is perhaps an incredible mistake. However. it will be agreeable to some of us to find that astronomers have committed just such almost incredible mistakes—

In *Cosmos*, n. s., 42-467, is a list of astronomers who reported "unknown" dark bodies that they had seen crossing the disc of the sun:

La Concha Montevideo Nov. 5, 1789;

Keyser Amsterdam Nov. 9, 1802;

Fisher Lisbon May 5, 1832;

Houzeau Brussels May 8, 1845.

According to the *Nautical Almanac*, the planet Mercury did cross the disc of the sun upon these dates.

It is either that the Flammarions do so punish those who see the new and the undesired, or that astronomers do "discover" Saturn, and do not know Mercury when they see him—and that Buckle overlooked something when he wrote that only the science of history attracts inferior minds often not fit even for clergymen.

Whatever we think of Flammarion, we admire his deftness. But we shall have an English instance of the ways in which Astronomy maintains itself and controls those who say that they see that which they "should" not see, which does seem beefy. One turns the not very attractive-looking pages of the *English Mechanic*, 1893, casually, perhaps, at any rate in no expectations of sensations—glaring at one, sketch of such a botanico-pathologic monstrosity as a muskmelon with rows of bunions on it (*English Mechanic*, Oct. 20, 1893). The reader is told, by Andrew Barclay, F.R.A.S., Kilmarnock, Scotland, that this enormity is the planet Jupiter, according to the speculum of his Gregorian telescope.

In the next issue of the *English Mechanic*, Capt. Noble, F.R.A.S., writes, gently enough, that, if he had such a telescope, he would dispose of the optical parts for whatever they would bring, and would make a chimney cowl of the tube.

English Mechanic, 1893-2-309—the planet Mars, by Andrew Barclay—a dark sphere, surrounded by a thick ring of lighter material; attached to it, another sphere, of half its diameter—a sketch as gross and repellent to a conventionalist as the museum-freak, in whose body the head of his dangling twin is embedded, its dwarfed body lopping out from his side. There is a description by Mr. Barclay, according to whom the main body is red, and the protuberance blue.

Capt. Noble—"Preposterous … last straw that breaks the camel's back!"

Mr. Barclay comes back with some new observations upon Jupiter's lumps, and then in the rest of the volume is not heard from again. One reads on, interested in quieter matters, and gradually forgets the controversy

English Mechanic, Aug. 23, 5897:

A gallery of monstrosities: Andrew Barclay, signing himself "F.R.A.S.," exhibiting:

The planet Jupiter, six times encircled with lumps; afflicted Mars, with his partly embedded twin reduced in size, but still a distress to all properly trained observers; the planet Saturn, shaped like a mushroom with a ring around it.

Capt. Noble—"Mr. Barclay is not a Fellow of the Royal Astronomical Society, and, were the game worth the candle, might be restrained by injunction from so describing himself!" And upon page 362, of this volume of the *English Mechanic*, Capt. Noble calls the whole matter "a pseudo F.R.A.S.'s crazy hallucinations."

Lists of the Fellows of the Royal Astronomical Society, from June, 1875, to June, 1896:

"Barclay, Andrew, Kilmarnock, Scotland; elected Feb. 8, 1856."

I cannot find the list for 1897 in the libraries. List for 1898—Andrew Barclay's name omitted. Thou shalt not see lumps on Jupiter.

Every one of Barclay's observations has something to support it. All conventional representations of Jupiter show encirclements by strings of rotundities that we are told are cloud-forms, but, in the *Jour. B. A. A.*, December, 1910, is published a paper by Dr. Downing, entitled "Is Jupiter Humpy?" suggesting that various phenomena upon Jupiter agree with the idea that there are protuberances upon the planet. A common appearance, said to be an illusion, is Saturn as an oblong, if not mushroom-shaped: see any good index for observations upon the "square-shouldered aspect" of Saturn. In *L'Astronomie*, 1889-135, is a sketch of Mars, according to Fontana, in the year 1636—a sphere enclosed in a ring; in the center of the sphere a great protruding body, said, by Fontana, to have looked like a vast, black cone.

But, whether this or that should amuse or enrage us, should be accepted or rejected, is not to me the crux; but Andrew Bar-clay's own opening words are:

That, through a conventional telescope, conventional appearances are seen, and that a telescope is tested by the conventionality of its disclosures; but that there may be new optical principles, or applications, that may be, to the eye and the present telescope, what once the conventional telescope was to the eye —in times when scientists refused to look at the preposterous, enraging, impossible moons of Jupiter.

In the *English Mechanic*, 33-327, is a letter from the astronomer, A. Stanley Williams. He had written previously upon double stars, their colors and magnitudes. Another astronomer, Herbert Sadler, had pointed out some errors. Mr. Williams acknowledges the errors, saying that some were his own, and that some were from Smyth's *Cycle of Celestial Objects*. In the *English Mechanic*, 33-377, Sadler says that, earnestly, he would advise Williams not to use the new edition of Smyth's *Cycle*, because, with the exception of vol. 40, *Memoirs of the Royal Astronomical Society*, "a more disgracefully inaccurate" catalogue of double stars had never been published. "If," says one astronomer to the other astronomer, "you have a copy of this miserable

production, sell it for waste paper. It is crammed with the most stupid errors."

A new character appears. He is George F. Chambers, F.R.A.S., author of a long list of astronomical works, and a tract, entitled, *Where Are You Going, Sunday?* He, too, is earnest. In this early correspondence, nothing ulterior is apparent, and we suppose that it is in the cause of Truth that he is so earnest. Says one astronomer that the other astronomer is "evidently one of those self-sufficient young men, who are nothing, if not abusive." But can Mr. Sadler have so soon forgotten what was done to him, on a former occasion, after he had slandered Admiral Smyth? Chambers challenges Sadler to publish a list of, say, fifty "stupid errors" in the book. He quotes the opinion of the Astronomer Royal: that the book was a work of "sterling merit." "Airy vs. Sadler," he says: "which is it to be?"

We began not very promisingly. Few excitements seemed to lurk in such a subject as double stars, their colors and magnitudes; but slander and abuse are livelier, and now enters curiosity: we'd like to know what was done to Herbert Sadler.

Late in the year 1876, Herbert Sadler was elected a Fellow of the Royal Astronomical Society. In *Monthly Notices, R.A.S.*, January, 1879, appears his first paper that was read to the Society: Notes on the late Admiral Smyth's *Cycle of Celestial Objects, volume second, known as the Bedford Catalogue*. With no especial vehemence, at least according to our own standards of repression, Sadler expresses himself upon some "extraordinary mistakes" in this work.

At the meeting of the Society, May 9, 1879, there was an attack upon Sadler, and it was led by Chambers, or conducted by Chambers, who cried out that Sadler had slandered a great astronomer, and demanded that Sadler should resign. In the report of this meeting, published in the Observatory, there is not a trace of anybody's endeavors to find out whether there were errors in this book or not: Chambers ignored everything but his accusation of slander, and demanded again that Sadler should resign. In *Monthly Notices*, 39-389, the Council of the Society published regrets that it had permitted publication of Sadler's paper, "which was entirely unsupported by the citation of instances upon which his judgment was founded."

We find that it was Mr. Chambers who had revised and published the new edition of Smyth's Cycle.

In the *English Mechanic*, Chambers challenged Sadler to publish, say, fifty "stupid errors." See page 451, vol. 33, *English Mechanic*—Sadler lists just fifty "stupid errors." He says that he could have listed, not 50, but 250, not trivial, but of the "grossest kind." He says that in one set of 167 observations,

117 were wrong.

The *English Mechanic* drops out of this comedy with the obvious title, but developments go on. Evidently withdrawing its "regrets," the Council permitted publication of a criticism of Chambers' edition of Smyth's *Cycle*, in *Monthly Notices*, 40-497, and the language in this criticism, by S. W. Burnham, was no less interpretable as slanderous than was Sadler's: that Smyth's data were "either roughly approximate or grossly incorrect, and so constantly recurring that it was impossible to explain that they were ordinary errors of observation." Burnham lists 30 pages of errors.

Following is a paper by E. B. Knobel, who published 17 pages of instances in which, in his opinion, Mr. Burnham had been too severe. Knowing of no objection by Burnham to this reduction, we have left 13 pages of errors in one standard astronomical work, which may fairly be considered as representative of astronomical work in general, inasmuch as it was, in the opinion of the Astronomer Royal, a book of "sterling merit."

I think that now we have accomplished something. After this we should all get along more familiarly and agreeably together.

Thirteen pages of errors in one standard astronomical work are reassuring; there is a likeable fallibility here that should make for better relations. If the astronomers were what they think they are, we might as well make squeaks of disapproval against Alpine summits. As to astronomers who calculate positions of planets—of whom he was one—Newcomb, in *Reminiscences of an Astronomer*, says—"The men who have done it are therefore, in intellect, the select few of the human race—an aristocracy above all others in the scale of being." We could never get along comfortably with such awful selectness as that. We are grateful to Mr. Sadler, in the cause of more comfortable relations.

6

English Mechanic, 56-184:

THAT, upon April 25, 1892, Archdeacon Nouri climbed Mt. Ararat. It was his hope that he should find something of archæologic compensation for his clamberings. He found Noah's Ark.

About the same time, Dr. Holden, Director of the Lick Observatory, was watching one of the polished and mysterious-looking instruments that, in the new ikonology, have replaced the images of saints. Dr. Holden was waiting for the appointed moment of the explosion of a large quantity of dynamite in San

Francisco Bay. The moment came. The polished little "saint" revealed to the faithful scientist. He wrote an account of the record, and sent copies to the San Francisco newspapers. Then he learned that the dynamite had not been fired off. He sent a second messenger after the first messenger, and, because messengers sometimes have velocities proportional to urgencies—"the Observatory escaped ridicule by a narrow margin." See the*Observatory*, 20-467. This revelation came from Prof. Colton, who, though probably faithful to all the "saints," did not like Dr. Holden.

The system that Archdeacon Nouri represented lost its power be. cause its claims exceeded all conceivableness, and because, in other respects, of its inertness to the obvious. The system that Dr. Holden represented is not different: there is the same seeing of whatever may be desirable, and the same profound meditations upon the remote, with the same inattention to fairly acceptable starting-points. The astronomers like to tell audiences of just what gases are burning in an unimaginably remote star, but have never reasonably made acceptable, for instance, that this earth is round, to start with. Of course I do not mean to say that this, or anything else, can be positively proved, but it is depressing to hear it said, so authoritatively, that the round shadow of this earth upon the moon proves that this earth is round, whereas records of angular shadows are common, and whereas, if this earth were a cube, its straight sides would cast a rounded shadow upon the convex moon. That the first part of a receding vessel to disappear should be the lower part may be only such an illusion of perspective as that by which railroad tracks seem to dip toward each other in the distance. Meteors sometimes appear over one part of the horizon and then seem to curve down behind the opposite part of the horizon, whereas they describe no such curve, because to a string of observers each observer is at the center of the seeming curve.

Once upon a time—about the year 1870—occurred an unusual sporting event. John Hampden, who was noted for his piety and his bad language, whose avowed purpose was to support the principles of this earth's earliest geodesist, offered to bet five hundred pounds that he could prove the flatness of this earth. Somewhere in England is the Bedford Canal, and along a part of it is a straight, unimpeded view, six miles in length. Orthodox doctrine—or the doctrine of the newer orthodoxy, because John Hampden considered that he was orthodox—is that the earth's curvature is expressible in the formula of 8 inches for the first mile, and then the square of the distance times 8 inches. For two miles, then, the square of 2, or 4, times 8. An object six miles away should be depressed 288 inches, or, allowing for refraction, according to Proctor (*Old and New Astronomy*) 216 inches. Hampden said that an object six miles away, upon this part of the Bedford Canal, was not depressed as it "should" be. Dr. Alfred Russell Wallace took up the bet. Mr. Walsh, Editor of the *Field*, was the

stakeholder. A procession went to the Bedford Canal. Objects were looked at through telescopes, or looked for, and the decision was that Hampden had lost. There was rejoicing in the fold of the chosen, though Hampden, in one of his most furious bombardments of verses from the Bible, charged conspiracy and malfeasance and confiscation, and what else I don't know, piously and intemperately declaring that he had been defrauded.

In the *English Mechanic*, 80-40, someone writes to find out about the "Bedford Canal Experiment." We learn that the experiment had been made again. The correspondent writes that, if there were basis to the rumors that he had heard, there must be something wrong with established doctrine. Upon page 138, Lady Blount answers—that, upon May 11, 1904, she had gone to the Bedford Canal, accompanied by Mr. E. Clifton, a well-known photographer, who was himself uninfluenced by her motives, which were the familiar ones of attempting to restore the old gentleman who first took up the study of geodesy. However, she seethes with neither piety nor profanity. She says that, with his telescopic camera, Mr. Clifton had photographed a sheet, six miles away, though by conventional theory the sheet should have been invisible. In a later number of the *English Mechanic*, a reproduction of this photograph is published. According to this evidence this earth is flat, or is a sphere enormously greater than is generally supposed. But at the 1901 meeting of the British Association for the Advancement of Science, Mr. H. Yule Oldham read a paper upon his investigations at the Bedford Canal. He, too, showed photographs. In his photographs, everything that should have been invisible was invisible.

I accept that anybody who is convinced that still are there relics upon Mt. Ararat, has only to climb Mt. Ararat, and he must find something that can be said to be part of Noah's Ark, petrified perhaps. If someone else should be convinced that a mistake has been made, and that the mountain is really Pike's Peak, he has only to climb Pike's Peak and prove that the most virtuous of all lands was once the Holy Land. The meaning that I read in the whole subject is that, in this Dark Age that we're living in, not even such rudimentary matters as the shape of this earth have ever been investigated except now and then to support somebody's theory, because astronomers have instinctively preferred the remote and the not so easily understandable and the safe from external inquiry. In *Earth Features and Their Meaning*, Prof. Hobbs says that this earth is top-shaped, quite as the sloping extremities of Africa and South America suggest. According to Prof. Hobbs, observations upon the pendulum suggest that this earth is shaped like a top. Some years ago, Dr. Gregory read a paper at a meeting of the Royal Geographical Society, giving data to support the theory of a top-shaped earth. In the records of the Society, one may read a report of the discussion that followed. There was no ridiculing. The President

of the Society closed the discussion with virtual endorsement, recalling that it was Christopher Columbus who first said that this earth is top-shaped. For other expressions of this revolt against ancient dogmas, see *Bull. Soc. Astro. de France*, 17-315; 18-143; *Pop. Sci. News*, 31-234; *Eng. Mec.*, 77-159; *Sci. Amer.*, 100-441.

As to supposed motions of this earth, axial and orbital, circumstances are the same, despite the popular supposition that the existence of these motions has been established by syntheses of data and by unanswerable logic. All scientists, philosophers, religionists, are today looking back, wondering what could have been the matter with their predecessors to permit them to believe what they did believe. Granted that there will be posterity, we shall be predecessors. Then what is it that is conventionally taught today that will in the future seem as imbecilic as to all present orthodoxies seem the vaporings of preceding systems?

Well, for instance, that it is this earth that moves, though the sun seems to, by the same illusion by which to passengers on a boat, the shore seems to move, though it is the boat that is moving.

Apply this reasoning to the moon. The moon seems to move around the earth —but to passengers on a boat, the shore seems to move, whereas it is the boat that is moving—therefore the moon does not move.

As to the motions of the planets and stars that co-ordinate with the idea of a moving earth—they co-ordinate equally well with the idea of a stationary earth.

In the system that was conceived by Copernicus I find nothing that can be said to resemble foundation: nothing but the appeal of greater simplicity. An earth that rotates and revolves is simpler to conceive of than is a stationary earth with a rigid composition of stars, swinging around it, stars kept apart by some. unknown substance, or inter-repulsion. But all those who think that simplification is a standard to judge by are referred to Herbert Spencer's compilations of data indicating that advancing knowledge complicates, making, then, complexity, and not simplicity, the standard by which to judge the more advanced. My own acceptance is that there are fluxes one way and then the other way: that the Ptolemaic system was complex and was simplified; that, out of what was once a clarification, new complications have arisen, and that again will come flux toward simplification or clarification—that the simplification by Copernicus has now developed into an incubus of unintelligibilities revolving around a farrago of inconsistencies, to which the complexities of Ptolemy are clear geometry: miracles, incredibilities, puerilities; tottering deductions depending upon flimsy agreements; brutalized observations that are slaves to infatuated principles

And one clear call that is heard above the rumble of readjusting collapses—the call for a Neo-astronomy—it may not be our Neo-astronomy.

Prof. Young, for instance, in his *Manual of Astronomy*, says that there are no common, obvious proofs that the earth moves around the sun, but that there are three abstrusities, all of modern determination. Then, if Copernicus founded the present system, he founded upon nothing. He had nothing to base upon. He either never heard of, or could not detect one of these abstrusities. All his logic is represented in his reasoning upon this earth's rotundity: that this earth is round, because of a general tendency to sphericity, manifesting, for instance, in fruits and in drops of water—showing that lie must have been unaware not only of abstrusities, but of icicles and bananas and oysters. It is not that I am snobbishly deriding the humble and more than questionable ancestry of modern astronomy. I am pointing out that a doctrine came into existence with nothing for a foundation: not a datum, not one observation to found upon; no astronomical principles, no mechanical principles to justify it. Our inquiry will be as to how, in the annals of false architecture, it could ever be said that—except miraculously, of course—a foundation was subsequently slipped under this baseless structure, dug under, rammed under, or God knows how devised and fashioned.

7

THE three abstrusities: The aberration of light, the annual parallax of the stars, the regular, annual shift of the lines of the stellar spectra. By the aberration of light is meant a displacement of all stars, during a year's observation, by which stars near the pole of the ecliptic describe circles, stars nearer the ecliptic describe ellipses, and the stars of the ecliptic, only little straight lines. It is supposed that light has velocity, and that these forms represent the ratio between the velocity of light and the supposed velocity of this earth in its orbit. In the year 1725, Bradley conceived of the present orthodox explanation of the aberration-forms of the stars: that they reflect or represent the path that this earth traverses around the sun, as it would look from the stars, appearing virtually circular from stars in the pole of the ecliptic, for instance. In Bradley's day there were no definite delusions as to the traversing by this earth of another path in space, as part of a whole moving system, so Bradley felt simple and satisfied. About a century later by some of the most amusing reasoning that one could be entertained with, astronomers decided that the whole supposed solar system is moving, at a rate of about 13 miles a second from the region of Sirius to a point near Vega, all this occurring in northern skies, because southern astronomers had not very much to say at that time.

Now, then, if at one time in the year, and in one part of its orbit, this earth is moving in the direction in which the whole solar system is moving, there we have this earth traversing a distance that is the sum of its own motion and the general motion; then when the earth rounds about and retraces, there we have its own velocity minus the general velocity. The first abstrusity, then, is knocked flat on its technicalities, because the aberration-forms, then, do not reflect the annual motion of this earth: if, in conventional terms, though the path of this earth is circular or elliptic relatively to the sun, when compounding with solar motion it is not so formed relatively to stars; and there will have to be another explanation for the aberration-forms.

The second supposed proof that this earth moves around the sun is in the parallax of the stars. In conventional terms, it is said that opposite points in this earth's orbit are 185,000,000 miles apart. It is said that stars, so differently viewed, are minutely displaced against their backgrounds. Again solar-motion —if, in conventional terms, this earth has been traveling, as part of the solar system, from Sirius, toward Vega, in 2,000 years this earth has traveled 819,936,000,000 miles. This distance is 4,500 times the distance that is the base line for orbital parallax. Then displacement of the stars by solar-motion parallax in 2,000 years, should be 4,500 times the displacement by orbital parallax, in one year. Give to orbital parallax as minute a quantity as is consistent with the claims made for it, and 4,500 times that would dent the Great Dipper and nick the Sickle of Leo, and perhaps make the Dragon look like a dragon. But not a star in the heavens has changed more than doubtfully since the stars were catalogued by Hipparchus, 2,000 years ago. If, then, there be minute displacements of stars that are attributed to orbital parallax, they will have to be explained in some other way, if evidently the sun does not move from Sirius toward Vega, and if then, quite as reasonably, this earth may not move.

Prof. Young's third "proof" is spectroscopic.

To what degree can spectroscopy in astronomy be relied upon? Bryant, *A History of Astronomy*, p. 206:

That, according to Bélopolsky, Venus rotates in about 24 hours, as determined by the spectroscope; that, according to Dr. Slipher, Venus rotates in about 224 days, as determined by the spectroscope.

According to observations too numerous to make it necessary to cite any, the seeming motions of stars, occulted by the moon, show that the moon has atmosphere. According to the spectroscope, there is no atmosphere upon the moon (*Pubs. Astro. Soc. Pacific*, vol. 6, no. 37)

The ring of light around Venus, during the transits of 1874 and 1882, indicated

that Venus has atmosphere. Most astronomers say that Venus has an atmosphere of extreme density, obscuring the features of the planet. According to spectrum analysis, by Sir William Huggins, Venus has no atmosphere (*Eng. Mec.*, 4-22).

In the *English Mechanic*, 89-439, are published results of spectroscopic examinations of Mars, by Director Campbell, of the Lick Observatory: that there is no oxygen, and that there is no water vapor on Mars. In *Monthly Notices, R.A.S.*, 27-178, are published results of spectroscopic examinations of Mars by Huggins: abundance of oxygen; same vapors as the vapors of this earth.

These are the amusements of our Pilgrim's Progress, which has new San Salvadors for its goals, or new Plymouth Rocks for its expectations—but the experiences of pilgrims have variety—

In 1895, at the Allegheny Observatory, Prof. Keeler undertook to determine the rotation-period of Saturn's rings, by spectroscopy. It is gravitational gospel that particles upon the outside of the rings move at the rate of 10.69 miles a second; particles upon the inner edge, 13.01 miles a second. Prof. Keeler's determinations were what Sir Robert Ball calls "brilliant confirmation of the mathematical deduction." Prof. Keeler announced that according to the spectroscope, the outside particles of the rings of Saturn move at the rate of 10.1 miles a second, and that the inner particles move at the rate of 12.4 miles a second—"as they ought to," says Prof. Young, in his gospel, *Elements of Astronomy*.

One reads of a miracle like this, the carrying out into decimals of different speeds of different particles in parts of a point of light, the parts of which cannot be seen at all without a telescope, whereby they seem to constitute a solid motionless structure, and one admires, or one worships, according to one's inexperience

Or there comes upon one a sense of imposture and imposition that is not very bearable. Imposition or imposture or captivation—and it's as if we've been trapped and have been put into a revolving cage, some of the bars revolving at unthinkable speed, and other bars of it going around still faster, even though not conceivable. Disbelieve as we will, deride and accuse, and think of all the other false demonstrations that we have encountered, as we will—there's the buzz of the bars that encircle us. The concoction that has caged us is one the most brilliant harlots in modern prostitution: we're imprisoned at the pleasure of a favorite in the harem of the God of Gravitation. That's some relief: language always is—but how are we to determine" that the rings of Saturn do not move as they "ought" to, and thereby add more to the discrediting of spectroscopy in astronomy?

A gleam on a planet that's like shine on a sword to deliver us—

The White Spot of Saturn—

A bright and shining deliverer.

There's a gleam that will shatter concoctions and stop velocities. There's a shining thing on the planet Saturn, and the blow that it shines is lightning. Thus far has gone a revolution of 10.1 miles a second, but it stops by magic against magic; no farther buzzes a revolution of 12.4 miles a second—that the rings of Saturn may not move as, to flatter one little god, they "ought" to, because, by the handiwork of Universality, they may be motionless.

Often has a white spot been seen upon the rings of Saturn: by Schmidt, Bond, Secchi, Schroeter, Harding, Schwabe, De Vico—a host of other astronomers.

It is stationary.

In the *English Mechanic*, 49-195, Thomas Gwyn Elger publishes a sketch of it as he saw it upon the nights of April 18 and 20, 1889. It occupied a position partly upon one ring and partly upon the other, showing no distortion. Let Prof. Keeler straddle two concentric merry-go-rounds, whirling at different velocities: there will be distortion. See vol. 49, *English Mechanic*, for observation after observation by astronomers upon this appearance, when seen for several months in the year 1889, the observers agreeing that, no matter what are the demands of theory, this fixed spot did indicate that the rings of Saturn do not move.

The White Spot on Saturn has blasted minor magic. He has little, black retainers who now function in the cause of completeness—the little, black spots of Saturn—

Nature, 53.109:

That, in July and August, 1895, Prof. Mascari, of the Catania Observatory, had seen dark spots upon the crepe ring of Saturn. The writer in *Nature* says that such duration is not easy to explain, if the rings of Saturn be formations of moving particles, because different parts of the discolored areas would have different velocities, so that soon would they distort and diffuse.

Certainly enough, relatively to my purpose, which is to find out for myself, and to find out with anybody else who may be equally impressed with a necessity, a brilliant, criminal thing has been slain by a gleam of higher intensity. Certainly enough, then, with the execution of one of its foremost exponents, the whole subject of spectroscopy in astronomy has been cast into rout and disgrace, of course only to ourselves, and not in the view of manufacturers of spectroscopes, for instance; but a phantom thing dies a

phantom death, and must be slain over and over again.

I should say that just what is called the spectrum of a star is not commonly understood. It is one of the greatest uncertainties in science. The spectrum of a star is a ghost in the first place, but this ghost has to be further attenuated by a secondary process, and the whole appearance trembles so with the twinkling of a star that the stories told by spectra are gasps of palsied phantoms. So it is that, in one of the greatest indefinitenesses in science, an astronomer reads in a bewilderment that can be made to correspond with any desideratum. So it is our acceptance that when any faint, tremulous story told by a spectrum becomes standardized, the conventional astronomer is told, by the spectroscope, what he should be told, but that when anything new appears, for which there is no convention, the bewilderment of the astronomers is made apparent, and the worthlessness of spectroscopy in astronomy is shown to all except those who do not want to be shown. Upon the first of February, 1892, Dr. Thomas D. Anderson, of Edinburgh, discovered a new star that became known as Nova Aurigae. Here was something as to which there was no dogmatic "determination." Each astronomer had to see, not what he should, but what he could. We shall see that the astronomers might as well have gone, for information, to some of Mrs. Piper's "controls" as to think of depending upon their own ghosts.

In *Monthly Notices*, February, 1893, it is said that probably for seven weeks, up to the time of calculation, one part of this new star had been receding at a rate of 230 miles a second, and another part approaching at a rate of 320 miles a second, giving to these components a distance apart of 550 miles × 60 × 60 × 24 × 49, whatever that may be.

But there was another séance. This time Dr. Vogel was the medium. The ghosts told Dr. Vogel that the new star had three parts, one approaching this earth at the rate of about 420 miles a second, another approaching at a rate of 22 miles a second, a third part receding at a rate of 300 miles a second. See *Jour. B. A. A.*, 2-258.

After that, the "controls" became hysterical. They flickered that there were six parts of this new star, according to Dr. Lowell's*Evolution of Worlds*, p. 9. The faithful will be sorry to read that Lowell revolted. He says: "There is not room for so many on the stage of the cosmic drama." For other reasons for repudiating spectroscopy, or spiritualism, in astronomy, read what else Lowell says upon this subject.

Nova Aurigae became fainter. Accordingly, Prof. Klinkerfues "found" that two bodies had passed, and had inflamed, each other, and that the light of their mutual disturbances would soon disappear (*Jour. B. A. A.*, 2-365).

Nova Aurigae became brighter. Accordingly, Dr. Campbell "determined" that it was approaching this earth at a rate of 128 miles a second (*Jour. B. A. A.*, 2-504).

Then Dr. Espin went into a trance. It was revealed to him that the object was a nebula (*Eng. Mec.*, 56-61). Communication from Dr. and Mrs. Huggins, to the Royal Society—not a nebula, but a star (*Eng. Mec.*, 57-397) . See *Nature*, 47-352, 425—that, according to M. Eugen Gothard, the spectrum of N. A. agreed "perfectly" with the spectrum of a nebula: that, according to Dr. Huggins, no contrast could be more striking than the difference between the spectrum of N. A., and the spectrum of a nebula.

For an account of the revelations at Stonyhurst Observatory, see *Mems. R. A. S.*, 51-129—that there never had been a composition of bodies moving at the rates that were so definitely announced, because N. A. was a single star.

Though I have read some of the communications from "Rector" and "Dr. Phinuit" to Mrs. Piper, I cannot think that they ever mouthed sillier babble than was flickered by the star-ghosts to the astronomers in the year 1892. We noted Prof. Klinkerfues' "finding" that two stars had passed each other, and that the illumination from their mutual perturbations would soon subside. There was no such disappearance. For observations upon N. A., ten years later, see *Monthly Notices*, 62-65. For Prof. Barnard's observations twenty years later, see *Sci. Amer. Sup.*, 76-154.

The spectroscope is useful in a laboratory. Spoons are useful in a kitchen. If any other pilgrim should come upon a group of engineers trying to dig a canal with spoons, his experience and his temptation to linger would be like ours as to the astronomers and their attempted application of the spectroscope. I don't know what of remotest acceptability may survive in the third supposed proof that this earth moves around the sun, though we have not found it necessary to go into the technicalities of the supposed proof. I think we have killed the phantom thing, but I hope we have not quite succeeded, because we are moved more by the æsthetics of slaughter than by plain murderousness: we shall find unity in disposing of the third "proof" by the means by which the two others were disposed of—

Regular Annual Shift of Spectral Lines versus Solar Motion—

That, if this earth moves around the sun, the shift might be found by scientific Mrs. Pipers so to indicate—

But that if part of the time this earth, as a part of one traveling system, moves at a rate of 19 plus 13 miles a second and then part of the time at a rate of 19 minus 13 miles a second, compounding with great complexities at transverse times, that is the end of the regular annual shift that is supposed to apply to

orbital motion.

We need not have admitted in the first place that the three abstrusities are resistances: however, we have a liking for revelations ourselves. Aberration and Parallax and Spectral Lines do not indicate only that this earth moves relatively to the stars: quite as convincingly they indicate that the stars in one composition gyrate relatively to a central and stationary earth, all of them in one concavity around this earth, some of them showing faintest of parallax, if this earth be not quite central to the revolving whole.

Something that I did not mention before, though I referred to Lowell's statements, is that astronomers now admit, or state, that the shift of spectral lines, which they say indicates that this earth moves around the sun, also indicates any one of three other circumstances, or sets of circumstances. Some persons will ask why I didn't say so at first, and quit the meaningless subject. Maybe it was a weakness of mine—something of a sporting instinct, I fear me, I have at times. I lingered, perhaps slightly intoxicated, with the deliciousness of Prof. Keeler and his decimals—like someone at a race track, determining that a horse is running at a rate of 2,653 feet and 4 inches a minute, by a method that means that no more than it means that the horse is brown, is making clattering sounds, or has a refreshing odor. For a study of a state of mind like that of many clergymen who try to believe in Moses, and in Darwin, too, see the works of Prof. Young, for instance. This astronomer teaches the conventional spectroscopic doctrine, and also mentions the other circumstances that make the doctrine meaningless. Such inconsistencies are phenomena of all transitions from the old to the new.

Three giants have appeared against us. Their hearts are bubbles. Their bones wilt. They are the limp caryatides that uphold the phantom structure of Palaeo-astronomy. By what miracle, we asked, could foundation be built subsequently under a baseless thing. But three ghosts can fit in anywhere.

Sometimes astronomers cite the Foucault pendulum-experiment as "proof" of the motions of this earth. The circumstances of this demonstration are not easily mode clear: consequently one of normal suspiciousness is likely to let it impose upon him. But my practical and commonplace treatment is to disregard what the experiment and its complexities are, and to enquire whether it works out or not. It does not. See *Amer. Jour. Sci.*, 2-12-402; *Eng. Mec.*, 93-293, 306; *Astro. Reg.*, 2-265. Also we are told that experiments upon falling bodies have proved this earth's rotation. I get so tired of demonstrating that there never has been any Evolution mentally, except as to ourselves, that, if I could, I'd be glad to say that these experiments work out beautifully. Maybe they do. See Proctor's *Old and New Astronomy*, p. 229.

8

It is supposed that astronomic subjects and principles and methods cannot be understood by the layman. I think this, myself. We shall take up some of the principles of astronomy, with the idea of expressing that of course they cannot be understood by the unhypnotized any more than can the stories of Noah's Ark and Jonah and the Whale be understood, but that our understanding, if we have any, will have some material for its exercises, just the same. The velocity of light is one of these principles. A great deal in the astronomic system depends upon this supposed velocity: determinations of distance, and amount of aberration depend. It will be our expression that these are ratios of impositions to mummeries, with such clownish products that formulas turn into antics, and we shall have scruples against taking up the subject at all, because we have much hard work to do, and we have qualms against stopping so often to amuse ourselves. But, then, sometimes in a more sentimental mood, I think that the pretty story of the velocity of light, and its "determination," will some day be of legitimate service; be rhymed some day, and told to children, in future kindergartens, replacing the story of Little Bopeep, with the tale of a planet that lost its satellites and sometimes didn't know where to find them, but that good magicians came along and formulated the indeterminable.

It was found by Roemer, a seventeenth-century astronomer, that, at times, the moons of Jupiter did not disappear behind him, and did not emerge from behind him, when they "should." He found that as distance between this earth and Jupiter increased, the delays increased. He concluded that these delays represented times consumed by the light of the moons in traveling greater distances. He found, or supposed he found, that when this earth is farthest from Jupiter, light from a satellite is seen 22 minutes later than when nearest Jupiter. Given measurement of the distance between opposite points in the earth's supposed orbit, and time consumed in traveling this distance—there you have the velocity of light.

I still say that it is a pretty story and should be rhymed; but we shall find that astronomers might as well try to formulate the gambols of the sheep of Little Bopeep, as to try to formulate anything depending upon the satellites of Jupiter.

In the *Annals of Philosophy,* 23-29, Col. Beaufoy writes that, upon Dec. 7, 1823, he looked for the emergence of Jupiter's third satellite, at the time set down in the National Almanac: for two hours he looked, and did not see the satellite emerge. In*Monthly Notices,* 44-8, an astronomer writes that, upon the

night of Oct. 15, 1883, one of the satellites of Jupiter was forty-six minutes late. A paper was read at the meeting of the British Astronomical Association, Feb. 8, 1907, upon a satellite that was twenty minutes late. In *Telescopic Work*, p. 191, W. F. Denning writes that, upon the night of Sept. 12, 1889, he and two other astronomers could not see satellite IV at all. See the *Observatory*, 9-237—satellite IV disappeared 15 minutes before calculated time; about a minute later it re-appeared; disappeared again; re-appeared nine minutes later. For Todd's observations see the *Observatory*, 2-227—six times, between June 9 and July 2, 1878, a satellite was visible when, according to prediction, it should have been invisible. For some more instances of extreme vagaries of these satellites, see *Monthly Notices*, 43-427, and *Jour. B. A. A.*, 14-27: observations by Noble, Turner, White, Holmes, Freeman, Goodacre, Ellis, and Molesworth. In periodical astronomical publications, there is no more easily findable material for heresy than such observations. We shall have other instances. They abound in the *English Mechanic*, for instance. But, in spite of a host of such observations, Prof. Young (*The Sun*, p. 35) says that the time occupied by light coming from these satellites is doubtful by "only a fraction of a second." It is of course another instance of the astronomers who know very little of astronomy.

It would have been undignified, if the astronomers had taken the sheep of Little Bopeep for their determinations. They took the satellites of Jupiter. They said that the velocity of light is about 190,000 miles a second.

So did the physicists.

Our own notion is that there is no velocity of light: that one sees a thing, or doesn't; that if the satellites of Jupiter behave differently according to proximity to this earth, that may be because this earth affects them, so affecting them, because the planets may not, as we may find, be at a thousandth part of the "demonstrated" distances. The notion of velocity of light finds support; we are told in the text-books, in the velocity of sound. If it does, it doesn't find support in gravitational effects, because, according to the same textbooks, gravitational effects have no velocity.

The physicists agreed with the astronomers. A beam of light is sent through, and is reflected back through, a revolving shutter—but it's complex, and we're simple: we shall find that there is no need to go into the details of this mechanism. It is not that a machine is supposed to register a velocity of 186,000 miles a second, or we'd have to be technical: it is that the eye is supposed to perceive—

And there is not a physicist in the world who can perceive when a parlor magician palms off playing-cards. Hearing, or feeling, or if one could smell light, some kind of a claim might be made—but the well-known limitations of

seeing; common knowledge of little boys that a brand waved about in the dark cannot be followed by the eyes. The limit of the perceptible is said to be ten changes a second.

I think of the astronomers as occupying a little vortex of their own in the cosmic swoon in which wave all things, at least in this one supposed solar system. Call it swoon, or call it hypnosis—but that it is never absolute, and that all of us sometimes have awareness of our condition, and moments of wondering what it's all about and why we do and think the things that sometimes we wake up and find ourselves doing and thinking. Upon page 281, *Old and New Astronomy*, Richard Proctor awakens momentarily, and says: "The agreement between these results seems close enough, but those who know the actual difficulty of precise time-observations of the phenomena of Jupiter's satellites, to say nothing of the present condition of the theory of their motions, can place very little reliance on the velocity of light deduced from such observations." Upon pages 603-607, Proctor reviews some observations other than those that I have listed—satellites that have disappeared, come back, disappeared, returned again so bewilderingly that he wrote what we have quoted—observations by Gorton, Wray, Gambart, Secchi, Main, Grover, Smyth-Maclear-Pearson, Hodgson, Carlisle, Siminton. And that is the last of his awareness: Proctor then swoons back into his hypnosis. He then takes up the determination of the velocity of light by the physicists, as if they could be relied upon, accepting every word, writing his gospel, glorying in this miracle of science. I call it a tainted agreement between the physicists and the astronomers. I prefer mild language. If by a method by which nothing could be found out, the astronomers determined that the velocity of light is about 190,000 miles a second, and if the physicists by another method found about the same result, what kind of harmony can that be other than the reekings of two consistent stenches? Proctor wrote that very little reliance could be placed upon anything depending upon Jupiter's satellites. It never occurred to him to wonder by what miracle the physicists agreed with these unreliable calculations. It is the situation that repeats in the annals of astronomy—a baseless thing that is supposed to have a foundation slipped under it, wedged in, or God knows how introduced or foisted. I prefer not to bother much with asking how the physicists could determine anything of a higher number of changes than ten per second. If it be accepted that the physicists are right, the question is—by what miracle were the astronomers right, if they had "very little" to rely upon?

Determinations of planetary distances and determinations of the velocity of light have squirmed together: they represent either an agreeable picture of co-operation, or a study in mutual support by writhing infamies. With most emphasis I have taken the position that the vagaries of the Jovian satellites are

so great that extremely little reliance can be placed upon them, but now it seems to me that the emphasis should be upon the admission that, in addition to these factors of indeterminateness, it was, up to Proctor's day, not known with anything like accuracy when the satellites should appear and disappear. In that case one wonders as to the state of the theory in Roemer's day. It was in the mind of Roemer that the two "determinations" we are now considering first most notably satisfied affinity: mutual support by velocity of light and distances in this supposed solar system. Upon his Third Law, which, as we shall see later, he constructed upon at least three absences of anything to build upon, Kepler had, upon observations upon Mars, deduced 13,000,000 miles as this earth's distance from the sun. By the same method, which is the now discredited method of simultaneous observations, Roemer determined this distance to be 82,000,000 miles. I am not concerned with this great discrepancy so much as with the astronomers' reasons for starting off distances in millions instead of hundreds or thousands of miles.

In Kepler's day the strongest objection urged against the Copernican system was that, if this earth moves around the sun, the stars should show annual displacements—and it is only under modern "refinements" that the stars do so minutely vary, perhaps. The answer to this objection was that the stars are vastly farther away than was commonly supposed. Entailed by this answer was the necessity of enlarging upon common suppositions generally. Kepler determined or guessed, just as one pleases, and then Roemer outdid him. Roemer was followed by Huygens, with continued outdoing: 100,000,000 according to Huygens. Huygens took for his basis his belief that this earth is intermediate in size to Mars and Venus. Astronomers, today, say that this earth is not so intermediate. We see that, in the secondary phase of development, the early astronomers, with no means of knowing whether the sun is a thousand or a million miles away, guessed or determined such distances as 82,000,000 miles and 100,000,000 miles, to account for the changelessness of the stars. If the mean of these extremes is about the distance of present dogmas, we'd like to know by what miracle a true distance so averages two products of wild methods. Our expression is that these developments had their origin in conspiracy and prostitution, if one has a fancy for such accusations; or, if everybody else has been so agreeable, we think so more amiably, ourselves, that it was all a matter of comfortably adjusting and being obliging all around. Our expression is that ever since the astronomers have seen and have calculated as they should see and should calculate. For instance, when this earth's distance from the sun was supposed to be 95,000,000 miles, all astronomers taking positions of Mars, calculated a distance of 95,000,000 miles; but then, when the distance was cut down to about 92,000,000 miles, all astronomers, taking positions of Mars, calculated about a distance of 92,000,000 miles. It may sound like a cynicism of mine, but in saying this I

am quoting Richard Proctor, in one of his lucid suspicions (*Old and New Astronomy*, p. 280).

With nothing but monotony, and with nothing that looks like relief for us, the data of conspiracy, or of co-operation, continue. Upon worthless observations upon the transits of Venus, 1761 and 1769, this earth's orbit was found by Encke to be about 190,000,000 miles across (distance of the sun about 95,000,000 miles). Altogether progress had been more toward the wild calculations of Huygens than toward the undomesticated calculations of Roemer. So, to agree with this change, if not progress, Delambre, taking worthless observations upon the satellites of Jupiter, cut down Roemer's worthless determinations, and announced that light crosses the plane of this earth's orbit in 16 minutes and 32 seconds—as it ought to, Prof. Young would say. It was then that the agreeably tainted physicists started spinning and squinting, calculating "independently," we are told, that Delambre was right. Everything settled—everybody comfortable—see Chambers' *Handbook of Astronomy*, published at this time—that the sun's distance had been ascertained, "with great accuracy," to be 95,298,260 miles

But then occurred something that is badly, but protectively, explained, in most astronomical works. Foucault interfered with the deliciousness of those 95,298,260 miles. One may read many books that mention this subject, and one will always read that Foucault, the physicist, by an "independent" method, or by an "absolutely independent" method, disagreed somewhat. The "disagreement" is paraded so that one has an impression of painstaking, independent scientists not utterly slavishly supporting one another, but at the same time keeping well over the 90,000,000 mark, and so essentially agreeing, after all. But we find that there was no independence in Foucault's "experiments." We come across the same old disgusting connivance, or the same amiable complaisance, perhaps. See Clerke's *History of Astronomy*, p. 230. We learn that astronomers, to explain oscillations of the sun, had decided that the sun must be, not 95,298,260 miles away, but about 91,000,000. To oblige them, perhaps, or innocently, never having heard of them, perhaps, though for ten years they had been announcing that a new determination was needed, Foucault "found" that the velocity of light is less than had been necessary to suppose, when the sun was supposed to be about 95,000,000 miles away, and he "found" the velocity to be exactly what it should be, supposing the sun to be 91,000,000 miles away. Then it was that the astronomers announced, not that they had cut down the distance of the sun because of observations upon solar oscillations, but because they had been very much impressed by the "independent" observations upon the velocity of light, by Foucault, the physicist. This squirm occurred at the meeting of the Royal Astronomical Society, February, 1864. There would have to be more

squirms. If, then, the distance across this earth's orbit was "found" to be less than Delambre had supposed, somebody would have to find that light comes from the satellites of Jupiter a little slower than Delambre had "proved." Whereupon, Glassenapp "found" that the time is 16 minutes and 40 seconds, which is what he should, or "ought to," find. Whereupon, there would have to be re-adjustment of Encke's calculations of distance of sun, upon worthless observations upon transits of Venus. And whereupon again, Newcomb went over the very same observations by which Encke had compelled agreement with the dogmas of his day, and Newcomb calculated, as was required, that the distance agreed with Foucault's reduction. Whether, in the first place, Encke ever did calculate, as he said he did, or not, his determination was mere agreement with Laplace's in the seventh book of the *Méchanique Céleste*. Of course he said that he had calculated independently, because his method was by triangulation, and Laplace's was the gravitational.

That the word "worthless" does apply to observations upon transits of Venus:

In *Old and New Astronomy*, Proctor says that the observations upon the transits of 1761 and 1769 were "altogether unsatisfactory." One supposes that anything that is altogether unsatisfactory can't be worth much. In the next transit, of 1874, various nations co-operated. The observations were so disappointing that the Russian, Italian, and Austrian Governments refused to participate in the expeditions of 1882. In *Reminiscences of an Astronomer*, p. 181, Newcomb says that the United States Commission, of which he was Secretary, had up to 1902 never published in full its observations, and probably never would, because by that time all other members were either dead or upon the retired list.

Method of Mars—more monotony—because of criticisms of the taking of parallax by simultaneous observations, Dr. David Gill went to the Island of Ascension, during the opposition of Mars of 1877, to determine alone, by the diurnal method, the distance of this earth from the sun, from positions of Mars. For particulars of Gill's method, see, for instance, Poor's *Solar System*, p. 86. Here Prof. Poor says that, of course, the orbital motion of Mars had to be allowed for, in Gill's calculations. If so, then of course this earth's orbital motion had to be allowed for. If Dr. Gill knew the space traversed by this earth in its orbit, and the curvature of its path, he knew the size and shape of the orbit, and consequently the distance from the sun. Then he took for the basis of his allowance that this earth is about 93,000,000 miles from the sun, and calculated that this earth is about 93,000,000 miles from the sun. For this classic deduction from the known to the same known, he received a gold medal.

In our earlier surveys, we were concerned with the false claim that there can

be application of celestial mechanics to celestial phenomena; but, as to later subjects, the method is different. The method of all these calculations is triangulation.

One simple question:

To what degree can triangulation be relied upon?

To great degree in measuring the height of a building, or in the little distances of a surveyor's problems. It is clear enough that astronomers did not invent the telescope. They adopted the spectroscope from another science. Their primary mathematical principle of triangulation they have taken from the surveyors, to whom it is serviceable. The triangle is another emblem of the sterility of the science of astronomy. Upon the coat of arms of this great mule of the sciences, I would draw a prism within a triangle.

9

ACCORDING to Prof. Newcomb, for instance, the distance of the sun is about 380 times the distance of the moon—as determined by triangulation. But, upon page 22, *Popular Astronomy*, Newcomb tells of another demonstration, with strikingly different results—as determined by triangulation.

A split god.

The god Triangulation is not one undivided deity.

The other method with strikingly different results is the method of Aristarchus. It cuts down the distance of the sun, from 380 to 20 times the distance of the moon. When an observer upon this earth sees the moon half-illumined, the angle at the moon, between observer and sun, is a right angle; a third line between observer and sun completes a triangle. According to Aristarchus, the tilt of the third line includes an angle of 86 degrees, making the sun-earth line 20 times longer than the moon-earth line.

"In principle," says Newcomb, "the method is quite correct and very ingenious, but it cannot be applied in practice." He says that Aristarchus measured wrong; that the angle between the moon-earth line and the earth-sun line is almost 90 degrees and not 86 degrees. Then he says that the method cannot be applied because no one can determine this angle that he had said is of almost 90 degrees. He says something that is so incongruous with the inflations of astronomers that they'd sizzle if their hypnotized readers could read and think at the same time. Newcomb says that the method of Aristarchus cannot be applied because no astronomer can determine when the moon is

half-illumined.

We have had some experience.

Does anybody who has been through what we've been through suppose that there is a Prof. Keeler in the world who would not declare that trigonometrically and spectroscopically and micro-metrically he had determined the exact moment and exasperating, or delightful, decimal of a moment of semi-illumination of the moon, were it not that, according to at least as good a mathematician as he, determination based upon that demonstration does show that the sun is only 20 times as far away as the moon? But suppose we agree that this simple thing cannot be done.

Then instantly we think of some of the extravagant claims with which astronomers have stuffed supine credulities. Crawling in their unsightly confusion that sickens for simplification, is this offense to harmony:

That astronomers can tell under which Crusade, or its decimalated moment, a shine left a star, but cannot tell when a shine reaches a line on the moon—

Glory and triumph and selectness and inflation—or that we shall have renown as evangelists, spreading the homely and wholesome doctrine of humility. Hollis, in *Chats on Astronomy*, tells us that the diameter of this earth, at the equator, is 41,851,160 feet. But blessed be the meek, we tell him. In the *Observatory*, 19-118, is published the determination, by the astronomer Brenner, of the time of rotation of Venus, as to which other astronomers differ by hundreds of days. According to Brenner, the time is 23 hours, 57 minutes, and 7.5459 seconds. I do note that this especial refinement is a little too ethereal for the Editor of the *Observatory:* he hopes Brenner will pardon him, but is it necessary to carry out the finding to the fourth decimal of a second? However, I do not mean to say that all astronomers are as refined as Brenner, for instance. In the *Jour. B. A. A.*, I-382, Edwin Holmes, perhaps coarsely, expresses some views. He says that such "exactness" as Capt. Noble's in writing that the diameter of Neptune is 38,133 miles and that of Uranus is 33,836 miles is bringing science into contempt, because very little is known of these planets; that, according to Neison, these diameters are 27,000 miles and 28,500 miles. Macpherson, in *A Century's Progress in Science*, quotes Prof. Serviss: that the average parallax of a star, which is an ordinary astronomic quantity, is "about equal to the apparent distance between two pins, placed one inch apart, and viewed from a distance of one hundred and eighty miles." Stick ins in a cushion, in New York—go to Saratoga and look at them —be overwhelmed with the more than human powers of the scientifically anointed —or ask them when shines half the moon.

The moon's surface is irregular. I do not say that anybody with brains enough

to know when he has half a shoe polished should know when the sun has half the moon shined. I do say that if this simple thing cannot be known, the crowings of astronomers as to enormously more difficult determinations are mere barnyard disturbances.

Triangulation that, according to his little priests, straddles orbits and on his apex wears a star—that he's a false Colossus; shrinking, at the touch of data, back from the stars, deflating below the sun and moon; stubbing down below the clouds of this earth, so that the different stories that he told to Aristarchus and to Newcomb are the conflicting vainglories of an earth-tied squatter—

The blow that crumples a god:

That, by triangulation, there is not an astronomer in the world who can tell the distance of a thing only five miles away.

Humboldt, *Cosmos*, 5-138:

Height of Mauna Loa: 18,410 feet, according to Cook; 16,611, according to Marchand; 13,761, according to Wilkes—according to triangulation.

In the *Scientific American*, 119-31, a mountain climber calls the Editor to account for having written that Mt. Everest is 29,002 feet high. He says that, in his experience, there is always an error of at least ten per cent. in calculating the height of a mountain, so that all that can be said is that Mt. Everest is between 26,100 and 31,900 feet high. In the *Scientific American*, 102-183, and 319, Miss Annie Peck cites two measurements of a mountain in India: they differ by 4,000 feet.

The most effective way of treating this subject is to find a list of measurements of a mountain's height before the mountain was climbed, and compare with the barometric determination, when the mountain was climbed. For a list of 8 measurements, by triangulation, of the height of Mt. St. Elias, see the *Alpine Journal*, 22-150: they vary from 12,672 to 19,500 feet. D'Abruzzi climbed Mt. St. Elias, Aug. 1, 1897. See a paper, in the *Alpine Journal*, 19-125 D'Abruzzi barometric determination-18,092 feet.

Suppose that, in measuring, by triangulation, the distance of anything five miles away, the error is, say, ten per cent. But, as to anything ten miles away, there is no knowing what the error would be. By triangulation, the moon has been "found" to be 240,000 miles away. It may be 240 or 240,000,000 miles away.

Pseudo heart of a phantom thing—it is Keplerism, pulsating with Sir Isaac Newton's regularizations.

If triangulation cannot be depended upon accurately to measure distance greater than a mile or two between objects and observers, the aspects of Keplerism that depend upon triangulation should be of no more concern to us than two pins in a cushion 180 miles away: nevertheless so affected by something like seasickness are we by the wobbling deductions of the conventionalists that we shall have direct treatment, or independent expressions, whenever we can have, or seem to have, them. Kepler saw a planetary system, and he felt that, if that system could be formulated in terms of proportionality, by discovering one of the relations quantitatively, all its measurements could be deduced. I take from Newcomb, in *Popular Astronomy*, that, in Kepler's view, there was system in the arrangement and motions of the four little traitors that sneak around Jupiter; that Kepler, with no suspicions of these little betrayers, reasoned that this central body and its accompaniments were a representation, upon a small scale, of the solar system, as a whole. Kepler found that the cubes of mean distances of neighboring satellites of Jupiter, divided by the squares of their times, gave the same quotients. He reasoned that the same relations subsisted among planets, if the solar system be only an enlargement of the Jovian system.

Observatory, December, 1920: "The discordances between theory and observation (as to the motions of Jupiter's satellites) are of such magnitude that continued observations of their precise moments of eclipses are very much to be desired." In the Report of the Jupiter Section of the British Astronomical Society (*Mens. B. A. A.*, 8-83) is a comparison between observed times and calculated times of these satellites. 65 observations, in the year 1899, are listed. In one instance prediction and observation agree. Many differences of 3 or 4 minutes are noted, and there are differences of 5 or 6 minutes.

Kepler formulated his law of proportionality between times and distances of Jupiter's satellites without knowing what the times are. It should be noted that the observations in the year 1899 took into consideration fluctuations that were discovered by Roemer, long after Kepler's time.

Just for the sake of having something that looks like opposition, let us try to think that Kepler was miraculously right anyway. Then, if something that may resemble Kepler's Third Law does subsist in the Jovian satellites that were known to Kepler, by what resemblance to logicality can that proportionality extend to the whole solar system, if a solar system can be supposed?

In the year 1892, a fifth satellite of Jupiter was discovered. Maybe it would conform to Kepler's law, if anybody could find out accurately in what time the

faint speck does revolve. The sixth and the seventh satellites of Jupiter revolve so eccentrically that, in line of sight, their orbits intersect. Their distances are subject to very great variations; but, inasmuch as it might be said that their mean distances do conform to Kepler's Third Law, or would, if anybody could find out what their mean distances are, we go on to the others. The eighth and the ninth conform to nothing that can be asserted. If one of them goes around in one orbit at one time, the next time around it goes in some other orbit, and in some other plane. Inasmuch then as Kepler's Third Law, deduced from the system of Jupiter's satellites, cannot be thought to extend even within that minor system, one's thoughts stray into wondering what two pins in a cushion in Louisville, Ky., look like from somewhere up in the Bronx, rather than to dwell any more upon extension of any such pseudo-proportionality to the supposed solar system, as a whole.

It seems that in many of Kepler's demonstrations was this failure to have grounds for a starting-point, before extending his reasoning.

He taught the doctrine of the music of the spheres, and assigned bass voices to Saturn and Jupiter, then tenor to Mars, contralto to the female planet, and soprano, or falsetto, rather, to little Mercury. And that is all very well and consistently worked out in detail, and it does seem reasonable that, if ponderous, if not lumpy, Jupiter does sing bass, the other planets join in, according to sex and huskiness—however, one does feel dissatisfied.

We have dealt with Newcomb's account. But other conventionalists say that Kepler worked out his Third Law by triangulation upon Venus and Mercury when at greatest elongation, "finding" that the relation between Mercury and Venus is the same as the relation between Venus and this earth. If, according to conventionalists, there was no "proof" that this earth moves, in Kepler's time, Kepler started by assuming that this earth moves between "Venus and Mars; he assumed that the distance of Venus from the sun, at greatest elongation, represents mean distance; he assumed that observations upon Mercury indicated Mercury's orbit, an orbit that to this day defies analysis. However, for the sake of seeming to have opposition, we shall try to think that Kepler's data did give him material for the formulation of his law. His data were chiefly the observations of Tycho Brahé. But, by the very same data, Tycho had demonstrated that this earth does not move between Venus and Mars; that this earth is stationary. That stoutest of conventionalists, but at the same time seeming colleague of ours, Richard Proctor, says that Tycho Brahé's system was consistent with all data. I have never heard of an astronomer who denies this. Then the heart of modern astronomy is not Keplerism, but is one diversion f data that beat for such a monstrosity as something like Siamese Twins, serving both Keplerism and the Tychonic system. I fear that some of our attempts to find opposition are not very successful.

So far, this mediæval doctrine, restricting to times and distances, though for all I know the planets sing proportionately as well as move proportionately, has data to interpret or to misinterpret. But, when it comes to extending Kepler's Third Law to the exterior planets, I have never read of any means that Kepler had of determining their proportional distances. He simply said that Mars and Jupiter and Saturn were at distances that proportionalized with their times. He argued, reasonably enough, perhaps, that the slower-moving planets are the remoter, but that has nothing to do with proportional remoteness.

This is the pseudo heart of phantom astronomy.

To it Sir Isaac Newton gave a seeming of coherence.

I suspect that it was not by chance that the story of an apple should so importantly appear in two mythologies. The story of Newton and the apple was first told by Voltaire. One has suspicions of Voltaire's meanings. Suppose Newton did see an apple fall to the ground, and was so inspired, or victimized, into conceiving in terms of universal attraction. But had he tried to take a bone away from a dog, he would have had another impression, and would have been quite as well justified in explaining in terms of universal repulsion. If, as to all inter-acting things, electric, biologic, psychologic, economic, sociologic, magnetic, chemic, as well as canine, repulsion is as much of a determinant as is attraction, the Law of Gravitation, which is an attempt to explain in terms of attraction only, is as false as would be dogmas upon all other subjects if couched in terms of attraction only. So it is that the law of gravitation has been a rule of chagrin and fiasco. So, perhaps accepting, or passionately believing in every symbol of it, a Dr. Adams calculates that the Leonids will appear in November, 1899—but chagrin and fiasco—the Leonids do not appear. The planet Neptune was not discovered mathematically, because, though it was in the year 1846 somewhere near the position of the formula, in the year 1836 or 1856, it would have been nowhere near the orbit calculated by Leverrier and Adams. Some time ago, against the clamor that a Trans-Uranian planet had been discovered mathematically, it was our suggestion that, if this be not a myth, let the astronomer now discover the Trans-Neptunian planet mathematically. That there is no such mathematics, in the face of any number of learned treatises, is far more strikingly betrayed by those shining little misfortunes, the satellites of Jupiter. Satellite after satellite of Jupiter was discovered, but by accident or by observation, and not once by calculation: never were the perturbations of the earlier known satellites made the material for deducing the positions of other satellites. Astronomers have pointed to the sky, and there has been nothing; one of them pointed in four directions at once, and four times over, there was nothing; and many times when they have not pointed at all, there has been something.

Apples fall to the ground, and dogs growl, if their bones are taken away: also flowers bloom in the spring, and a trodden worm turns.

Nevertheless strong is the delusion that there is gravitational astronomy, and the great power of the Law of Gravitation, in popular respectfulness, is that it is mathematically expressed. According to my view, one might as well say that it is fetishly expressed. Descartes was as great a mathematician as Newton: veritably enough may it be said that he invented, or discovered, analytic geometry; only patriotically do Englishmen say that Newton invented, or discovered, the infinitesimal calculus. Descartes, too, formulated a law of the planets and not by a symbol was he less bewildering and convincing to the faithful, but his law was not in terms of gravitation, but in terms of vorticose motion. In the year 1732, the French Academy awarded a prize to John Bernouli, for his magnificent mathematical demonstration, which was as unintelligible as anybody's. Bernouli, too, formulated, or said he formulated, planetary inter-actions, as mathematically as any of his hypnotized admirers could have desired: it, too, was not gravitational.

The fault that I find with a great deal of mathematics in astronomy is the fault that I should find in architecture, if a temple, or a skyscraper, were supposed to prove something. Pure mathematics is architecture: it has no more place in astronomy than has the Parthenon. It is the arbitrary: it will not spoil a line nor dent a surface for a datum. There is a faint uniformity in every chaos: in discolorations on an old wall, anybody can see recognizable appearances; in such a mixture a mathematician will see squares and circles and triangles. If he would merely elaborate triangles and not apply his diagrams to theories upon the old wall itself, his constructions would be as harmless as poetry. In our metaphysics, unity cannot, of course, be the related. A mathematical expression of unity cannot, except approximately, apply to a planet, which is not final, but is part of something.

Sir Isaac Newton lived long ago. Every thought in his mind was a reflection of his era. To appraise his mind at all comprehensively, consider his works in general. For some other instances of his love of numbers, see, in his book upon the Prophecies of Daniel, his determinations upon the eleventh horn of Daniel's fourth animal. If that demonstration be not very acceptable nowadays, some of his other works may now be archaic. For all I know Jupiter may sing bass, either smoothly or lumpily, and for all I know there may be some formulable ratio between an eleventh horn of a fourth animal and some other quantity: I complain against the dogmas that have solidified out of the vaporings of such minds, but I suppose I am not very substantial, myself. Upon general principles, I say that we take no ships of the time of Newton for models for the ships of today, and build and transport in ways that are magnificently, or perhaps disastrously, different, but that, at any rate, are not

the same; and that the principles of biology and chemistry and all the other sciences, except astronomy, are not what they were in Newton's time, whether every one of them is a delusion or not. My complaint is that the still mediæval science of astronomy holds back alone in a general appearance of advancement, even though there probably never has been real advancement.

There is something else to be said upon Keplerism and Newtonism. It is a squirm. I fear me that our experiences have sophisticated us. We have noted the division in Keplerism, by which, like everything else that we have examined, it is as truly interpretable one way as it is another way.

The squirm:

To lose all sense of decency and value of data, but to be agreeable; but to be like everybody else, and intend to turn our agreeableness to profit;

To agree with the astronomers that Kepler's three laws are not absolutely true, of course, but are approximations, and that the planets do move, as in Keplerian doctrine they are said to move but then to require only one demonstration that this earth is one of the planets;

To admire Newton's *Principia* from the beginning to the end of it, having, like almost all other admirers, never even seen a copy of it; to accept every theorem in it, without having the slightest notion what any one of them means; to accept that moving bodies do obey the laws of motion, and must move in one of the conic sections—but then to require only one demonstration that this earth is a moving body.

Kepler's three laws are popularly supposed to demonstrate that this earth moves around the sun. This is a mistake. There is something wrong with everything that is popular. As was said by us before, accept that this earth is stationary, and Kepler's doctrines apply equally well to a sun around which proportionately interspaced planets move in ellipses, the whole system moving around a central and stationary earth. All observations upon the motions of heavenly bodies are in accord with this interpretation of Kepler's laws. Then as to nothing but a quandary, which means that this earth is stationary, or which means that this earth is not stationary, just as one pleases, Sir Isaac Newton selected, or pleased himself and others. Without one datum, without one little indication more convincing one way than the other, he preferred to think that this earth is one of the moving planets. To this degree had he the "profundity" that we read about. He wrote no books upon the first and second horns of his dilemma: he simply disregarded the dilemma.

To anybody who may be controversially inclined, I offer simplification. He may feel at a disadvantage against batteries of integrals and bombardments of quaternions, transcendental functions, conics, and all the other stores of an

astronomer's munitions—

Admire them. Accept that they do apply to the bodies that move around the sun. Require one demonstration that this earth is one of those bodies. For treatment of any such "demonstration," see our disquisition, or our ratiocinations upon the Three Abstrusities, or our intolerably painful attempts to write seriously upon the Three Abstrusities.

We began with three screams from an exhilarated mathematician. We have had some doubtful adventures, trying hard to pretend that monsters, or little difficulties, did really oppose us. We have reached, not the heart of a system, but the crotch of quandary.

11

We have seen that some of the most brilliant inspirations of god-like intellects, or some of the most pestilential emanations from infected minds, have been attempts to account for the virtual changelessness of the stars. Above all other data of astronomy, that virtual changelessness of positions stands out as a crucial circumstance in my own mind. To account for constellations that have not changed in 2,000 years, astronomers say that they conceive of inconceivable distances. We shall have expressions of our own upon the virtually changeless positions of the stars; but there will be difficulties for us if the astronomers ever have found that some stars move around or with other stars. I shall take up the story of Prof. Struve and the "Companion of Procyon," with more detail, for the sake of some more light upon refinement, exactness, accuracy in astronomy, and for the sake of belittling, or for the sake of sneering, or anything else that anybody may choose to call it.

Prof. Struve's announcement of his discovery of the "Companion of Procyon" is published in *Monthly Notices*, 33-430—that, upon the 19th of March, 1873, Struve had discovered the companion of Procyon, having compared it micrometrically, having tested his observations with three determinations of position-angle, three measures of distance, and three additional determinations of position-angle, finding all in "excellent agreement." No optical illusion could be possible, it is said, because another astronomer, Lindemann, had seen the object. Technically, Struve publishes a table of his observations: sidereal time, distances, position-angles; from March 19 to April 2, 1873, after which his observations had to be discontinued until the following year. In *Monthly Notices*, 34-355, are published the resumed observations. Struve says that Auwers would not accept the discovery, unless, in the year that had elapsed, the "companion" had shown increase in position, consistent with theory.

Struve writes—"This increase has really shown itself in the most remarkable manner." Therefore, he considers it "decisively established" that the object of his observations was the object of Auwers' calculations. He says that Ceraski, of Moscow, had seen the "companion," "without being warned of the place where it was to be looked for."

However—see back some chapters.

It may be said that, nevertheless, other stars have companions that do move as they should move. Later we shall consider this subject, thinking that it may be that lights have been seen to change position near some stars, but that never has a star revolved around another star, as to fit palæo-astronomic theory it should. I take for a basis of analogy that never has one sat in a park and watched a tree revolve around one, but that given the affliction, or the endowment, of an astronomer, illusion of such a revolution one may have. We sit in a park. We notice a tree. Wherever we get the notion, we do have the notion that the tree has moved. Then, farther along, we notice another tree, and, as an indication of our vivid imagination or something else, we think it is the same tree, farther along. After that we pick out tree after tree, farther along, and, convinced that it is the same tree, of course conclude that the thing is revolving around us. Exactness and refinement develop: we compute the elements of its orbit. We close our eyes and predict where the tree will be when next we look; and there, by the same process of selection and identification, it is where it "should" be. And if we have something of almost everybody's mania for speed, we make that damn thing spin around with such velocity that we, too, reel in a chaos of very much unsettled botanic conventions. There is nothing far-fetched in this analogy, except the factor of velocity. Goldschmidt did announce that there were half a dozen faint points of light around Sirius, and it was Dawes' suspicion that Clark had arbitrarily picked out one of them. It is our expression that all around Sirius, at various distances from Sirius, faint points of light were seen, and that at first, even for the first sixteen years, astronomers were not thoroughly hypnotized, and would not pick out the especial point of light that they should have picked out, so that there was nothing like agreement between the calculated and the observed orbit. Besides the irreconcilable observations noted by Flammarion, see the *Intel. Obs.*, 1-482, for others. Then came standardized seeing. So, in the *Observatory*, 20-73, is published a set of observations, in the year 1896, upon the "Companion of Sirius," placing it exactly where it should be. Nevertheless, under this set of observations is published another set, so different that the Editor asks—"Does this mean that there are two companions?"

Dark Companions require a little more eliminative treatment. So the variable nebulæ, then—and do dark nebulæ revolve around light nebulæ? For instances

of variable nebulæ, see *Mems. R. A. S.,* 49-214; *Comptes Rendus,* 59-637; *Monthly Notices,* 38-104. It may be said that they are not of the Algol-type. Neither is Algol, we have shown.

According to the compulsions of data, our idea is that the stars that seem to be fixed in position are fixed in position, so now "proper motion" is as irreconcilable to us as relative motions.

As to "proper motion," the situation is this:

The stars that were catalogued 2,000 years ago have virtually not changed, or, if there be refinement in modern astronomy, have changed no more than a little more nearly exact charting would account for; but, in astronomic theory, the stars are said to be thought of as flying apart at unthinkable velocity; so then evidence of changed positions of stars is welcome to astronomers. As to well-known constellations, it cannot be said that there has been change; so, with several exceptions, "proper motion" is attributed to stars that are not well-known.

The result is an amusing trap. Great proper motion is said to indicate relative nearness to this earth. Of the twenty-five stars of supposed greatest proper motion, all but two are faintest of stars; so these twenty-three are said to be nearest this earth. But when astronomers take the relative parallax of a star, by reference to a fainter star, they agree that the fainter star, because fainter, is farther away. So one time faintness associates with nearness, and then conveniences change, and faintness associates with farness, and the whole subject so associates with humorousness, that if we're going to be serious at all in these expressions of ours we had better pass on.

Observatory, March, 1914:

A group of three stars that disappeared.

If three stars disappeared at once, they were acted upon by something that affected all in common. Try to think of some one force that would not tear the seeable into visible rags, that could blot out three stars, if they were trillions of miles apart. If they were close together that ends the explanation that only because stars are trillions of miles apart have they, for at least 2,000 years, seemed to hold the same relative positions.

In Agnes Clerke's *System of the Stars,* are cited many instances of stars that seem to be so closely related that it seems impossible to think that they are trillions, or billions, or millions of miles apart: such formations as "seven aligned stars appearing to be strung on a silvery filament." There are loops of stars in a cluster in Auriga; lines and arches in Opiuchus; zig-zag figures in Sagittarius. As to stars that not only seem close together but that are colored

alike, Miss Clerke expresses her feeling that they are close together—"If these colors be inherent, it is difficult to believe that the stars distinguished by them are simply thrown together by perspective." As to figures in Sagittarius, Fison (*Recent Advances in Astronomy*) cites an instance of 30 small stars in the form of a forked twig, with dark rifts parallel. According to Fison, probability is overwhelmingly against the three uncommon stars in the belt of Orion falling into a straight line, by chance distribution, considering also that below this line is another of five faint stars parallel. There are dark lanes or rifts in the Milky Way that are like branches from main lanes or rifts, and the rifts sometimes have well-defined edges. In many regions where there are dark rifts there are lines of stars that are roughly parallel

That it is not distances apart that have held the stars from changing relatively to one another, because there are hosts of indications that some stars are close together, and are, or have been, affected, in common, by local formative forces.

For a detailed comparison, by J. E. Gore, of stars of today with stars catalogued by Al-Sufi about 1,000 years ago, see the*Observatory*, vol. 23. The stars have not changed in position, but it does seem that there have been many changes in magnitude.

Other changes—*Pubs. Astro. Soc. Pacific*, No. 185 (1920)—discovery of the seventeenth new star in one nebula (Andromeda). For lists of stars that have disappeared, see *Monthly Notices*, 8-16; 10-18; 11-47; *Sidereal Messenger*, 6-320;*Jour. B. A. A.*, 14-255. Nebulæ that have disappeared—see *Amer. Jour. Sci.*, 2-33-436; Clerke's *System of the Stars*, p. 293;*Nature*, 30-20.

In the *Sidereal Messenger*, 5-269, Prof. Colbert writes that, upon August 20, 1886, an astronomer, in Chicago, saw, for about half an hour, a small comet-like projection from the star *Zeta*, in Cassiopeia.

So, then, changes have been seen at the distance of the stars.

When the new star in Perseus appeared, in February, 1901, it was a point of light. Something went out from it, giving it in six months a diameter equal to half the apparent diameter of the moon. The appearances looked structural. To say loosely that they were light-effects, something like a halo, perhaps, is to ignore their complexity and duration and differences. According to Newcomb, who is occasionally quotable in our favor, these radiations were not mere light-rays, because they did not. go out uniformly from the star, but moved out variously and knotted and curved.

It was visible motion, at the distance of Nova Persei.

In *Monthly Notices*, 58-334, Dr. Espin writes that, upon the night of Jan. 16,

1898, he saw something that looked like a cloud in Perseus. It could have been nothing in the atmosphere of this earth, nor anything far from the constellation, because he saw it again in Perseus, upon January 24. He writes that, upon February 17, Mr. Heath and Dr. Halm saw it, like a cloud, dimming and discoloring stars shining through it. At the meeting of the British Astronomical Association, Feb. 23, 1898 (*Jour. B. A. A.*, 8-216), Dr. Espin described this appearance and answered questions. "It was not a nebula, and was not like one." "Whatever it was it had the peculiar property of dimming and blotting out stars."

This thing moved into Perseus and then moved away.

Clerke, The *System of the Stars*, p. 295—a nebula that changed position abruptly, between the years 1833 and 1835, and then changed no more. According to Sir John Herschel, a star was central in this nebula, when observed in 1827, and in 1833, but, in August, 1835, the star was upon the eastern side of the nebula.

That it is not distance from this earth that has kept changes of position of the stars from being seen, for 2,000 years, because occasional, abrupt changes of position have been seen at the distance of the stars.

That, whether there be a shell-like, revolving composition, holding the stars in position, and in which the stars are openings, admitting light from an existence external to the shell, or not, all stars are at about the same distance from this earth as they would be if this earth were stationary and central to such a shell, revolving around it—

According to the aberration-forms of the stars.

All stars, at the pole of the ecliptic, describe circles annually; stars lower down describe ellipses that reduce more and more the farther down they are, until at the ecliptic they describe straight lines yearly.

Suppose all the stars to be openings, fixed in position relatively to one another, in some inter-spacing substance. Conceive of a gyration to the whole aggregation, and relatively to a central and stationary earth: then, as seen from this earth, all would describe circles, near the axis, ellipses lower down, and straight lines at the limit of transformation. If all were at the same distance from this earth, or if all were points in one gyrating concave formation, equi-distant at all points from the central earth, all would have the same amplitude. All aberration-forms of the stars, whether of brilliant or faint stars, whether circles or ellipses or straight lines, have the same amplitude: about 41 seconds of arc.

If all stars are points of light admitted from externality, held fixed and apart in

one shell-like composition that is opaque in some parts and translucent in some parts and perforated generally—

The Gegenschein—

That we have indication that there is such a shell around our existence.

The Gegenschein is a round patch of light in the sky. It seems to be reflected sunlight, at night, because it keeps position about opposite the sun's.

The crux:

Reflected sunlight—but reflecting from what?

That the sky is a matrix in which the stars are openings, and that, upon the inner, concave surface of this celestial shell, the sun casts its light, even if the earth is between, no more blotted out in the middle by the intervening earth than often to considerable degree is its light blotted out upon the moon during an eclipse of the moon, occupying no time in traveling the distance of the stars and back to this earth, because the stars are near, or because there is no velocity of light.

Suppose the Gegenschein could be a reflection of sunlight from anything at a distance less than the distance of the stars. It would have parallax against its background of stars.

Observatory, 17-47:

"The Gegenschein has no parallax."

At the meeting of the Royal Astronomical Society, Jan. 11, 1878, was read a paper by W. F. Denning. It was, by its implications, one of the most exciting documents in history. The subject was: "Suspected repetitions in meteor-showers." Mr. Denning listed twenty-two radiants that lasted from three to four months each.

In the year 1799, Humboldt noticed that the paths of meteors, when parts of one display, led back to one point of common origin, or one point from which all the meteors had radiated. This is the radiant-point, or the radiant. When a radiant occurs under a constellation, the meteors are named relatively. In the extraordinary meteoric display of Nov. 13-14, 1833, there was a circumstance that was as extraordinary as the display itself: that, though this earth is supposed to rotate upon its axis, giving to the stars the appearance of revolving nightly, and supposed to revolve around the sun, so affecting the seeming motions of the stars, these meteors of November, 1833, began under the constellation Leo, and six hours later, though Leo had changed position in the sky, had changed with, and seemed still coming from, Leo.

There was no parallax along the great base line from Canada to Florida.

Then these meteors did come from Leo, or parallax, or absence of parallax, is meaningless.

The circumstance of precise position maintained under a moving constellation upon the night of Nov. 13-14, 1833, becomes insignificant relatively to Denning's data of such synchronization with a duration of months. When a radiant-point remains under Leo or Lyra, night after night, month after month, it is either that something is shifting it, without parallax, in exact coincidence with a doubly shifting constellation, which is so unthinkable that Denning says, "I cannot explain," or that the constellation is the radiant-point, in which case maintenance of precise position under it is unthinkable if it be far away—

That the stars are near.

Think of a ship, slowly sailing past a seacoast town, firing with smokeless powder, say. Shells from it burst before quite reaching the town, and all explosion-points are in line between the city and She ship, or are traceable to one such radiant. The bombardment continues. The ship moves slowly. Still all points of exploding shells are traceable to one point between the ship and the town. The bombardment goes on and goes on and goes on, and the ship is far from its first position. The point of exploding shells is still between the ship and the town. Wise men in the town say that the shells are not coming from the ship. They say this because formerly they had said that shells could not come from a ship. They reason: therefore shells are not coming from this ship. They are asked how, then, the point of explosion could so shift exactly in line with the moving ship. If there be a W. F. Denning among them, he will say, "I cannot explain." But the other wise men will be like Prof. Moulton, for instance. In his books, Prof. Moulton writes a great deal upon the subject of meteors, but he does not mention the meteors that, for months at a time, appear between observers and a shifting constellation.

There are other considerations. The shells are heard to explode. So then they explode near the town. But there is something the matter with that smokeless powder aboard ship: very feeble projectile-force, because also must the shells be exploding near the ship, or the radiant-point would not have the same background, as seen from different parts of the town. Then, in this town, inhabitants, provided they be not wise men, will conclude that, if the explosion- is near the town, and is also near the ship, the ship is near the town —

Leo and Lyra and Andromeda—argosies that sail the sky and that bombard this earth—and that they are not far away.

And some of us there may be who, instead of trying to speculate upon an

unthinkable remoteness, will suffer a sensitiveness to proximity instead; enter a new revolt against a black encompassment that glitters with a light beyond, and wonder what exists in a brilliant environment not far away—and a new anguish for hyperæsthesia upon this earth: a suffocating consciousness of the pressure of the stars.

The Sickle of Leo, from which come the Leonids, gleams like a great question-mark in the sky.

The answer—

But God knows what the answer to anything is.

Perhaps it is that the stars are very close indeed.

12

We try to have independent expressions. Accept that it is not distance that has held the stars in unchanging position, if occasional, abrupt change of position has been seen at the distance of the stars, and it is implied that the not enormously distant stars are all about equally far away from this earth; or some would be greatly particularized, and that this earth does not move in an orbit, or stars would be seasonally particularized, but would not be, if the stars, in one composition revolve; also if this earth be relatively close to all stars, if many changes of magnitude and of appearance and disappearance have been seen at the distance of the stars, and, if, in the revolutions of the stars, they do not swirl in displacements as bewildering as a blizzard of luminous snowflakes, and if no state of inter-repulsion can be thought of, especially as many stars merge into others, this composition is a substantial, concave formation, or shell-like enclosure in which stars are points. So many of the expressions .in the preceding chapter imply others, or all others. However, we have tried to have independent expressions. Of course we realize that the supposed difference between inductive and deductive reasoning is a false demarcation; nevertheless we feel that deductions piled upon other deductions are only architecture, and a great deal in this book expresses the notion that architecture should be kept in its own place. Our general expression is not that there should be no architecture and no mathematics in astronomy, or neo-astronomy; not that there should be no poetry in biology; no chemistry in physiology—but that "pure" architecture or "pure" mathematics, biology, chemistry, has its own field, even though each is inextricably bound up with all the other aspects of being. So of course the very thing that we object to in its extreme manifestations is essential to us in some degree, and the deductive

is findable somewhere in every one of our inductions, and we are not insensible to what we think is the gracefulness of some of the converging lines of our own constructions. We are not revolting against aspects, but against emphases and intrusions.

This first part of our work is what we consider neo-astronomic; and now to show that we have no rabidity against the mathematical except when over-emphasized, or misapplied, our language is that all expressions so far developed are to us of about 50% acceptability. A far greater attempted independence is coming, a second part of this work, considering phenomena so different that, if we term the first part of our explorations "neo-astronomic," even. some other term by which to designate the field of the second part will have to be thought of, and the word "extra-geographic" seems best for it. If in these two fields, our at least temporary conclusions be the same, we shall be impressed, in spite of all our cynicisms as to "agreements."

Neo-astronomy:

This supposed solar-system—an egg-like organism that is shelled away from external light and life—this central and stationary earth its nucleus—around it a revolving shell, in which the stars are pores, or functioning channels, through some of which spray irradiating fountains said to be "meteoric," but perhaps electric—in which the nebulæ are translucent patches, and in which the many dark parts are areas of opaque, structural substance—and that the stars are not trillions nor even millions of miles away—with proportional reductions of all internal distances, so that the planets are not millions, nor even hundreds of thousands of miles away.

We conceive of the variability of the stars and the nebulæ in terms of the incidence of external light upon a revolving shell and fluctuating passage through light-admitting points and parts. We conceive of all things being rhythmic, so, if stars be pores in a substance, that matrix must be subject to some changes, which may be of different periodicities in different regions. There may be local vortices in the most rigid substance, and so stars, or pores, might revolve around one another, but our tendency is to think that if light companions there be to some stars, they are reflections of light, passing through channels, upon surrounding substance, flickering from one position to another in the small undulations of this environment. So there may be other displacements, differences of magnitude, new openings and closings in a substance that is not absolutely rigid. So "proper motion" might be accounted for, but my own preference is to think, as to such stars as 1830 *Groombridge* and Barnard's "run-away star," that they are planets—also that some of the comets, especially the tailless comets, some of which have been seen to obscure stars, so that evidently they are not wisps of highly

attenuated matter, are planets, all of them not conventionally recognized as planets, because of eccentricity and remoteness from the ecliptic, two departures, however, that many of the minor planets make to great degree. If some of these bodies be planets, the irregularities of some of them are consistent with the irregularities of Jupiter's satellites.

I suggest that a combination of the Ptolemaic and the Tychonic doctrines is in good accord with all the phenomena that we have considered, and with all planetary motions that we have had no occasion to pay much attention to—that the sun, carrying Mercury and Venus with him, revolves at a distance of a few thousand miles, or a few tens of thousands of miles, in a rising and falling spiral around this virtually, but not absolutely, stationary earth, which, according to modern investigations, is more top-shaped than spherical; moon, a few thousand miles away, revolving around this nucleus; and the exterior planets not only revolving around this whole central arrangement, but approaching and receding, in loops, also, quite as they seem, to the remotest of them preposterously near, according to conventional "determinations."

So all the phenomena of the skies may be explained. But all were explained in another way by Copernicus, in another way by Ptolemy, and in still another way by Tycho Brahé. One supposes that there are other ways. If there be a distant object, and, if one school of wise men can by their reasoning processes excellently demonstrate that it is a tree, another school positively determine that it is a house, and other investigators of the highest authoritativeness variously find and prove that it is a cloud or a buffalo or a geranium, why then, their reasoning processes may be admired but not trusted. Right at the heart of our opposition, and right at the heart of our own expressions, is the fatality that there is no reasoning, no logic, no explanation resembling the illusions in the vainglories of common suppositions. There is only the process of correlating to, or organizing or systematizing around, something that is arbitrarily taken for a base, or a dominant doctrine, or a major premise—the process of assimilating with something else, making agreement with something else, or interpreting in terms of something else, which supposed base is never itself final, but was originally an assimilation with still something else.

I typify the result of all examinations of all principles or laws or dominant thoughts, scientific, philosophic, or theologic, in what we find in examining the pronouncement that motion follows the least resistance:

That motion follows least resistance.

How are we to identify least resistance?

If motion follows it.

Then motion goes where motion goes.

If nothing can be positively distinguished from anything else there can be no positive logic, which is attempted positive distinguishment. Consider the popular "base" that Capital is tyranny, and almost utmost wickedness, and that Labor is pure and idealistic. But one's labor is one's capital, and capital that is not working is in no sense implicated in this conflict.

Nevertheless we now give up our early suspicion that our whole existence is a leper of the skies, quaking and cringing through space, having the isolation that astronomers suppose, because other celestial forms of being fly from infection—

That, if shelled away from external light and life, it is so surrounded and so protected in the same cause and functioning as that of similarly encompassed forms subsidiary to it—that our existence is super-embryonic.

Darkness of night and of lives and of thoughts—super-uterine entombment. Blackness of the unborn, quasi-illumined periodically by the little sun, which is not light, but less dark.

Then we think of an organism that needs no base, and needs nothing of finality, nor of special guidance to any part local to it, because all parts partake of the pre-determined development of the whole. Consequently our spleens subside, and our frequently unmannerly derisions are hushed by recognitions —that all organizations of thought must be baseless in themselves, and of course be not final, or they could not change, and must bear within themselves those elements that will, in time, destroy them—that seeming solidities that pass away, in phantom-successions, are functionaries relatively to their periods, and express the passage from phase to phase of all things embryonic.

So it is that one who searches for fundamentals comes to bifurcations; never to a base; only to a quandary. In our own field, let there be any acceptable finding. It indicates that the earth moves around the sun. Just as truly it indicates that the sun moves around the earth. What is it that determines which will be accepted, hypnotically blinding the faithful to the other aspect? Our own expression is upon Development as serial reactions to successive Dominants. Let the dominant spirit of an era require that this earth be remote and isolated; Keplerism will support it: let the dominant change to a spirit of expansion, which would be impossible under such remoteness and isolation; Keplerism will support, or will not especially oppose, the new dominant. This is the essential process of embryonic growth, by which the same protoplasmic substance responds differently in different phases.

But I do not think that all data are so plastic. There are some that will not assimilate with a prevailing doctrine. They can have no effect upon an arbitrary system of thought, or a system subconsciously induced, in its time of

dominance: they will simply be disregarded.

We have reached our catalogue of the sights and the sounds to which all that we have so far considered is merely introductory. For them there are either no conventional explanations or poor insufficiencies half-heartedly offered. Our data are glimpses of an epoch that is approaching with far-away explosions. It is vibrating on its edges with the tread of distant space-armies. Already it has pictured in the sky visions that signify new excitements, even now lapping over into the affairs of a self-disgusted, played-out hermitage.

We assemble the data. Unhappily, we shall be unable to resist the temptation to reason and theorize. May Super-embryology have mercy upon our own syllogisms. We consider that we are entitled to at least 13 pages of gross and stupid errors. After that we shall have to explain.