sible, new uses and processes which may tend to develop industries in the Colonies themselves.

Basic surveys may be said to have three aspects or values: (1) They clear the way for more fundamental research by indicating clearly which are the greatest needs; (2) in themselves, they are of the utmost value for the planning and execution of schemes of development in the economic or other fields; and (3) they enable Colonial peoples to know themselves and their environments and thus take an ever-increasing part in the development of their own lands and the building up of their own communities on a basis of light and knowledge.—*C. Y. Carstairs* (Secretary, Colonial Research Committee, British Colonial Office).

In the Laboratory

An Indwelling Arterial Needle for Use in the Radial Artery[1]

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The problem of obtaining arterial blood when at altitude interposes a major difficulty in the way of analyzing the merits of various types of high-altitude equipment. It is desirable to implant a needle in the artery before commencing the experiment and to be able to allow the subject a few minutes to recover from the effects of the arterial puncture before proceeding. The direct tapping of an artery at altitude is difficult, requiring delicacy of procedure by the operator and vasomotor stability on the part of the subject. Both of these are not necessarily available under conditions when there may be severe anoxia and marked discomfort.

Although satisfactory for clinical work, it was felt that implants into the femoral artery (1) were too immobilizing to be safe for chamber work, where rapid movement might at any time be necessary to meet an emergency. After a number of experiments in which various difficulties were encountered, a modified Lindemann needle has been developed for radial implantation. Although still in the process of modification, it has already been shown to be of practical value in altitude studies. The following technique, modified in certain respects from that used by the Columbia group for femoral implantation (*1*) to allow for anatomical differences between the two puncture sites, is employed in these laboratories.

After heating the hand in water at 48° C. for five minutes to increase blood flow, the radial artery is palpated carefully while the subject rests the wrist upon a wooden block with the hand sharply extended at the wrist. The skin is sterilized, and a small amount (0.3 cc.) of 2 per cent novocain is placed on either side of the artery above the radial styloid, using a 25-gauge needle. No attempt is made to infiltrate

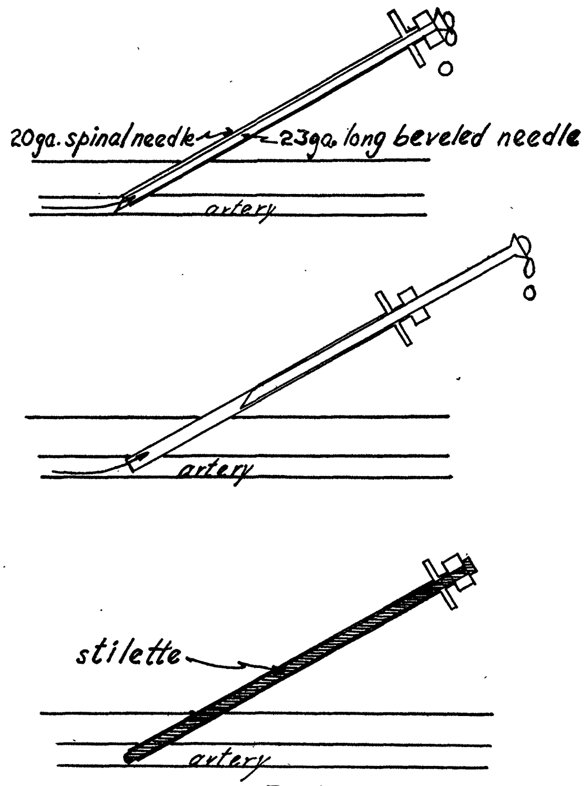

Fig. 1

the wall of the artery. If a small amount of anesthetic is used, the landmarks and the artery will not be obliterated by the mass of subcutaneous infiltration. When anesthetized, the skin is pierced directly over the artery by the implant needle. In Fig. 1 the insertion of this implant needle is presented. It consists of a 23-gauge needle honed down

[1] The work described in this paper was done under a contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the University of Southern California.

to fit within a 20-gauge spinal needle. A lock is placed on the inner needle which holds it in place, making the two needles integral. The point of the inner needle and the tip of the outer needle are carefully ground to present the smoothest contour possible in an attempt to avoid any abrupt discontinuity which might render the passage of the needle point jerky. When the tip of the inner needle pierces the arterial wall, blood will flow from the butt. The needle is then advanced slightly to insure that the outer needle is also within the arterial wall. This may be verified by detaching the inner needle by operation of the lock and withdrawing slightly. If blood flows freely from the inner needle, the tip of the outer one is usually well within the lining of the vessel. The inner needle is then removed and a cone-shaped introducer slipped over the rearward projecting shaft of the outer needle. This introducer is then used to permit the easy insertion of the stilette into the outer needle. The point of the stilette is ground with the aim of converting the tip of the outer needle into a rounded surface. Once the stilette is in situ, the outer needle can be advanced one-half to one inch up the artery and the needle strapped into place on the wrist with adhesive tape.

In order to obtain blood during the ensuing one to two hours it is necessary only to remove the stilette and introducer, placing them in hydrogen peroxide, and place a Luer syringe in situ. If blood is not flowing freely, reintroduction of the peroxide-wet stilette will usually clear the needle, especially when combined with slight suction on the syringe. On completion of sampling, the introducer is replaced, and the stilette can then be slipped into place without trouble. In the absence of the introducer, considerable difficulty was experienced in inserting the stilette into the shaft of the outer needle in the face of the stream of blood issuing from it. The introducer was devised to overcome this obstacle which becomes a serious one when dexterity is poor, as during a pressure-breathing experiment at altitude.

The needles developed so far have been successfully implanted in more than 70 per cent of all attempted punctures by the three persons who have employed them. It is thought that with improved dexterity and modifications in technique the percentage of failures could be further reduced. The needle permits free use of the hand in spite of its presence at the wrist. The procedure for sampling is so simple when using the implant that blood can be obtained by the subject himself if necessary.

Although originally developed for use in high-altitude physiology, it is to be noted that this technique may be applied to the study of arterial blood pressure by the use of a suitable pressure-recording device (*2*). In these laboratories a "strain gauge" pressure recorder developed in collaboration with the Statham Laboratories, Los Angeles, has been used for this purpose.

References

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Letters to the Editor

Origin of Microseisms

Since it is now reasonably certain from the work of Ramirez (Ph.D. Dissertation, Saint Louis University, 1939; *Bull. seismol. Soc. Amer.*, 1940, **30**, 35–84, 103–178) and Gilmore (*Bull. seismol. Soc. Amer.*, 1946, **36**, No. 2) that group microseisms, as defined by Gherzi in his various publications, originate in the ocean bottom under the center of each hurricane, typhoon, or extratropical cyclone, a satisfactory explanation is needed for the mechanics of their production.

At a conference on storms and the origin of microseisms held early last January at the U. S. Coast and Geodetic Survey in Washington and at the meeting of the American Meteorological Society in St. Louis, 29 March 1946, the writer suggested a possible mechanism which would seem to give the right order of magnitude for the quantities involved.

While quantitative data on the conditions in the interior of a hurricane are sparse and difficult to obtain, we have at our disposal some fairly reliable qualitative information.

In the first place, a hurricane is an air vortex which exerts a frictional torque on the water surface. The air-water friction is considerable; in fact, the observed values of such friction seem to be greater than would be expected from simple theory. Consequently, we must expect a water vortex to be generated. A vortex motion, once generated in the water, must extend to the sea bottom, since, as is well known, a vortex in a nearly perfect fluid cannot begin or end within the fluid. It must either form a closed vortex ring or begin and end at boundaries, such as the free air surface and the sea bottom in the case of the ocean. Observations seem to indicate considerable convergence and consequent piling up of the