carbonic anhydrase of the parietal cells can function unrestricted by inactivating agents.[13] Carbonic anhydrase injection, into dogs, is reported to produce a rise in alveolar CO_2,[14] indicating increased tolerance.

Fuller, Colebrook and Maxted[15] find that the growth of most group A hemolytic streptococci in human blood is favored by increase in CO_2 and retarded by decrease. In the blood stream, inactivation of carbonic anhydrase would tend to retard conversion of metabolically produced CO_2 into bicarbonate—an action possibly favoring growth and counteracting bacteriostasis. Bicarbonate is reported by Pappenheimer and Hottle[16] to be no substitute for CO_2 for the maintenance of optimum growth. The possession by sulfanilamide of an unmodified sulfonamide grouping capable of producing inactivation of carbonic anhydrase may, therefore, be a source not only of increased toxicity but also of lowered bacteriostatic effectiveness.

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14 F. Schmitt, *Deut. Arch. klin. Med.*, 134: 300, 1939.
15 A. T. Fuller, L. Colebrook and W. R. Maxted, *Jour. Path. Bact.*, 48: 443, 1939.
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SCIENTIFIC APPARATUS AND LABORATORY METHODS

REUNION OF STUMPS OF SMALL NERVES BY TUBULATION INSTEAD OF SUTURE[1]

IN the course of extensive experiments with peripheral nerves of amphibians,[2] recently extended to rats,[3] a method of nerve union has been perfected which, owing to its adequacy and wide applicability, deserves to be placed on record. The problem is to appose closely the cut surface of a proximal nerve stump, as the source of regenerating fibers, to the cut surface of a distal stump, as the channel into which the fibers are to be routed. Apposition by ordinary suturing can never be precise enough to prevent masses of fibers from escaping into the surroundings and straying off to uncontrollable destinations. Moreover, when we are dealing with nerves of only a fraction of a millimeter in diameter, neat suturing becomes a mechanical impossibility. Both difficulties can be met by tubulating the nerve ends with a tightly fitting cuff of fresh artery.[4]

A fragment of artery slightly narrower than the width of the nerves to be united is chosen, squeezed free of blood and immersed in Ringer's solution. All further manipulations take place in this solution. For instruments we use two pairs of hard steel (watchmaker's) forceps ground down until the ends have become very slender and sharp-pointed. The steps of the operation are illustrated in the accompanying figures. (1) With forceps F pull artery A over closed forceps G; artery becomes greatly dilated. (2) Open forceps G slightly and grasp perineurium of nerve stump NP. (3) With forceps F strip artery from G and pull half-way over NP. (4) Withdraw G. (5) Insert F into empty end of artery and open prongs slightly; introduce nerve stump ND into the opening, until the two stumps meet (some additional pressure, flanging the ends, is advisable). (6) Stretch the arterial cuff until it fits snugly.

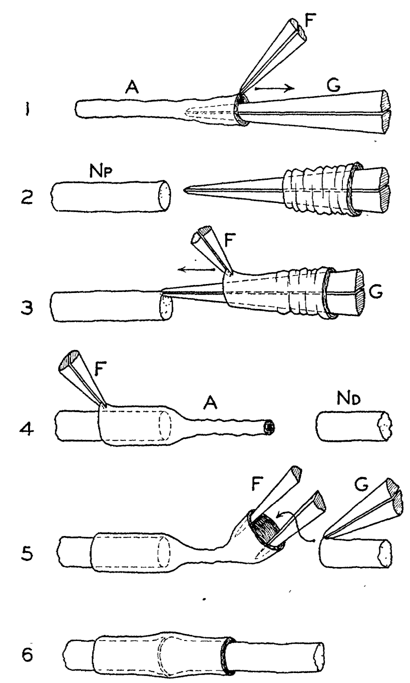

FIG. 1

Enough slack should be allowed to the nerve stumps to insure apposition without stress. After sucking and blotting the excess Ringer's solution from the wound, clotting occurs rapidly. The arterial cuff, firstly, provides a firm link between the nerve ends and, secondly, prevents the formation of a neuroma

1 Research aided by the Dr. Wallace C. and Clara A. Abbott Memorial Fund of the University of Chicago.
2 Paul Weiss, *Biol. Rev.*, 11: 494, 1936.
3 R. W. Sperry, *Jour. Comp. Neurol.*, 73: 1940.
4 Tubes filled with various media have been used by surgeons to bridge nerve defects. In the present note tubulation is introduced in a different capacity and on a different order of magnitude.

and the uncontrollable escape of fibers. It is gradually transformed into perineural connective tissue and after several months can no longer be identified. Regenerating fibers traverse the wound in straight parallel courses instead of in the usual confusion following nerve suture.

It has recently been described[5] that good binding between severed nerve trunks can be obtained by applying clotting blood plasma to the apposed cut ends, and that regenerating fibers under these conditions take fairly straight courses in crossing the scar.[6] Whether this method provides the experimenter with as definite an insurance against undesirable stray fibers as tubulation does, remains to be seen.

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A METHOD FOR DETERMINING AND SPECIFYING LOCALITY BY COLLECTORS

While engaged in studying the flora of Maryland the author devised a system for determining and specifying locality which may be of interest to collectors. The system employs the topographical maps published by the United States Geological Survey which are scaled one inch to the mile. These quadrangle maps are already divided by the coordinates of longitude and latitude into nine nearly equal and approximately rectangular divisions. The longitudinal meridians, of course, converge to the north so that the northern boundary of the quadrangle and the northern boundary of every primary division is, in each case, slightly smaller than the opposite or southern boundary. The nine primary divisions of each quadrangle are numbered .1 to .9 counting from left to right: top row, .1, .2, .3; middle row, .4, .5, .6, and bottom row, .7, .8, .9.

A transparent celluloid over-lay is cut the size of an average primary division for the area to be studied. Since no over-lay can be made to fit all the quadrangular divisions for an area as large as the United States, due to the northward convergence of the meridians of longitude, it is necessary to take the average primary division in a given area as the size of the over-lay to be used.

The over-lay may be prepared from either of two kinds of celluloid: (a) with one side frosted so that it may be ruled with India ink, or, (b) with both sides smooth so that lines may be etched or cut into one side and subsequently filled with colored wax or India ink. This over-lay is divided by coordinately ruled lines into nine equal and approximately rectangular divisions each of which represents a secondary division of the quadrangle. These secondary divisions are numbered .01 to .09, and in the manner indicated above for the primary divisions. Each secondary division is, in a similar way, divided into nine tertiary rectangles and numbered .001 to .009. Finally, each tertiary subdivision is divided into nine rectangles which are numbered .0001 to .0009. Thus, the preparation of the over-lay in the manner indicated provides four sizes of rectangular divisions.

By placing the celluloid over-lay on any one of the primary rectangular divisions of the quadrangle map, any point on the division can be read as a four point decimal. The fifth decimal can be estimated if desired and will locate the point to within approximately a 250 foot radius. Since each quadrangle already bears a name (printed on the map), this name precedes the decimal code in specifying locations, as, for example: "Ellicott .99887."

For field use, the author has found it convenient to cut each topographical map into its nine primary divisions and paste these into a loose-leaf notebook of appropriate size where each is labeled with the name of the quadrangle from which it was cut and the proper primary division number, as, for example: "Ellicott .9." Through the use of these maps in the field, specific locations are determined and recorded at the time of collecting each specimen.

Fortunately, the over-lay described above can be used on the soil maps which are published by the Bureau of Chemistry and Soils, United States Department of Agriculture, and which are scaled one inch to the mile. For field use, as well as for other kinds of uses, it is convenient to mount the soil maps in the same loose-leaf form referred to above, and with each map opposing the page on which the corresponding topographic map is mounted. The simultaneous use of both maps often brings to light very interesting ecological features.

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[6] These experiments essentially reproduce conditions first established in tissue culture by the author (P. Weiss, *Jour. Exp. Zool.*, 68: 393, 1934) and confirm the guiding effect of an oriented fibrin matrix on nerve fiber growth.