Spalteholz technique.[2] Illustrations are stereoscopic photographs made as described by Long.[3]

The aortic arches exhibit the greatest development and remodeling during this interval, while the head vessels undergo extensive rearrangements. The major features of Tandler's[4] work is confirmed and extended to later stages. A summary of the development of the vessels to the limb buds and visceral organs is included.

The need for a standard and consistent nomenclature which takes into account both embryonic structures and their adult derivatives is discussed.

This is a preliminary note on an extensive study now in preparation for the press.

MARY SANFORD LEITCH

DEPARTMENT OF ZOOLOGY
UNIVERSITY OF CALIFORNIA

THE REMOVAL OF FLUORIDES FROM WATER BY SAND FILTRATION

SINCE it has been established that the dental disease in man known as "mottled enamel" is due to the drinking of water containing fluorine, the removal of fluorides by filtration has become an important problem.

I have found that a contact filter 15 cm high, made of river sand passing a screen 60 to the inch, to which has been added 2 per cent. by weight of powdered aluminium, will remove the fluoride from a solution containing 30 parts per million of sodium fluoride. The absence of fluoride in the filtrate was determined by the zirconium-alizarin colorimetric method.

S. P. KRAMER

FT. THOMAS, KY.

SPECIAL ARTICLES

RARE GASES NOT ESSENTIAL TO LIFE[1]

HERSHEY[2] reported that small animals such as rats could not survive more than a week approximately in an atmosphere of 21 per cent. oxygen and 79 per cent. nitrogen in which the rare gases were left out. He concluded that helium, argon, neon, krypton and carbon dioxide were vital to normal respiration and life. Fidlar,[3] accepting the results reported by Hershey, conceived of the rare gases playing a rôle in the atmosphere similar to the vitamins in foods. Previously, Ramsay[4] considered these gases inert biologically.

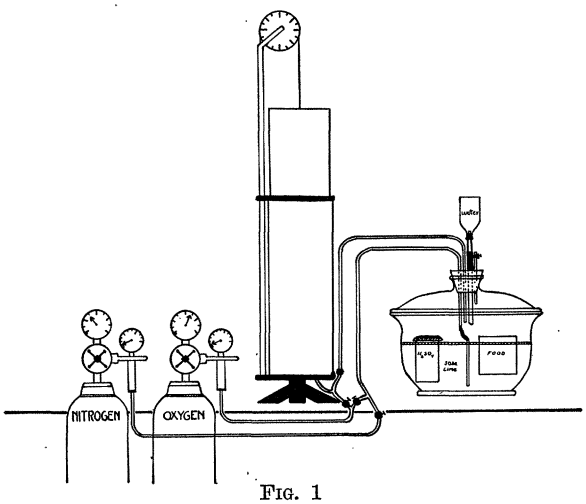

FIG. 1

Through the assistance of the engineering staff of the Linde Air Products Company, oxygen and nitrogen were especially prepared in order to exclude the rare gases. Oxygen was made from electrolytic dissociation of water. The nitrogen was produced by cracking ammonia and removing the hydrogen by control combustion with electrolytic oxygen. Both gases were prepared for the following purpose only, and every precaution exerted to secure pure oxygen and nitrogen. After the work was commenced, it was found that the nitrogen employed by Hershey was not free from rare gases. Nevertheless, it was thought desirable to determine whether these so-called inert gases had any detectable biological activity in the animal organism.

The problem presented the additional possibility of throwing a light on the cause of death in animals continuously exposed to from 80 to 100 per cent. oxygen for two to five days. Lorrain Smith[5] was the first to point out that fatal pulmonary lesions characterized by edema and finally consolidation took place when animals lived for periods exceeding two to three days in these high oxygen atmospheres. Although Hershey submitted no autopsy protocols of the animals who died presumably in the absence of rare gases, the hypothesis was apparent that perhaps the high oxygen atmospheres achieved a relative exclusion of rare gases. Smith's work was confirmed and amplified by many others[6-9] without affording

[2] F. Reagan, *Univ. Calif. Publ. Zool.*, 28: No. 18, 1926.
[3] J. A. Long, SCIENCE, this issue.
[4] J. Tandler, *Morph. Jahrb.*, 30: 275–373, 1902.
[1] From the Department of Medicine, College of Physicians and Surgeons, Columbia University, and the Presbyterian Hospital, New York City.
[2] J. Willard Hershey, *Trans. Kansas Academy of Science*, 32: 51, 1929; *ibid.*, 33: 133, 1930; *ibid.*, 34: 240, 1931; *ibid.*, 35: 141, 1932. SCIENCE, 71: 394, 1930.
[3] Edward Fidlar, SCIENCE, 72: 296, 1930.
[4] Ramsay, "The Gases of the Atmosphere."
[5] Lorrain Smith, *Jour. Physiol.*, 24: 19, 1899.
[6] L. Hill and J. J. R. Macleod, *Jour. Physiol.*, 29: 492, 1903.
[7] H. T. Karsner, *Jour. Exper. Med.*, 23: 149, 1917.