that the nuclear magnetic moment of hydrogen is sufficient to produce alignment in a magnetic field of 10^{-4} - 10^{-5} gauss. But there is no physical reason for the existence of fields of this magnitude.

It is not unlikely, in view of the failure of the magnetic attack, that the dynamic interaction of the interstellar gas and dust defines a direction, and therefore is responsible for polarization. It is well-known that in optical experiments with particles in suspension, as soon as a direction is established in some way (for instance by enclosing the material in a thin slab), the light passing through the medium is polarized. The preferential direction in interstellar space is established by the structure of the galaxy and its rotation; the peculiar velocities of the gas clouds thus tend to lie in the galactic plane. Microscopically speaking, the particles have to align perpendicular to the direction of the interstellar wind. Now a spinning flake or needle falling through air lines itself up in this way. But the interstellar medium is quite a different place; the mean free path is too great for such effects to occur. A simple calculation of the torque exerted on a particle 10^{-5}cm in radius by a gas flow of 5 km/sec gives a value of only 10^{-29}gm cm^{2}sec^{-2}, which produces an angular acceleration of only 10^{-4}radians/sec^{2}. Thus there is no direct alignment with the flow (which we do not want anyway) but a precession, complicated by the fact that the particle tends always to rotate about an extreme axis. (A characteristic of spinning bodies is that rotation about an intermediate axis is always unstable). A second effect that occurs when there is relative motion between gas and dust is the asymmetric sputtering away of the grains (The sputtering process is discussed in the immediately preceding note). Velocities of several kilometers per second correspond to heavy atoms with energy of 10 volts, approximately, and these produce rapid sputtering. Since the particle does not change its orientation appreciably, the sputtering is wholly in the direction of flow, and the net extent of solid matter in that direction is reduced.

In a recent paper Gold (Observatory, 72, 13, 1952; Nature, 169, 322, 1952) has also suggested that gas motions are responsible for the polarization of starlight. He makes the following points: a) Gas motions are primarily perpendicular to the galactic plane. b) The gas motion tends to align the particles of dust preferentially along the line of flow, thus producing the observed effect. There are several serious objections to this picture. First of all, as noted above, the torque produced by the gas motion is far too small to produce a direct alignment or preferential orientation in the direction of flow. Furthermore, even if the particles could be lined up directly, only the prolate grains could produce polarization, the oblate particles being randomly arranged about their long axes. Now although many authors often speak of needle-like grains, no theoretical or observational reason exists (nor has any been presented) for such a shape. Any explanation of polarization must work for both shapes. Lastly, it is doubtful that gas motions are primarily perpendicular to the galactic plane; it is more likely that they are parallel to the plane.

The chief difficulty in explaining polarization by the alignment of dust grains by moving gas is, the short distance to which particles will penetrate a cloud. There will, however, always be a certain amount of relative motion, due to the different times of relaxation and the different ways in which the gaseous and solid states react to forces such as radiation and gas pressure.

It appears quite reasonable that the motion of gas coulds in the plane of the galaxy defines a direction, and thus polarizes the light passing through the interstellar medium. Inasmuch as magnetic definition of a plane requires an implausibly high magnetic energy density, the polarization by gas motions appears the only solution to this baffling problem.

THE LIGHT CURVE OF NOVA AQUILAE, 1952

By Charles A. Whitney

Nova Aquilae, 1952, was discovered by S. Arend, July 19.98, 1952 (Harvard Announcement Card 1183). All available Harvard plates of the region taken since June 1, 1952 have been examined and eight observations covering the interval June 21-July 25 were obtained from them. A sequence of comparison stars was set up in the region of the nova, and IPg magnitudes were determined by reference to the comparison stars of V Aquilae, AE Aquilae, and S Scuti. All magnitude determinations were made by eye estimate. The sequence was established on five independent exposures of the region and the mean error of the magnitudes ranges from $0\overset{m}{.}07$ to $0\overset{m}{.}14$.

The derived magnitudes are given in the table. The times of mid-exposure are given in the first column, the magnitudes in the second, and the serial numbers of the plates used in the third. The AC and RH numbers designate Harvard patrol plates, and ST designates the Superschmidt camera. Where two plates were taken within a very short interval (less than 30^m) the magnitude given is the mean of two observations, since in no such case could the differences in magnitude (zero to $0^m.1$) be judged real. The observation of July 19 was taken from a print sent by Arend shortly after the original announcement, and the time of this photograph was taken as that of discovery.

Magnitudes of Nova Aquilae, 1952

Date GCT	*Magnitude IPg*	*Plate*	*Date GCT*	*Magnitude IPg*	*Plate*
June $21^d07^h.5$	12.4	ST 610	July $14^d04^h.2$	11.6	AC 42283
June 23 07.4	11.3	ST 630, 631	July 15 04.9	11.6:	RH 15839
June 23 05.3	10.5	AC 42269	July 18 05.0	11.5	RH 15845
June 23 07.5	10.1	ST 656, 657	July 19 23.5	11.7	Print sent by Arend
June 28 07.2	10.2	ST 727, 728	July 25 05.0	12.3	RH 15853

The light curve is interesting in three respects. Four observations were obtained within two days prior to the time of maximum light (which is estimated to be within several hours of July 23^d $07^h.5$ GCT). Two plates taken about five hours apart, with different cameras, show a brightening of $0^m.4$ shortly before maximum light. A second point of interest is the suggested temporary increase of $0^m.1$ or $0^m.2$ around July 17, which may well be real since it was determined on a series of plates taken with the same camera. It occurred about 25 days after maximum light. The third point to be noted is that eight available plates were exposed within an interval of seven days including the time of maximum light. This was made possible through the utilization of the Baker Superschmidt plates which were exposed in New Mexico for the purpose of meteor photography. These cameras have a field with a diameter of approximately 52°, and since they are used in pairs converging on a point about 75 km up in the atmosphere and situated 12 km apart, the combination covers a considerable fraction of the sky. A typical plate of this series reaches to $12^m.5$ and some reach $0^m.5$ fainter. The exposures are about ten minutes duration (the effective exposure is much shorter due to the rotating shutter) and hence the light curve of a variable object is not integrated over intervals comparable with usual periods of detectible variation. The plates taken by these cameras are ideal for the determination of the light curves of rapidly-changing and "sporadic" variables.

It is a pleasure to thank Dr. S. Gaposchkin for setting up the sequence of comparison stars. The Superschmidt plates were taken under Navy contract N5ori-07647 and were made available through the kindness of Dr. F. L. Whipple, Project Director, Harvard Meteor Program, and the staff of the Harvard meteor stations in New Mexico.

PUBLICATION OF BASIC MARINE NAVIGATION: SECOND EDITION

Bok and Wright. Houghton Mifflin Company, Boston, New York, Chicago, Dallas, Atlanta, San Francisco, 1952. 424 pages. $6.00.

Since the first edition of this book was published, many changes have been made in the *American Nautical Almanac*. Therefore the sections describing the *Nautical Almanac* have been completely rewritten to bring the material up to date. All the examples and problems of celestial navigation, in Chapters 12-16, have been revised to conform to the current, 1952, edition of the *Almanac*, and they can all be solved with the aid of the *Extracts* therefrom which appear in the present edition of this book. Included, also, are two pages of the 1953 *Nautical Almanac* and a list of the major changes which will appear in the 1953 *Nautical Almanac*.

Tide and Current forms have been added, and also a check list for basic procedures of compass compensation.