versity Club, a Conference on Industrial Physics. The purpose of this conference is to direct attention to the increasingly important part which physics and physicists are playing in industry and to provide facilities for the interchange of ideas on industrial physics. The tentative program follows: "Putting Physics to Work," Dr. A. W. Hull, General Electric Research Laboratory; "New Electronic Tubes and their Uses," Dr. D. L. Ulrey, Westinghouse Electric and Manufacturing Company; "What X-rays Can Do for Industry," Dr. V. Hicks, University of Pittsburgh; "Copper-Oxide Rectifiers and Their Applications," Dr. L. O. Grondahl, Union Switch and Signal Company; "How Physics Is Applied in the Oil Industry," Dr. P. D. Foote, Gulf Research Laboratory; "Spectroscopy in Industry," Dr. Keivin Burns, Allegheny Observatory; "Applications of Thermodynamics to Alloy Systems," Dr. William L. Fink, Aluminum Company of America; "Physics and Air Conditioning," Dr. Emerson Pugh, Carnegie Institute of Technology.

THE Central Pennsylvania Branch of the Society of American Bacteriologists held its annual fall meeting at the Pennsylvania State College on October 18. A dinner was held at the University Club at which Dr. R. R. Mellon, of the Western Pennsylvania Hospital of Pittsburgh, addressed the members and their guests on "Life Cycles of the Mycobacterium Tuberculosis." Dr. John W. Rice, of Bucknell University, succeeds Dr. J. A. Sperry, head of the division of bacteriology of the Pennsylvania State College, as president of the branch.

THE A. Cressy Morrison Prize in Natural Science of the New York Academy of Sciences, for the most acceptable paper in a field of science covered by the academy or by an affiliated society, will be awarded on December 16. The papers submitted must embody the results of original research not previously published.

THE U. S. S. R. has been admitted to membership in the International Commission on Illumination, according to an announcement by G. H. Stickney, president of the United States National Committee. With the addition of Spain, which was admitted to membership during the convention in Germany last July, there are now seventeen countries affiliated with the commission.

APPLICATIONS for various grades of public health consultants, and for public health research assistant, must be on file with the U. S. Civil Service Commission, Washington, D. C., not later than November 25. Optional subjects for the consultant positions are: Maternal and child health, general public health practice and orthopedics. The specialty for the research assistant is maternal and child health. Entrance salaries for the consultant positions range from $2,600 to $4,600 a year. The entrance salary for research assistant is $2,000 a year. These salaries are subject to a deduction of 3½ per cent. toward a retirement annuity. Vacancies in these positions in the Children's Bureau, Department of Labor, and in the U. S. Public Health Service, Treasury Department, both in Washington, D. C., and in the field, will be filled from these examinations. Certain education and experience are required.

MOUNT SINAI HOSPITAL, New York City, as the residuary legatee, receives more than $1,300,000 from the estate of Miss Bertha Weinman. A bequest of $25,000 is made to the College of the City of New York for its library, in memory of Moses Weinman.

PUBLIC bequests amounting to $902,553 are made in the will of Mrs. Margaret I. Howe, who died in Brooklyn on January 8. The largest single bequest is the sum of $200,000 to the Brooklyn Museum of Arts and Sciences. Seven other institutions received shares of the residuary estate and remainder interests in trust funds after the deaths of the life beneficiaries.

THE Society of the New York Hospital, as residuary legatee, is the principal beneficiary of the estate of the late Mrs. Jane O. Sheldon, which includes also the residuary estate of Mrs. Sheldon's sister, Susan E. Urie. Fourteen charitable and civic institutions receive bequests amounting to $177,000. The residuary estate is of undetermined value.

DR. AVERY A. ASHDOWN writes: "In examining the obituary notice of Arthur Dehon Little, SCIENCE 82, 362 (1935), I noticed, with regret, that an error had slipped my attention in the galley proof. The fifth paragraph, line two, should read William H. Walker where Willis R. Whitney stands."

DISCUSSION

"REMARKS ON SULAIMAN'S THEORY OF RELATIVITY"

UNDER the above heading, D. R. Hamilton, of Princeton University, has criticized my theory.[1] My humble claim is that, without making the unconvincing assumptions and involving oneself in the serious anomalies of the generalized theory of relativity, all its results can be obtained from the Newtonian mechanics if Newton's method of working, based on the as-

[1] SCIENCE, 81: 2098, 271–272, March 15, 1935.

sumption of the infiniteness of the velocity of propagation of gravitational action, *i.e.,* forces act in the same way whether a body is stationary or is moving, is corrected.

I must at the outset remove the misapprehension that my mathematical theory is based on the assumption of the existence of gravitons. For the purposes of mathematical analysis, it was considered convenient to concentrate attention on the path of a particle. But it was pointed[2] out on page 5, paragraph 2 (and again on pages 219, 229, 236 and 261 in the later chapters), that gravitons are not at all necessary for the theory. *There is only one solitary assumption, and no more, viz., that all influences travel with finite and not infinite velocities.* The rest are mere mathematical deductions from this one single assumption. LeSage's theory has been misunderstood to be identical with mine, as it was not one of emission but impact of corpuscles and led to proportionality to dimensions and not masses.[3] When the assumption of gravitons is dispensed with, the analogy of LeSage's physical theory altogether disappears.

It is gratifying that there are no adverse remarks regarding my formulae for the deflection of light and the vibration of solar atoms, and it is acknowledged that my result regarding the advance of the perihelion is close to the desired value. These are three chief results on which the claims of general relativity are based. The criticism of Mr. Hamilton is directed exclusively against the resultant perturbations in the semi-major axis and the eccentricity. The remark that calculations of these perturbations had not been carried out by me is surprising, as their exact values were actually worked out at some length on pages 20–22. The further consideration of these perturbations was intentionally postponed to a later chapter because I was first concerned with offering substitutes for the three main results of general relativity, which, it was previously believed, could not be deduced from Newtonian mechanics.

The great Laplace was, of course, aware of the aberration phenomenon, and Tisserand also made use of it. But as has been conceded, their methods were quite different, and did not yield any formula tallying with the observed advance of the perihelion. The gravitational deflection of light and the red shift of the spectral lines were not considered by them and indeed were not known at the time. The law of force adopted by them was the plain Newtonian law, which made the integration easy. Laplace's theory was based on the idea that the attraction was produced by the impulse of a fluid on the center of the attracted body, and accordingly it led to a retardation of motion. My equations are based on the well-known principle of retarded potential for electric attraction, and lead to acceleration. They also contain additional terms which render the equations extremely complex and incapable of exact solution. Only a few solutions by successive approximations, by omitting higher powers, have been published by me. As objection has been taken to my work on the basis of these perturbations, I must now briefly announce how I intend to meet them in a later chapter.

In the first place, it is submitted that calculations based on yearly increases for a large number of revolutions are fallacious. The curve found by the approximate solutions, which do not involve it, merely represents a geometrical picture of the orbit and that too *only within the limits of the approximations.* It does not at all profess to give the whole history of the revolutions of a planet for a long period. The fallacy underlying the contrary assumption becomes at once apparent when similar increases are applied to Professor Einstein's equation for the curve and his value for the advance of perihelion[4]:

$$u = \frac{\mu}{h^2}\left[1 + e\cos(\phi - \omega) + \frac{3\mu^2}{c^2h^2}\cdot e\cdot(2n\pi + \phi)\cdot\sin(\phi - \omega)\right]$$

$$= \frac{\mu}{h^2}\left[1 + e\cos(\phi - \omega - \delta\omega)\right]$$

where

$$\cos\delta\omega = 1, \text{ and } \sin\delta\omega = \delta\omega = \frac{3\mu^2}{c^2h^2}\cdot(2n\pi + \phi).$$

These break down when n is large. The obvious explanation is that the geometrical shape of the orbit is one thing and its whole history through its spiral path is quite another.

In the second place, it will be seen that the force of gravitation along the shifted direction has a very large component along the radius vector, which accounts for the orbit being a Keplerian ellipse, while the component along the transversal is very small, of the order of 1/10,000 in the case of the earth. This latter component can be resolved into two still smaller components along the normal and the tangent, respectively. Quoting Laplace, Mr. Hamilton remarks: "The resulting tangential acceleration (retardation?) of the planets had no effect on the longitude of perihelion but introduced secular perturbations in the semi-major axis and eccentricity of the orbit and in the mean longitude of the planet in the orbit." On the authority of Jenneck and Chazy, he concludes that

[2] *Proc. Acad. Sci.,* U. P., India, Vol. 4: Parts I and IV.
[3] Lorentz, "Lect. on Theo. Phys.," Vol. I: 151–152.
[4] Sir A. S. Eddington, "Relativity," p. 88.

the velocity of gravitation would have to be extremely large. He argues that otherwise Mercury would leave the solar system in about 300 years from now, and that, if the velocity is so large, the advance of perihelion would be negligible. Now Laplace and Tisserand could not assume a resisting medium because their equations led to a retardation, and a resisting medium would have made things worse. But in my theory the resisting medium, through which the planets move, acts tangentially in the opposite direction, counteracts the tangential acceleration and, while producing a null effect on the advance of the perihelion, reduces the dreaded perturbations!

Admittedly, the sign predicted by my formula, in the case of the eccentricity of Venus, the earth and Mars, agrees with Newcomb's observations.[5] In the case of Mercury, which passes closer to the sun, the retardation just overcomes the acceleration, and the discrepancy changes sign. In the case of Encke's comet, which passes closer still, the resistance is so great that it actually causes a marked shortening of the period!

It is, therefore, rather premature to jump to the conclusion that my theory will, of a necessity, founder ultimately on this yet untouched rock. The only phenomenon which can be exactly observed because of accurate photography is the deflection of light from a star passing close to the sun. My result, which accords fairly closely with the present known values, differs widely from that obtained from the generalized principle of relativity. The next solar eclipse on June 8, 1937, in Peru will furnish the final test. In the meantime, Chapters III, IV and V, dealing with the "Expanding Universe" and "Special Relativity," have also been published, though owing to the length of the paper the last sections relating to experiments are unfortunately not full. Criticisms thereon would be welcome.

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IN the above defense of his "theory of a new relativity," Sir Shah Sulaiman does not deny the main point of the author's original criticism, namely, that the new theory in its published form predicts a yearly secular logarithmic perturbation of Mercury's eccentricity of the order of $+1.3\times10^{-2}$, whereas that observed is -4×10^{-8}; and while the point is made that the signs of predicted and observed perturbations agree for Venus, the earth and Mars, it should be remembered that the predicted values range from 6×10^{4} to 2×10^{6} times the observed changes of the eccentricity.

The statement is made that "the resisting medium, through which the planets move, acts tangentially in the opposite direction, counteracts the tangential acceleration and, while producing a null effect on the advance of the perihelion, reduces the dreaded perturbations"! Also, "only a few solutions by successive approximations, by omitting higher powers, have been published by me." The inference is that an attempt is to be made to modify the present results by the consideration of higher order terms and the introduction of a resisting medium (which has not been considered in the two papers thus far published). However, as regards higher order terms, the author has found since the publication of his original comments on Sulaiman's theory that a consideration of *all* terms of order $1/D^2$, which were introduced by Sulaiman himself (D being the velocity of propagation of gravitation, assumed equal to the velocity of light), several of which were subsequently neglected by Sulaiman, converts the previously obtained correct advance of the perihelion to an actual retrogression, in absolute magnitude one sixth the previously predicted advance; but the perturbations of the eccentricity and semi-major axis remain unaltered. An *ad hoc* resisting medium may cancel out the latter undesired perturbations, but as Sulaiman points out above, it can have no secular effect on the longitude of perihelion.[1] Prediction of the proper perihelion advance was supposedly one of the strongest points in support of the new theory.

The details of these corrections to Sulaiman's theory, as well as a complete account of the numerical perturbations predicted by Sulaiman's formulae, are to be published shortly.

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THE NEW ERGOT ALKALOID

H. W. DUDLEY and C. Moir,[1] M. S. Kharasch and R. R. Legault,[2] M. R. Thompson[3] and W. A. Jacobs and L. C. Craig[4] have published in this journal their investigations on new physiologically interesting substances isolated from ergot of rye. Since Sir Henry Dale[5] has continued the discussion by means of a brief on the question of priority and especially on the naming of the new ergot alkaloid, I take this opportunity to inform the readers of SCIENCE of the isolation of "Ergobasine," its characteristics and the reasons for selecting this particular name. The report of H. H. Dale will be supplemented from the chemical

[5] Tisserand, "Mécanique Celeste," Vol. 4: 535.

[1] H. C. Plummer, "Dynamical Astronomy," pp. 177–179.

[1] SCIENCE, Supplement, p. 10, March 29, 1935, and 81: 559, 1935.

[2] SCIENCE, 81: 388 and 614, 1935.

[3] SCIENCE, 81: 636, 1935.

[4] SCIENCE, 82: 16, 1935.

[5] SCIENCE, 82: 99, 1935.