the best instrument to date. Several limitations of his technique of destruction, which are obviated by the method to be described herein, are deserving of mention. When the soldering iron technique is employed the area to be destroyed must be fully exposed. This requires the removal of bone equal to or in excess of the size of this area. Any minimizing of bone removal, especially when large areas are to be ablated, is conducive to a lessening of the operative shock and therefore increases the chances of survival of the animal. Direct entrance to regions along the ventral borders of the cortex requires the removal of surrounding bony structures. Certain of these deeper portions would be very difficult to reach with the copper heat applicator. Judging from photographs published by Dusser de Barenne of lesions produced by this method, there is considerable tendency for the middle portion of the destruction to invade the tissues more deeply than does the peripheral portion. This tendency was also encountered in devising our method, but apparently can be controlled to a greater extent than with the other technique.

A low voltage radio frequency thermo-coagulator,[3] developed for the production of controlled injury in the interior of tissue masses, has been successfully adapted to the problem of cortical destruction. The electrodes consist of two thin strips of spring-tempered steel 1 mm wide, .05 mm thick and 7 mm in length. They are soldered to two small brass pieces $.7 \times 4 \times 10$ mm, riveted to a rectangular bakelite handle $2 \times 10 \times 50$ mm. The strips are arranged parallel, with their flat surfaces in the same plane, and are separated by 3.5 mm. The brass pieces extend longitudinally about 3 mm beyond the end of the bakelite, the extended parts being bent 45° so that the plane of the electrodes intersects the plane of the handle at its end. Light-weight flexible connection wires are attached to the brass pieces. The soldering of the steel strips to the brass pieces is best carried out while holding the two strips together and in alignment with a small toolmaker's parallel jaw clamp. The brass parts are coated with bakelite insulating varnish.

The electrodes are inserted through a pair of small holes made with a dental drill trephine and are carefully slid between the dura and the inner surface of the skull into the desired position. Since the steel strips are quite flexible, they follow the curvature of the skull within limits. Applying approximately 16 volts of radio frequency energy across the electrodes destroyed the cortical tissue to a depth of .8 mm and to a width of 6 mm along the entire length of the electrodes. Variation in the depth of destruction can be obtained by varying the magnitude of the voltage and the duration of the exposure. When smaller localized lesions are desired a suitable portion of the electrode surface is rendered inactive through the application of insulating varnish. It is possible in this way to create local lesions in areas that are inaccessible to other methods without considerable incidental destruction, although the electrodes are more difficult to place because of their added stiffness. Larger areas of destruction can be obtained by using larger electrodes and increasing the spacing between them.

Uniform results can only be secured with a properly designed source of radio frequency energy.[4] The cross-sectional shape of the lesion is affected by the width and spacing of the steel strips, the voltage and current density and the duration of the exposure. Incorrect parameters may lead to lesions surrounding each electrode only or to a single ellipsoidal region instead of the desired contour approximately rectangular in shape. Calibration may be most conveniently carried out through the use of a rapid method developed by one of the writers for investigating the action of radio frequency currents in cell masses.[5] Blocks of tissue from the root of the common garden beet are used. The electrodes are placed on a freshly cut surface of this material and covered with a glass slide. After exposure to the current, free-hand sections of about .5 mm are cut and soaked in tap water for one or two hours. Cells that have been injured will suffer a loss of pigment and become clearly differentiated.

Calibrations made in this way will not hold precisely in the living animal because of the influence of structures characteristic of the vegetable cell, and because of the cooling and distributing action of blood circulation in the animal. Nevertheless, the results are in approximate agreement. A few brain sections worked up by the conventional method, supplemented by preliminary experiments with the beet tissue, avoids much of the really formidable amount of work that is otherwise expended in preparing sections. This method also has proved very useful in developing the technique for producing internal lesions in cell masses.

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A METHOD OF MOUNTING MAPS

MOUNTING of maps on muslin or linen for use in the field or in the classroom is standard practice in

[2] J. G. Dusser de Barenne and H. M. Zimmerman, *Arch. of Neur. and Psychiat.*, 33: 123, 1935.

[3] C. W. Brown and F. M. Henry, SCIENCE, 79: 457, 1934.

[4] C. W. Brown and F. M. Henry, *Proc. Nat. Acad. Sciences*, 20, 310, 1934.

[5] F. M. Henry, *Yearbook Carnegie Inst. of Wash.;* 30: 265, 1930.

geology and related sciences. The usual method involves wetting the cloth and the map, stretching the cloth on a mounting board, spreading paste on its surface, and smoothing and pressing the map with a rubber roller. The process is time-consuming, since the map must be allowed to dry completely before it is removed from the board. The necessary soaking of the map may cause an appreciable change in scale, or may damage certain colored maps. Subsequent unavoidable wettings in the field may loosen the paste or cause the cloth to shrink. An alternate method, which involves the use of paper-thin sheets of a pliable wax-like substance, known as Parafilm,[1] has been developed during the last two years at the University of Washington, having been first suggested by Mr. Allen Cary, a graduate student in the department of geology. Much interest expressed by visiting professors has suggested the desirability of a brief description of the method, so that it may be tested and used by others who work with maps.

The wax-like sheeting is sold in rolls of varying widths; the twenty-inch width has been found most convenient. The table top to be used in mounting should be covered by cardboard or paper, which can be replaced when it is soiled. If the map to be mounted is a single sheet it should be laid on the table, face down, and covered completely with a sheet of Parafilm. The film may be stretched to approximately one and one half times its original length or width before it is cut to size, but it is doubtful whether the slight saving effected by this procedure justifies the loss of time. The sheet (or sheets) of the film need not be perfectly smooth. A piece of muslin or linen slightly larger than the map should then be spread over the two layers. Wrinkles and creases may be eliminated by thumbtacks near the margins, but the cloth must not be stretched. Finally the three layers should be pressed with a moderately hot pressing iron, at first rapidly around the margins (since Parafilm tends to contract slightly when warmed near the iron), and then more slowly over the whole surface until the melted film has completely sealed every part of the cloth to the map. The mounted map may then be removed from the table and trimmed.

If necessary, two or more pieces of cloth may be joined by placing a one half inch strip of Parafilm between the overlapped edges and pressing with the iron.

If the map consists of a number of sheets that must be matched or if it is to be mounted in sections so that it may be folded for use in the field, a slightly different procedure is recommended. The cloth should be spread out on the table, held in place (not stretched) with thumbtacks, and covered with the film. The sections of the map should be laid on the film in the desired position, with no overlap, and fixed in place by pressing with the iron directly on the surface or through a sheet of heavy paper, but the iron should not be passed over the seams lest the film be drawn through and smeared over the map. When all the sections have been fixed the whole mount should be turned over and pressed thoroughly on the reverse side, as before. If Parafilm from the seams seals the mount to the cardboard it may be freed by heating with the iron.

Mounted groups of topographic sheets can be prepared for use as wall maps by attaching "half-round" wooden strips at the top and bottom margins and fitting with hooks and tie cords. Over 40 such group sheets have been prepared, at small expense, for use in geology courses at the University of Washington. Our aim is to provide, wherever practicable, group sheets showing regional relations of features which appear on individual topographic maps assigned for laboratory study.

If a map is to be used in the field it may be protected from damage by water by drawing a very thin film of the same wax sheeting over the surface with the pressing iron. If very high temperatures prevail in the district where the map is to be used a thin coating of flexible lacquer may be applied to the surface of the map, before mounting, in place of the Parafilm.

The method outlined above commends itself because it is economical and ideally simple, and because it does not damage the map. If it is necessary to make a tracing from a field sheet, or to replace one section of a group mount with a later edition of the same quadrangle, the map can be detached from the cloth by heating with the iron. Maps in use for two years show no signs of stiffening or loss of adhesive properties of the film.

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[1] Made by the Marathon Paper Mills Company, Rothschild, Wis.

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