

Midgley, Jr. Subjects to be discussed include financial problems of the transition period, the outlook for foreign trade in chemicals, the need for more intensive research, the prospect for new engineering developments, the enhanced importance of technical progress to management and trends in professional education. Dr. Lawrence W. Bass, director of the New England Industrial Research Foundation, will be chairman of the symposium. Ralph E. Flanders, president of Jones and Lamson Machine Company, Springfield, Vt., chairman of the Research Committee of the Committee for Economic Development, will deliver an address on "Technology and Industrial Management." Other speakers will be D. M. Sheehan, comptroller of the Monsanto Chemical Company, St. Louis; Dr. W. L. Badger, of Ann Arbor, manager of the consulting engineering division of the Dow Chemical Company; John B. Glenn, president of the Pan American Trust Company, New York, vice-president of the New York Board of Trade; Raymond Stevens, vice-president of Arthur D. Little, Inc., Boston, and Dr. H. S. Rogers, president of the Polytechnic Institute of Brooklyn.

THE late Lady Thomazine Mary Lockyer, widow of the astronomer Sir Norman Lockyer, bequeathed her residence and other house property to the Norman Lockyer Observatory Corporation, and the residue of her estate in trust for the benefit of the corporation. She left £100 to the British Association for the Advancement of Science.

*The Times*, London, reports that a grant of £28,600 has been made under the Colonial Development and Welfare Act to enable a tuberculosis survey to be made in Fiji, to determine the extent of the problem and the best means of dealing with it. It is hoped to extend the survey to the British Solomon Islands Protectorate and the Gilbert and Ellice Islands Colony.

*Nature* reports that the shipbuilding industry in Great Britain, after consultation with the Department of Scientific and Industrial Research and the Admiralty, has decided to establish a British Shipbuilding Research Association, to develop all branches of research associated with shipbuilding, marine engineering and ship repairing.

## DISCUSSION

### FLOCCULAR MASSES AND APPARENT ALTERATIONS IN SUNSPOT PENUMBRAE

It is well known that high level, cloud-like masses of ionized Ca and other atoms are related in some way to ordinary sun spots. They are observed to be unusually active in the immediate neighborhood of spots and to partake of the vortical movement of the solar atmosphere about such spots. Unlike the spots, however, individual flocculi can not be observed by direct vision. Observation of the various kinds of flocculi are by spectroheliograms, generally obtained in the K line of Ca for that element, in the H $\alpha$  line for H, and so on.

Some time ago it occurred to the writer that under certain conditions floccular masses composed of various atoms and having a general absorption and emission might be seen by direct vision, or at least might be demonstrated by the masking effect such masses would have in passing over the dark parts of a sun spot.

That flocculi of various kinds, both Ca and H, for instance, overlie spot groups is, of course, common knowledge. However, the writer proposes that certain apparent changes in the penumbrae of sun spots may often be illusionary, due to the movements of superimposed floccular masses, having general emission and absorption, which are thus rendered directly visible. Both Ca and other atoms may be supposed to share in the phenomenon.

It was shown by Hale that sun spots have magnetic fields centered on the umbrae, which fields appear to derive from the rotation of charged particles. Sun spots, therefore, are vortices. However the vortex itself may be formed, the genesis of a spot appears to be as follows:

An ascending convection current, rising above the photosphere, reaches levels of reduced pressure where the top of the column expands. Heat is lost by expansion and the temperature of the expanded gas falls several thousand degrees relative to the photosphere. Its visible radiation decreasing proportionately, the cloud thus formed is seen as a relatively dark spot against the brilliant photospheric background. This constitutes the umbra of a sun spot. Surrounding it is a periphery of more diffused gases forming the penumbra. This penumbra is commonly and evenly striated and in most cases appears to slope inward and downward towards the umbra. Striation of the penumbra appears to be caused by currents flowing inward and outward to and from the umbra. Essentially, therefore, a sun spot is a funnel-shaped cloud roughly similar to a terrestrial tornado.

Bearing in mind the above facts certain striking metamorphoses are occasionally observed in the penumbrae of sun spots, difficult to explain on the assumption that such changes are real.

A spot is sometimes observed to lose its penumbra entirely on one side, retaining it on the opposite; and the lost portion is frequently regained. Other spots

are observed in which the penumbra alternately expands and contracts on both sides of the umbra. Since such changes are also frequently accomplished without any apparent effect on the striation of the penumbra, the question may be asked whether they are real or illusionary. The writer believes that all such changes, in which the striation is not affected, are only apparent and due to the masking effects of flocculi moving above the penumbra.

The striation of the penumbra may be used to separate real from apparent changes quite readily. Remembering that this whole structure is gaseous, it is clear that any profound alteration in the penumbra itself will certainly affect the striation by disturbing the currents which produce it.

Consider the case of a spot which suddenly appears to be dichotomized, say 24 hours after first observation, the penumbra appearing to vanish on one side while it remains whole and unaffected on the other and with no sensible disturbance of the striation in the visible half. Assuming such a change to be real we would have to believe that a vortex existed in which there was an indraught *only from one side*, an obvious impossibility.

The simplest explanation for such an appearance (by no means rare) is that some bright, opaque screen has come between the penumbra and the eye of the observer. This is most strongly suggested when the missing half of the penumbra reappears, the striation in the unaffected half meanwhile remaining undisturbed.

In order to cause apparent changes in the shape and area of the penumbra, without actually altering it physically, it seems clear that the agent effecting the apparent change must be in the nature of a screen superimposed upon but at a considerable altitude *above* the spot. Indeed the phenomenon is analogous to the projection of prominences on umbrae, which give rise to the bright bridges often observed; but the difference in volume between the slender umbral filaments and the obscuring masses which blot out whole areas of the penumbra make it fairly certain that the latter are floccular in nature. By learning to distinguish between physical changes in the penumbra and those caused by obscuring flocculi, it is thus possible to study their local movements by direct vision.

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#### PERTUSSIS IMMUNE ROOSTER SERUM

As a member of the American Association for the Advancement of Science I am greatly interested in the current article by Hilleman and Gordon in *SCIENCE*

for October 15, 1943, relative to the preparation of a protective rooster antiserum against mouse pneumonitis virus.

I wonder whether or not the authors are familiar with the work of Dr. John Bailey, of the University of Indiana,<sup>1</sup> who in 1933 described an anti-serum of high potency produced in the rooster by repeated intraperitoneal inoculations of suspensions of live *H. pertussis*.

Bailey's serum was effective in alleviating to a considerable degree the paroxysmal cough in the early stages of pertussis in a limited number of children when administered intramuscularly. However, local reactions were at times severe and wide-spread usage of the serum was not attempted.

Three years ago I again became interested in the rooster as a possible source of immune serum particularly against type b *H. influenzae* for the treatment of influenzal meningitis in children, as past experience had demonstrated the failure of chemotherapeutic agents and antisera in the treatment of this disease. Approximately two years ago I submitted a problem to the research committee of the Michael Reese Research Foundation, Chicago, involving an attempt to produce a potent rooster immune against type b *H. influenzae* for the treatment of influenzal meningitis. The initiation of this work was curtailed when I entered the Army.

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#### A PROPOSAL CONCERNING THE KILGORE BILL

BECAUSE its arguments were based on generalities L. A. Hawkins (*SCIENCE*, January 14) criticizes my letter on the Science Mobilization Bill (*SCIENCE*, November 26, 1943). Since I was attempting to answer an earlier letter of Dr. Harlan T. Stetson (*SCIENCE*, October 22, 1943), to whose generalizations I objected, my reply was not an answer to specific objections to the bill.

Mr. Hawkins's interpretation of my remarks perverts my meaning and intention, perhaps because they were not clear. However, instead of offering specific answers to his specific objections to my general statements, I urge opponents and proponents of the bill to direct their efforts in exactly the manner he desires. If the less informed scientific public could have before it objective and specific analyses prepared by competent persons of divergent views, I believe the formulation of sound judgment would be hastened. I suggest, therefore, the publication and wide circulation of specific objections and specific answers to them.

<sup>1</sup> *Jour. of Infect. Dis.* 52: 97, 1933.