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WHITE MAN VERSUS THE PRAIRIE[1]

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THE prairie that I have in mind in this essay is that vast sweep of potentially natural grassland that stretches from the ninety-fifth meridian westward to about the one hundred and fifth meridian, and from Canada southward to the Rio Grande and the Gulf. The title suggests something of the nature of a contest in which the advantage may swing now toward one factor, and at another period the other may be favored. We are thus reminded of the ebb and flow of the rhythms that characterize so many of the phenomena of dynamic natural history.

Much of the thrill that helps to compensate the scientist, in his constant search for truth, comes from the contemplation of the natural cycles that appear on every hand. Man himself is a composite rhythm of precariously complex balances, as indeed is the universe as a whole. Life and death are but two of the termini that mark the rhythmic phenomena of the cosmos. As Goethe wrote:

> The spectacle of nature is always new, for she is always renewing the spectators. Life is her most exquisite invention, and death is her expert contrivance to get plenty of it.

During the past century scientists have clearly demonstrated that nature and time had played with inferior organisms of great variety in lapping waters and by muddy shorelines for hundreds of millions of years before man entered the dynamic landscape. Many of those early creatures had already gone the way of all dust because they failed to adjust their fundamental affairs to meet the rhythmic vicissitudes that have characterized the sweep of time. Primitive man, crude as he may have been, was "smart enough"

[1] Address of the retiring vice-president and chairman of the Section on Botanical Sciences, American Association for the Advancement of Science, Columbus, Ohio, December 28, 1939.

about 15 to 17 per cent. of the protein portion of the purified fraction.

Tables I and II give the results of chemical analysis of the purified fractions before and after extraction with organic solvents. In the present experiments, the purified material was found to represent 3 to 7 per cent. of the tumor tissues and as much as 9 to 12 per cent. of the combined tissues derived from the whole mouse and chick embryos.

TABLE II

CHEMICAL COMPOSITION OF THE PURIFIED MATERIAL (LIPOID-FREE) ISOLATED BY DIFFERENTIAL CENTRIFUGATION

Source of material	N	P	C	H	Ash (total)	Ash (less P)
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Chick Embryo	13.80	1.21	49.92	7.02	4.07	1.27
Chicken Tumor I ..	12.74	1.16	48.52	7.29	5.94	3.24
Mouse Embryo ...	14.30	1.37	....	...	4.82	1.67
Mouse Sarcoma No. 180 (spontaneous)	14.51	1.21	49.32	6.84	4.23	1.45
Mouse Sarcoma No. 1549 (induced) ..	14.90	1.23	49.77	6.70	4.51	1.68

The above observations indicate that particulate elements, present in normal and tumor tissues, have the general constitution of a phospholipid-ribonucleoprotein complex. The occurrence, in tissue extracts, of a complex of definite chemical composition raises the question whether or not these elements may preexist in the form of similar bodies in the protoplasm. That the structure of cellular components may persist through the process of purification is suggested by the fact that the preparation of the purified fraction is accomplished by purely mechanical means, and that the method was precisely devised with the view of preserving, as much as possible, the integrity of certain active elements of the cell.

The formed elements of the cell which, by their mass, represent an important part of the cellular body, are the nucleus, the Golgi apparatus and the chondriome. The fact that the purified materials appear to contain ribose nucleic acid only is taken to indicate that the particles are not fragments of the nucleus. Furthermore, the nuclei are usually discarded by the first centrifugation at low speed.[9] As regards the Golgi apparatus, it has been shown that the substance of this cellular component has a relatively low density and that it moves toward the centripetal pole when the tissue is submitted to high-speed centrifugation.[10] On the other hand, a review of the general properties of mitochondria indicates that these elements possess many important features in common with the constituents of the purified fractions.[11] According to Cowdry,[12] the breadth of mitochondria may vary, in different localities, from 50 to 200 mμ in diameter. Particles of this size are those which would be concentrated by our method of differential centrifugation at high speed.

The assumption that the granular elements of the purified tissue fraction may represent isolated mitochondria or fragments of mitochondria is also supported by the chemical nature of the material. It is now generally admitted that mitochondria are complex elements made in large part of phospholipids and proteins.[13,14] The occurrence together of nucleoproteins and of certain phospholipids, highly soluble in alcohol and presenting the properties of aldehydes, might explain the response of mitochondria to certain histological dyes and fixatives.[15] There is strong evidence that mitochondria play an important part in the differentiation of the cell.[16] The demonstration that the material isolated from normal and tumor tissues represents, in fact, part of the chondriome and the fact that at least one of these fractions possesses tumor-producing activity[17] should lead to interesting developments in the study of the chemical nature of mitochondria and their possible role in the evolution of the malignant cell.

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9 R. R. Bensley and N. L. Hoerr, *Anat. Rec.*, 60: 251 and 449, 1934; also personal observations.

10 H. W. Beams and R. L. King, *Anat. Rec.*, 59: 363, 1934.

11 The literature on mitochondria is summarized in the monograph of Cowdry (footnote 12) and in that, more recent, of Guilliermond (footnote 14).

12 E. V. Cowdry, Carnegie Institution of Washington, *Contrib. Embryol.*, 8: 39, 1918.

13 *Ibid.*

14 A. Guilliermond, "Les constituants morphologiques du cytoplasme," Hermann et Cie, Paris, 1934.

15 Bensley and Hoerr (footnote 9) and Bensley (footnote 18) found that mitochondria preparations contained as much as 43 per cent. lipoids, but concluded that the predominating fats were glycerides, not phospholipins. They drew no conclusions regarding the nature of the proteins found in the preparations.

16 F. Meves, *Arch. Mikr. Anat.*, 72: 816, 1908.

17 See footnote 1.

18 R. R. Bensley, *Anat. Rec.*, 69: 341, 1937.

BOOKS RECEIVED

CUTRIGHT, PAUL R. *The Great Naturalists Explore South America.* Pp. xii + 340. Illustrated. Macmillan. $3.50.

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