What The New Telescope Will Do

Astronomy

About a half billion stars, that cannot now be seen or photographed with any telescope, as well as thousands of inconceivably remote nebulae, will be within the reach of astronomers when the new 200-inch telescope, of the California Institute of Technology, at Pasadena, is completed. But astronomers are not interested merely in great numbers, and that alone would not justify the millions of dollars that will be spent on the great instrument.

The closer and brighter things that will be seen better are what particularly interest the astronomer, and which will occupy most of the attention of the new telescope. But even some of these would have been thought impossibly far only a few years ago. For instance, there are the spiral nebulae. Thousands of these have been observed in the sky, all with the characteristic spiral structures more or less evident. For years their nature was subject of dispute until Dr. Edwin P. Hubble, of the Mt. Wilson Observatory, with photographs made with the 100-inch telescope, still the world's largest, definitely showed what they are. His photographs revealed the individual stars of which they are constituted. They showed that these nebulae are system of stars like that of which the Milky Way, and all the stars that we can see, including the sun, are part. Dr. Hubble also measured the distances of two of these nebulae and showed that they are independent systems of this kind —far beyond the limits of our own. These are known to astronomers as Messier 31 and Messier 33, after their numbers in one of the first catalogs of such objects.

Two spiral nebulae, out of the thousands that are shown, do not form a very large proportion, although there is plenty of evidence that the two studied are rather typical of the group. Astronomers have been anxious to observe more nebulae, and they also wish to observe the two even better.

The 200-inch telescope will do this. Perhaps a half dozen or so nebulae, that now appear as continuous areas of light, will be resolved into their constituent stars. If this is done, their distance can be measured.

Some distant spiral nebulae, now invisible, undoubtedly will come into view. The farthest now within reach of the 100-inch are something like 840 million million million miles away—so far that their light takes 140 million years to reach us. With the new telescope thousands beyond will be visible, the farthest of them being nearly five thousand million million million, or five sextillion, miles from us. And when they are seen, the light exposing the photographic plates, will have been on its way for a thousand million years—since a time long before man appeared on the earth, and when the planet itself was still young.

Though perhaps the most sensational work of the new telescope, even the observations of the spiral nebulae will not constitute the only work of the instrument. Most of our present-day knowledge of stars has come from study of their spectra, obtained when their light is broken up into the constituent colors. The light from a star, that would fall on a single point of the photographic plate, must be spread out in making a spectrum photograph. Therefore, it is not possible to make such studies of many stars that can now easily be seen directly. The new telescope will permit of far more powerful spectroscopes than any that can now be brought to bear on the stars.

Another field for the 200-inch telescope will be in the members of the solar system. As it is planned to make the mirror of quartz, which will not expand distortingly under the sun's rays, it will be possible to use it for observations of the sun. The planets will be brought almost to within hailing distance, and some of the present day mysteries concerning Mars, Jupiter, and the other planets may be solved.

In deciding on a telescope with a mirror 200 inches in diameter, the astronomers are making the greatest jump in size since Isaac Newton invented the reflecting telescope. It was in 1672 that, in order to overcome the defects that were then inherent in refracting telescopes, in which the light rays were brought to a focus by a glass lens, he made the first reflector. Here, a dish-shaped mirror reflected the rays back towards the object, and at the same time brought them to a focus. A second, and flat, mirror, reflected the rays to the side, where the observer could see the image, without getting his head in the way. Newton's original reflector, with a mirror only two inches in diameter, is still in the possession of the Royal Society in London. In 1723 the astronomer Hadley showed the proper curves that should be given to the mirror to give the best images, and from then on, large reflectors became possible.

Before 1800 Sir William Herschel began to make large reflecting telescopes, finally building one with a mirror 48 inches across. Then an Irish nobleman, the Earl of Rosse, began to make them, and actually made one about 1845 with a 60-inch mirror, which was only exceeded in size in 1919, at the time the 72-inch at Victoria, B. C., was completed. Long before this, however, smaller instruments had passed the Earl of Rosse's in quality of performance. A 60-inch, of the very finest construction, had been completed at Mt. Wilson in 1906, and is still in regular use. Then came the 100-inch. Delayed by the war, this was finished in 1920. And now the Mt. Wilson Observatory will cooperate with the California Institute in building the 200-inch, and in a few years the biggest jump of all will have been made.

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