

EINSTEIN/VELIKOVSKY LETTERS: What Einstein Really Said

[No effort has been made to preserve original spacing, or accuracy of layout of salutations and sign-off. : ELM]

July 8, 1946

Dear Mr. Velikovsky:

I have read the whole book about the planet Venus. There is much of interest in the book which proves that in fact catastrophes have taken place which must be attributed to extraterrestrial causes. However it is evident to every sensible physicist that these catastrophes can have nothing to do with the planet Venus and that also the direction of the inclination of the terrestrial axis towards the ecliptic could not have undergone a considerable change without the total destruction of the entire earth's crust. Your arguments in this regard are so weak as opposed to the mechanical-astronomical ones, that no expert will be able to take them seriously. It were best in my opinion if you would in this way revise your books, which contain truly valuable material. If you cannot decide on this, then what is valuable in your deliberations will become ineffective, and it may be difficult finding a sensible publisher who would take the risk of such a heavy fiasco upon himself.

I tell you this in writing and return to you your manuscript, since I will not be free on the considered days.

With friendly greetings, also to your daughter,

Your, Albert Einstein

July 16, 1946

Dear Professor Einstein:

I thought carefully of what you wrote in your letter of July 8, for which I thank you very much. I thank you also wholeheartedly for the time you gave me on July 5, and for reading a part of my Ms “Worlds in Collision.”

I was perfectly aware that my historical cosmology is in conflict with the accepted physical laws, and because of that I asked you to read it. You stress two instances. The reversal of rotation (not revolution) is attested not only in traditions but also in geo-physics: the magnetization of rocks “indicate that the polarity of the Earth has been completely reversed within recent geological times.” . . .

In the last part of my cosmology I try to solve the problem of the conflicting geological and historical data versus the accepted laws.

Best regards to Miss H. Dukas who received us with friendliness at your home.

Very truly yours, Immanuel Velikovsky

[NOTE; EINSTEIN STATES HE READ “THE WHOLE BOOK ABOUT THE PLANET VENUS”, AND V. RESPONDS THANKING HIM FOR “READING A PART OF MY MS. “WORLDS IN COLLISION.”

VELIKOVSKY FURTHER ASSERTS HE WAS “PERFECTLY AWARE THAT MY HISTORICAL COSMOLOGY IS IN CONFLICT WITH THE ACCEPTED PHYSICAL LAWS”. EINSTEIN, HE SAYS, STRESSES 2 ISSUES, 1) THE “REVERSAL OF ROTATION”—(NOT THE REVERSAL OF REVOLUTION) AND TELLS EINSTEIN HE IS WRONG. FOLK LORE TRADITION PROVES THAT A REVERSAL OF ROTATION HAS OCCURRED (NOT A REVERSAL OF REVOLUTION) AND ALSO, 2) PHYSICAL FACTS PROVE IT BY THE GEO-PHYSICS OF REVERSAL OF THE POLARITY OF THE “MAGNETAZATION OF ROCKS” elm]

THERE ARE NO MORE LETTERS BETWEEN JULY 16, 1946 AND JAN. 5, 1951 WHEN EINSTEIN WRITES TO VELIKOVSKY—THANKING V FOR SENDING HIM A COPY OF *Worlds In Collision*

January 5, 1951

Dear Mr. Velikovsky:

Thank you very much for sending me your book and also for the old tape of our former publication. I believe you have what it takes to refute even the basics of historical and philological methods thoroughly. The applause of Lainen [Leyen?] having a secret rage against the calculation, you can be sure.

She greets friendly

Your, Albert Einstein

[LETTER IN GERMAN, see below, no translation given. Above translation derived from Google. In this letter, if valid, Einstein tells Velikovsky he has “what it takes to refute even the basics of historical and philological methods thoroughly.”]:

den 5. Januar 1951

Dr. Immanuel Velikovsky
558 West 113th Str.
New York 25, N. Y.

Sehr geehrter Herr Velikovsky:

Ihr danke Ihnen sehr für die Zusendung Ihres Buches und auch für den alten Band unserer damaligen Publikation. Ich glaube Sie haben das Zeug dazu, auch das kleine Einmaleins mit historisch-philologischen Methoden gründlich zu widerlegen. Des Beifalls der Lainen, welche einen geheimen Grimm gegen die Rechnerei haben, können Sie sicher sein.

Freundlich grüsst Sie
Ihr, Albert Einstein

August 26, 1952

Dear Professor Einstein:

When, by chance, we met last week at the lake, I became aware that you are angry with me personally for my "Worlds in Collision." From you I have not expected this reaction.

I have written a culture-historical book. A physicist cannot prescribe to an historian what he is allowed to find in the past, even if he finds contradiction between the alleged historical facts and our understanding of natural laws. There are facts a physicist observes daily which are in conflict with the laws he formulated; one such case is the keeping together of positive elements in the nucleus of an atom; he accepts the fact though it contradicts the law, and he looks for some explanation.

Two facts appeared to the scientists as fallacious in my book: 1. No forces in the celestial sphere but a head long collision could retard the earth in its rotation or incline its axis into a different astronomical position, and in such a collision our earth would have perished; 2. No planet could have come to its orbit as recently as a few thousand years ago, and therefore Venus could not have traveled on a cometary orbit in historical times.

These two assertions are true only if gravitation and inertia are responsible for planetary motions, a notion subscribed by every "vernünftigen Physiker." Here, though no physicist or astronomer, I am provoked to disagree.

The sun has a general magnetic field, the solar spots are magnets, the solar prominences return on an oblique line to the place on the solar surface from where they erupted, the cometary tails are repelled by the sun in a manner and with velocities which the pressure of light cannot explain; the earth is a magnet; the ionosphere, the polar light, the ground currents, the terrestrial magnetism react to solar disturbances; cosmic rays are charges that travel in magnetic lines of force; meteorites come down in a magnetic state; the position of the moon influences the radio

reception (Stetson); the position of the planets influences the radio reception (Nelson of RCA); the fixed stars are strong magnets (Babcock). In the face of all this is it true or wrong to insist that only gravitation and inertia act in the celestial sphere? And if the electromagnetic fields are not invented by me for the solar system ad hoc in order to explain the phenomena and their interpretation as found in "Worlds in Collision," then may I ask: Who is in conflict with observed facts, the astronomers that have all their calculations concerning the planetary motions perfect on the assumption that there are no electromagnetic fields in the solar system, or the author of "Worlds in Collision" ?

Venus could come to a circular orbit and the Earth could be retarded in its rotation or have its axis inclined, under the influence of electromagnetic fields. Such fields exist; at close distances they would act strongly. I believe, therefore, that not only the historical phenomena that I describe in my first book could have happened, but also that celestial mechanics that has all its motions explained without taking into account the electromagnetic fields in the solar system, is in conflict with facts.

I have read a book of a prominent astronomer of this city who says that nothing could take place in the celestial sphere which conflicts with the words of Jesus of Nazareth as preserved in the Gospels. Thus he has two world conceptions that live side by side in his mind—one of mathematics, the other of faith. But the rest of astronomers are like him: they acknowledge the magnetic and electrical properties of the sun and its spots, or of the fixed stars, of meteorites, of cosmic rays, occasionally also of cometary tails, and they do not deny that the Earth is a magnet, and that the sun, the moon, and the planets influence in some way the ionosphere; but as soon as it comes to the celestial motions, they still keep to pre-Faraday, Laplace and Lagrange, and actually postulate sterile electricity and impotent magnetism, which do not act at distances, and which do no more than produce a Zeeman effect.

In my debate with Prof. J. Q. Stewart of Princeton Observatory in Harper's Magazine, he presented the common view by asserting that electromagnetic forces have no part in the planetary relations. I, on the other hand, have written that the general solar magnetic field discovered by Hale (1912) was often denied to exist (Menzel). "Has not a basic

mistake in observation or interpretation been committed?" Now this April, the same Menzel announces that the sun must have a very strong magnetic field, and that there was a difficulty of finding it because of the angle of observation.

For over two years I have been a target of abuse and calumny. When did it happen that a spurious book caused such a fury in the minds of the contemporary scientists?

I have taken too much of your time. I wish you everything best.

Cordially, Immanuel Velikovsky

August 27, 1952

Dear Dr. Velikovsky:

The reason for the energetic rejection of the opinions presented by you lies not in the *assumption* that in the motion of the heavenly bodies only gravitation and inertia are the determining factors. The reason for the rejection lies rather in the *fact* that on the basis of this assumption it was possible to calculate the temporal changes of star locations in the planetary system with an unimaginably great precision.

Against such precise knowledge, speculations of the kind as were advanced by you do not come into consideration by an expert. Therefore your book must appear to an expert as an attempt to mislead the public. I must admit that I myself had at first this impression, too. Only afterwards it became clear to me that intentional misleading was entirely foreign to you.

With friendly greetings,

Yours, Albert Einstein

September 10, 1952

Dear Professor Einstein:

By your answer to my letter you have truly obliged me to think the problem all over again. I have tarried to answer because I did not wish to appear just obstinate; but the problem is permanently on my mind. I have to ask patience, which a "Fachman" is generally reluctant to accord to an outsider. Without this patience we shall build barriers between sciences, in this case—astronomy and history. I would certainly listen carefully to what you may say on history or psycho- analysis.

You say that the *fact* of the exact correspondence of the planetary motions with the theory proves this theory as correct: in the celestial motions only two agents participate—gravitation and inertia. Let us first assume that your statement of exact correspondence between theory and phenomena is rigidly correct. Still the mere fact of a force acting at an inverse square rate would not exclude electricity and magnetism, also acting at the inverse square rate, from participation in celestial motions. But the statement is not rigidly correct, either. Let me illustrate.

Here is the year 1845. Leverrier in France and Adams in England, out of perturbations of Uranus calculated, to the exactness of one degree of arc, the presence of a yet unseen planet. Both of them assumed that a planet of a size not larger than that of Uranus travels on an orbit at a distance dictated by Bode's law. Neptune is actually of the size of Uranus, but the mean distance between their orbits is not ca. 1,750,000,000 miles, as Bode's law required, but only ca. 1,000,000,000 miles; thus the error is equal to ascribing to Neptune a triple mass. The discovery of Pluto did not solve the conflict between the theory and the fact and caused also conflicting estimates of Pluto's mass. Thus the finding of the planetary stations in relation to a chart of fixed stars is not enough; if the theory is true the distances must also be correct. And still the discovery of Neptune is regarded as the strongest proof of the Newtonian theory of celestial motions.

Now in the same 1845, the year of this triumph, Leverrier calculated also the anomaly of Mercury, and by this caused to think that the Newtonian law of gravitation may be not precisely true. Leverrier first thought of some planet moving inside the Mercurial orbit or of a possible unequal distribution of the mass in the sun. You have used the fact of the anomaly to prove that the space is curving in the presence of a mass. About the same time—in 1913—G. E. Hale published his paper on “The general magnetic field of the sun” (*Contr. M. Wilson Obs.*, #71), in which he estimated the general magnetic field of the sun as of 50 Gauss intensity. At this intensity “under certain conditions electromagnetic forces are much stronger than gravitation.” (Alfven) The last named author in his “cosmical Electro-dynamics” (Oxford, 1950, p. 2) shows that a hydrogen atom at the distance of the earth from the sun and moving with the earth’s orbital velocity, if ionized, is acted upon by the solar magnetic field ten thousand times stronger than by the solar gravitational field.

Now the visible streamers of the sun that conveyed to Hale the idea that the sun is a magnet reach a long way toward Mercury, almost half the way. Was the electromagnetic state of the sun ever considered as the cause of the anomaly? The effect of the e.-m. action must have been reckoned, and possibly excluded, but not disregarded. . . .

The *fact* that the theory accurately coincided with the observed planetary positions was the main argument for the Ptolemaic system and against the heliocentric system. For more than two generations, until 1600, it was not the Roman Church who opposed the Copernican theory; the scientists opposed it and used as their main argument their ability to predict planetary positions, conjunctions and eclipses. They have actually predicted eclipses that we still have to experience in the future. How could they achieve this degree of accuracy with the sun revolving on one of the orbs around the earth? By a continuous adjustment of their observations to their theories and their theories to observations. Similarly it is today. And when the facts prove to be different from what they were supposed to be—that the sun is charged, or that the cometary tails are electrically glowing, or that planetary positions of Saturn or Jupiter markedly influence our ionosphere,—then these facts are left

outside of the theory and it covers less and less of the phenomena. No wonder that it agrees with the residual facts in such an arrangement.

Sometimes it seems to me that the hidden psychological cause of the emotional attitude of the scientists to “Worlds in Collision” is in its reminding a few repressed physical facts. In that book I have not invented new physical laws or new cosmical forces, as cranks usually do; I have also not contradicted any physical law; ** I came into conflict with a mechanistic theory that completely coincides with a *selected* group of observations; my book is as strange as the fact that the Earth is a magnet, the cause of which is indeterminate and the consequences of which are not estimated in the Earth-Moon relations.

[Note: Earlier in Palestine, V. contradicted the Law of the Conservation of Energy—he must have forgotten that]

When over a year ago, Professor Stewart, your neighbor, was invited together with myself by the Presbyterian Society of this town to participate in a debate about my book, and the time became short, I asked my opponent: “But you have excluded the existing electromagnetic conditions in the solar system from the celestial mechanics,” his answer was: “We do not need them: our calculations are perfect without them.” Later, when our debate was renewed on the pages of Harper’s Magazine, I observed: “If the balance sheet of a bank is correct to the last cent, but two large deposits (electricity and magnetism) are omitted, the entire balance may be questioned.”

January 6, 1954

Dear Professor Einstein:

I have carefully put into writing my lecture before the Forum of the Graduate Students here (October 14, 1953). Doing so I was guided by the desire to place it before you for reading.

In the written form I have considerably shortened the archaeological and geological parts of my address; but I have elaborated on the astronomical part of it to a greater length than I did orally. Before submitting this paper to you I have asked Professor Lloyd Motz of the Astronomy Department of Columbia University to check its factual statements.

I am aware of the great demand on your time made by various authors; therefore have my sincerest thanks for agreeing to read this paper.

Cordially yours,

Immanuel Velikovsky

May 21, 1954

Dear Professor Einstein:

It may be that I said more than I was aright to say when yesterday evening I expressed myself that Einstein is humanly obliged not to be indifferent to the wrong that was and is still done by an organized group of scientists. But because of your position of a recognized leader among scientists and fighter for human rights, I feel obligated to you not to keep you uninformed.

These are two problems, entirely independent: Am I right in my theory? I am striving to prove it. Have I the right to express in writing the conclusions to which I came in an honest endeavor? Though the answer is elementary, this right was so mistreated that, following an attack this month, after some hesitation, I decided to ask more than just a few minutes of your most precious time.

With sincere regard,

Immanuel Velikovsky

May, 22, 1954.

Dear Mr. Velikovsky!

Remarks on the part of your manuscript "poles displaced."

The first impression is that the generations of scholars have a "bad memory." Scientists generally have little historical sense, so that each single generation knows little of the struggles and inner difficulties of the former generation. Thus it happens that many ideas at different times are repeatedly conceived anew, without the initiator knowing that these subjects had been considered already before. In this sense I find your patience in examining the literature quite enlightening and valuable; it deserves the attentive consideration of researchers who according to their natural mentality live so much in the present that they are inclined to think of every idea that occurs to them, or their group, as new. *The* idea of a possible displacement of the poles as an explanation of the change of climate in any one point of the earth's crust is a beautiful example. Even the idea of the possibility of a sliding of the rigid crust in relation to the plastic, or fluid deeper strata of the earth, was already considered by Lord Kelvin (and was in fact rejected).

A. Einstein

June 16, 1954

Dear Professor Einstein:

During the three weeks since I received your kind letter, I have composed in my mind many answers to you, and made a few drafts. I realized soon that I would be unable to compress all the problems into one letter and I decided to try to achieve with this writing only one step - to bring you closer to the insight that the global catastrophes of the past were caused not by a terrestrial but by an extra-terrestrial cause. Before discussing

this, I would like to say that I am very conscious of the fact that you give me of the most precious in your possession - your time; and I would not have asked to pay attention to these matters if I did not believe that my material may, perchance, serve you too, whatever your conclusions should be. My delay in replying you is certainly not an act of lack of attention; just the opposite - not a quick reply, but a well thought through is a real courtesy.

You agree that (1) there were global catastrophes, and (2) that at least one of them occurred in the not too remote past. These conclusions will make you, too, to a heretic in the eyes of geologists and evolutionists.

Eight years ago, in 1946, under the impression of those chapters of *Worlds in Collision* that you have read then in manuscript, you have acceded in a letter that "in der Tat Katastrophen stattgefunden haben, die auf extra-terrestreale Ursachen zurückgeführt werden müssen."¹

Now, without re-examining the material that made you think so, you would like to retreat from this position. On the other hand, in 1946 you have brought two arguments against my theory, namely:

(1) "Dass diese Katastrophen nichts zu tun haben mit dem Planeten Venus."²

(2) "Dass auch die Rotationstichtung der Erde gegenüber der Ecliptic keine erhebliche Aenderung hat erfahren können, ohne dass die ganze Erdkruste völlig vernichtet worden wäre."³

It appears to me that today you keep no longer the second objection in that definite form; you presently assume that the terrestrial crust, rather catastrophically, moved over the interior of the earth; the experiences that the human kind must have had in such a plunge, would satisfactorily explain the phenomenon of the retreating sun (the cause of a great wrath in the days of Joshua and of Velikovsky as well), the change of cardinal points, of latitudes, of seasons and climate, and the inability of the ancient water- and sun-clocks to show correctly the time of today. It would, however, not explain the change in the number of days in the year, of which all ancient calendars (Maya, Inca, Hindu, China, Persia,

Egypt, Babylonia, Assyria, Palestine, Greece, Rome) concur (“Worlds in Collision,” pp. 312-359: these pages would certainly impress you).

Against a terrestrial cause of global catastrophes:

The surmise that an asymmetrical growth of polar ice caused in the past a sudden shifting of the terrestrial crust

(1) disregards all references in the folklore to the celestial phenomena accompanying the catastrophe: meteorites and “bursting of the sky,” also darkness.

(2) disregards the geological find of unusual concentration of meteoric iron and nickel in the ocean bed (I attach a section of my new manuscript, “The floor of the seas,” with a description of the work of M. Pettersson of Goeteborg Oceanic Institute).

(3) disregards the magnitude of the force necessary to move the terrestrial crust over the equatorial bulge. Ice covers of the polar regions are placed in the least favorable position to disrupt the balance. The seasonal migration of ice and snow from one hemisphere to the other never induced the slightest displacement of the poles. And finally, the most important counter-argument concerns the mass and the form of the terrestrial crust:

(4) “The data secured from observations . . . of the transmission of seismic waves indicate that the earth is either solid throughout with the rigidity of steel, or that it is solid to a distance approximately 2000 miles below sea-level, with the solid portions having a rigidity greater than that of steel . . . This seems to indicate a contradiction between isostasy and geophysical data.” (W. Bowie, “Isostasy,” in *Physics of the Earth*, II, 104).

The theory of isostasy was conceived in 1851 when J. H. Pratt found that the Himalayas do not deflect the plumb line as expected considering the mass of the mountains. It was assumed that the crust is thin and lighter than the magma and that every mountain has a mirror image protuberance immersed into the magma, thus the excess of the mass of

the mountains is counterbalanced by a defect in the mass (difference between the lighter granite of the crust and the heavier magma). This, however, would signify that in order to move the crust over the very dense magma (twice the weight of granite) the isostatic protuberances (besides the equatorial bulge) will present obstacles that cannot be overcome by an asymmetric position of polar ice. If, moreover, the crust is 2000 miles thick, its mass represents a very substantial part of the globe.

What are the arguments against an extraterrestrial cause of the global catastrophes?

Arguments against extra-terrestrial agents are:

1. Ancient solar eclipses would not have taken place in appropriate times.
Answer: As shown in my answer to Stewart, there is not a single case known where they actually did. By the way: the same argument, if true, would be good against the motion of the terrestrial crust in historical times.
2. Earth's axis of rotation would wobble: It does.
3. Things would have flown away if unattached: This depends on the time element.
4. Waves of translation and hurricanes would be generated: they were. A section from the first file of my geological work is attached, and explains, partly, the "wilde Raubergeschichte,"⁴ in the (second) file you just read.

Argument against a massive comet: The observed comets are of small mass. In answer:

1. Even Jupiter, as all other planets, was once in the category of comets, according to the planetismal and tidal theories.
2. The origin of the terrestrial planets (Mercury, Venus, Earth, Mars) from the large planets (to explain the difference in the specific weights) is an old legitimate story.

Arguments against the mechanism of disturbance: A gravitational pull by a passing body could not disturb the rotational velocity of the earth or the inclination of its axis. Answer: In *Worlds in Collision* I brought historical material leaving astronomers to choose:

1. Either the earth was disturbed in rotation,
2. or the axis of rotation changed its inclination to the plane of the ecliptic.

Once more, I left for astronomers to choose: The earth was disturbed by entering

1. into a thick cloud of dust,
2. or into a magnet field.

In *Worlds in Collision* I left open the problem which of these mechanisms was in action (p. 386). You are indignant at the idea that magnetic fields had anything to do with the disturbances. You oppose such explanation

1. because magnetic actions are excluded from the celestial mechanics. Answer: At large distances. But at close approaches the magnetic fields could be felt.
2. because in a cloud of iron particles there is no reason for all of them to have the same magnetic orientation. Answer: The same question is asked concerning the polarized light of fixed stars that supposedly passes through clouds of gases or dust particles. Also: would the earth, which is a magnet, and possibly has an iron core, moving through a large charged cloud of dust preserve the direction of its axis or not?

The real cause of indignation against my theory of global catastrophes is the implication that celestial bodies may be charged. It was argued that only an astronomer can imagine the degree of coincidence between the calculations based on the gravitational theory and the observed planetary motions. But this very degree of coincidence is disturbing in the face of many facts known about the sun (behavior of protuberances), the

planets (influence of radio-transmission), the comets (self-illuminating; behavior of tails), the fixed stars (strong magnets), the meteorites (magnets). Even for the cases of observed anomalies magnetic or electric charges were not considered, as if they were a tabu in celestial mechanics. Of the many unexplained phenomena presented in my address before the Forum of the Graduate College, you have explained only the apparent spherical form of the sun (and was it correct to disregard the very low atmospheric pressure on the sun in calculating its expected shape?), but not why the sun rotates quicker on the equator, nor many other similar violations of mechanical laws.

Of course, I am a heretic, for I question the neutral state of celestial bodies. There are various tests that could be made. For instance, does Jupiter send radio-noises or not? This can easily be found, if you should wish.

If planets are charged, gravitation is a short range force, a terrible statement to make. Cavendish experiment with varying distances between the attracting bodies would easily disprove such notion. But if I am not wrong, the Cavendish experiment is not performed in a Faraday cage. It should be easy to find out the constant in a cage. But not easy for me. Especially since Shapley in a relentless effort made me "out of bounds" for scientists.

You, too, would not have had any suspicion about my motives in my book on folklore and ancient literature, were it not for the campaign initiated by Shapley. The few pages on astronomy in my book were edited by Lloyd Motz, professor of astronomy at Columbia University. Too early you have thrown the mantle of Jewish compassion over Shapley: you have seen only the beginning of the file of the documents concerning the "Stargazers and Gravediggers" and their leader. His being a liberal is not an excuse but an aggravating circumstance. My appeal to you to investigate this material was prompted by a new attack, a few days before I last saw you. Then I immersed myself in my work and calmed down.

Cordially,
Immanuel Velikovsky

References

1. "that in fact catastrophes have taken place which must attributed to extraterrestrial causes."
2. "That these catastrophes can have nothing to do with the planet Venus."
3. "That also the direction of the inclination of the terrestrial crust towards the ecliptic could not have undergone a considerable change without the total destruction of the entire earth's crust."
4. "wild robbers' story"

September 17, 1954

Dear Professor Einstein:

May I renew our discussion? At our last long conversation on July 21, you have acceded that the cause of the global catastrophes of the past could have been extra-terrestrial.

You have found the behavior of Lexell's comet almost unbelievable.

The next step in my strategy is to show that the comets do not revolve as neutral bodies around a neutral sun. I quote from H. Spencer Jones:

"The presence of bright lines in the spectra [of comets] can only be due to a self-luminous body. . . . the electrical phenomena obtained by discharge through a Gessler's vacuum tube enable the assertion to be made with a high degree of probability that the comet's self-luminosity is due not to an actual combustion, but to an electrical phenomenon."

More facts point to a charged state of the comets. The envelope (coma) of a comet contracts with the approach to the sun and expands with recession, though in the heat of the sun the reverse could be expected.

“There is good evidence that all particles in the comet influence the motion of each other. The configuration of the streamers in the tails . . . strongly indicates a mutual repulsion.” (N. Bobrovnikoff, “Comets” in *Astrophysics*, ed. Hynek, 1951, p. 328).

As to the sun: “Certainly the formation of coronals over centers of attraction and sunspots can be caused by the extended electrical fields of these areas of the sun; just so, coronals can be formed by the electrical fields about the end of a moving prominence.” (E. Pettit, “The Sun and Solar Radiation,” *ibid.*, p. 296).

When prominences on the sun were observed to run one into another, “both prominences participating in the action recoiled violently . . . Strong electrical fields of the same sign might explain the phenomenon.” (*ibid.*, p. 297).

As to the spherical shape of the sun, the measurements were carried to one hundredth part of a second of an arc, and no departure from spherical shape was observed (*ibid.*, p. 260); the admitted error of observation could not exceed a tenth of a second.

Should we now assume that a comet moves in perihelion without experiencing an electromagnetic effect between itself and the sun?

Cordially yours,

Immanuel Velikovsky

January 11, 1955

Dear Professor Einstein:

Am I right or wrong in the following: A comet grazing the sun can experience an el.-magn. effect without violating Kepler’s 3rd law, because:

1. A static potential difference between the sun and a body on an orbit would also produce an inverse square relation which can be hidden in the gravitational effect.
2. The magnetic component of the effect would produce acceleration. And actually an unaccounted for acceleration is observed in comets passing close to the sun; this effect was studied on Comet Encke. (J. Zenneck, 'Gravitation's in *Encyclop. d. Mathem. Wiss.* vol. V, part I, p. 44).
3. Even assuming a comet as a neutral body partly consisting of ionized gases, and a solar protuberance as a collection of ions of one sign on a neutral sun, we would have in a grazing comet a conductor passing through an electrical field.

By the way, Kepler himself regarded the motion of the planets and comets on ellipses as originating wholly in the sun, and for a time thought of magnetic action (electricity was not yet known; but Gilbert's book on magnetism already appeared in 1600). Kepler wrote:

" [Sol] trahendo et repellendo retinet, retinendo circumducit" (*Opera omnia*, VI, 345).

Actually Kepler's idea of a magnetic field reaching from a primary to a satellite can be checked as follows:

If the lunar daily librations in latitude follow the rotation of the polar magnetic field of the earth around the geographical pole, then the magnetic field of the earth reaches sensitively to the moon. Among lunar daily librations are some unaccounted for. According to H.T. Stetson of M.I.T., a magnetic needle slightly follows the sun.

As to Lexell's comet: It was removed by Jupiter from a parabolic orbit to an ellipse of $5\frac{1}{2}$ (five and a half) year period, and at the next passage it was sent away on a hyperbolic orbit. This I mentioned; you have thought it impossible, even after reading this in Newcomb's astronomy.

You have asked me: what do the specialists say about the shape of the sun. I quote Donald Menzel of Harvard Solar Observatory (*Our Sun*, 1950,

p. 39): “but the measures are as likely as not to indicate a *polar* diameter greater than the equatorial, which we are indeed loath to believe.”

With all good wishes,

cordially,

Im. Velikovsky

February 2, 1955

Dear Prof. Einstein:

All I wanted in my last letter to you was to gain the concession that a comet, going through the corona of the sun or through an outburst of ionized gases, sustains an electromagnetic effect. The consequences of opening the gate to such an effect into the heavenly mechanics force the astronomer to disregard physical experiences, in order not to violate in the least the system of 1666. But in fact the comets do not follow precisely Kepler’s third law: those that pass near the sun (like Encke’s comet) show acceleration unexplained by gravitational mechanics.

My knowledge is not great, yet gravitation with static electricity I do not identify, as you understood me and then refuted me with the fall of a body which must discharge itself upon touching the ground. In the following I present my thoughts about the nature of gravitation and discuss also in short—more in the form of questions—the four systems of the world, of which the first is the Newtonian, and the second actually does not violate the Newtonian.

Do you remember how I asked you: If the good Lord would give you the task to conceive a plan for a new universe, where gravitation of the inverse-square variety takes no part, would you be able to comply? To Newton He could not have made such a proposition, since Newton had

only a very vague idea of electricity. However, the sentence with which he concludes the “Principia” is very interesting. I let this sentence follow as a supplement.

Enclosure 1

The end paragraph of the PRINCIPIA by Newton

But hitherto I have not been able to discover the cause of those properties of gravity from phenomena, and I frame no hypotheses . . .

And now we might add something concerning a certain subtle spirit which pervades and lies hid in all gross bodies; by the force and action of which spirit the particles of bodies attract one another at near distances, and cohere, if contiguous; and electric bodies operate to greater distances, as well repelling as attracting the neighboring corpuscles; and light is emitted, reflected, refracted, inflected, and heats bodies; and all sensation is excited, and the members of animal bodies move at the command of the will, namely, by the vibrations of this spirit, mutually propagated along the solid filaments of the nerves, from the outward organs of sense to the brain, and from the brain into the muscles. But these are things that cannot be explained in few words, nor are we furnished with that sufficiency of experiments which is required to an accurate determination and demonstration of the laws by which this electric and elastic spirit operates.

[end of the *Mathematical Principles*; transl. by F. Cajori]

Plan 1

Newton’s plan in which the heavenly bodies in their movements are influenced only by gravitation (and in a very small measure by light pressure). For this plan speak:

a) The simplicity of the law of gravitation. (The simplicity would be more complete if the same system would also be in action as the dominating force in the atom, and if gravitation, like all other energies in nature, were given to transformations).

b) The exactness with which the positions of the planets are predicted. (The exactness of Ptolemaic astronomy in predicting eclipses and conjunctions was superior to that of Copernicus; and still the geocentric system is false).

c) The discovery of Neptune and Pluto (Neptune's position, but not its distance from the Sun was calculated in advance; Pluto's mass is by far not sufficient to explain the disturbances it causes).

Some of the circumstances which cannot be explained, or only with great effort, are:

1. The Sun, Jupiter and Saturn rotate quicker on their equators; the rings of Saturn rotate quicker than the planet. The inner satellite of Mars revolves quicker than Mars rotates; the sun possesses only 2% of the "angular momentum" of the solar system.
2. The Sun's protuberances *gain* in speed with the distance from the Sun. They fall back as if attracted to the place from which they erupted, falling back (as if on a rubber band) to the sun without acceleration.
3. The Sun's equatorial diameter is equal to, and in the consensus of other observers is 0.038 seconds of the arc smaller than the polar diameter (and to this says Menzel: "We are loathe . . .").
4. The tides caused by the Sun in the Earth's atmosphere are 16 to 20 times greater than those caused by the Moon.
5. The Moon and [some] other satellites always show their planets the same face.
6. The comets' tails are turned away from the sun and move in perihelion with a speed approaching the speed of light; no attempt at quantitative calculation has been made in this direction.

The heavenly bodies are held in their orbits mainly by gravitation; however they are not neutral.

Since static electricity also acts according to the inverse square law, its presence is masked by gravitation. From this follows: The masses of the heavenly bodies are not exactly calculated.

This plan can explain satisfactorily most of the difficulties of Plan 1. For this Plan 2 speak also, among others, the following facts:

1. The Sun too has a general magnetic field the strength of which is estimated very differently—the difficulty lies in the angle of observation. The corona has a form which resembles the lines of force of a magnetic field and extends far out.
2. In several stars a strong magnetic field (7000 gauss) has been detected. These stars must also be electrically charged because electrical currents would hardly occur on hot stars. The movement of two members of a double star system which rotate around each other in a few hours must probably be affected by more than just gravitation alone.
3. The earth is a magnet. The earth is enveloped in electrical layers of the ionosphere. Chapman postulates a strong electrical layer high (12,000 to 16,000 miles) over and around the earth.
4. The planets Mercury, Venus, Mars, Jupiter, Saturn, clearly influence our ionosphere and radio-reception; Jupiter and Saturn also have a connection to the origin of the sunspots.
5. The polar lights consist of electrical charges which come from the sun and which, after eruptions on the sun, or after the passage of a big sunspot, influence radio transmission and ground currents, and cause magnetic storms.
6. Meteorites are magnetized without exception. Also, upon entering the atmosphere they are regularly diverted toward the east and sometimes even seem to be hurled out after they have already penetrated into the atmosphere.

7. The fact that comets glow in cold space (lines of emission), and also the contraction of their heads when closer to the sun, speaks for an electrical effect.

8. A rise and fall in the strength of mutual disturbances between Jupiter and Saturn in the years 1898-99 as opposed to that of the years 1916-17 (18 % difference: J. Zenneck, "Gravitation" in *Encycl. der Math. Wiss.*, vol. V, first part, p. 44), speaks also for this and the following plans.

As to the argument that the photoelectric effect of the sun would neutralize the charges on the planets, I would like to ask: Would not the photoelectric effect cause charges on neutral planets? And why is not our ionosphere neutralized by the photoelectric effect?

The other argument against this plan is in the assumption that the sun cannot be charged because it would repel the surplus ions. I would answer: According to spectral analysis, the atoms on the sun have been left without many, often without any orbiting electrons. Could not the electrons which have left the protons in their closest proximity where the attraction is tremendous, also have left the sun entirely? Actually the sun hurls out charged particles (polar lights, also cosmic rays) as if it were charged and would like to reach a neutral state. (However the sun, charged as it is, changes its charge imperceptibly: were it not so, then the system would constantly change its paths.)

Another reply: In the atom the same problem exists: how can charges of the same sign hold together in the nucleus?

Now a third reply: The stars, which are strong magnets, must also be electrically charged, because no electrical currents can exist at such temperatures. Why do the surplus protons or electrons stay there? And if there, then probably also on the sun.

And finally: Should we not, instead of considering the sun as neutral, rather consider the whole solar system neutral, with a surplus of charge of one sign on the sun and of another sign on the planets?

Gravitation would be a force which quickly diminishes with distance. Static electricity would be the dominating force between the heavenly bodies.

This would mean that the force which we know from our experience on earth as gravitation does not effectively reach the moon.

Against such an explanation speaks the fact that the Cavendish experiment under different conditions and distances between mutually attracting masses always showed the same results. However, as far as I can judge, this experiment was not performed in a Faraday cage; at the same time we know that the atmosphere has an electric potential and that the potential difference strongly increases with distance from the ground, but probably could be almost identical in different laboratories.

This plan of static electricity as the dominating force between the heavenly bodies would explain most of the phenomena which are unexplainable in plans 1 and 2, but against it speak the following facts:

1. In the case the planets are all of the same charge (positive or negative), they would repel each other. But would they not behave like two parallel conductors which attract each other when their currents flow in the same direction?
2. If, for instance, the sun is positive and the earth negative, then the moon would again be positive, and the sun would repel the moon.

Plan 4

In this plan, too, gravitation would be a force which diminishes rapidly with distance. Planets, satellites, and comets are charged bodies which move in the magnetic field of the sun, and which themselves create magnetic fields.

This plan would explain:

- a. The retrograde movement of various satellites and comets;

- b. the distribution of angular momentum;
- c. the behavior of cometary tails; also the fact that comets are attracted to the sun from great distances, but were never seen falling into the sun, even though they are unstable in their orbits;
- d. the position of the moon and other satellites which continuously turn the same face to their planets;
- e. the energy of cosmic rays;

also the fact that the sun is hotter in the corona than in the photosphere; and several other facts.

Since magnetic force decreases quickly with distance, the heavenly bodies must be differently charged in order to obey Kepler's laws. The planets which are further away from the sun must have a correspondingly stronger charge. This would be analogous to the arrangement of electrons in the atom. It would also explain the disturbances caused by Pluto, the mass of which is by far not sufficient to explain such perturbations.

Against this (4) plan speak the enormity of electric and magnetic forces necessary to make this plan effective.

The sun moves in relation to the stars; it rotates; the charged planets revolve around the sun, and create a Rowland magnetic field. How does the magnetic field between the sun and the planets behave, and how quickly does it decrease? (The calculations which I received from several young physicists differ greatly and go all the way from $1/r$ to $1/r^4$).

But above all, are the physical experiences of laboratories always applicable to the sky? There, a very great and hot mass of gases moves in the coldness of space; how would the magnetic field behave under such conditions?

It is apparent that plans 2 and 4 are less against facts and observations than do plans 1 and 3. In order to decide between plan 2 and 4 the

Cavendish measurements between impeccably neutral bodies must be repeated. But how impeccably? The electrical repulsion between two protons is 10^{40} times stronger than their gravitational attraction.

With cordial greetings,
Yours
Immanuel Velikovsky

March 7, 1955

Dear Professor Einstein:

I thank you again for the discussion of the first 8 pages of my letter. Here are the quotations from John Herschel and W. Pickering I have mentioned in our last conversation:

“There is beyond any question some profound secret and mystery of nature concerned in the phenomenon of their tails”; “enormous sweep which it [the tail] makes round the sun in perihelion, in the manner of a straight and rigid rod, is in defiance of the law of gravitation, nay, even of the recorded laws of motion.”

J. Herschel, *Outlines of Astronomy*, p. 406

“What has puzzled astronomers since the time of Newton, is the fact that while all other bodies in the sidereal universe, as far as we are aware, obey the law of gravitation, comets’ tails are clearly subject to some strong repulsive force, which drives the matter composing them away from the sun with enormously high velocities.”

— W.H. Pickering, article “Comets” in *Encyclopedia Americana*.

Cordially yours,

Immanuel Velikovsky

March 17, 1955

Lieber Herr und liebe Frau Velikowsky!

Sie haben mich bei Gelegenheit dieses unseligen Geburtstags aufs neue beschenkt mit Früchten einer geradezu eruptiven Produktivität. Ich freue mich auf die Lektüre des historischen Werkes, das ja die Hühneraugen meiner Gilde nicht in Gefahr bringt. Wie es mit den Hühneraugen der andern Fakultät steht, weiss ich noch nicht. Ich denke an das rührende Gebet: Heiliger St. Florian, verschon's mein Haus, zünd'ändere an!

Den ersten Band der Memoiren zu "Worlds in Collision" habe ich bereits aufmerksam gelesen und mit einigen leicht zu radeirenden Randbemerkungen versehen. Ich bewundere Ihr dramatisches Talent und auch die Kunst und Geradheit von Thakeray, der brüllenden astronomischen Löwen dazu gebracht hat, eingermassen den königlichen Schwanz einzuziehen unter nicht völliger Respektierung der Wahrheit. Ich würde glücklich sein, wenn auch Sie die ganze Episode von der drolligen Seite geniessen konnten.

Unvorstellbare Korrespondenz-Schulden und ungelesene zugesändte Manuskripte zwingen mich zu Kurze. Vielen Dank Euch beiden und Freundliche wünche.

Ihr

A. Einstein

Translation Given At Varchies:

Dear Mr. and dear Mrs. Velikovsky!

At the occasion of this unpropitious birthday you have presented me once more with the fruits of an almost eruptive productivity. I look forward with pleasure to reading the historical book that does not bring into danger the toes of my guild. How it stands with the toes of the other

faculty, I do not know as yet. I think of the touching prayer: "Holy St. Florian, spare my house, put fire to others!"

I have already carefully read the first volume of the memoirs to "Worlds in Collision," and have supplied it with a few marginal notes in pencil that can be easily erased. I admire your dramatic talent and also the art and straightforwardness of Thackeray who has compelled the roaring astronomical lion to pull in a little his royal tail without showing enough respect for the truth. I would be happy if you, too, could enjoy the whole episode from its funny side.

Unimaginable letter debts and unread manuscripts that were sent in force me to be brief. Thanks to both of you and friendly wishes,

Your,

A. Einstein