It will be obvious from the preceding data that the number of university research funds and especially of permanent endowments is small, and that several of our universities which are distinguished for the amount and the excellence of the scientific papers emanating from them do not possess such funds, so that by far the greater amount of scientific research which is carried on in this country is sustained by special appropriations. And, furthermore, much of the research work pursued in institutions possessing research funds is also sustained by such budget and special appropriations.

In many of the replies received by the committee attention is called to the fact that while there is no endowment for research yet appropriations sometimes large in amount are regularly made for the purpose. The following abstracts of certain of these replies, although lying somewhat outside of the immediate scope of the inquiry made, will be of interest.

Ohio State University: several graduate fellowships established requiring research work. Johns Hopkins University: besides appropriations for research made in budget for each department, income of various funds is drawn upon for purposes of research. Bowdoin College: maintains a table at the Marine Biological Laboratory at Woods Hole. University of Chicago: special appropriations for research made from time to time from the general funds of the university. Field Museum of Natural History: appropriations for surveys, investigation, etc., made from general fund. University of North Dakota: $700 annually from departmental appropriations used for research. Denison University: annual appropriation, $500, made for publication of research work done in the university. Dartmouth College: besides general departmental appropriation in budget, special appropriations for research are made from time to time. Drexel Institute: pays in part fees for professors engaged in investigation. Cornell University: besides appropriations in budget, the university sometimes releases a professor from teaching in order to carry on research. University of Kansas: $8,000 available for fellowships. Mellon Institute of Industrial Research: expenses of researches met by private subscription. Leland Stanford Junior University: appropriations for research made from budget. Pennsylvania State College School of Engineering: expended for research, 1915–16, $1,549. Rose Polytechnic Institute: research work provided for by special appropriation. University of Arizona: will probably receive $5,000 from the state for research in mining. Tufts College: department of biology maintains a room at Harpswell Laboratory. Wellesley College: occasionally an appropriation is made for research carried on by a professor on leave of absence. University of Manitoba: sum of $1,000 has been collected for research in physiology. Worcester Polytechnic Institute: part of annual appropriation spent for research.

The data which the committee has gathered regarding research funds, while fulfilling the ends which it was intended to reach, can not furnish any definite idea of the real amount expended annually in this country in aid of the progress of scientific research. Such information is very desirable, but to obtain it will require a much more extended inquiry than the present one.

While much care has been exercised in the compilation of the foregoing matter, there will doubtless be found errors both of omission and of statement. The undersigned will be glad to receive corrections of such and to insert them later.

Charles R. Cross,
Chairman

KARL SCHWARZSCHILD

The American friends of Professor Schwarzschild hoped that the report of his death was a mistake, but since its confirmation by private letters from Germany, they have felt a great sense of sorrow and loss, not only to science, but to themselves personally. Schwarzschild made a visit to this country in 1910, attending the meeting of the Astronomical and Astrophysical Society of America at the Harvard College Observatory and the meeting of the Solar Union at Pasadena. This visit gave an opportunity for closer acquaintance which ripened into personal friendship, and increased our admiration for the man as well as for the astronomer.

Schwarzschild was born at Frankfort-on-the Main, 1873, October 9. His first astronomical work was done as assistant at the von Kuffner Observatory in Vienna from 1896 to 1899. This work appeared in volume five of the pub-

lications of the von Kuffner Observatory entitled *B*, "Die Bestimmung von Sternhelligkeiten aus Extrafocalen Photographischen Aufnahmen," *C*, "Beiträge zur Photographischen Photometrie der Gestirne." This was pioneer work in the use of extrafocal images, in that it was brought to a successful outcome and applied to various regions of the sky. The Director de Ball published a very appreciative description of Schwarzschild's work in the *Bulletin Astronomique* for 1905.

From 1899 to 1901 Schwarzschild was "privatdocent" at the University in Munich, and in 1901 was called to the University of Göttingen as director of the observatory and professor of astronomy. He held this position for eight years, which were rich in astronomical results, both theoretical and practical. The theoretical work appeared in parts 9–11 of the "Astronomische Mittheilungen der Königlichen Sternwarte zu Göttingen." Perhaps the most interesting part relates to the improvement of the reflecting telescope by a combination of curves of the two mirrors which would give a field as flat as the refractor used for the "Astrographic Chart."

The practical part of the work at Göttingen included an improvement on the method of extra-focal images which had been used at Vienna. This consisted in giving a motion to the plate during the exposure, so that the image (itself in focus) was built up into a square area sufficiently large to be measured as an extra-focal image. This attachment was called the "Schraffierkassette," and there resulted from its use the "Göttingen Aktinometrie," which covered the zone 0° to +20° declination. This appeared as part fourteen of the Göttingen publications, and gave the photographic magnitudes of 3,522 stars, also the visual magnitudes as measured at Potsdam by Müller and Kempf.

About this time Schwarzschild suggested the use of the difference between the photographic and the visual magnitudes as a measure of the color of the stars. He suggested the term "Farbentönung" (color-index), and gave this quantity for each of the stars in the "Aktinometrie." He was also one of the first to apply the color-index to the determination of the temperature of the stars.

During his stay at Göttingen he also devised instruments for determining geographical positions in the navigation of airships. The sextant as modified for this purpose was described in "Zeitschrift für Flugtechnik und Motorluftschiffahrt," 1913.

Schwarzschild was called to succeed Vogel as director of the Astrophysical Observatory at Potsdam in 1909. He brought to this trying position a talent exceptionally ripened for a man only thirty-six years of age, and he filled the position with distinguished success. During his term the astrophysical work at Potsdam was carried forward in a way worthy of its first director and his brilliant staff, and the list of publications bears witness not only to the work of the different astronomers, but also to Schwarzschild's ability as a director. Among Schwarzschild's theoretical contributions during this period may be mentioned his work on the distribution of stars in space.

The remarkable range included in Schwarzschild's work, from the improvement in the sextant to the distribution of stars in space, showed that he combined theoretical and practical ability in an unusual degree, thus fitting him especially for the directorship of a great astrophysical observatory.

Schwarzschild's personality was especially pleasing. He was lacking entirely in that stiff formality which renders so many men in high positions unapproachable. He had a great capacity for friendships, and his admiration for Dyson, the English Astronomer Royal, was very pronounced. What could be finer than the simple statement which he made in regard to Dyson, "We nearly always think alike." Schwarzschild's disposition was not in the least jealous. As an example of this may be mentioned his suggestion to the International Committee, that the magnitudes of the Harvard System should be taken as the international standards, and that the other systems should be reduced to this by the application of suitable corrections.

Schwarzschild was happy in his domestic relations and his home was always open to his

friends without any formality. It will be extremely difficult to fill his place and the sense of loss on account of his early death will be very widespread.

J. A. Parkhurst
Yerkes Observatory

REPORT ON INFANTILE PARALYSIS

The conference committee of pathologists which met in New York City on the invitation of the city authorities has made the following report to Dr. Haven Emerson, commissioner of health.

Having been called to New York at your suggestion, and for the purpose of consulting with you concerning the practical measures employed in dealing with the present epidemic of poliomyelitis, we offer the following statement.

We have spent two days in studying the situation and investigating prevailing conditions.

On Thursday morning we went over with you the history of the origin and spread of the epidemic of this year. We made a careful study of your maps and diagrams showing the number and distribution of cases in the different boroughs of the city. This was followed by a discussion of the methods that have been employed, both here and elsewhere, in attempts to control the spread of the disease.

In the afternoon of the same day we visited Willard Parker Hospital and made a careful inspection of the treatment and care given by the city to the children afflicted with this disease.

Thursday evening we had a discussion concerning the methods being employed and the possibility of making these more efficient.

On Friday morning we visited cases quarantined in their own homes, and in this way were able to compare the hospital care with the home care of the sick. We also made a survey of certain crowded infected districts, and, with a diagnostician, we visited certain homes in which cases have been recently reported.

Friday afternoon we gave to a more formal discussion and the suggestion of definite recommendations.

We have given special attention to the methods now employed by you and your department, and we approve of the measures you have taken.

The weight of opinion favors the view that infantile paralysis is mainly spread through personal contact, and measures have been directed chiefly from this point of view. Cognizance, however, has been given to additional methods of transmission, among which is the bite of insects. For sanitary purposes it is proper to consider that this disease is transmissible directly from the sick to susceptible persons, or indirectly from the sick through carriers.

Even with our incomplete knowledge of the dissemination of the disease, it is evident that, in seeking to abate the epidemic, stress must be especially laid upon two things, as is now being done:

1. The early recognition and notification of the disease, and

2. The immediate isolation of patients and cases of suspicious illness.

Furthermore, on account of incomplete knowledge concerning the disease, measures known to be effective in checking the spread of other infections should be applied and these are, particularly, personal hygiene, cleanliness of person and surroundings, and care of food, which should be thoroughly cooked.

In order to secure the earliest possible recognition and notification of cases and their prompt isolation, we wish to direct particular attention to the appeals that have been made by the department to the physicians of the city and to the public generally that they cooperate with the department in all these measures.

We strongly recommend that you inaugurate a house-to-house inspection of as large a part of the city as is practicable, twice a week, for the purpose of education and of securing the early recognition, notification and isolation of the disease.

We are of the opinion that satisfactory isolation is secured only in hospitals. Moreover, not only is more thorough protection secured for the public by the hospitalization of patients, but it is also better for the individual patient.