

both to science and to religion, keeping up several centuries of misunderstanding.

The concluding portion of the statement of Castel Gandolfo is concerned with practical applications of genetics. Having been addressed to the participants in the so-called "First Symposium on Medical Genetics," it naturally takes up the problem of defective heredity and its control. Geneticists will be gratified by the recognition that "the fundamental tendency of genetics and eugenics is to influence the transmission of hereditary factors in order to promote what is good and to eliminate what is harmful; this fundamental tendency is irreproachable from the moral point of view." Concerning the methods of accomplishing these ends, genetic counseling is endorsed. The carriers of bad heredity must be warned of the burdens which they are likely to impose upon themselves and their descendants. Eugenic sterilization is nevertheless opposed as a manifestation of "racism," which is explicitly rejected. However, when a carrier of a hereditary defect is incapable of conducting himself as a human being, one is justified in preventing him "in licit manner" from procreating new life. The statement closes with a reiteration that "the practical ends pursued by genetics are noble and worthy of being recognized and encouraged."

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A Jugular Technique for the Repeated Bleeding of Small Animals¹

INVESTIGATORS in various fields have long been plagued by the problem of obtaining repeated blood samples from small laboratory animals. Mice, in particular, have presented just such a problem. To obtain

¹ This technique was developed during the course of investigations supported by the Damon Runyon Memorial Fund for Cancer Research (grant No. 222).

repeated blood samples from the same mouse, a technique for bleeding from the external jugular vein has been developed and used in this laboratory. With the hope that such a technique may be of value to other investigators, an outline of the procedure follows.

Consistent success is dependent upon the animal being in the proper position for venipuncture. The animal is held by grasping the loose skin of the back firmly between the thumb and index finger of the left hand, and the ventral surface of the animal held upwards to expose the neck and upper thorax. Several threads of a 2 × 2 gauze sponge may then be caught on to the upper central incisors of the animal by pulling the taut edge of the sponge forward over the animal's mouth. This sponge is used to hold the head in hyperextension. When working alone, this position may be maintained by pulling the 2 × 2 gauze across the back of the hand and locking it between two fingers (Fig. 1a). In this hyperextended position, depilation from chin to mid-thorax is accomplished with little difficulty and exposes both external jugulars. These vessels are often distended and may be located without difficulty (Fig. 1b).

The puncture approach is determined, dependent upon the distention of the vessels, their size, etc. The needle (26 gage) and syringe should be wet with an anticoagulant. Immature animals, in which the jugulars are small, may be bled by introducing the needle 1- to 2-mm lateral to the sternoclavicular junction. At this point the expansion of the vessel, just cephalad to where it dips under the clavicle, may be visible as a blue, pulsating area. Fewer hematomas were formed when the needle was introduced over the sternum, puncturing the skin 1 to 2 mm below the sternoclavicular junction, and the vessel approached in a caudo-cephalic direction (Fig. 1c). The blood is withdrawn slowly so as not to cause collapse of these small vessels.

Using this technique, it has been possible to obtain blood samples from weanling mice. Several older animals have been bled a total of twelve times within a

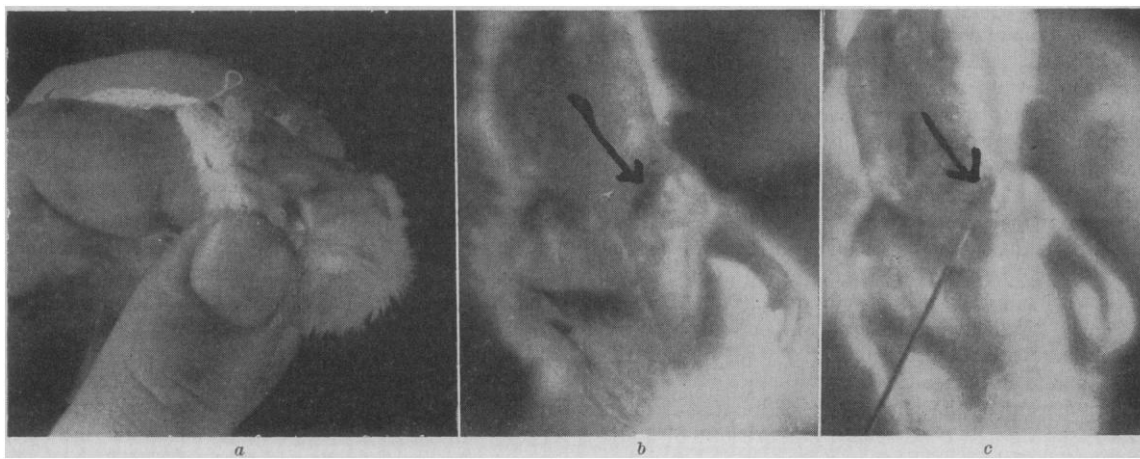


FIG. 1. (a) Mouse held in hyperextension to expose and dilate external jugular veins. (b) Dilated external jugular vein (see arrow). (c) Introduction of 26 gage needle into dilated external jugular vein (see arrow).

period of about six weeks. The method should be readily adaptable to experiments requiring that multiple micro quantities of blood be obtained within a short period of time.

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Sperm Survival in Rodents?

IN SCIENCE, 117, 159 (1953), there is a report by Florence L. Evans of "Unusual Reproductive Phenomena in Rodents." In this report Dr. Evans cites three authentic cases in which a female rat or mouse

dropped a 2nd litter 25-28 days after the first (no mating having occurred in this interval). She suggests that these phenomena involve "delayed implantation of the blastocyst stage," superfetation, or both. Another explanation much simpler than those suggested by Dr. Evans would be to suppose that sperms survived from matings toward the end of the initial pregnancy, and that these sperms were able to fertilize ova which were matured at parturition. It is fairly common to observe rodents in heat at this time. Sperm survival in rodents has also been observed in the vaginal plug for prolonged periods of time.

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Book Reviews

The Human Senses. Frank A. Geldard. New York: Wiley; London: Chapman & Hall, 1953. 365 pp. Illus. \$5.00.

This timely monograph presents a comprehensive description of all human sensations, resting upon a review of 330 papers, with more than a hundred well-chosen illustrations. The contributions of anatomy, physiology, and psychology are skillfully integrated to give a text which is remarkably clear and forceful, written in a distinguished scientific style. The author is fully at home in all three fields and indicates relationships which are brought together in no other single source. The careful descriptions combine the most accurate experimental studies with examples taken from everyday human experience, so that the discussion often becomes an intimate account of the reader's own sensory life, answering many questions never before resolved.

Much of the author's own research has been concerned with the physiology and psychology of vision. His discussions of visual phenomena (4 chs.) are particularly clear, reaching their highest level in an excellent chapter on color vision and color blindness. Only on the anatomical side does the text seem to be somewhat inadequate, resting its argument on older histological descriptions of retinal structure which are surely too simple to explain such phenomena as those of color contrast and spatial interaction. Hartline's recent important work on spatial inhibitions in the eye of *Limulus* (*Symposia on Quantitative Biology*, 17, 125, [1952]) is barely mentioned, and the descriptions of recently discovered collateral connections between visual units in this material were apparently not available in time to influence the text.

The treatment of the phenomena of hearing is lucid (3 chs.), ending in a good review and critique of auditory theories. It is concluded that the original form of the Helmholtz theory is no longer tenable. "A kind of

resonance occurs. The relative amplitudes of vibration of different parts of the basilar membrane . . . change in a regular manner as stimulus frequency is changed . . . but a large portion of the membrane is in operation for all frequencies. The membrane . . . is not a series of stretched transverse fibers. . . [It] is not even under tension."

Three chapters are devoted to the various cutaneous sensibilities. The chapter on pressure and pain, including vibratory sensibility, contains important but little-known material including the author's own studies. The history of the "protopathic-epicritic" theory of Head and Rivers is reviewed, with the author joining the numerous group of students in this field who discount or reject it. The chapter on temperature sensitivity is largely written in terms of the older literature of experimental psychology. New interpretations in this field have become necessary as the result of the very recent physiological work of Zotterman and his colleagues (*Ann. Rev. Physiol.*, 15, 357, [1953]), who have succeeded in recording the nerve impulse discharges along single warm and cold fibers in the tongue of cat and dog.

The treatment of kinesthetic sensibility is rather brief, considering its importance in physiology. The emphasis is properly made that "muscle sense" is largely a matter of joint sensibility, a view which has recently been again confirmed by Mountcastle and his associates (*A.R.N.M.D.*, 30, 339, [1952]). Our newer knowledge of the role of the "small-nerve" efferent fibers in controlling the nervous discharges from muscle proprioceptors has not been covered (Kuffler *et al.*, *A.R.N.M.D.*, 30, 24, [1952]).

In sensory physiology the terms "lumen" and "decibel" are well understood. Less well known is the more recently introduced "dol" scale of pain intensity. Scarcely known at all are the "olfactie" scale for smell and the "gust" scale for taste, resting upon psy-