# Calcium Clouds Spread Through Space

*Astronomy*

A vast cloud of calcium, one of the commonest of earthly elements, and familiar as a component of lime, permeates all the space between the stars in the Milky Way system to which our sun belongs. It shares the motion of the Milky Way system, or Galaxy, in slowly turning around a center, along with most of the other celestial objects that belong to our own swarm. This announcement was made by Dr. J. A. Pearce, of the Dominion Astrophysical Observatory at Victoria, B. C., speaking at the meeting of the American Astronomical Society at Ottawa.

Dr. Pearce and his chief, Dr. J. S. Plaskett, have been working on this problem for five years, he stated, and have now solved one of the chief problems that they presented.

Though so widely distributed, the calcium is exceedingly diffuse, it is far less dense than the highest terrestrial vacuum. Yet when the light from distant stars passes through it, it takes out certain colors, and when the light is examined through the prisms of an astronomical spectroscope, dark bands appear. Some bands and lines would appear in the spectra of the stars even if there were no calcium, but there is an important difference. As the stars move or recede from us, the lines in their spectrum are displaced to one end or the other. But the calcium bands, due to material that does not share in the individual motions of the stars, always appear in the same place, and so they can be identified. However, while the existence of the clouds has been recognized, astronomers have been divided as to how they are distributed.

"They surround the stars," said one group.

"No, they are spread through space," said the other, chiefly represented by the English astronomer, Prof. A. S. Eddington of Cambridge. Dr. Plaskett and Dr. Pearce have now proven that this view is correct.

Should there be any further doubts as to the reality of the gradual turning of the Galaxy, Dr. Pearce also presented the results of another research on which he and Dr. Plaskett have been engaged. This concerned a group of stars of the type known to astronomers as O and B. They measured their motion towards us or away from us, as shown by the displacements of their spectral lines, and found that these motions could only be explained by such a galactic rotation.

This rotation is such that the sun travels around, and the Solar System with it, at a speed of 180 miles a second. Yet so far is the trip around this celestial merry-go-round that it will take us 120 million years to complete a single circuit.

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# Maker Tells of Large Telescopes

*Astronomy*

The available funds of the astronomer are the chief limit to the size of telescopes that cen be built.

So declared J. W. Fecker, of Pittsburgh, in a lecture in connection with the meeting of the American Astronomical Society at Ottawa. He is the successor to John A. Brashear, one of the most famous of telescope makers of the past. During his previous connection with a Cleveland firm, he designed the 72-inch telescope now at Victoria, B. C., second largest in the world. Now he is engaged in completing one only slightly smaller for Ohio Wesleyan University. In this instrument the light from the stars will be collected by a dish-shaped mirror 69 inches in diameter, so that it will be the third largest in the world. This mirror is being constructed from glass made at the Bureau of Standards, in Washington. It is the largest piece of optical glass ever prepared in the United States.

But the astronomers are constantly calling for bigger and better eyes with which to scan the heavens, and a combination of astronomical and engineering science can supply their wants, said the speaker. Telescopes with mirrors even larger than 200 inches, the size of one now being designed for the California Institute of Technology, can be built, he believes. Such instruments cost money, however, and the price of a telescope with a mirror several hundred inches in diameter would be many millions of dollars—nearly as much as a single battleship.

With the coming of these giant instruments there has been developed an entirely new method of design and construction. Years ago, a large telescope was mainly a one man job, so far as design was concerned. The size and relation of the various parts were determined by trial and error. Now, engineering has entered astronomy, said Mr. Fecker. The telescope maker must design the telescope with all the engineering skill used in planning and erecting a bridge. But the large telescope is comparable to a drawbridge that works with the precision of a fine watch. To achieve this the astronomer, the engineer and the optician must all cooperate, each contributing his special knowledge.

Many new materials are now available and must be used in the future, he said. These include such things as duralumin, alloy used in girders for airships, to make moving parts that must be as light and rigid as possible; or new kinds of glass or quartz for lenses and mirrors.

Another paper presented to the astronomers by Prof. R. K. Young, of the University of Toronto, indicated one improvement that may come in the future for reflecting telescopes. In the reflector, the concave mirror is ordinarily covered with silver to reflect the light to the focus. Though universally used, silver is not ideal. Even when new, it reflects red light better than blue, or the shorter invisible waves beyond, in the ultra-violet. It soon deteriorates, and does so most rapidly in this same blue and ultra-violet region. Yet these are the very waves in which the astronomer is most interested. Prof. Young made comparative tests of the reflecting power of silver and chromium, a metal formerly rather rare, but now common as one of the chief constituents of stainless steel, commonly used for kitchen knives. When new, he found, a chromium surface does not send back as much light as silver, but it does reflect all colors equally well, and reflects the ultra-violet as well as silver. Furthermore, it does not tarnish, and a coat a year old is as good as new, and much better than silver of the same age. So the same quality that has made chromium of value in peeling tomatoes may help the astronomer solve the secrets of the stars.

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