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A THEORY OF GRAVITATION AND PLANETARY EVOLUTION[1]

By Alvin J. Powers

Anything that may show the probable evolution and development of the planets, the sun and the solar system should prove of value to the interplanetary traveller. He will then be better able to judge the conditions of space surrounding the various members of the solar system. He will be able to anticipate more accurately the conditions now existing on these objects. And he may also receive some suggestions as to the forces he can or cannot use in overcoming the power of gravitation and propelling himself through space.

It is with these ideas in mind that we are presenting a new theory of gravitation and stellar evolution.

We shall show that the mechanism which produces gravitation causes all revolving bodies to follow a spiral course which will eventually crash them into their primaries. It is merely a question of time until the moon will crash into the earth, and the earth and all the other planets will crash into the sun. This is probably the result of the fact that there is something which impedes every kind of material movement, and gravitation acts as a trap. It thus becomes a simple matter for one body to capture another by means of their mutual gravitational attractions. Of course, if the two bodies are moving too rapidly in relation to each other, the mutual gravitational pull will be insufficient to effect a capture.

Let us suppose that we had a pendulum such that there were no friction from the support or any surrounding medium. According to the classical theory of gravitation if we start the pendulum swinging it continues to swing forever under the gravitational pull of the earth. Under the new theory which is proposed each swing will be slightly shorter than the one preceding. Of course, this difference would be so small that it would be impossible of detection if a few swings only are measured. If, however, we allow sufficient time to elapse between measurements the lessening amplitude of the swings can be detected.

If time enough elapses, the pendulum will stop at dead center. Let us now substitute for the pendulum a body that has come under the influence of the gravitation of the sun. It first approaches the sun in a very elliptical or perhaps hyperbolic orbit. As it nears the sun it keeps gaining momentum, but due to this movement it does not gain as much motion as it should, thus there is not enough moment of momentum to again carry it beyond the gravitational pull of the sun. The sun has thus made a capture.

Now begins a reshaping of the new satellite's

1 Summary of an Address delivered before the Society on March 11, 1932.

orbit. The eccentricity is gradually reduced, producing finally an orbit which is very nearly circular. At the same time it is getting smaller and smaller until the body finally falls into the sun.

Let us now examine the proofs for such a theory. We shall then endeavor to outline a mechanical model of gravitation which would produce the results we have suggested.

Every object has a tendency to lose any molecular movement which it may have, and cool off. This is so well known that astronomers apparently have overlooked its enormous implications. If the various vibrating elements which produce light and heat gradually slow down and finally stop it is not impossible to conceive that larger aggregations of these vibrating bodies, such as moon and planets should also slow down in their movements and finally stop.

If there is anything which impedes the movement of the planets around the sun, they are forced to spiral toward the sun. This is a well-established astronomical principle. If a planet were suddenly completely stopped in its movement around the sun it would fall directly into the sun. Should it be stopped a little at a time the resulting path would be a spiral. As the planet approaches the sun in a spiral course the period of revolution becomes much more rapid in accordance with Kepler's third law of planetary motion. It has been calculated that the moon would encircle the earth in about two hours' time if the moon were just far enough away to miss the earth.

This brings us to a consideration of the rotation of the heavenly bodies upon their axes. It doesn't take very much imagination to see that if the moon struck the earth while encircling it in two hours' time, the period of rotation of the earth would be increased considerably. The plane of the equator of the earth would also be changed somewhat. The equator of the earth would then coincide more closely with the present orbit of the moon. The next logical conclusion is that the present rotation of the earth and other heavenly bodies has been caused by satellites spiralling into them. This is a hypothesis which is reasonable and easily understood. No other theory has been developed which accounts satisfactorily for the tremendous energy contained in the rotation of these bodies. This is one of the weakest points of all the theories which have been developed to explain the formation of the solar system.

It is quite possible that two bodies coming together would be reduced to a liquid mass or a gaseous ball depending upon the relative sizes and the original temperatures of the two objects.

Since the moon is not massive enough to hold an atmosphere, there is practically no erosion or weathering taking place there. As a result we should be able to find evidences of the last cataclysm which took place on the moon when its last satellite crashed into it. On looking at the moon the first impression one receives is that it must have been in a more or less molten state at some time in the past. The so-called seas appear to have been areas which were more nearly in a liquid condition than the mountainous regions. The seas also appear to have cooled at a time when there were very few volcanoes or meteorites. Another fact which we notice is that the seas are confined mostly to a region along a great circle of the moon. The remainder is very mountainous and pitted with innumerable craters. The craters give the appearance of having been formed by large and small pieces of matter falling into the moon at points where the surface was not completely liquid. We notice craters transposed upon other craters which could hardly be formed except by falling objects.

Along the borders of the smooth seas we find craters which have very smooth bottoms surrounded by walls which are not so high as in the more mountainous regions. There are, however, a few craters in the seas themselves which have quite high walls and bottoms much below the level of the sea floor. It would be logical to assume that these were formed by large meteorites falling after the seas had begun to cool. All the features which we have just named suggest that at some time in the past a large satellite spiralled into the moon. This body, due to tidal forces, must have broken into several large pieces which later fell into the moon.

At the same time the force of the impacts threw large fragments of the colliding bodies out into space. As these objects fell back into the moon, innumerable craters were formed. Since these fragments would not all be driven out with the same velocity, they would not fall back at the same time. Some of them may have escaped from the moon entirely. Here we have a very satisfactory explanation for the existence of meteors and other similar objects in interplanetary space. These objects will add greatly to the dangers of interplanetary travel.

It has already been stated that the seas are more numerous around what was apparently the former equatorial region of the moon. This is exactly what we would expect if our theory is correct. It is here that the energy of the colliding satellite is dissipated, thus producing a higher degree of temperature around the equator than anywhere else. Thus a greater degree of liquid-

ity would exist in this region. Any fragments which fell back here would be completely absorbed and leave no trace of ever having existed at all.

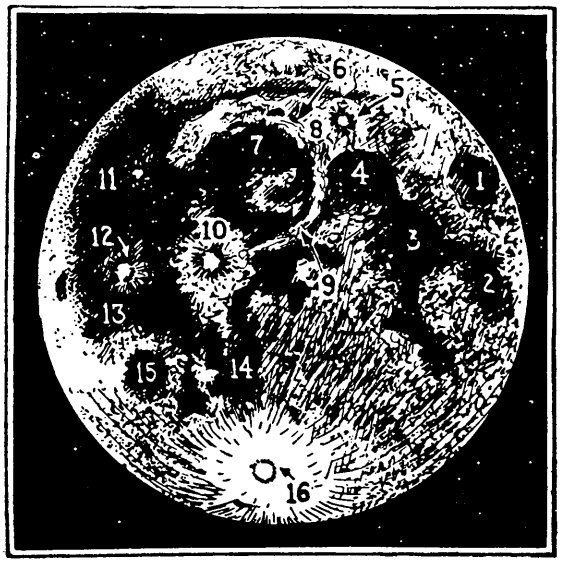
However, should any meteorites strike the seas after they had cooled sufficiently we would expect craters to result. This is exactly what we find. We also see the traces of craters which were not completely absorbed in the semi-liquid seas. There are craters which were apparently produced at the same time by a group of fragments striking together in the same district.

We find two such craters in the sea known as the *Mare Imbrium* which must have been produced by a double meteorite. There are numerous other pairs of craters which must have been formed at the same time in the same manner. This is undoubtedly the result of the tidal action of the moon upon the large fragments as they fell back. This force would break them into two pieces in most cases and the relative sizes of the pieces would be the same. One piece is nearly always larger than the other.

The distances between the two pieces when they strike is in all cases about the same. The larger pairs, however, are nearly always a little farther apart. This is what we would expect according to the law of gravitation in producing tides. The tidal effect would be much greater upon the larger pieces than upon the smaller ones. If the pieces were too small they would not be broken up at all.

Let us now consider in more detail the collision between the moon and the former satellite. The great elliptical, or polygonal areas along the equatorial regions of the moon suggest that the satellite must have been broken into a great many pieces by the tidal action. This would indicate that the satellite must have been broken into many large pieces by the tidal action. This would indicate that the satellite must have been in a solid condition when it was broken up. As these pieces struck the moon they must have created much heat. This heat together with the possible internal heat of the moon produced a liquid condition where the impacts took place. The force of the impacts also threw up great walls around the places where these large pieces fell. The molten material then flowed in forming smooth plains in the bottoms of these huge craters. The smooth floors of the seas on the earth suggest that they may have been formed in the same manner.

Let us now consider the formation of the earth, moon, sun system. At the time the earth-moon system was captured by the sun it is quite likely that the orbit of the moon around the earth was very nearly in the plane of the earth's equator. At the present time the moon's orbit is inclined 5 degrees 9 minutes to the plane of the ecliptic. Its orbit has been gradually pulled out of its original position by the attraction of the sun. The recession of the nodes of the moon is caused almost entirely by the sun. The bulging of the earth at the equator has a tendency to pull the orbit of the moon back into the plane of the equator. But due to the nearness of the sun this force is not nearly so great as the pull of the sun. As a result of the braking effect of which we have spoken, each swing of the moon's orbit becomes smaller. The result will be finally that the orbit of the moon will approach the plane of the ecliptic.



In this rough map of the moons' principal areas and prominent seas, the location of the seas around an equatorial region can be noted, according to Mr. Powers' theory. The numbers denote: 1, Sea of Crises (**Mare Crisium**). 2, Sea of Fruitfulness (**Mare Foecunditatis**); 3, Sea of Tranquillity; 4, Sea of Serenity; 5, Aristotle; 6, Plato and Lunar Apennines; 7, Sea of Shadows (**Mare Umbrium**); 8, Archimedes; 9, Lunar Alps; 10, Copernicus; 11, Aristarchus; 12, Kepler; 11-13 Ocean of Tempests (**Oceanus Procellarum**) with Grimaldi at the left; 14, Sea of Clouds (**Mare Nubium**); 15, Sea of Humors; 16, Tycho. The Sea of Nectar is the extension below (3); and the central dark spot at the left of the figure (9) is the Sea of Vapors. The term **Mare** or "Sea" was coined by early astronomers who took these dark plains for water. Here the moon's south pole is shown at the bottom, as the eye sees it.

We shall now examine the effect of the impediment upon the formation of the orbits of the various planets around the sun. Since the planet Jupiter is larger than all the others put together,

its mass being about 317 times as great as that of the earth, we would expect it to have a great deal to do with the formation of the orbits of the other planets and to pull the orbits of the other planets into nearly the same plane as that of its own orbit. This is apparently what has taken place. Taking the orbit of Jupiter as zero we find the others inclined to it as follows; Mercury 5 degrees 42 minutes, Venus 2 degrees 6 minutes, Earth 1 degree 18 minutes, Mars 33 minutes, Jupiter zero degrees, Saturn 1 degree 11 minutes, Uranus 32 minutes, Neptune 29 minutes, Pluto 15 degrees 49 minutes. The equator of the sun is inclined 5 degrees 52 minutes to the orbit of Jupiter. This indicates that at some time in the past the sun had a system of planets which revolved around it in its present equatorial plane. Since the capture of the massive Jupiter, however, the orbits of the remaining planets have been pulled out of this plane.

There is one planet that still retains nearly its original orbit. We refer to Mercury. Of course, the other planets cause its node to recede. If we examine the inclinations of the orbits of the planets between Jupiter and the sun we find the inclination greater the nearer we get to the sun. This is due to the decreasing effect of Jupiter as the distance becomes greater. It also suggests that several of the inner planets are the remnants of the sun's former planetary system.

The three nearer planets may at one time have revolved around the sun in the plane of its equator. Beyond Jupiter we find the massive Saturn with its orbit inclined to that of Jupiter by a little over 1 degree. We find Uranus and Neptune with orbits which are about halfway between those of Jupiter and Saturn. This is exactly what we should expect according to our theory. The greater effect of Jupiter's mass is overcome by the nearness of Saturn. Pluto has probably been captured more recently than any of the other planets so that there has been insufficient time to bring its orbit into the same plane as the others.

When we examine the orbits of the systems of the moons of the planets we find the oblateness of most of them holding their moons very nearly in the equatorial planes. The Earth and Neptune are the only important exceptions. This force is particularly effective for the nearer moons. The orbit of Neptune's moon is slowly being forced into the plane of the planet's equator. Neptune may not have had a very elaborate system of moons when the present moon was captured so that the forces pulling the orbit of its moon into the equatorial plane have been insufficient up to the present time.

We shall now attempt to explain why all the planets and most of the comets go around the sun in the same direction. As any new body approaches the solar system it comes under the gravitational pull of the planets. This force tends to pull the newcomer around the sun in the same direction as that of the planets. There would be certain positions, however, where the planets would tend to pull the new planet around in the opposite direction.

While the two bodies were approaching each other this would be the case. As soon as they passed each other the effect would be reversed. But after they passed, the pull would continue for a longer time while they were closer together. They would remain closer together due to the fact that they would be going in somewhat the same direction. This would be due to the circular shape of the planetary orbits, the curvature bringing the planets around in a direction somewhat similar to that of the newcomer. The greater force is therefore exerted in the direction in which the planets go around the sun.

There would be certain cases where this force would not be sufficient to pull a new planet around into the same direction as the others. This is what has happened in the case of the two outer moons of Jupiter and the outer moon of Saturn. This would happen only when the newcomer had a considerable proper motion of its own in the wrong direction.

Another thing which proves our theory is the fact that calculations made from ancient eclipses of the sun show that the moon has gained about one half degree in its orbit during the last 2,000 years. This is exactly what we should expect if the moon has spiralled slightly closer to the earth in this time. Some of this gain is no doubt due to the fact that the earth has slowed down some in its rotation. Encke's comet is another object whose period of revolution is getting shorter. This comet gains about two and one half days in its period of revolution every hundred years. Its average distance from the sun also decreases about 775,000 miles every hundred years.

We must now return to a certain phase of gravitation which has to do with the effect of the movement of a body upon the effectiveness of the gravitational mechanism. According to the theory, any movement of a body reduces the effectiveness of the force of gravitation. The theory generally accepted at present states that the mass of an object increases as its speed increases. This theory was introduced to explain the action of the rapidly-moving electron while under the influence of a strong electrical or magnetic field. It has also

been used to explain the peculiar movement of the perihelion of Mercury.

It has been found that a strong electrical or magnetic field does not have as much effect upon a rapidly-moving electron as we should expect. If the electron approaches the speed of light, the field has practically no effect at all. According to the generally-accepted theory, the mass of an object becomes infinite when its speed equals that of light. Any electrical field that we could produce would have little effect upon an object of infinite mass. The theory we are proposing is that the effectiveness of the electrical magnetic and gravitational fields approaches zero as the speed of the object approaches that of light. The inertial mass of the object remains the same at all times.

Let us imagine that all matter is bathed in an etherial gas, the particles of which are infinitely hard. These particles cannot be abraded, indented or divided. What will be the most probable result of a collision between two such particles? They could not act like two billiard balls in collision since there will be no indentations at the point of contact to spring back into their original positions.

Each particle will be pushed in a direction identical with that formerly pursued by the other particle. The particles thus merely change positions and directions. As a result, collisions will not interfere with energy transfer from one material body to another. An energy impulse would be transmitted in the same direction forever if no material body intercepted it.

Let us now assume that whenever an electron or proton comes in contact with these particles, the particles are shot through space at the speed of light. The pattern assumed by the speeding particles will depend upon whether they have come from an electron or a proton. This conformation will also be effected by any movement of the electron or proton. The great speed produced in the particles upon contact with an electron or proton could be due to the fact that the elements of the electron and proton may be in a state of rapid rotation.

The pattern of the particles coming from any one electron would be similar to that of every other electron and similarly for protons. Thus the particles would be reflected back and forth between any two electrons. This may be exactly what takes place when light is reflected back and forth which produces the repulsive forces between electrons. We should expect the results to be the same between protons. The results, however, between an electron and proton would not be the same since the structure of these objects must be very dissimilar. One has a mass times 1830 greater than the other. Any reflection between them would be the result of casual collisions between the particles and the elements of the electron and proton. As a result we would not expect them to repel each other. But how are we to account for the attraction between them?

Because there is matter distributed in every direction we would expect to find our ether particles shooting in every direction through space. As a result, every electron and proton will produce a shadow in the speeding particles. Thus, the number of particles coming from the direction of any piece of matter will be less than in any other direction. This would be caused by a certain number of the particles being turned back by the matter. This reasoning applies particularly to an electron and proton. Each intercepts particles going in the direction of the other. Thus there are fewer impacts from the particles directly between them. Therefore they are forced together. Gravitation must result from the fact that the attraction between the electron and proton is greater than the repulsive forces.

Let us now examine the proofs for such a theory. If bodies were driven together by missiles in a manner such as we have proposed, the more rapidly the bodies move the less effective become the missiles. Finally when the bodies approached a speed equal to that of the missiles, the propulsive force would disappear. We have three possible examples of this phenomenon in nature.

Let us first examine the effect of such gravitational mechanism upon the movement of the perihelion of a planet which revolves in an elliptical orbit. It has been proved that any thing which forces a planet outside of its normal orbit while it is approaching the sun will cause the perihelion point to advance in a direction similar to that of the planet. Also, if anything forces the planet inside of its normal orbit while it is receding from the sun, the perihelion will be advanced. If these conditions are reversed, the perihelion will move in a retrograde motion.

With these facts in mind, let us now examine the movements of Mercury. As the planet passes aphelion and approaches the sun it continues to gain speed until the perihelion point is passed. But according to our theory when an object gains in speed, the effectiveness of gravitation is reduced. The planet, however, retains its inertial momentum.

The same reasoning would apply in the case of the speeding electron and a positive electrical or magnetic field. However, we must look for some other cause in the case of the moving electron and a negative field. Here the weakening of the elec-

trical repulsion could be produced by the distortion of the electron as a result of the speed of movement. If the shape of the electron were changed, the pattern of ether particles coming from it would not coincide with those composing the electrical field.

The recession of the nodes of Mercury is caused by the pull of the other planets and any bulge at the equator of the sun due to the sun's rotation. Since Venus is the nearest of the planets to Mercury, it produces most of the recession of the nodes. This pull is greatest when the two planets happen to move around the sun in nearly parallel courses. According to our model, however, the pull under such conditions will not be as great as it should be for two stationary bodies of the same mass.

The effects of aberration intervene, due to the movement of the two planets. The ether particles effective in producing gravitation between the two bodies transverse a greater distance and exert a pull at an angle to the line joining their centers. This produces a material reduction in the gravitational pull between the two planets. But this also reduces the recession of the nodes of Mercury below the amount which we should expect according to the accepted theories of gravitation.

Another phenomenon which tends to prove our theory is the so called "red shift" of the light coming from the distant nebulae and massive bodies. As we have already explained, the forces of electrical attraction and repulsion are produced by impinging ether particles. We have also explained how every body of matter produces a shadow in these rapidly-moving particles. These shadows vary as the inverse square of the distance from the object. But wherever there is a shadow, the number of particles will be reduced. Therefore, since the number of particles available to produce electrical attraction and repulsion is reduced, these forces will also be reduced. If the inertial mass of the electron and proton remain the same, any weakening of the actuating forces will reduce the vibration rates.

The weakened motivating forces are no longer able to move the electron and proton back and forth with the same speed. As a result, the vibrating arcs will become longer and the frequency slower. This would account for the shifting of the light coming from the most massive stars. If we assume that we are able to see only the largest and most massive of the extragalactic nebulae, we have here a very logical explanation for the "red shift" of the light coming from them. All of them that send us light which is shifted toward the red end of the spectrum must be larger than our own galactic system.

On the other hand, those with a shift toward the violet must be smaller than our system. The two nearest nebulae whose size we know to be smaller than that of the Milky Way system, have a shift toward the violet. If our theory is correct some of the nebulae with large "red shifts" must be enormously larger than our stellar system. We would also have a measuring rod for the size of the extra-galactic nebulae. This in turn would aid us in determining their distances with a great deal more accuracy. Most of them must be much more distant than is now generally supposed.

The results of the Michelson-Morley experiments which showed that there is no appreciable ether drift, are exactly what we would expect if our theory is correct.

A ray of light was split and the two portions were reflected back and forth between mirrors over paths at right angles to each other. The two rays were then brought together in such a way that they produced interference fringes. The whole arrangement could be rotated so that the directions taken by the rays could be varied at will.

It was possible to have one ray going back and forth in the same direction as that traversed by the earth in space. The other ray would go at right angles to this path. If the earth were rushing through the ether and the light waves travelled in the usual manner of waves through other substances, the ray going back and forth in the same direction as that taken by the earth should be retarded and there would be a shifting of the light fringes.

But there was no shifting of the fringes. If, however, the light is composed of ether particles such as we have described, the light would take its speed from the last reflector it struck, and the two rays would always get back in exactly the same time no matter which directions the rays took.

If our theory is true, we would expect every star to have a family of planets more or less like the solar system. If this is true, there must be innumerable worlds on which life would be possible. Almost every star might have a planet upon which there could be some kind of life.

Should some such theory of gravitation as we have outlined prove to be true, it would seem that there is little hope that we shall ever be able to eliminate the pull of gravitation. We shall probably never be able to suspend gravitational attraction. The rocket thus becomes the only possibility we have of ever getting away from the earth.

NEWS OF THE MONTH

WINKLER DEVISES NEW ROCKET

A new rocket has been built by Johannes Winkler, German rocket pioneer, and has been given preliminary tests already, according to information received from abroad. The design of the rocket, according to photographs, seems to be of a radically different nature from any that have preceded it.

Two fuel tanks are in a straight line, one above the other, and in the shape of inflated balloons, slightly elongated. The fuel tanks are connected by a narrow waist joint. Both tanks have external lead pipes to the combustion chamber which is below the lower tank. The chamber itself is long and narrow, and leads to a long and slightly flaring exhaust nozzle. No mention was made of the fuels to be used in Winkler's rocket.

Herr Winkler, who is a German engineer, was one of the founders of the German Interplanetary Society.

NEW GAUGE CAN MEASURE TOP OF ATMOSPHERE

The problem of determining the first rocket that has ascended to the top of the earth's atmosphere appears to be settled by a new device of the Bell Telephone Laboratories. Arthur Brisbane, writing of it in one of his columns, said recently, "Bell Telephone scientific laboratories have developed a new air gauge to interest you. You know that the atmosphere presses on us living at the botton of the air, as water presses on fish living at the bottom of the ocean. No living man could carry half the weight that his body carries, without knowing it, in atmospheric pressure.

"Messrs. Jaycox and Weinhart, engineers of the laboratories, have invented an air gauge that will measure air pressure within one trillionth. The pressure on your body would be reduced to one-trillionth (1/1,000,000,000,000) of normal if you could go to the top of our atmosphere and you would instantly explode. That is the ordeal to be met on our first journey to the moon or Mars."

(Editor's Note—Mr. Nathan Schachner in a recent report to the Society demonstrated that one would not explode, even if exposed unprotected in a complete vacuum. But naturally no one will deliberately expose himself to this vacuum.)

TO USE ECLIPSE IN STUDY OF HEAVISIDE LAYER

The total eclipse of the sun on August 31, 1932 will be used by scientists in Canada to study the transmission of radio signals through the upper atmosphere, according to the National Research Council of Canada.

The layer of the atmosphere, varying from 50 to 500 miles high, which reflects radio waves back to earth, is formed by the action of certain of the sun's rays on the upper air. During the eclipse the moon will interrupt the sun's rays and thus scientists will have a chance to study the destruction and creation of this Kennelly-Heaviside Layer, an opportunity that will not recur in Canada until the next total eclipse on July 9, 1945.

The National Research Laboratories at Ottawa, the University of Toronto and McGill University are cooperating in this program that will measure, particularly, the height of the layer immediately before, during and after the eclipse. This will be done by noting the times of arrival of a radio signal travelling over the surface of the earth and up to the Kennelly-Heaviside layer and back.

REPORTS VENUS HAS 265-MILE ATMOSPHERE

The atmosphere of Venus has been measured by Professor John A. Curtin of D'Youville College, who announced it as being 265 miles high. This is believed to be the first time that such a measurment has been made.

Professor Curtin obtained his results from telescopic observations made near Akron, N. Y. "In making my observations," said the professor, "I used the interference method, which scientists have found to be best suited to this work. Latest measurments of the earth's atmosphere indicate that it extends from 177 to 188 miles above the surface, so the earth's sister planet has an atmosphere from 77 to 88 miles higher than our own.

"Spectroscopic observations show the presence of carbon dioxide on Venus, which together with the faint green markings which are sometimes visible indicate the existence of vegetable life."

INTERPLANETARY COMMUNICATION PREDICTED BY ENGINEER

The coming of interplanetary communication by the use of ultra-short wave beam radio was predicted by Dr. I. E. Mouromtseff, research

engineer of the Westinghouse Electric and Manufacturing Company.

The energy that can be concentrated in a narrow radio beam, according to Dr. Mouromtseff is sufficient to pierce the Kennelly-Heaviside Layer in the outer atmosphere, which reflects back to earth the longer waves.

"It is conceivable," he said, "that the power we have succeeded in getting into our 42-centimeter beam is sufficient to pierce the layer and travel the 35,000,000 miles to Mars. Because practically all of the intervening space is a vacuum and does not absorb the waves, this can be done with small power."

SOCIETY HOLDS THIRD ANNUAL MEETING

David Lasser, Nathan Schachner, G. Edward Pendray, C. P. Mason and Laurence Manning were elected directors of the American Interplanetary Society for 1932-33 at its third annual meeting, held at the American Museum of Natural History, New York, on Friday evening, April 1, The officers elected for the year 1932-1933 will be announced in the next issue of the Bulletin.

"CONQUEST OF SPACE" TO BE PUBLISHED IN ENGLAND

The publication of "The Conquest of Space" by David Lasser, president of the American Interplanetary Society, in England was assured as a result of the purchase of the English rights to the book by Hurst and Blackett of London, from the Penguin Press, the American publishers.

"The Conquest of Space" which is the only book in English describing in popular language the history and development of the rocket, and its future, will be published by Hurst and Blackett in the fall of 1932.

MOON'S EFFECT ON RADIO ESTABLISHED

Veteran radio operators who have long held the "superstition" that a full moon weakens distant radio signals are right. Recent tests prove the fact, said Orestes H. Caldwell, formerly a member of the Federal Radio Commission.

Thousands of tests to determine the relation of the moon's position to radio reception have been made, said Mr. Caldwell, who is also editor of *Electronics* and of *Radio Retailing*. It became evident from the tests that reception invariably was at its best when the moon was below the horizon, while as soon as the moon "rose" reception fell off fifty percent. Little difference was noted whether the moon was lighted or dark or whether "new" or last quarter. The quality of reception seemed to depend only on the presence of the satellite in the sky and its distance overhead.

The moon, said Mr. Caldwell, in swinging through space for countless centuries apparently has collected a considerable negative electrostatic charge from the electrons poured down upon it with the sun's rays. Such a charged moon passing over the earth's Heaviside reflecting layer, would induce an electrostatic charge that would depress and distort the reflecting layer beneath it, making a sort of bulge, thus interfering with the reflection and local reception of distant radio signals.

MARTIAN POLE MOST HABITABLE

Mr. Gleb S. Simonow, of Odessa, Russia, writing in the March 1932 *Popular Astronomy*, after analyzing all of the evidence on the climate of Mars, comes to the conclusion that in the summer polar regions, during the long polar day, the temperature is most fit for human life, being at about 18° Centigrade (about 64° Fahrenheit).

Mr. Simonow believes, however, that the "most important argument for the living organism" on Mars, "similar to the Earth's organisms, is the atmosphere. Its composition may be presumed similar to the Earth's atmosphere. Moreover, we have some ground to believe that the Martian atmosphere contains relatively more oxygen than the Earth's, though the absolute quantity is about 15% of the earth's atmosphere. By means of the investigation of the photographs of Mars with violet and infra-red light, Wright estimates the dimension of the Martian atmosphere as 100 kilometers and the pressure as 60 mm. It is conformable to the pressure of the atmosphere at 18 kilometers above the earth's surface. The water vapor is about 5 to 6 percent of that in the Earth's atmosphere." The following are the data of the temperature of Mars:

Mean	—16° C.
on the equator-daytime	+ 5° C.
on the equator-morning	—45° C.
on the equator-dark regions	+10 to +20° C.
in the winter polar regions	—70° C.
in the summer polar regions	+18° C.

"Evidently rain is absent," Mr. Simonow goes on to say. "The existence of vegetation, perhaps very scanty, is evident. The changes of the seasons cause the revival or dying of vegetation just as on Earth, though the development of the spring vegetation begins at high latitudes. In regard to organic life no suggestion can be noticed. The Martian climate is very severe, perhaps too severe for highly developed creatures. Mars may, however, posses life which had adapted itself to the hard Martian conditions."