

blue-print paper. A glass plate may be used to maintain a good contact between the strips and the sensitive paper. Thirty to ninety seconds exposure in sunlight is sufficient for medium speed blue-print paper. The sheets may be fixed by washing under running tap water. When purchased in fifty yard rolls, the blue-print paper for tables of convenient size, two or three feet by three feet, costs about five cents per table.

Any number of tables representing any groupings or any rankings of the data which are desired may be made with no more work than is required for a rearrangement of the strips. Groupings of the data may be conveniently separated by a white band on the printed table by placing an opaque strip in the frame between the groups. An inspection or an average of the groups in the columns under the various headings will often be sufficient to determine whether a relationship is worthy of further study.

If it is desired to study the data with regard to two different dimensions, they may be ranked according to the chosen variables, divided into appropriate groups, blue-printed, and the various columns of data cut and pasted on separate sheets to show the distribution of any desired third variable with respect to x and y .

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BEHAVIOR RESEARCH FUND, AND THE
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AN IMPROVED CAPILLARY MERCURY VAPOR LAMP

THE capillary mercury vapor lamp designed by Daniels and Heidt¹ has been extensively used in some radiation studies. With this use of the lamp we have introduced several changes in construction which have made it more practical and have extended its usefulness.

Instead of using quartz tubing of uniform diameter throughout, the part of the lamp above the upper pair of bulbs is made of tubing of inside diameter 0.5 mm larger than that of the remainder of the lamp. Through this capillary of larger diameter is introduced a short piece of graphite (fired pencil lead). Otherwise the lamp is arranged in the usual manner. In the completed lamp the graphite is caused, by slight tapping, to come to rest at the point where the capillary of smaller diameter begins, that is, at the base of the lower bulb of the upper pair. The piece of graphite now blocks the capillary and is in contact with the mercury column above and below. When the current is passed through the lamp the graphite, because of its high resistance, becomes very hot. Some of the mercury vaporizes and the arc starts immediately. By following the above procedure the lamp may be started as many times as desired.

The advantages of this self-starting lamp are: (1) the awkward procedure of starting the lamp with a flame or heater is avoided; (2) the lamp is started under water and is constant immediately; (3) breakage of lamps due to the sudden cooling of the exterior by water when they are started by the older methods is largely avoided; (4) when light of wave-length longer than 3100 Å is desired materials other than quartz may be used. It was found possible to use lamps constructed with special glass, thus cutting their cost to a few cents each.

It has also been practicable to fill these lamps with amalgams (Hg + Cd, Hg + Zn, etc.) of such composition that they can be used repeatedly without breakage. These amalgams supply light of wave-lengths not present in the mercury spectrum.

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SPECIAL ARTICLES

INVESTIGATIONS IN PUERTO RICO ON MANSON'S BLOOD-FLUKE INFEC- TION (SCHISTOSOMIASIS MANSONI)

AN intensive study of *Schistosoma mansoni* infection in Puerto Rico is being undertaken this summer by cooperative efforts of the School of Tropical Medicine of the University of Puerto Rico under the auspices of Columbia University and the Department of Tropical Medicine of Tulane University. The investigation has been made possible by grants from

the Bailey K. Ashford Fund and the National Research Council.

Schistosoma mansoni is a unisexual blood-fluke living in the portal vessels of its host, usually man. It produces dysentery and later fibrous and papillomatous modifications of the intestinal tract and cirrhosis of the liver. The female worms lay large lateral-spined eggs into the mesenteric and rectal vessels, so that the majority of these eggs work their way through into the intestinal lumen and are passed in the feces. In water the eggs hatch and the emergent larva (*miracidium*) attacks and penetrates the soft tissues of the appropriate snail (species of *Planorbis*), in the "liver gland" of which a twofold

¹ Farrington Daniels and L. J. Heidt, *Jour. Amer. Chem. Soc.*, 54: 2381-2384, 1932.

multiplication takes place. After several weeks a swarm of fork-tailed *cercariae* emerge from the snail, swim about in the water and in case mammalian species enter this "infected water," the cercariae adhere to the skin of the mammal, drop their tails, penetrate through the skin and by way of the afferent and systemic circulation eventually reach the portal system, where they develop into male and female worms.

This infection, which is relatively common in parts of Africa, particularly in the Nile Valley, was brought to the New World with the importation of slaves and became established in Brazil, Venezuela and the Guianas. It has also been reported from Peru, Panama and Costa Rica, although it has probably not become established in the latter two countries. It is known to be present in the Lesser Antilles, especially in Antigua, Guadeloupe, St. Kitts, Martinique and Barbadoes. It also occurs in Puerto Rico, where it was first reported by Gonzalez-Martinez in 1904, three years before the species was differentiated from *Schistosoma haematobium* (the vesical blood-fluke), with which it is frequently coextensive in Africa. No autochthonous case of *S. mansoni* infection is known for North America.

In view of the limited size of the Island of Puerto Rico, and because of the economic importance of the disease on the island, a unique opportunity is afforded for study of the infection.

Important preliminary studies on the epidemiology, biology, pathology and clinical aspects of the disease have been made by members of the staff of the School of Tropical Medicine at San Juan. The present investigation will be confined to the following program:

BIOLOGICAL ASPECTS

- (1) Ways by which the viable eggs reach the waterways where the intermediate host lives.
- (2) Hatching phenomena and infection of the snail. (An abundance of viable eggs is needed to determine experimentally if species of *Planorbis* in the United States can be readily infected).
- (3) Length of time required for complete development in the appropriate snail, and period of discharge of viable cercariae from the snail.
- (4) Route of migration of the young worm through the human body, once it has penetrated through the skin.
- (5) Number of eggs in the uterus of the female worm.
- (6) Method of deposition of eggs in the gut wall. Do eggs migrate in the tissues?

PATHOLOGICAL AND CLINICAL ASPECTS

- (1) Does schistosomiasis splenomegaly constitute an important clinical entity in Puerto Rico?
- (2) Can splenomegaly and hepatic cirrhosis develop

in experimental animals harboring only one sex of the worm (male or female)?

(3) Types of ulceration and papillomata developing in experimental animals (monkeys, rabbits, etc.).

(4) The reliability of precipitin and other serological tests as a means of diagnosis.

(5) Factors determining selection of mesenteric and rectal veins by worms.

EPIDEMIOLOGICAL ASPECTS

(1) How and in what locations do the people of Puerto Rico expose themselves to infections?

(2) Natural reservoir hosts of the infection in Puerto Rico. The types of canals and ponds where the snails abound and afford an opportunity for carrying on the life cycle.

(3) Determine the best method or methods for attacking the problem of prevention in Puerto Rico.

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TRANSMISSION OF INFECTIOUS EQUINE ENCEPHALOMYELITIS IN MAMMALS AND BIRDS

IN 1931, Meyer, Haring and Howitt¹ reported the recovery of a filtrable virus from the brain of a horse suffering from an acute form of encephalomyelitis which had been particularly prevalent among horses and mules of rural sections of California during the years 1930 and 1931. They have conducted extensive experiments with this and subsequently recovered strains of the virus and reported horses, mules, guinea pigs, monkeys, white rats, white mice and rabbits² as being susceptible to the infection. Guinea pigs have been found to be admirably adapted to the investigation of the experimental disease.

In 1932 the writers recovered a strain of encephalomyelitis virus from the brain of a field case which occurred in South Dakota where the disease was epizootic. In the course of experimental work with this virus, calves (2), sheep (2), dogs (4) and cats (2) have been tested for evidence of susceptibility to intracerebral inoculation. In these preliminary trials, the three last named species have been found to be definitely refractory.

The inoculated calves developed a febrile reaction which persisted for several days. Five days following inoculation of a 0.5 cc dose of encephalomyelitic guinea pig brain emulsified 1 part in 10 parts (approximate) of physiological saline, both animals displayed anorexia, difficult swallowing, stupor, incoordination, grinding of the teeth, localized myopalmus and photophobia. The intensity of these symptoms

¹ K. F. Meyer, C. M. Haring, B. Howitt, "Etiology of Epizootic Encephalomyelitis of Horses in the San Joaquin Valley," *SCIENCE*, n. s., 74: 227-8, 1930.

² K. F. Meyer, C. M. Haring, B. Howitt, "Newer Knowledge of the Neurotropic Virus Infections of the Horse," *J. A. V. M. A.*, n. s., 32: 3, 1931.