In conclusion the administration of guanidine to persons with myasthenia gravis appears to be a rational procedure. In our brief experience guanidine has caused a marked improvement in muscle strength without the production of any untoward symptoms in a patient with the disease. We have been able to maintain a more even level of improved function than was possible with prostigmine. Further experience with the use of this drug will show whether the use of guanidine is any real advance in the treatment of myasthenia gravis.

A. S. MINOT
KATHARINE DODD
SAMUEL S. RIVEN
DEPARTMENTS OF PEDIATRICS AND MEDICINE
VANDERBILT UNIVERSITY HOSPITAL
NASHVILLE, TENN.

THE EXISTENCE OF MERCERIZED CELLULOSE AND ITS ORIENTATION IN HALICYSTIS AS INDICATED BY X-RAY DIFFRACTION ANALYSIS

WHILE making an x-ray study of the large, single-celled, marine plant, *Halicystis*, the presence of mercerized cellulose and certain unusual features regarding its orientation were found, a preliminary report of which would seem of interest prior to the publication of a more extended investigation pending the collection of fresh material next summer.

There are two polymorphic crystalline forms of cellulose (native and mercerized) which may be distinguished by their x-ray diagrams. In the native form, cellulose gives three principal x-ray diffraction rings corresponding to interplanar spacings of 6.1, 5.4 and 3.95 Å. If cellulose is regenerated from solution or liberated from its compounds with sodium hydroxide or certain other strong-swelling reagents, the native spacings are replaced by new spacings of 7.4, 4.45 and 4.0 Å. These latter spacings are associated with the hydrated or mercerized form.

The 7.4, 4.45 and 4.0 Å lines, and also three other outer lines characteristic of mercerized cellulose, may be identified in the x-ray diagram of *Halicystis*. There is also present a line not associated with cellulose, corresponding to the approximate spacing of 12.5 Å.

All samples of plant cellulosic membranes heretofore subjected to x-ray diffraction analysis show the cellulose to exist in the native form. For this reason the existence of diffraction rings in *Halicystis* corresponding to those of the mercerized form is of special interest. Whether or not this mercerized condition is specific for *Halicystis* is not known, since comparatively few of the lower plant membranes, or membrane constituents other than cellulose, have been subjected to x-ray analysis. The mercerized cellulose pattern was identified in three species of *Halicystis* (*grandis*, *ovalis* and *Osterhoutii*) obtained from different localities.

The orientation of cellulose in *Halicystis* is also unusual. With the x-ray beam perpendicular to the membrane surface, the 7.4 Å line is missing, and the 4.45 and 4.0 Å lines give a random oriented pattern; with the beam parallel, the 7.4 Å line is present as two arcs. This indicates that at any particular point in the membrane the 7.4 Å crystallographic planes are oriented parallel to the membrane surface, while the *b* axes of the crystallites (*i.e.*, the direction of cellulose chains) have a random orientation in the plane of the membrane. The non-cellulosic material has an orientation similar to that of the cellulose, as indicated by the fact that the 12.5 Å line is absent with the x-ray beam perpendicular, and present as two arcs when the beam is parallel to the membrane.

The structure of *Halicystis* is of special interest when compared with that of the similar, single-celled marine plant, *Valonia*, which has been the subject of considerable x-ray work.[1] The x-ray pattern of *Valonia* is that of native cellulose. Furthermore, the 6.10 Å crystallographic planes of *Valonia* are oriented parallel to the membrane surface (similar to *Halicystis*), while the *b* axes are oriented parallel in two sets which make an angle of approximately 80° to each other in the plane of the membrane (unlike *Halicystis*).

The present x-ray work was carried out in conjunction with the microscopic and microchemical studies of Farr[2] on the same samples.

WAYNE A. SISSON
CELLULOSE DEPARTMENT,
CHEMICAL FOUNDATION,
BOYCE THOMPSON INSTITUTE

WATER-SOLUBLE DERIVATIVES OF P-AMINOBENZENE-SULFONAMIDE (SULFANILAMIDE)

THE low water-solubility of sulfanilamide suggested that related compounds of greater solubility might be of higher therapeutic efficiency because they would be absorbed and circulated more quickly; thus smaller doses could be administered.

For the purpose of this study a series of sulfonic acid compounds of p-aminobenzene-sulfonamide were prepared.[1] In the present work only those compounds

[1] Sponsler, *Nature*, 125: 633, 1930; *Protoplasma*, 12: 241, 1931; Astbury, Marwick and Bernal, *Proc. Roy. Soc. London*, 109B: 443, 1932; Preston and Astbury, *Proc. Roy. Soc. London*, 122B: 76, 1937.

[2] W. K. Farr, Paper presented before the Physiological Section of the American Association for the Advancement of Science at the Indianapolis meeting, December 28, 1937.

[1] This synthesis was carried out by the Laboratories of The Farastan Company, Philadelphia, Pennsylvania.

having a solubility in water greater than 1 in 20 were considered. They are shown in the accompanying table.

Compound	Solubility in H_2O at 25° C.	Per cent. of sulfanilamide in molecule	Toxicity for albino rats in milligrams per kilo of body weight
Sulfanilamide	1 in 200	100	7,040
Camphorsulfonate ..	1 in 2	42.5	6,240
Benzenesulfonate ...	1 in 14	49.4	5,400
Phenolsulfonate	1 in 14	49.7	7,040
Sulfosalicylate	1 in 16	44.1	6,000

The toxicity of these water-soluble compounds as determined by oral administration to albino rats is indicated in the table. The probable dose which would kill 50 per cent. of the animals fed is above the amount indicated.

It will be noted from the table that the toxicity of some of the soluble compounds is slightly greater than that of sulfanilamide. This may be due to the fact that the relatively insoluble sulfanilamide is not absorbed as readily as these compounds.

In the preliminary protective tests it was possible to demonstrate a protective action of the water-soluble derivatives equal to or greater than that of sulfanilamide, although the derivatives contain only 40 to 50 per cent. of the mother substance (sulfanilamide). The protective tests were performed on albino rats which had been infected intraperitoneally with lethal doses of beta-hemolytic streptococci of Lancefield's group A, and then treated by oral administration with the compounds studied. Three hundred and fifty animals were used in these tests.

The protective action of the most soluble of the compounds listed (camphorsulfonate) was not due to the camphorsulfonic acid radical alone, since this failed to protect rats when it was administered in equivalent doses. This material apparently had slight bactericidal effect on the strain of streptococcus used when tests were performed in vitro. This bactericidal effect was entirely lost, however, when the material was combined with the mother substance to form the camphorsulfonate compound.

Clinical studies and further animal experiments are now in progress and will be reported in the near future.

HENRY FIELD SMYTH
CHARLES P. CARPENTER

LABORATORY OF HYGIENE,
UNIVERSITY OF PENNSYLVANIA,
PHILADELPHIA, PA.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

SUSTAINING LONGITUDINAL VIBRATIONS IN RODS

THE well-known demonstration of the Bernoulli effect, in which a card can not be blown from the end of a spool, has suggested a means of maintaining longitudinal vibrations in a rod such as that employed in the Kundt tube experiment.

If the card is replaced by the smoothly squared end of the rod, the latter may be kept vibrating indefinitely by a stream of compressed air. It may be necessary to start the vibrations in the rod in the usual way by stroking by hand. Then, a little adjustment of the clearance between the end of the spool and the end of the rod and also of the air pressure will very easily secure vibrations of such large amplitude that the intensity of the sound produced is quite surprising. In so far as the writer knows, this method of sustaining longitudinal vibrations in rods has not been described previously.

This method has some distinct advantages over the standard mechanical, electromagnetic, electrostatic, magnetostriction and piezoelectric methods. It requires only the simplest of apparatus, little or no attention during operation, and it is applicable to rods (and other bodies) of many shapes.

Inasmuch as the pitch of the tone produced depends on the physical constants of the rod, a considerable variation in the air pressure is permissible. Ordinarily the writer has used a line pressure of about fifty pounds per square inch when working with a one-inch metal rod about six feet long. The hissing of the escaping air is quite unobjectionable, but if it is desirable to eliminate this sound entirely, the free end of the rod may be passed through a hole in the wall so as to serve as a source of sound in an adjacent room.

A rod vibrated by the method described here is ideal for the production of the Kundt dust figures or for setting up stationary waves in a large room. These may be detected by merely walking across the room.

If the end of the rod is replaced by the bottom of a "tin" can, such violent vibrations may be set up as to be deafening. In the same way a tuning fork may be operated continuously if the lateral face of one of the prongs is placed against the air jet. The sound thus produced may reach an intensity difficult to obtain otherwise.

E. H. JOHNSON

KENYON COLLEGE

DISCOLORED PLATES

IN the Smithsonian Contributions to Knowledge, Volume VII, is an article by J. W. Bailey, "Notes