sity scientists, Drs. Kenneth Wiberg and Jerome Berson, sent questionnaires to 500 investigators whose primary research is in this field and received replies from close to 200 of them. Two years ago, those researchers had a combined total of $2.6 million from NIH. Now, they have only $1.5 million, and do not expect approval of any new grant applications. Support from the Department of Defense declined $630,000 in two years and NSF support dropped by $377,000. In the same time period, NIH has dropped 78 fellowships in chemistry, while NSF dropped 35.

These representative figures do not cover the still further reductions anticipated by the end of fiscal year 1970. At NIH alone, a 64 percent cut is expected in fellowships and training grants. The cuts and anticipated cuts are also affecting individuals now applying to graduate schools in chemistry. Yale is a case in point. "Last year," says Dr. Berson, "we had 40 first-year graduate students. This year we have accepted only 15."

Across the board, support of chemistry in the United States by these three agencies appears to be down by about 50 percent, from totals of about $50 million to closer to $25 million. Says Dr. Wiberg, "If this continues, it seems clear that we shall no longer be able to maintain the present United States position in chemistry and that there will be a major decrease in graduate enrollments." Though the job market for chemists is small at present, both industry and the academic community predict an upswing in the demand by 1975. "If we lose students now," observes Dr. Berson, "there will be no one to fill those positions in five years."

The prognosis is grim. Because of the Defense research restrictions, DOD has virtually pulled out of academic support of chemistry. There is no indication that things will change at NIH.

There are chemists who see no reason why they should. One, responding to the Yale questionnaire said, "Frankly, I do not think the NIH should support organic work, but I do support a larger role and budget for the NSF."

Theoretically, perhaps, the suggestion is sound. But there is little chance that NSF will expand significantly. Its total budget is only about $500 million, distributed across a host of research areas and concentrating new money in environmental areas (SN: 3/7, p. 240). To try to offset the grant reductions in other agencies, it is asking for an additional $10 million this year, but even if the request is honored the total impact will be comparatively small.

"The only way we have," says Dr. Berson, "is to educate the persons in Congress who are receptive to our problems." But they are hard to find.

Polarization and magnetism

In an ordinary light beam the electric and magnetic waves vibrate in random directions; in a polarized beam each kind vibrates in a single direction, and the two directions form an angle of 90 degrees. Polarization can be accomplished by passing the light through certain crystals or reflecting it from certain surfaces.

Astronomers now generally agree that the polarization observed in the light from stars in the Milky Way should be attributed to reflection from grains of interstellar dust. If that is done, the polarization gives away the direction of any magnetic field in the galaxy, since the dust grains are electrically charged and the field will orient them in specific directions.

If reasoning of this kind holds for the magnetic field in the Milky Way, it ought to hold as well for other galaxies. It has now been applied to Magellanic Clouds, a pair of galaxies nearest to the earth, visible clearly from the Southern Hemisphere, and a prime subject of study for astronomers.

The Milky Way galaxy has a general magnetic field with a strength of about a millionth of a gauss.

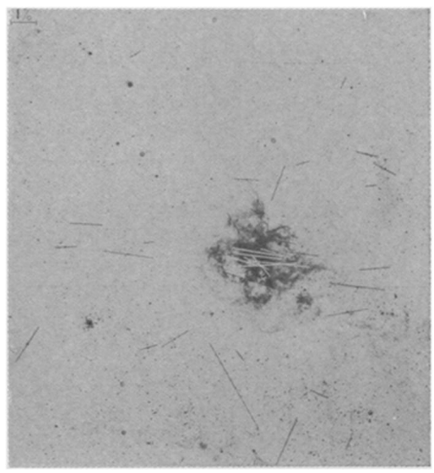
From evidence of polarization in light from Magellanic Clouds, Drs. D. S. Mathewson and V. L. Ford of the Mount Stromlo and Siding Spring Observatories and Australian National University conclude that the Magellanic Clouds have magnetic fields too, and that these fields appear to be connected with one another and possibly with that of the Milky Way. The data apparently give them no information on the strength of the field in the Magellanic Clouds.

Evidence of polarization in light from 30 stars in the Large Magellanic Cloud dates back to 1966, but Drs. Mathewson and Ford allege that up to now the data were insufficient to draw many conclusions about the structure of the magnetic field.

They set out therefore to measure the polarization of 180 stars in the Large Magellanic Cloud and 80 in the Small Magellanic Cloud. From the evidence they gathered they conclude that there is such a field.

"The two clouds are enveloped in a very regular magnetic field with lines of force parallel to the line joining the two galaxies," they find. Superimposed on this are some local regions where the field lines are twisted, probably by some local source of magnetism.

Drs. Mathewson and Ford, in a report in ASTROPHYSICAL JOURNAL LETTERS for April, go on to point out that if the line joining the Magellanic



Astrophysical Journal

Polarization in a Magellanic Cloud.

Clouds is extended toward the Milky Way, it runs along a prominent spur of the Milky Way, which was discovered in 1960. Many astronomers believe this to be a bridge of stars building out from the Milky Way toward the Magellanic Clouds. At that point the magnetic field of the Milky Way points in roughly the same direction, and Drs. Mathewson and Ford suggest that the field in the Magellanic Clouds may be an extension of that of the Milky Way.

From the overall regularity of the magnetic field in the Magellanic Clouds, Drs. Mathewson and Ford conclude that it is primordial and has been present since the formation of the two galaxies. Most astronomers would say the same about the Milky Way field.

But Dr. Eugene Parker of the University of Chicago is now proposing that the Milky Way field is constantly generated by the motions of interstellar gas in a manner very similar to the way the earth's field is generated by motions of liquid in the core. Dr. Parker considers the work of Drs. Mathewson and Ford a very good observation, but their conclusions about primordiality of the field in the Magellanic Clouds does not shake his confidence in his own theory.

The field findings add another piece of apparent evidence to the growing belief that the Magellanic Clouds form a bound system that may somehow be connected to the Milky Way. Other data include a giant gas cloud that envelops both of the Magellanic Clouds, and the apparent motions of the Magellanic Clouds, which lead to the suggestion that they are satellite galaxies orbiting the Milky Way. One seems to be moving away from the Milky Way, the other toward it.