cave on the university domain. It is estimated that these remains are more than 160 years old. They are being carefully cataloged as excavation continues.

An annual lectureship has been established at Vanderbilt University in memory of Dr. Barney Brooks, late professor of surgery. The first lecture was given by Dr. Ewarts A. Graham, Emeritus Professor of Surgery, Washington University School of Medicine, St. Louis, on "The Relation of Cigarettes to Bronchiogenic Carcinoma," on January 21, 1953.

RECENT PUBLICATIONS BY TENNESSEE AUTHORS

Baker, William K., and Charles Edington (ORNL). 1952. The induction of translocations and recessive lethals in Drosophila under various oxygen concentrations. *Genetics*, 37:665-677.

Benjamin, Ben M., and Clair J. Collins (ORNL). 1953. Studies in the Wagner rearrangement. IV. The steric effect of an ortho methyl group. *Jour. Amer. Chem. Soc.*, 75:402.

Billen, Daniel, G. E. Stapleton, and Alexander Hollaender (ORNL). 1953. The effect of x-radiation on the respiration of *Eschericia coli*. *Jour. Bact.*, 65:131.

Carlson, J. Gordon (ORNL). 1952. Microdissection studies of the dividing neuroblast of the grasshopper, *Chortophaga viridifasciata* (De Geer). *Chromosoma*, 5:199-220.

Clark, Sam L. (Vanderbilt University). 1953. Oral folic acid tolerance test in normal human subjects and patients with pernicious anemia. *Proc. Soc. Exper. Biol. & Med.*, 82:25-28.

Coniglio, John G., W. J. Darby, M. C. Wilkerson, Richard Stewart, Anne Stockell, and G. W. Hudson (Vanderbilt Univ.). 1953. Effect of X-irradiation on fat balance and on lipid and vitamin A content of the liver. *Amer. Jour. Physiol.*, 178:86.

Collins, Clair J., L. S. Ciereszko, and J. G. Burr, Jr. (ORNL). 1953. Studies in the Wagner rearrangement. V. Further evidence for a steric effect. *Jour. Amer. Chem. Soc.*, 75:405.

Collins, Clair J., D. N. Hess, R. H. Mayor, G. M. Toffel, and A. R. Jones (ORNL). 1953. Studies in the Wagner rearrangement. III. Chrysene —5, 6—C_1^{14}. *Jour. Amer. Chem. Soc.*, 75:397.

Cronheim, George, J. Stanton King, and Nelta Hyder (Massengill Co., Bristol, Tenn.). 1953. Effect of salicylic acid on adrenal-pituitary system. II. Influence of amino acids and other compounds. *Proc. Soc. Exper. Biol. & Med.*, 82:109-111.

Denison, F. W., Jr., and E. F. Phares (ORNL). 1952. Rapid method for paper chromatography of organic acids. *Analytical Chem.*, 24:1628.

Dent, James N., and Ernest L. Hunt (ORNL). 1952. An autoradiographic study of iodine distribution in larvae and metamorphosing specimens of Anura. *Jour. Exper. Zool.*, 121:79.

Felton, Jean S., and Mary D. Owen (ORNL). 1953. Forecasting the number of employee visits to an industrial health service. *Indus. Med. & Surg.*, 22:1-7.

(Continued on page 195)

THE ROYALFERN, THE CINNAMONFERN, AND THE INTERRUPTED-FERN IN TENNESSEE

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INTERRUPTED-FERN
Osmunda Claytoniana L.

(Continued from the October, 1952, number)

Grier (1927) found the number of fertile leaflets (in 609 leaves) to range from ½ a pair to 7½ pairs with 3 pairs being commonest (occurring in 24 percent of the leaves observed). Also, Robinson (1875, p. 52) mentions specimens

fruiting all the way from the base and one, he believed, clear to the top. Above and apical to the region of fertile leaflets are sterile leaflets. In numbers, these vary from 11½ pairs to 21 pairs with 16 to 19 pairs being most common (for instance, 18 out of 23 leaves fell in this group).

In general, the sterile leaflets of fertile leaves are essentially similar to the leaflets of sterile leaves as to arrangement on the rachis, shape, apices, margin, texture, and pubescence. It may be that there are more hairs on the underside of sterile leaflets from fertile leaves than on leaflets from sterile leaves but this has not as yet been definitely determined. The longest sterile leaflet from each of 22 leaves averaged about 5 inches in length by about 1⅛ inches in width. This is slightly larger than similar leaflets from sterile leaves for the average size of 50 such sterile leaflets was about 4½ inches in length by about 1 inch in width. The average number of segments for the longest leaflet was 16½ pairs which is 3 pairs more than the average number from a similar leaflet from a sterile leaf. This must be because of the extra length of the leaflet from a fertile leaf for the average length and width of segments from both the sterile and fertile leaves are the same. In practically all respects (shape, apex, margin, and veining) sterile segments from fertile leaves and sterile segments from sterile leaves are essentially alike. However, some segments on some of the sterile leaflets below the fertile leaflets of one leaf (no. 10416) have crenated margins, each crenation being around the branches of a single oblique vein. These oblique veins usually fork twice instead of once, as is the rule.

Fertile leaflets are ascending and short, the ones measured being about 1½ inches long by ½ inch wide. They have short petiolules and are compound with short petioluled pinnules (Fig. 213, *D*). Both the costae and the costules are dark brown or black in color and both have brownish or reddish wool or hair. The costules are often slightly flattened or winged and the margin of the wing has small branches to which the sporangia are attached by small stalks, or perhaps some sporangia may be sessile. These little branches are arranged alternately. The winged portion of the costules may be less dark than the central part. Some very young fertile leaves with just opened sporangia and mature spores have some very thin, white, membranous, and scale-like structures scattered among the sporangia. These are lanceolate, long acuminate, and about 1/40 inch in length. I have not been able to find any of these attached to the costae or costules nor have I found any scars or other evidence of such attachment. Some of these structures have been found half-way in sporangia. They may represent an early caducious lining of the sporangium which is shed at the first opening of the sporangium; the internal thin-walled layer of the jacket (Smith, 1938, p. 290).

There are a great many naked and brown sporangia about 1/80 to 1/70 inch in diameter present but no indusia. Each sporangium opens by a vertical slit between a few thin-walled cells. On one side, the slit extends to the sporangial stalk. On the opposite side, the slit does not extend so far because it ends at the annulus (Fig. 213, *C*). This ring is in reality a small circular yellowish area made up of thick-walled radiating cells which appear to almost touch the sporangial stalk on one side. While it is mentioned in many manuals as being rudimentary, it can readily be seen under the binocular microscope and seems to be efficient in opening the two halves of each sporangium. I would neither call it rudimentary nor few celled, as does Small (1938, p. 339), for it seems to me to be made up of a number of very definite, thick-walled cells, even more so than illustrated by Smith (1938, p. 290). The numerous spores are green. They usually mature here in April or early May.

My Tennessee material has many fertile leaves with leaflets partly sterile and partly fertile. Such transitional leaflets are well known. They are mentioned by Chrysler and Edwards (1947). The fertile part is usually not green and probably contains little chlorophyll. The sterile part is green and does contain chlorophyll. This sterile part may have a few sporangia on it. Two sketches have been made to indicate two of the mixed combinations found (Fig 213, *B*, *E*).

A Minor Variant

A minor variant of the interrupted-fern was found in my collection. It is represented by two sterile blades (no. 4116) collected from a wooded roadside (highway, U. S. 70) in Roane County, Tennessee. The basal two to three pairs of leaflets are petiolulate and not sessile (as is usually true of the interrupted-fern). However, both the inferior basal segments of these leaflets are decurrent on the costae. The segments are large and ovate to oblong in shape. Some few are slightly constricted at the base (Fig. 213, *A*). All are very thin, obtuse, and have minute serrulations on the margins where the oblique veins slightly project. Most of the oblique veins fork twice. A few fork three times, and a very few only once. Most of the sinuses between segments are very narrow and acute but some on the two basal pairs of leaflets are ¼ to ½ as wide as the adjacent segments and are the shape of an U with a flat bottom. It is hoped that more of this material can be secured in order to study it more in detail.

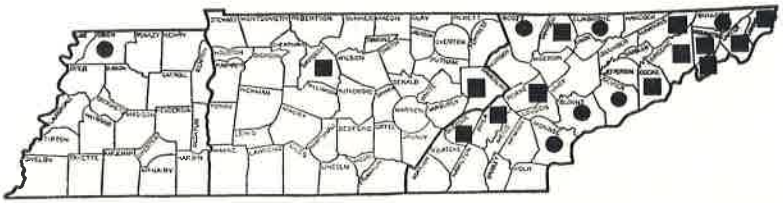

Fig. 214. County distribution of the interrupted-fern in Tennessee. Shaver's collections are indicated by black squares, those of others by black circles as follows: Claiborne County (T. A. Frick, Lincoln Mem. Univ.); Blount and Sevier counties (Anderson, 1931); Monroe, Obion, Scott, and Sullivan counties (U. of T. herbarium).

The distribution of *Osmunda Claytoniana* in Tennessee, in so far as it is known to the author, is given in the map (Fig. 214). There are two disjunct stations, one in Obion County, represented by a specimen collected by O. E. Jennings from Reelfoot Lake and now in the herbarium of the University of Tennessee (Dr. A. J. Sharp has kindly allowed me to examine this specimen), and one in Davidson County represented by several specimens and photographs (Figs. 209 and 210). This Davidson County Station is still in existence and is a fine one composed of about six plants. Were it not for the existence of this station, one might think that the leaf from Reelfoot Lake had been collected elsewhere and gotten mislabelled through error. In the country at large, according to Broun (1938, p. 127), the interrupted-fern is found from Newfoundland to eastern Manitoba, south to Georgia and northern Arkansas.

Bibliography

Anderson, W. A., Jr. 1931. A list of Tennessee ferns. *Amer. Fern Jour.*, 21(2): 64-71. Apr.-Jun. He lists this fern from Blount, Cocke, Greene, and Sevier counties.

Benedict, R. C. 1919. Osmundaceae. *North Amer. Flora*, 16:27-28. Nov. 6.

Broun, Maurice. 1938. *Index to North American ferns.* Pp. 1-217. Published by the author, R. F. D., Kempton, Penna.
Chrysler, M. A., and J. L. Edwards. 1947. *The ferns of New Jersey.* Pp. i-vii, 1-201. Rutgers Univ. Press, New Brunswick, N. J.
C[lute,] W. N. 1901. Helps for the beginner. IV.—The flowering ferns. *Fern Bull.,* 9(2):38-39. Apr.
Faull, J. H. 1901. The anatomy of the Osmundaceae. *Bot. Gaz.,* 32(6):381-420. Dec.
Fernald, M. L. 1950. *Gray's Manual of botany.* 8th. ed. Pp. i-lxiv, 1-1632. Amer. Book Co., New York City.
Furniss, W. E. 1938. "Vegetation of a wooded north slope and an old field." Unpublished master's thesis, George Peabody College for Teachers, Nashville, Tenn.
Gray, Asa. 1842. Notes of a botanical excursion to the mountains of North Carolina, &c.; with some remarks on the botany of the higher Allegheny Mountains (in a letter to Sir Wm. J. Hooker). *Amer. Jour. Sci.,* &c. vol. 42(1):1-49. Apr. He has the interrupted-fern from Carter Co., Tenn.
Grier, N. M. 1927. A note on the interrupted-fern. *Torreya,* 27:8-9. Feb.
Neidorf, Charles. 1949. New fern variants from Weschester County, New York. *Amer. Fern Jour.,* 39(4):97-105. Oct.-Dec.
Ogden, Edith B. 1948. The ferns of Maine. *Maine Bull.,* vol. 51, no. 3, Oct.
Shaver, Jesse M. 1937. Vacationing among Tennessee ferns. *Amer. Fern Jour.,* 27(3):73-90. Jul.-Sept. Shaver has this fern from Carter, Cocke, and Unicoi counties.
Small, J. K. 1938. *Ferns of the southeastern states.* Pp. 1-517. The Science Press, Lancaster, Penna.
Smith, Gilbert M. 1938. *Cryptogamic Botany.* Vol. II. Pp. i-vii, 1-380. McGraw-Hill Book Co., New York City.
Tryon, R. M., Jr. 1940. An Osmunda hybrid. *Amer. Fern Jour.,* 30(2):65-66. Apr.-Jun. X *Osmunda Ruggii,* n. hybr. (*O. regalis* var. *spectabilis* X *O. Claytoniana*).
Weatherby, C. A. 1935. A list of varieties and forms of the ferns of eastern North America. *Amer. Fern Jour.,* 25(3):95-100. Jul.-Sept.
Woodruff, Nathan H. 1936. Soil acidity at the roots of some Tennessee pteridophytes. *Jour. Tenn. Acad. Sci.,* 11(1):31-52. Jan.

NEWS OF TENNESSEE SCIENCE

(Continued from page 192)

Geckler, R. P., and R. F. Kimball (ORNL). 1953. Effect of x-rays on micronuclear number in *Paramecium aurelia. Science,* 117:80-81.
Hansard, Sam L. (U. T.-A.E.C. Agri. Res. Prog.). 1953. A metabolism unit designed for radioisotope balance studies with dogs. *Science,* 117:301-302.
Hollaender, Alexander, and G. E. Stapleton (ORNL). 1953. Fundamental aspects of radiation protection from a microbiological point of view. *Physiol. Rev.,* 33:77.
Kelly, Myron T., and Hugh Miller (ORNL). 1952. High sensitivity recording polarograph. *Analytical Chem.,* 24:1895-1899.
Khym, Joseph X., and Waldo E. Cohn (ORNL). 1953. The separation of sugar phosphates by ion exchange with the use of the borate complex. *Jour. Amer. Chem. Soc.,* 75:1153.
Kimball, R. F., R. P. Geckler, and Nenita Gaither (ORNL). 1952. Division delay by radiation and nitrogen mustard in Paramecium. *Jour. Cell. and Comp. Physiol.,* 40:427.
Riley, H. P., N. H. Giles, Jr., and A. V. Beatty (ORNL). 1952. The effect of oxygen on the induction of chromatid aberrations in Tradescantia microscopes by x-irradiation. *Amer. Jour. Botany,* 39:592.
Snell, Arthur (ORNL). 1952. The nuclear reactor as a research instrument. *Amer. Jour. Phys.,* 20:527-535.

(Continued on page 197)