

we find that he has not been as cautious and that he sees in Dr. Walcott's fossil bacteria certain resemblances in appearance and structure to nitrogen-fixing bacteria from soil (by context the bacteria referred to appear to be *Azotobacter* and related forms). He is not dismayed by the fact that the metabolism of marine, denitrifying, lime-depositing bacteria, and that of the nitrogen-fixing bacteria in soil which utilize both atmospheric nitrogen and organic carbon, are in a sense opposed to each other. Still less is he troubled by the very great difference between the metabolism of nitrogen-fixing bacteria and the autotrophic, nitrifying bacteria like *Nitrosococcus* and *Nitrosomonas* organisms which do not utilize organic food and derive their nitrogen from ammonium salts instead of free nitrogen). In fact, he apparently thinks of the nitrifying and the nitrogen-fixing bacteria as essentially identical, as appears in the following statement (p. 292):

The great antiquity of even higher forms of bacteria feeding on atmospheric nitrogen is proved by the discovery, announced by Walcott in 1915, of a species of pre-Paleozoic fossil bacteria attributed to "*Micrococcus*" but probably related rather to the existing *Nitrosococcus* which derives its nitrogen from ammonium salts.

The illogical nature of this statement may be brought out by substituting groups more familiar to paleontologists than are bacteria. Thus we have:

The great antiquity of Carnivores feeding on flesh is proved by the discovery of a species of pre-Paleozoic mammal attributed to Herbivores, but probably related rather to Rodents who derive their food largely from grain and nuts.

Needless to say that Dr. Osborn would be the first to see the weakness in such a statement. In reality this paraphrase does not exaggerate the illogical nature of the original statement, though it may appear to do so to the layman unfamiliar with the fact that great differences in these tiny organisms are very frequently hidden behind superficial resemblances in appearance.

The almost universal uniformity in protoplasmic structure of living species of bacteria

and their universal possession of a definite membrane which gives them definite form will cause bacteriologists to wonder at the statements on the following page of Dr. Osborn's article where he says:

The cell structure of the Algonkian and of the recent *Nitrosococcus* bacteria is very primitive and uniform in appearance, the protoplasm being naked or unprotected.

Any one who looks at the uniform black of the fossil organisms in the microphotographs given and who realizes that these are pictures of fossils and not of living organisms will be skeptical in regard to the evidence on which this statement is based.

Statements based on evidence of the sort furnished which claim that the presence in the Algonkian of nitrifying, denitrifying or nitrogen-fixing bacteria has been shown appear like a pyramid of speculation supported on an apex of fact. They have, however, already misled a bacteriologist into an acceptance of one of these claims, for I. J. Kligler⁵ says in a recent paper (p. 166):

Finally Walcott's discovery of bacteria closely resembling our nitrogen fixers of the soil is added proof of the primitiveness of these microbes.

It is because of the great interest of the findings by Drew and Walcott, that this word of warning has been uttered to protect science from conclusions which others have drawn from them. If this is not done there is danger that the next time reference is made to their work it will be in some textbook as a positive statement that nitrifying, denitrifying or nitrogen-fixing bacteria, or all three, have been shown to exist as far back as the Algonkian.

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MAN AND THE ANTHROPOID

TO THE EDITOR OF SCIENCE: In the July 27 number of SCIENCE Prof. Mattoon M. Curtis devotes a column and a half to a criticism of the "common error" that man is a lineal descendant of the anthropoid apes. "The evident implication," he tells us, "is that the

⁵ *Jour. Bact.*, 165-176, 1917.

extant anthropoids, orang, gibbon, gorilla and chimpanzee are intended." He proceeds to cite Duckworth to prove that this is an error, and concludes, so far as one can judge of his meaning, that man and the anthropoids are "not genetically related"—an amazing *non sequitur*.

One may parallel his argument in some such form as this: The existing Nordic peoples are currently asserted to be descendants of primitive races of man. The evident implication is that the extant primitive races, negroes, Australians, Red Indians, and Polynesians are intended. But Professor Ripley has recently shown that none of these races, constituted as they now are, figured in the ancestral history of the Nordic race. This may relieve our anxieties lest we might be descended from savages. While we do not know as much about such creatures as we might, it is perfectly clear that there is nothing to the absurd tradition that we Nordics are descended from them or they from us. It appears to be a sound principle that groups showing inverse developments are not genetically related, and it is well known that the Nordics are unusually light-colored while the savage races are remarkably dark; that the high and straight nose of the Nordic and his blue eyes are not to be found in these so-called inferior races of mankind; while most of them display thick lips which do not appear in the Nordic race.

And so on—but this surely is a sufficient *reductio ad absurdum*. Who believes that the human race is descended from the *existing* anthropoid apes? Who ever did that knew anything about it? How could it be so? How could prehistoric human beings be descended from anthropoids still living, unless, like Rider Haggard's "She," they were endowed with eternal life to outlive their descendants? Surely the writer can not but know that the current assertion means and can mean only that man is descended from the same ancestral stock as the anthropoid apes. What that ancestral stock was like, and how far and in what directions its living descendants have departed from it, is the problem

which the "scientists" (whom he puts in "quotes" apparently intended in some obscure derogatory sense) are trying to find out, by the inferential evidence of anatomy, physiology, and kindred sciences, and by the direct but as yet scanty evidence of paleontology and archeology.

The final paragraph opens with a curious sentence which I quote:

Whether "scientists" are entitled to believe what they please or are to be guided by observations and verifications is perhaps an open question.

Possibly I am mistaken and Mr. Curtis means by "scientists" the followers of Mrs. Eddy. I don't know their principles very well, but very possibly they do consider themselves entitled to "believe what they please" irrespective of evidence other than the assertions of "Science and Health." But surely no scientific man—without quotes—thinks himself entitled to believe anything regarding science save upon the evidence of observations and conclusions made and verified by himself and others. Nor does anybody else. The attitude is not peculiar to science. It is the ordinary man's attitude towards the common world about us; and science has no other attitude than that.

It is difficult to see in this letter anything save an attempt to discredit theories which the writer, without knowing much about them, does not wish to believe. I can hardly suppose that many readers of SCIENCE will take the argument seriously, in spite of a not inconsiderable dialectic skill. But however appropriate in some theological journal it appears somewhat in the category of "eccentric literature" in its present surroundings.

W. D. MATTHEW

SCIENTIFIC BOOKS

Bibliography of William Henry Welch, M.D., LL.D., 1875-1917. Prepared by WALTER C. BURKET, M.D., with foreword by HENRY M. HURD, M.D. Baltimore, The Johns Hopkins Press. 47 pp. 4°.

This is a notable contribution to medical bibliography, in the special sense of the term,