cepts the judgment made by me in 1917, namely, that the spiral nebulae rotate in the direction of the arbor of a spiral spring that is being wound up; in his new words "they trail their arms."

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THE PERFUSION OF RAT LIVERS

J. SCHILLER and G. PINCUS report in the November 5 issue of SCIENCE on the "perfusion of rat livers with estrogen in vitro."

In Table 1, page 412, they present data which they interpret as controverting the findings of Heller and Zondek. Upon analyzing their data, however, we find them to be entirely in accord with our concepts of estrogen inactivation as set forth in *Endocrinology*, 32: 64, 1943, and *Endocrinology*, 26: 619, 1940.

(1) Their failure to find hepatic conjugation of estrogens is wholly in agreement with our findings that this mechanism for metabolizing estrogens plays an insignificant role in estrogenic inactivation.

(2) They find that amounts of α-estradiol as large as 208 r. u. are completely inactivated by perfusion through the liver in a period of 3 hours. Only a small percentage was recovered when as much as 300 r. u. was perfused through the liver, whereas 90 per cent. was recovered when 300 r. u. was perfused through the heart for a similar period of time. If the 208 r. u. of α-estradiol had been converted to estrone or estriol by the liver, as postulated by these authors, measurable activity should have been obtained from the perfusate. The fact that they found none beyond the amount found in control perfusate experiments to which no estrogen had been added is in keeping with our data that α-estradiol is destroyed by the liver when present in small or physiological quantities. Our own experiments indicate that the destruction is accomplished with the aid of an oxidative enzyme system.

(3) When they used very large amounts (3200 r. u. in the perfusate) one third of the activity was recovered. Their data obtained through fractionation experiments are unclear, since calculation of the estrogen fractions in terms of weight shows a recovery of 650 γ (50 γ as estradiol, 400 γ as estrone and 200 γ as estriol) when only 400 γ of α-estradiol had been added to the perfusate originally. However, their biological data, showing recovery of one third of a massive dose of 3200 r. u., fit in with our concept that "the liver and kidneys have a definite threshold capacity for oxidizing α-estradiol. Any amount above the threshold will escape oxidation. . . . At least two mechanisms for dealing with estrogen occur in the body, (*a*) an oxidative mechanism which inactivates the greater part of *physiologically* circulating estrogens, and (*b*) an overflow mechanism which operates mainly after liver oxidative capacity is reached. . . ." We also conceded that this overflow mechanism involved conjugation of free estrogens or transformation of one estrogen into another.

The data these authors present thus confirm the results of our experiments, although the conclusions they reach from their own data "controvert" our findings.

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ANTHRACITE COAL ASHES FOR ROOTING CUTTINGS

A NOTE in SCIENCE,[1] of a few months ago, suggested to victory gardeners the use of sifted anthracite coal ashes to improve the texture of heavy clay soils. May I suggest another use for this material?

My father, who operated a successful wholesale cut flower business for many years in New York City, found during his later years that sifted hard coal ashes from the furnaces used to heat his greenhouse were excellent for the propagation of cuttings of chrysanthemums, roses, bouvardia, etc. Damping off was unknown in his cutting beds and mortality from other causes was very low. In addition, cuttings developed a fine ball of roots, and showed an exceptional vigor which the plants retained to maturity. No soil treatment was ever found necessary, water retention was adequate and aeration was excellent.

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JOULE AGAIN

LETTERS covering three fourths of p. 602 in the November 20, 1943, issue of *Nature* make desirable a restatement of what was said in SCIENCE in the issue of January 20, 1933: In the summer of 1897, while being conducted through the Physics Laboratory of the University of Edinburgh by Professor P. G. Tait, I chanced to ask him how we should pronounce the name of the physicist Joule. He smiled and said, "Well, I used to work with him and I can only say that he always called himself Joule," sounding the *ou* as in *you*.

Soon after the publication of this communication of mine in SCIENCE, Sir D'Arcy W. Thompson, of the University of Aberdeen, wrote me a letter from which I take the liberty of quoting: "You are perfectly right. The matter is not in doubt. *Joule* (*ou* as in *you*) is the great man's name, and every English physicist from Kelvin and Tait downwards—or onwards—has always called him so."

[1] SCIENCE, January 8, 1943.