not to be terminated merely as an incident in a change of administrative policy. This view was concurred in by Dr. Vaughan, at the time of his succession to the directorship of the Scripps Institution, and the *Peromyscus* studies were continued for some years after the institution had adopted an otherwise exclusively oceanographic program. But such an anomalous situation could not be expected to continue indefinitely. As an emergency measure, the Carnegie Institution of Washington came to the rescue in 1927, in order that results already obtained or material already at hand might be utilized to the fullest. The liberal contribution then made by the Carnegie Institution permitted not only of full utilization of previous data and material, but made possible considerable further progress with the work. The funds which were contributed for the purpose, however, are now exhausted.

Despite past and recent efforts by the administration of the University of California, it has proved to be impracticable to transfer this program of research to Berkeley, and to have it conducted under the auspices of any university department there. Such a time-consuming research program is naturally incompatible with one's carrying an even moderate teaching schedule, particularly if one's teaching experience has been limited.

For these reasons, the *Peromyscus* program, at least so far as the present writer is concerned, has been brought to a close. In its place, studies will be undertaken of the ecology and possibly the genetics of certain species of fishes, both fresh water and marine. Certain of these studies are already in progress. The remaining stock of *Peromyscus,* comprising seven subspecies, has been sent to Dr. Lee R. Dice, of the Zoological Museum, University of Michigan.

That university is the only one, so far as I know, in which experimental breeding operations are being conducted in connection with its museum of zoology. It is to be expected that other universities will, in time, recognize the wisdom of such a policy.

It has seemed desirable to issue the foregoing statement, owing to misunderstandings which have prevailed for some years regarding the status of the investigations in question and the writer's connection with the Scripps Institution. I will conclude by saying that reprints of papers, including those on genetic subjects, will still be welcomed by the writer at the same address.

F. B. SUMNER
SCRIPPS INSTITUTION OF OCEANOGRAPHY

PHYSICOCHEMICAL PHENOMENA IN THE ANTARCTIC

THE paper of Rear Admiral Richard E. Byrd entitled "The Conquest of Antarctica by Air" published in the August number of the *National Geographic Magazine* brings out several facts which are not only of general scientific interest but are also of particular importance to those who have to deal with low temperature conditions, *e.g.,* aviation and pilot balloon investigations.

The influence of intense cold on chemical reaction appeared when he was examining a crevasse while the temperature was *only* 50 degrees below zero (presumably F.). Byrd writes: "We could not use hand flashlights, because the cold stopped the chemical action of the dry batteries. We provided light by linking a portable gasoline engine generator to a locomotive-type searchlight pointed down the dark fissure." When the thermometer was 71 degrees below, they had to warm the candles used under the meteorological balloons before they could be lighted.

The ready formation of finely dispersed (presumably colloidal) ice is shown by the following: "It was amazing to see fogs at these temperatures. The air holds a very small amount of moisture at 50 below, but when the wind stirs the warmer and the colder air condensation of this minute amount of moisture occurs and a real fog is evolved. . . . Even a book lying against a cold wall steamed like a teakettle when opened in a slightly warmer atmosphere. When a man stood inside the entrance to one of the house tunnels, the vapor formed by his breathing was so heavy the house appeared to be on fire." Water in the form of colloidal ice seems to be the cause of so great an effect from so small a quantity.

Some peculiar physical effects may be noted. At 64 below, "It was so cold that when a man stood outside the tunnel he could hear his breath freeze. The condensation caused a faint swishing sound like snow blown across the ice surface by a strong wind." Kerosene froze solid. "One mid-July day the mercury touched 71 below zero. That caused the barrier snow to contract sharply. All about us we could hear the ice snapping and cracking. Then, as large cracks occurred, the bay ice began booming like distant guns. The guy wires on the antenna posts became as taut as harp strings and the wind played odd humming tunes on them."

In order to avoid dangers following failure of soldered cans, which Dr. B. T. Brooks pointed out as due to formation of gray tin ("tin disease") at low temperatures, the supplies (oil, gasoline, etc.) were packed in copper cans made with silver solder.

JEROME ALEXANDER

CIRCULAR SHADOWS FROM VORTICES

YESTERDAY while I was sitting in the bright sunshine on a rock in the middle of the Croton River my

attention was called to circular shadows on the rocks and the bottom of the stream. These shadows varied in size from about one inch to one and one half inches in diameter. Around the outer edge of the shadows was a halo and occasionally faint rotating streamers.

The water was quite clear and it was perfectly obvious that floating objects were not responsible for the shadows. It was observed that the shadows came from vortices and, further, that these vortices depressed the surface in such a manner that the light, falling in the vortex, was deflected outward somewhat, as in the concave lens.

This is simply one of those interesting phenomena which I never happened to observe previously. I am thinking that perhaps others who read this may find one additional thing to look for when they are in the open.

F. C. BROWN

MUSEUMS OF THE PEACEFUL ARTS
NEW YORK, N. Y.

PLANETARY SYSTEMS

IN his retort to Professor Porter, who had criticized him for saying that planets like those of the solar system are rare, though there are millions of stars more or less similar to our sun, Professor Arthur H. Compton seems to feel that he fully justifies his position by citing as his authority the distinguished theoretical astronomer, Sir J. H. Jeans.

Doubtless Professor Porter overstates his case in claiming that "there is absolutely no reason for the assumption that the formation of attendant worlds may not be the ordinary course of evolution for the single stars." On the other hand, it must be recognized that Jeans's conclusion is based upon highly theoretical assumptions and should not be given too much weight. It is to be feared that Professor Compton has erred in asking his readers to accept as a demonstrated fact what is in actuality little more than an educated guess.

G. B. BLAIR

UNIVERSITY OF NEVADA

SCIENTIFIC BOOKS

The Size of the Universe: Attempts at a Determination of the Curvature Radius of Spacetime. By DR. LUDWIK SILBERSTEIN. viii + 215 pp. Oxford University Press, London, 1930.

THE problem of the curvature of space was born directly out of the relativity theory of gravitation and was therefore first raised seriously by Einstein, who was led to adopt as a basic geometry of the universe one of constant curvature in space, leaving the time coordinate "straight." De Sitter, on the other hand, contemplated another possibility, in which the four-dimensional world is perfectly spherical, the time being curved along with the space coordinates. These two possibilities are generally referred to as Einstein's cylindrical world and de Sitter's spherical world, and they fairly exhaust the worlds of constant curvature.

Does our own world belong to the class of constant curvature, and, if so, is it of the cylindrical or the spherical class, and what is the actual value of its radius of curvature? These are the questions Dr. Silberstein sets out to answer.

The first part of the book is concerned with the general theory of curved surfaces, the theory of tensors and the relativity theory of gravitation. The second part is devoted to a discussion of the relative merits of Einstein's and de Sitter's worlds. The third part contains an extensive, and rather unexpected, criticism of Dr. Hubble's estimate of the world radius corresponding to Einstein's cylindrical world. The fourth and fifth parts are concerned with the Doppler effect in de Sitter's world and how this may be used to find the world radius from an analysis of the radial velocities of the stars. This latter problem is also the subject of miscellaneous notes at the end of the book.

The reader is likely to finish this book in a state of mingled admiration and depression. Its every page bears witness of a strong personality, and the formal style is unusually clear and attractive. The introductory chapter on non-Euclidean geometry is, in particular, a product of fine, artistic beauty. On the other hand, the book is written exclusively from Dr. Silberstein's personal point of view, and as this frequently runs opposite to the opinion of other authorities the reader will have to do a lot of reading in the general literature in order to be fully informed on the subject. For an astronomer it is especially disconcerting to read the last part and the notes. In fact, to search for the de Sitter-Doppler effect in the motion of the nearer stars seems, to put it mildly, like hunting for a needle in a haystack. Considering that in this search much more pronounced peculiarities in the laws of stellar motion have been sacrificed, Dr. Silberstein can scarcely blame the astronomers for having little faith in his results.

So much has been written about the curvature of space, both in scientific journals and in the press, that a separate book on the subject should meet with general approval. The present book seems more calculated to stimulate than to satisfy this demand. This may be fortunate, as, according to some recent