

1032 ✓

MR. ARNETT:

ON SATURDAY DOCTOR HALE TELEPHONED TO  
GIVE YOU THE FOLLOWING MESSAGE: SINCE SPEAKING  
WITH YOU ABOUT THE DATE OF RELEASE OF THE ARTICLE  
ON THE TELESCOPE, HE HAS TALKED WITH ONE OF THE  
EDITORS OF THE NEW YORK TIMES, WHO, FOR TECHNICAL  
REASONS, STRONGLY RECOMMENDED MONDAY, OCTOBER 29,  
RATHER THAN SUNDAY, THE 28TH (WHICH DOCTOR HALE  
SAID HAD SEEMED TO BE YOUR PREFERENCE).  
MR. HENRY M. ROBINSON HAS JOINED DOCTOR HALE IN  
NEW YORK, AND IN CONFERENCE THEY DECIDED TO ACCEPT  
MONDAY, THE 29TH, AS THE RELEASE DATE SINCE  
DOCTOR HALE UNDERSTOOD THAT IT DID NOT MATTER  
GREATLY TO YOU WHICH ONE WAS CHOSEN.

LFA

10/20/28

O.K.  
Jen

For the newspapers - to be released Oct. 29, 1928  
1032

A NEW ASTROPHYSICAL OBSERVATORY

WITH A 200-INCH TELESCOPE

The International Education Board has made an appropriation to the California Institute of Technology in Pasadena for the construction of an astrophysical observatory and laboratory, to be equipped with a 200-inch reflecting telescope and many auxiliary instruments. A prime purpose of the gift is to assure the new observatory the advantage in its design, construction, and operation, of the combined knowledge and experience of the strong group of investigators in the research laboratories of the Institute and in the neighboring Mount Wilson Observatory of the Carnegie Institution of Washington. This has been guaranteed by the unanimous approval of the Trustees of the California Institute and by that of the Executive Committee of the Carnegie Institution, taken on recommendation of its President, John C. Merriam, as well as by the cordial support of the members of the research staffs of both institutions, who have closely cooperated for several years in a study of the constitution of matter. ~~Other departments of the Carnegie Institution will also join in the plan of cooperation.~~

The terms of the gift are so broad as to offer a unique opportunity for securing scientific results of the greatest interest. This can be seen from the nature of the equipment, the problems to be solved, and the group of men assembled to attack them.

The new observatory, which will be designed to supplement, not to duplicate, the Mount Wilson Observatory, will comprise two main parts. One of these will be the 200-inch telescope with its buildings, dome, and auxiliary equipment, to be erected on the most favorable mountain

within effective working distance of Pasadena, site that can be found in Southern California. The other will be an Astrophysical Laboratory on the campus of the California Institute, in Pasadena. This new Laboratory will be equipped with instruments and all necessary facilities for the study and interpretation of the observational results obtained with the 200-inch telescope, and for graduate instruction and research in astrophysics. It will be supplemented by optical and instrument shops capable of constructing the largest and most delicate instruments required for use in conjunction with the 200 inch telescope.

What may we hope to learn with the new telescope and its auxiliary instruments? It should render possible the exploration of many "island universes" beyond the Milky Way, the nearest two or three of which are now but slightly known. It should tell us something about the evolution of these spiral nebulae, millions of light-years distant, and much about the development of the stars of our own galactic system, one of which is the sun with its encircling planets. It should solve many of the problems of physics or chemistry that depend upon the enormous masses or temperatures, or upon the immense density or extreme tenuity, exhibited by celestial bodies in which titanic experiments exceeding the capacity of any terrestrial laboratory are constantly in progress. Incidentally, it should reveal hundreds of millions of stars and <sup>hundreds</sup> ~~tens~~ of thousands of nebulae beyond the range of existing telescopes.

Special emphasis is laid on the fact that a modern telescope for astrophysical research is not merely the traditional lens or concave mirror, gathering up starlight and concentrating it at its focus. Equally vital is the whole battery of instruments and devices developed in recent years to receive, record, and interpret the telescopic images of celestial objects. These are so important that by doubling or treb-

ling their efficiency we may multiply the power of the telescope in the same proportion. The new gift provides for the first time for a general study of all these auxiliary instruments and devices, and for ~~their~~ their development to such a point as to give the telescope the highest efficiency attainable.

Possibly omit - { The largest auxiliary of the telescope will be a 40-foot Michelson stellar interferometer, attached across the upper end of the tube and arranged so that it can be rotated. This should make possible the measurement of the separation of many so-called spectroscopic ~~max~~ binary stars, giving us new knowledge of the evolution of these stellar systems, and throwing a flood of light on the life-histories of stars.

A prime necessity is the photographic plate in its many varieties, sensitized to light of all wave-lengths from the extreme ultra-violet to the remote infra-red. Through the generous aid of Mr. George Eastman and of Dr. C.E.K. Mees, Director of the Research Laboratory of the Eastman Kodak Company, further important improvements in photographic plates for astronomical and spectroscopic research, equal to those recently accomplished under the direction of Dr. Mees, will doubtless be perfected.

Similar special studies of all the other auxiliaries of the telescope will be made by the ablest specialists in this country and abroad. These include the spectroscope in its various forms, for the analysis of the light of celestial objects; the radiometer, the thermocouple, and the photoelectric cell, for the measurement of energy radiation<sup>the ed</sup> by them; and the various special forms of laboratory instruments needed to interpret the results of telescopic observations.

The success of the undertaking depends upon the intimate cooperation

of many experienced investigators. The California Institute has appointed four members of its Executive Council in general charge of the project. The Observatory Council thus established comprises Messrs. George Ellery Hale, Honorary Director of the Mount Wilson Observatory; Robert A. Millikan, Director of the Norman Bridge Laboratory of the Institute; Arthur A. Noyes, Director of the Gates Laboratory of Chemistry, and Henry M. Robinson, <sup>a leading trustee</sup> ~~Vice-President of the Trustees~~ of the Institute. Through the courtesy of the Carnegie Institution of Washington, Dr. John A. Anderson, a member of the staff of the Mount Wilson Observatory, will serve as Executive Officer in direct charge of design and construction. An Advisory Committee has been appointed consisting of Dr. Walter S. Adams, Director of the Mount Wilson Observatory, Professor Frederick H. Seares, its Assistant Director; Dr. Charles G. Abbot, Secretary of the Smithsonian Institution; Professor A. A. Michelson of the University of Chicago; Professor Henry Norris Russell of Princeton University; and Professors Richard C. Tolman, Paul S. Epstein, and Ira S. Bowen of the California Institute. This Committee will actively assist the Observatory Council and Dr. Anderson in determining matters of policy.

Many other leading astronomers, physicists, chemists, meteorologists, and engineers in these and other institutions have been and will be called upon for advice and assistance. Thus the General Electric Company, through its President, Mr. Gerard Swope, has offered its invaluable cooperation; and Dr. Elihu Thomson with the assistance of Mr. A. L. Ellis, an able research engineer of the company, has begun preliminary work which he believes will lead to the successful casting of a 200-inch mirror disk of fused quartz, a material greatly superior to glass for this purpose, because its form remains almost unchanged under variations of temperature.

Mr. Ambrose Swasey, Chairman of the Board of the Warner + Swasey Company;  
 Mr. Gano Dunn, President of the J. G. White Engineering Corporation,  
 and other eminent authorities, have <sup>their</sup> also promised the Observatory Council the benefit of ~~the~~ <sup>their</sup> ~~most~~  
 experience in engineering and instrumental design and construction.  
 Dr. Frank E. Ross of the Yerkes Observatory <sup>has undertaken the</sup> ~~has come to Pasadena to~~  
 study some of the optical problems, and the design of the telescope  
 and its mounting will be worked out jointly by Dr. Francis G. Pease,  
 Dr. Anderson, and other members of the Mount Wilson Observatory and  
 the California Institute, together with Dr. Ross, Mr. Dunn, and others  
 especially qualified to take part.

For "Science"

THE ASTROPHYSICAL OBSERVATORY OF  
THE CALIFORNIA INSTITUTE OF TECHNOLOGY

The International Education Board, at its recent annual meeting in May, authorized its Executive Committee to provide for the construction of an Astrophysical Observatory, equipped with a 200-inch reflecting telescope and many auxiliary instruments, for the California Institute of Technology in Pasadena. A prime purpose of the gift was to secure for the new Observatory the advantage, in its design, construction and operation, of the combined knowledge and experience of the strong group of investigators in the research laboratories of the Institute and in the neighboring Mount Wilson Observatory of the Carnegie Institution of Washington. The assurance of such cooperation, and of the willingness of the Institute to assume full responsibility for the ~~construction~~<sup>establishment</sup> of the Observatory and its maintenance when completed, were accordingly made conditions of the gift. These conditions were unanimously agreed to by the Board of Trustees of the Institute on July 5, and the Executive Committee of the International Education Board, at its ~~first autumn~~ meeting on Oct. 18, has ratified the arrangement and provided for its execution.

The prompt action of the Institute trustees was made possible by the fact that on May 13 President John C. Merriam of the Carnegie Institution of Washington, with the unanimous approval of the Executive Committee of the Institution and of Director Walter S. Adams and his associates of the Mount Wilson Observatory, cordially accepted a request for cooperation from the California Institute and assured President Wickliffe Rose

of the International Education Board of the willingness of the Carnegie Institution to join in the proposed undertaking. Formal approval has thus been given to the continuation and extension of the cooperation which has been in progress between the California Institute and the Mount Wilson Observatory for several years, especially in the study of the astronomical, physical, and chemical aspects of the constitution of matter.

The purpose of the Astrophysical Observatory is thus to supplement and not to duplicate the Mount Wilson Observatory. The chief problems in view are those that naturally fit into the general scheme of research in which the two institutions are engaged. Thus the increased light-collecting power of the 200-inch telescope should permit further studies of the size and structure of the galactic system, the distance, radiation, and evolution of stars, the spectra of the brighter stars under very high dispersion, the distance and nature of spiral nebulae, and many phenomena bearing directly on the constitution of matter. It is hoped that a 40-foot Michelson stellar interferometer, designed to rotate in position angle, may be attached to the telescope. In the opinion of Professor Aitken and others who have joined us in considering the matter, this should permit the measurement of the separation of the components of more than thirty spectroscopic binary stars, thus giving very complete information regarding the nature of these systems and the masses of their components.

Possibly  
omit this  
(to be dis-  
cussed with  
Russell and  
others)

The new observatory will consist of two parts. One of these will comprise the 200-inch telescope, with its building, dome, and auxiliary equipment, to be erected on the most favor-

able high-altitude site that can be found. <sup>within effective working distance of Pasadena.</sup> The other will be an Astrophysical Laboratory on the campus of the California Institute. This Laboratory will serve as the headquarters in Pasadena of the Observatory staff and the Graduate School of Astrophysics. Its equipment will include instruments and apparatus for the measurement of photographs, the reduction and discussion of observations, and for such astrophysical investigations as can be made there to the best advantage. Its instruments for the interpretation of astrophysical phenomena will be designed to supplement those of the laboratories of the Institute and the Pasadena laboratory of the Mount Wilson Observatory. It will also include an optical shop, but the astrophysical instrument shop will be housed in a separate building, to avoid the effects of the vibration of machine tools.

The value of a telescope depends as much upon the efficiency of the instruments and apparatus used to receive, record, and interpret celestial images as upon its optical and mechanical perfection and its light-collecting power. In the present plan special emphasis is therefore laid upon the development of all forms of auxiliary apparatus, such as spectrographs and their optical parts; photographic plates of the various types required for astrophysical and spectroscopic research; radiometers, thermocouples, and photoelectric cells; recording microphotometers and other forms of measuring machines; and laboratory apparatus for reproducing or interpreting celestial phenomena. The study of these auxiliaries will be pushed forward as rapidly as possible, in view of the fact that any results obtained will be immediately applicable in existing observatories and laboratories.

In order to expedite the work, President Wickliffe Rose approved its initiation immediately after the meeting of the California Institute trustees on July 5. An Observatory Council, consisting of four members of the Executive Council of the California Institute, was placed by the trustees in full charge of the design, construction, and operation of the Astrophysical Observatory and Laboratory. This Council consists of Messrs. Robert A. Millikan, Arthur A. Noyes, Henry M. Robinson, and George E. Hale (chairman). Through the courtesy of the Carnegie Institution of Washington, Dr. John A. Anderson of the Mount Wilson Observatory has been appointed by the Observatory Council as its Executive Officer, in direct charge of design and construction. An Advisory Committee, including Dr. Walter S. Adams, Director of the Mount Wilson Observatory; Professor Frederick H. Seares, Assistant Director; Dr. Charles G. Abbot, Secretary of the Smithsonian Institution; Professor A. A. Michelson of the University of Chicago; Professor Henry Norris Russell of Princeton University; and Professors Richard C. Tolman, Paul S. Epstein, and Ira S. Bowen of the California Institute, will aid the Observatory Council and Dr. Anderson in determining matters of policy, and many other leading astronomers, physicists, chemists, meteorologists, and engineers in these and other institutions will be called upon for advice and assistance. Dr. St. John and Dr. King of the Mount Wilson Observatory, who were attending the meeting of the International Astronomical Union in Leyden, were at once requested by cable to look up many matters calling for early decision, and the reports they have presented embody much valuable information kindly given by leading authorities on the design

and construction of instruments.

The first decision of the Observatory Council and the Advisory Committee, supported by the unanimous opinion of everyone consulted in this country and abroad, favored the use of fused silica for the 200-inch and other mirrors of the large telescope. President Gerard Swope and Dr. Elihu Thomson immediately promised the cordial cooperation of the General Electric Company, and work was undertaken in July at West Lynn, Massachusetts, under the personal direction of Dr. Thomson. After coating with bubble-free silica the face of a 22-inch disk already in hand, a 60-inch disk will be undertaken, for use as one of the minor mirrors of the telescope. If this proves to be satisfactory, a still larger disk will be made before the casting of the 200-inch mirror disk is attempted.

A mathematical study of the optical design of the telescope which Dr. Frank E. Ross of the Yerkes Observatory, with the kind approval of Director Edwin B. Frost, <sup>Came</sup> ~~has come~~ to Pasadena to undertake, has led to the adoption of the ratio  $F: 3.3$  for the 200-inch mirror. The field of sharp definition in the principal focus of such a mirror will be small, but the possibility of photographing extremely faint stars, especially in the spiral nebulae, makes such a powerful concentration of light highly advantageous. Dr. Ross, who will devote himself to these optical problems during the coming year, also believes that a lens can be designed, for use in the converging beam, which will serve when desired to give a much larger field, also with a short equivalent focal length. It is planned to use a Cassegrainian combination with a ratio of  $F: 10$ , having a sharp field 30' (17 inches) in diameter, for spectrographic and other

work. A coude arrangement similar to that of the 100-inch Hooker telescope, permitting the images of celestial objects to be formed in a constant temperature laboratory, for study with large fixed spectrographs, radiometers, or other auxiliary instruments, is also projected.

Dr. Pease has devoted considerable time to a study of the telescope mounting, which has been facilitated by his previous work in designing <sup>large instruments.</sup> ~~a mounting for his proposed 300-inch reflector.~~ Much additional study will be necessary, however, before even a preliminary design can be adopted, because of recent advances accomplished by telescope builders in this country and abroad. It is our hope that an equatorial design of the fork type, of sufficient rigidity to carry a 40-foot interferometer and meet other severe requirements, can ultimately be worked out. In this task we <sup>have been promised</sup> ~~trust we may have~~ the cooperation of many leading engineers, including Mr. Gano Dunn, Mr. Ambrose Swasey and his associates of the Warner & Swasey Company, and others of wide experience.

The extensive investigation of auxiliary instruments that forms a prime feature of the general scheme has been begun, and will soon be developed in various directions. Mr. George Eastman and Dr. G. E. K. Mees have generously agreed to deal with many of the special photographic problems at the Research Laboratory of the Eastman Kodak Company. A Zeiss recording microphotometer has been ordered, and will be used in a comparative study of various forms of this instrument. Dr. Sinclair Smith will attempt to develop and improve the radiometer recently used very

successfully by Dr. Abbot with the Hooker telescope in measuring the distribution of energy in the spectra of stars of several types, *and work on other <sup>auxiliary</sup> instruments will soon be begun.*

A comparative study of several possible high-altitude sites has been undertaken. Precise measures of the seeing, rather than estimates, are desirable. Dr. Anderson accordingly devised a simple means of measuring the atmospheric oscillations of star images under a power of 600 with a 4 or 5-inch telescope, and Mr. Ellerman tested it satisfactorily on Mount Wilson, in comparison with the estimates of experienced observers with the 60-inch and 100-inch telescopes. Preliminary observations with this method by Messrs. Ellerman and Humason have been made at Palomar and Horse Flats, and some tests made by Dr. Abbot and Mr. Moore at Table Mountain show that this site, like the others, *Dr. Hubble is also making telescopic tests in Arizona.* deserves careful examination. *work* This will be facilitated by the loan of three sets of recording meteorological instruments by Dr. Charles G. Marvin, Chief of the U. S. Weather Bureau, who has also kindly supplied us with many meteorological data for various sites in California and Arizona.

The policy of the Observatory Council, in all phases of this undertaking, is to bring into cooperation the most competent authorities in their respective fields. The willingness of so many leading men of science to lend their assistance, and the fact that all our decisions have been unanimous, give promise of such results as the broad-minded generosity of ~~Dr. Wickliffe Rose and his associates~~ of the International Education Board most certainly deserve.

*attitude* *M.M.?*