

ENGINEERING AND SCIENCE

Monthly

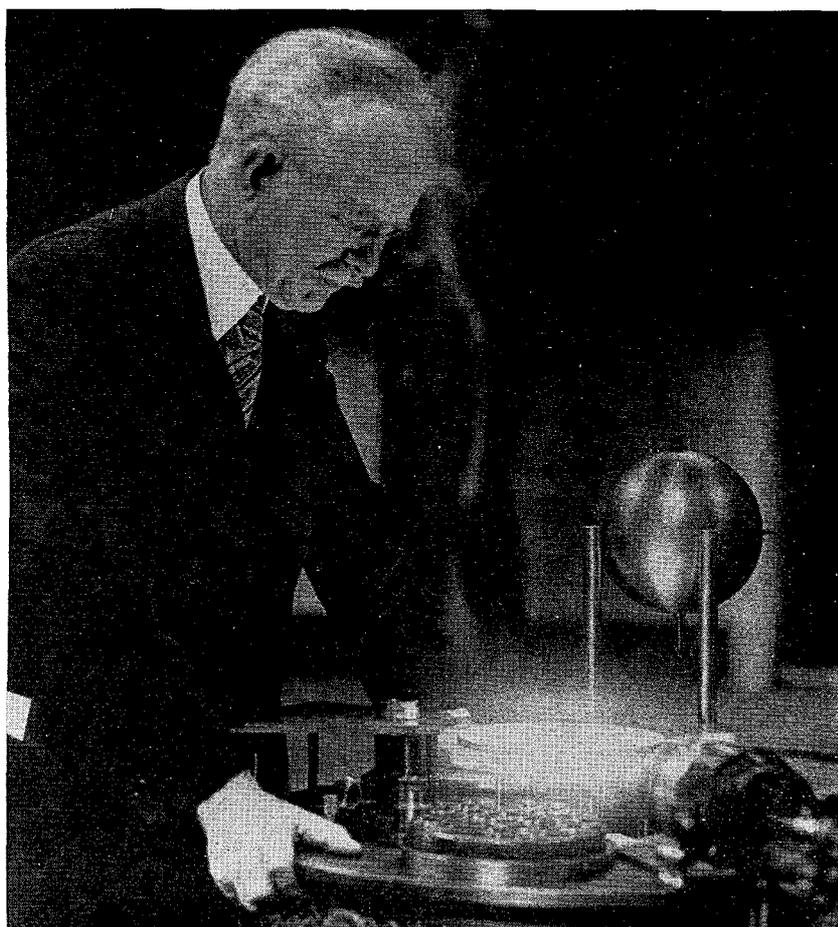


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PALOMAR -- Dedication of the Observatory

By LEE A. DUBRIDGE



1868

GEORGE ELLERY HALE

1938

It is not often in the history of science or of mankind that a group of men and women have such a high privilege as we have in dedicating to the service of man this magnificent and significant scientific instrument.

Since long before the dawn of history man has gazed wonderingly and thoughtfully at the heavens. Since the time of Galileo he has been able to study

the heavenly bodies ever more searchingly and more precisely with ever finer and more precise instruments. While these instruments have vastly increased man's understanding of the universe, each new advance has raised new questions. A 60-inch telescope raised problems that only a 100-inch instrument could answer, the 100-inch called for a 200-inch. How much farther this quest will lead no one can foretell. But

the great telescope before us here marks the culmination of over 200 years of astronomical research, and for generations to come it will be a key instrument in man's search for new knowledge.

It is with great pride that the California Institute of Technology formally dedicates this great observatory to the service of science and of mankind. We cannot know what new knowledge will accrue as a result of the work that goes on in coming years on this mountain top. But it is certain that new knowledge will come which will lead men a few steps farther along the road toward a more perfect understanding of this great universe.

It was almost precisely 20 years ago to the day that the 200-inch telescope project was assured. In June, 1928, the International Education Board voted to give six million dollars to the California Institute for the purpose of building this instrument and all the other facilities necessary for its construction and operation.

But it was long before 1928 that the idea of the telescope was born in the minds of George Ellery Hale and some of his associates. Soon after the 100-inch telescope on Mount Wilson was put into successful operation in 1917, Dr. Hale saw that an even larger telescope was both feasible and desirable, and as early as 1923 he put forth this idea in a paper he published in the magazine *Popular Astronomy*. As the work with the 100-inch telescope developed it became more and more clear to those who worked with it that a still greater instrument must some day be built. Dr. Hale and his colleagues talked over the possibilities among themselves and with other astronomers all over the world, discussing methods of mounting, methods of fabricating glass or fused quartz or metal mirrors, the requirements of a desirable site and dozens of other technical problems. By 1927 Drs. Hale, Adams, Pease, Hubble, and the other members of the staff of Mount Wilson had the broad outlines of a large telescope project in mind and an article outlining the purposes and possibilities of such an instrument was written by Dr. Hale for *Harper's Monthly*, appearing in the spring of 1928. That article did not fix a size for the mirror but mentioned that Dr. Pease had sketched a mount for a mirror 25 feet or 300 inches in diameter.

Before the article appeared, however, Dr. Hale on February 14, 1928 wrote to Dr. Wickliffe Rose, then president of the General Education Board, sending a proof copy of the *Harper's* article and inquiring as to the possible interest of the Rockefeller Boards. Given an encouraging reply he went at once to New York to discuss the matter, and within a few weeks the dream had been reduced to the form of a definite proposal for a 200-inch instrument. On June 12, 1928 Dr. Hale was informed that the International Education Board had voted a grant of six million dollars to the California Institute to finance the project. The Institute in turn had agreed to undertake the project, to cooperate with the Mount Wilson staff and to finance the operation of the Observatory after it was complete. Dr. Hale was asked to serve as Chairman of the Observatory Council which was to supervise the whole project, with Dr. Millikan, Dr. A. A. Noyes, and Mr. H. M. Robinson as the other members.

And so began what was to become one of man's greatest scientific enterprises. Unfortunately, Dr. Hale did not live to see it completed; but for 10 years

from 1928 until his death in 1938, Dr. Hale gave all his energy to this task. His vision and leadership were decisive factors during those critical years and this great Observatory stands today as a monument to that great scientist.

On May 10, 1948, the Board of Trustees of the California Institute of Technology unanimously adopted the following resolution, which I herewith announce for the first time:

"The Board of Trustees of the California Institute of Technology hereby resolve that the 200-inch telescope of the Palomar Mountain Observatory shall hereafter be known as

THE HALE TELESCOPE

By this action the Board of Trustees seeks to recognize the great achievements of Dr. George Ellery Hale (1868-1938) who served as Director of the Mount Wilson Observatory from 1904 to 1923, who served as a member of the Board of Trustees of the California Institute from 1907 to 1938, who originated the bold conception of the 200-inch telescope and whose brilliant leadership has made possible its design and construction. As this great instrument probes the secrets of the universe, it is fitting that it should stand also in memory of the great scientist and the great leader who contributed so brilliantly to the science of astronomy and who served so ably his community and his nation.

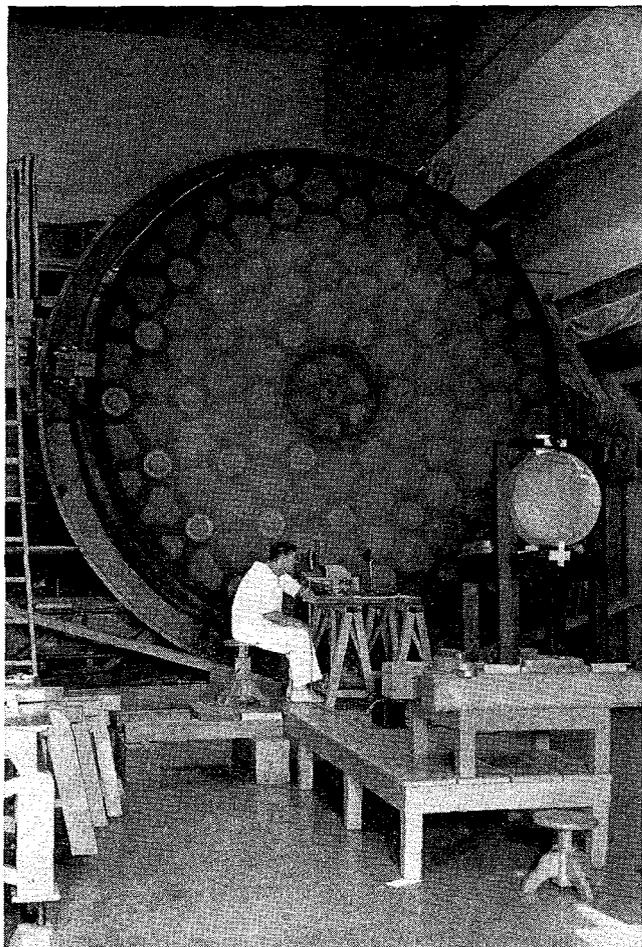
"The Board of Trustees further directs that a suitable plaque in Dr. Hale's honor be permanently installed in the Observatory and that an engrossed certified copy of this resolution be presented to Mrs. Hale."

No one would have predicted in June 1928 that the completion of this great instrument would not be accomplished for 20 years. No one could have foreseen the stupendous difficulties to be overcome nor the devastating World War which caused an additional four-year delay.

But the difficulties were overcome. Those who laid the plans planned well. Those who carried them out performed superbly.

Unfortunately, it is impossible at this time to pay adequate tribute to the hundreds of men who have contributed to this great enterprise. I should like, however, to mention briefly at this time the names of four men who have been closely associated with the project almost since its inception. One is Dr. Max Mason, who in 1936 succeeded Dr. Hale as Chairman of the Observatory Council and who had previously aided the project as President of the Rockefeller Foundation. A second is Dr. John A. Anderson, who, as Executive Officer of the Observatory Council from 1928 to date, has had the task of supervising the painstaking grinding, polishing and testing of the surface of the 15-ton disk of Pyrex glass to its present degree of perfection. Another is one who has contributed immeasurably to the realization of the plan, cooperating as Director of the Mount Wilson Observatory from 1923 to his retirement in 1946, Dr. Walter S. Adams. The plan was conceived and largely executed by his staff at Mount Wilson, and for 20 years, Dr. Adams' knowledge and abilities, his unstinting collaboration, and his kindly wisdom have been decisive in the success of the work. Finally, no history of this project would be complete

(Continued on page 15)



Marcus Brown checking for parabolic accuracy near the end of the polishing. The 200-inch disk has been turned to a vertical position on the grinding and polishing machine for testing.

with water. Iron oxide (rouge) mixed with water also was used for polishing. To prevent scratching the surface of the mirror, a constant program of sweeping and mopping was carried on, and when changing from one grade of abrasive to the next, even the walls of the room were thoroughly washed. For protection against foreign particles, particularly metal chips, which would mar the mirror's surface, workmen were required to leave their street shoes outside the large room. Rubber soled shoes and uniforms were provided to replace their street clothes, and as an added precaution, a magnetic sweeper was kept in constant operation on the floor.

Marcus H. Brown

Marcus H. Brown, in charge of the Institute's optical shop, has been the man directly supervising the grinding operation of the 200-inch mirror. From 1936 to 1947, except for the interruption of the war years when endeavors were turned to government research, Brown and his crew of 21 men executed the precision task of smoothing the Pyrex surface to Dr. Anderson's requirements.

First taken in to Mt. Wilson's optical shop in 1928, Brown had no training as an optician until that time. Doing odd jobs in the laboratory shops, he showed such interest in optics that he eventually was given a chance to work with the men who had ground the 100-inch Hooker telescope mirror. His training and experience under them, combined with intensive study on his own, led to his appointment in 1931 by Dr. Anderson as optician in charge of the grinding of the 200-inch.

From 1932 to 1936, Brown completed the organization of the optical shop, selected his crew, and made preparations for the arrival of the mirror. Many of the tools and procedures used in the grinding and polishing were developed by him during this preparatory period.

When he supervised the packing of the finished mirror for its trip to the Observatory on Palomar Mountain in November 1947, Brown was the only man who had stayed with the 200-inch disk since it was brought into the shop in 1936.

Dedication of the Observatory

(Continued from page 8)

without a long section devoted to the part played by Dr. Robert A. Millikan, who so wisely led the California Institute through all the years until 1945. He has been a member of the Observatory Council from the beginning. He and Dr. Hale and others discussed the plan exhaustively from the start. It was Dr. Millikan who boldly pledged the Institute to assume responsibility for the enterprise including financial responsibility for its operation.

To these four men I have named and to the multitude of others who made outstanding contributions we all join in tribute. This Observatory stands as a monument to their collective efforts. And it is a living monument. For from this Observatory will flow down through the ages the one indestructible thing that mankind achieves—new knowledge, new understanding.

As is known, the Board of Trustees of the California Institute of Technology and the Carnegie Institution of Washington some time ago agreed mutually that the Palomar Observatory and the Mount Wilson Observatory should operate cooperatively as one, under

single management, with mutual sharing of facilities and staff. I wish only to emphasize that the California Institute has entered into this cooperative arrangement with greatest enthusiasm. In dedicating this Observatory, we dedicate it as one part of the Combined Observatories. We pledge ourselves to work in fullest collaboration with the Carnegie Institution as we devote our combined facilities to the service of science. We deeply appreciate the collaboration of Dr. Bush and the other officers and trustees of the Carnegie Institution. We and they are fully aware that in combining talents and facilities in this way we are creating in Southern California the mightiest astronomical center the world has ever seen or is likely ever to see. The California Institute assumes its share in this joint enterprise with pride, but also with humility and a deep sense of our responsibility.

The word "dedicate" in the English language means to set apart by a promise. It is essentially synonymous with consecrate, which means to make holy by a special act. The word has more than a formal or material significance. It carries also a spiritual implication. It is in this sense actually that we do today set aside this temple of learning and promise that it shall be devoted henceforth to deepening man's intellectual and spiritual understanding.