

The cine-x-ray photos of Barclay, Franklin and Pritchard³ suggest that in the sheep only a small fraction of the blood from the umbilical vein reaches the heart through the ductus venosus; the greater part goes through the liver reducing the pressure in the thoracic inferior vena cava to a still lower level.

Indeed the degree of openness of the sphincter of the ductus venosus⁴ may be one factor which effects the pressure in the umbilical vein. However, the readings of the pressure have this property: that, in cases of approximately equal age, the lower venous pressure is always accompanied by the higher pressure in the umbilical artery, which suggests that the explanation of the variation in pressure lies either in the degree of resistance presented by the placental vessels or the distance of the point at which the pressure is measured from the foetus.

JOSEPH BARCROFT

DEPARTMENT OF PHYSIOLOGY,
CAMBRIDGE, ENGLAND

DONALD H. BARRON

UNIVERSITY OF MISSOURI

PETER FORSHAM

HARVARD MEDICAL SCHOOL

FUSION OF TOP SOIL BY AN ELECTRIC ARC

AN interesting and spectacular event took place during a violent thunderstorm on May 30. The point of location of this event is 4 miles east of Wooster, Ohio, in Green Township, Wayne County, Section 32, along the highway on the farm of S. S. Woods. A stroke of lightning sheared off the field wire at the insulator on a pole supporting a 3-phase, 60-cycle transmission line carrying 22,000 volts. The wire and insulator were blistered by the heat. The bare wire, a No. 2, about 5 sixteenths of an inch in diameter, approximately the diameter of a lead pencil, and supported by poles 150 feet apart, was severed at one end and dropped into a field. For a distance of 45 feet, where the wire touched the ground, the current produced a series of electric arcs. Where these arcs occurred, tremendously high temperatures were produced, such as those in an electric furnace. The loud, somewhat musical sound of variable intensity, characteristic of the electric arc, could be heard at a distance of an eighth of a mile. The brilliant, bluish white light and flames, increasing and decreasing in intensity, produced a weird effect.

The downpour of rain was accompanied by heavy flashes of lightning which produced additional voltage and increased the surges of current along the wire. The wire was severed at 12.18 P.M. and the location of the break was not discovered until 3 P.M. During this interval, nearly 2 and $\frac{3}{4}$ hours, at the point of the arc, the soil was fused into molten material. These

masses of molten rock or slag were lying parallel with the wire. They cooled into round, elongate masses, having the shape of the trunk of a tree with branches extending from the main mass. The branches extended into the ground for a distance of not more than a foot. At the point of the greatest arc, the ground is baked for a distance of not more than a foot from the location of the wire. From this area, a mass of fused material, 18 inches long and 4 inches in diameter, with 4 branches more than an inch in diameter, was removed.

It is obvious that the material was in a molten condition, for it is glassy in character and thoroughly vesicular like volcanic scoria or pumice, due to the expansion of enclosed gases, mostly steam. The soil in this locality is glacial in origin, containing clay, sand, humus and occasional rocks. The ground was wet and the soil with its carbon is a good conductor. The high temperature, driving off the water and baking the soil, as well as burning out the carbon, making the ground a poor conductor, would cause the arc to extend parallel with the wire to points beyond, where the ground was wet, producing by this process an elongate structure. The forking of the arc produced the branches extending from the main mass.

There are instances where lightning has struck beach sands and produced round, rod-shaped, fused masses extending into the ground. All the specimens seen by the writer are of small diameter. It may be that the observations described here will help in the interpretation of the structures produced by lightning.

KARL VER STEEG

COLLEGE OF WOOSTER

MODERN FACSIMILE REPRODUCTIONS OF RARE TECHNICAL PUBLICATIONS

NOT infrequently basic technical publications, especially those of the older authors, are unavailable in modern libraries, and it becomes increasingly difficult to secure copies of them. Sometimes the reason is the original small edition, sometimes because the reserve stock was destroyed by accident or otherwise, and sometimes because of the very great demand for what was considered to be an adequate edition at the time the publication was issued. In any case, these rare items are always high-priced. Many of them are rarely or never quoted in catalogues of out-of-print books, yet the actual demand for them is usually insufficient to warrant one in undertaking the expense of issuing facsimile editions.

The case of Rafinesque's very numerous publications is an interesting one, and copies of his original papers are almost never offered by dealers. He was particularly productive in the decade preceding his death in Philadelphia in September, 1840, yet it is now impossible to acquire copies of the majority of

³ *Brit. Jour. Rad.*, 15: 69.

⁴ *Anat. Rec.*, 82: 398.

his publications. Some of these have been reprinted in the past, such as his remarks on Loudon's "Encyclopedia of Plants" (1832), reprinted in the *Journal of Botany* (38: 225-229, 1900), Fitzpatrick's 1908 reprint of the very rare "Annals of Nature" (1820), the *American Midland Naturalist* series of facsimile reprints (1912-13), including the "Neogenyton" (1825), "Monographie des coquilles bivalves et fluviatiles de la rivière Ohio" (1820), "Scadiography of Ombelliferous Plants" (1840) and the "Natural Family of Carexides" (1840). Now the exceedingly rare "Autikon Botanikon" (1840), a two-hundred-page volume, nomenclaturally touching all parts of the world, is available, having been lithoprinted in 1942 under the auspices of the Arnold Arboretum. Because of the cheap, often badly discolored or foxed paper on which many of Rafinesque's works were printed, the modern lithoprint reproductions are much clearer and much easier to consult than are the originals, and are thus even to be preferred to the originals, except from the standpoint of a bibliophile.

Reasons for the great scarcity of many of Rafinesque's publications are the original limited editions (for the "Flora Telluriana" he states that only 160 copies were printed and this probably applies to the "Sylva Telluriana" and the "Autikon Botanikon"), the time and method of publication, the fact that his contemporaries looked on his publications as worthless and thus to be ignored, and his death in 1840 at the height of his publishing career. Rafinesque being in debt at the time of his death, his effects were sold at auction to meet the demands of his creditors and the evidence available seems to indicate that much of his unsold stock of publications was utilized as waste paper. In any case, the "Herbarium Rafinesquianum," published in Philadelphia in 1833, is apparently represented in American libraries by the single complete copy at the New York Botanical Garden and a partial copy containing 44 of its 80 pages at the Arnold Arboretum. Of the "Autikon Botanikon" only about ten or twelve copies are known in all libraries, while the "Flora Telluriana" and the "Sylva Telluriana" are apparently nearly as rare as the "Autikon Botanikon."

Attention is called to the fact that in various scattered papers and volumes published by Rafinesque, there are apparently between 1,200 and 1,500 new, validly published, generic names and binomials that are not as yet listed in "Index Kewensis." Thus,

although the numerous generic names in the "Autikon Botanikon" were listed in 1929, several hundred new binomials therein published still remain to be incorporated in that standard work, over a hundred years after the names were published, while none of the numerous new names in the "Herbarium Rafinesquianum" and the "Good Book or Amenities of Nature" (1840) is listed in any of our botanical indices.

In view of the fact that many of Rafinesque's pamphlets and books contain the valid publications of a great many new generic names and binomials—and no matter what the status of these entities may be, their actual publication over a hundred years ago places them in a category that must be considered because of the universally accepted homonym rule in botany—it is highly desirable that all these names be listed. Work on this project is being prosecuted, but it is a complicated matter, as it involves a critical examination of all the very numerous technical botanical papers that Rafinesque published, and it is often difficult to locate copies of essential items. But to make Rafinesque's more important works generally available to working botanists everywhere it is highly desirable that certain other works published by him, particularly the "Herbarium Rafinesquianum" (1833), the "Flora Telluriana" (1837-38), the "Sylva Telluriana" (1838) and the "Good Book" (1840), be reissued in modern facsimile editions. The new data published in these works issued over a hundred years ago touch all parts of the world, a fact that has not been realized by many American and practically all European, Asiatic, African, Australian and South American botanists because these Rafinesque publications are even more rare in foreign libraries than they are in those of the United States. Whether or not it may be possible to reproduce some or all of these works will depend in part on support extended to the recent lithoprint facsimile reproduction of the "Autikon Botanikon." Clearly the prices for these modern reproductions must be kept low if these works are to be made generally available. In my judgment the price should not exceed \$0.015 per page, which is in very sharp contrast to over \$0.30 per page charged for one modern reproduction of a sixteen-page Rafinesque pamphlet and from \$0.03 to \$0.10 per page for still others; and all these are scientifically of much less importance than is the "Autikon Botanikon."

E. D. MERRILL

QUOTATIONS

ARTIFICIAL ANTIBODIES

In vitro synthesis of type specific anti-pneumococcus precipitins and agglutinins has been reported recently

by Pauling and Campbell¹ of the Department of Chemistry, California Institute of Technology. Sub-

¹ Linus Pauling and Dan H. Campbell, *SCIENCE*, 95: 440, April 24, 1942.