LETTERS

To the Editor

Query

Dear Sir:

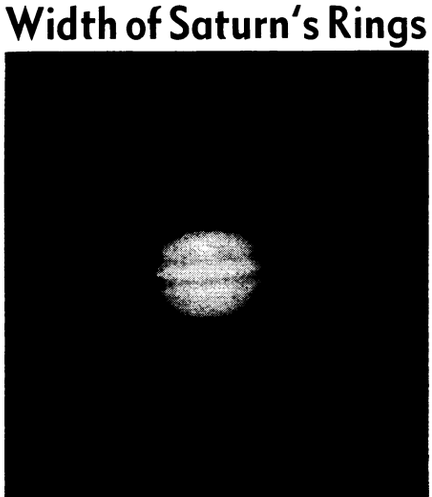
The tenth satellite of Saturn story (SN: 1/14) contained a fact which seems to have caused considerable response from readers over here. The story says: "The rings, recently estimated to be less than one foot thick, lie exactly in the plane . . ." I have had literally dozens of letters from readers, saying that it is impossible to measure such a thickness at the distance Saturn is from Earth. I wonder if you can throw some light on it.

What I suspect is behind the statement is that estimates have been made on the basis of idealized models of the belt system. It is quite feasible that assumptions inherent in such a study could yield answers of this order. However, I really would be grateful for any references you have on the matter.

Nicholas Valery
News Editor
Science Journal
London, England

Response

Width of Saturn's Rings



Naval Observatory

At the time of the December discovery, the most recently estimated value was less than one foot thick. Most textbooks cite a figure of "no more than 10 miles."

At the distance of Saturn, of course, the rings' thickness cannot be measured directly but can be estimated from the fact that they do become invisible when they are viewed edge-on. This is the method by which the 10-mile figure was reached in the late 19th century.

Another way of estimating the thickness is by the amount of sunlight scattered by the particles composing the rings. This is the method used by Drs. Allan Cook and Fred Franklin of the Smithsonian Astrophysical Observatory in Cambridge, Mass.

The Smithsonian astronomers studied some 1,000 photographs of Saturn taken from a South African Observatory, measuring the brightness of the planet and of the rings by photoelectric means.

While the measurements were being made, the rings, sun and earth changed their relative positions. The measurements thus gave information with which calculations of the rings' thickness could be made more accurately than was previously possible.

The astronomers found that the relationship of length to width of the rings was 356.4 million to one. The rings are about 45,000 miles wide, which works out to 0.66528 feet for the thickness.

However, doubt has now been cast on this figure by measurements made this year on photographs taken in 1966 when the earth crossed the plane of Saturn's rings three times, on April 2, Oct. 29 and Dec. 17, and by laboratory experiments concerning the back scattering of light from a variety of materials.

The back-scattering experiments showed a very rapid, and as yet unexplained, brightening at small angles from a variety of materials tested. These unexpected results cannot now be attributed to the surface structure of materials.

Since the photoelectric measurements of the brightness of Saturn's rings are also made at small angles, the Smithsonian astronomers are now taking another look not only at their original photographs but also those made last year.

One recent contribution concerning Saturn's rings that may help solve the problem of how thick they actually are is the finding that the ring material consists of or is covered with frozen paraformaldehyde.

Lawrence Mertz and Isaiah Coleman of Block Associates, Cambridge, Mass., have observed the sunlight reflected from Saturn in the infrared portion of the spectrum. They found an absorption peak at 1.66 microns, which is not consistent with the theory that the rings consist of ice, but indicates paraformaldehyde.