a term of one year. Dr. John H. Mueller, now associate professor at Columbia University, has been appointed assistant professor of bacteriology and immunology in the medical school. Dr. E. L. Chaffee has been promoted from an assistant professorship in the department of physics to an associate professorship. Dr. Hilding Berglund, research assistant, has been appointed assistant professor of medicine.

DR. OSCAR M. SLOSS has resigned his post at the Children's Hospital, Boston, to become professor of pediatrics in the Cornell University Medical School.

DUE to the continued illness of President Samuel F. Kerfoot, of Hamline University, Dean Henry L. Osborn, professor of biology and geology, has been authorized to assume the responsibilities of president in his absence.

DISCUSSION AND CORRESPONDENCE

THE ENDOWMENT OF SCIENTIFIC RESEARCH

SCIENCE for April 13 contains two timely reflections upon the use of wealth to aid research. One of them laments the taking over of the research functions of the university by wealthy corporations; the other, echoing Dr. Pritchett's pessimistic query—Can wealth be given away to the benefit of the public?—raises a doubt as to the efficacy of large benefactions in aid of scientific research.

If corporate capital is robbing our universities of their best research professors, should not the fact constitute a stimulus for increasing the diminishing supply rather than a cause for deploring the increasing demand? And if it is lamented that great benefactions to scientific research as now administered do not produce the results one would rightly expect, is not that a reason for changing the prevailing modes of administering these great trusts, rather than a ground for discouraging them altogether?

It is idle to maintain that great corporations can exhaust the most interesting fields of modern science; for every new scientific discovery opens up a dozen new problems of scientific research. Moreover, the fact that these corporations with their great capital of wealth and inventive brains are every day providing science with improved tools for research that university resources could never hope to supply is constantly ignored in these Jeremiads.

It is equally idle to maintain that benefactions in the aid of science are in themselves and *per se* fatal to scientific progress. For these benefactions are supposed to be gifts to science, not gifts to persons. If science does not derive benefit from them, it argues that there is something wrong with the method by which they are administered, not with the gifts themselves.

That the prevailing mode of administering great benefactions in the aid of science is not as efficient as it might be may be due to the fact that those who determine the personal recipients of these funds and the particular research problems to which they shall be applied must decide these matters largely from a personal rather than from a scientific point of view. I do not mean to charge favoritism—that this "kissing goes by favor": but no dozen men in the world, scientists or business men, are capable of wisely determining in all cases and under all circumstances the most fruitful application of these great benefactions. If the proposed benefaction is to be limited to some field of research, its application should be determined by the consensus of the majority of the most experienced research scientists in that field, and not upon the special predilections and enthusiasms of one or two of them; if it is to cover the whole field of scientific research it should first be impartially budgeted with regard to the needs of each particular field and then applied in accordance with the consensus of the majority of its most experienced representatives.

We now have special American organizations for research in the cardinal branches of science and a general clearing house for activities of American scientific research as a whole. By using these instrumentalities to determine the application of benefactions to scientific problems we should at least escape from the limitations of small groups of scientific almoners. Even though the results might not prove to be all that could be desired, the plan is well worth trying, especially in view of the fact that it seems already to have worked well on a small scale. Such a plan would at least prevent the

frittering away of large resources upon schemes of research that are unwisely planned or prematurely undertaken or imperfectly coordinated with other activities of advancing science. And if it failed it would at least put the responsibility of justifying these expenditures of wealth, where it really belongs, upon American science as a whole.

With such a scheme of apportioning benefactions in the aid of pure science, the commercial utilities of research might safely be left to take care of themselves; for the large majority of the members of our scientific associations are themselves college professors, and would know well enough what scientific problems needed the support of benefaction and what could be wisely left for solution to the selfish interests of commercial organizations.

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A TEST FOR ECLIPSE PLATES

THE mere fact that photographs taken during a total solar eclipse show a bending of light rays does not, of itself, prove the Einstein theory. Such bending may be due to the Einstein effect, or may be due to one of several perfectly natural causes: refraction of light through the masses of matter surrounding the sun, or abnormal refractions in the atmosphere of the earth. Until the possible effects of these natural causes have been completely eliminated, the observed light deflections during an eclipse cannot be taken as proof of relativity.

The effects of abnormal refraction in the earth's atmosphere may be very similar in character to the so-called Einstein effect. The higher the sun in the heavens at the time of the eclipse, the more nearly will the effects of abnormal refraction approach the Einstein effect. In fact, in the ideal case the two effects (abnormal refraction and Einstein) follow practically the same law. If, at the time of the eclipse, the sun be in the zenith of the observer and the atmosphere be perfectly quiet, then the shadow of the moon would cause a funnel of cool air to form, coolest along the vertical axis of the shadow. A ray of light from a star would, therefore, pass from warmer air to the cooler air of the shadow axis in reaching the photographic plate, and such ray would be refracted, or would show a bending; and the amount of such refraction would depend upon the distance of the star from the axis of the shadow. The law by which the amount of such refraction would decrease with the distance of the star from the center of the shadow would be the same as that for the so-called Einstein effect. A difference in temperature of only a very few degrees between the air at the axis of the shadow and that at the edges would cause a bending of the rays fully as large as that called for by Einstein. This abnormal effect might be larger than and completely mask the ordinary refraction.

There is rather a simple way of testing an eclipse plate for the presence of such abnormal refraction. Such a plate shows not only the images of the stars, but also the image of the moon. Various points on the edge of the moon might be measured in identically the same way as the star images. Such moon measures could be reduced in a manner entirely similar to that used for the stars, applying the same corrections for orientation, scale value, differential refraction, etc. From these measures could thus be obtained the values for various diameters of the moon and such measured diameters could be compared with that calculated from the lunar tables.

Such an operation ought to give a very good check on other measurements on the plates, it ought to show up any plate distortions, instrumental errors or atmospheric abnormal refractions. If the various diameters of the moon, so measured, show no distortion and agree with the calculated value, then this check would be fairly conclusive evidence that any star deflections obtained are caused by some cosmic action, are due to some cause or causes at a distance farther from the earth than the moon. On the other hand, if the moon diameters show distortions, or a value different from the calculated value, it would be good evidence that any other observed deflections are also of terrestrial origin, either instrumental or atmospheric.

On a plate of very long exposure the motion of the moon during the interval might cause complications, but on a plate exposed for only a few seconds such motion ought to be negligible.

Unless this, or a similar test can be made, the possibility that the observed bending of the light rays from the stars may be due to ter-