therefore its various parts are cell-parts or organelles, and are homologues of the parts of the tissue cell, and not of the organs of a metozoon. It is true that the ciliate is an elaborate cell, but its specializations are intra-cellular and as such can not be homologized with entire organs or systems of the Metazoa. The tubular "rectum" of *Diplodinium* is not a homologue of the rectum of higher animals and therefore the word "rectum" should not be applied to the ciliate organelle if it is to bring about confusion of relationships. The ciliates swim by means of cilia, but we do not compare them structurally with the fins of fish.

The "nervous system" of the ciliate with "brain" and fibers was also compared to that of the higher animals to show that cellular organization is not necessary. Ehrenberg had a similar idea, but Dujardin and others finally exploded it. Now, in the first place, the "brains" of *Diplodinium* and *Euplotes,* the two classical examples of the neuromotorium in ciliates, have both been shown to be artifacts.[3,4] Neurofibrils which coordinate ciliary activity are, however, present as clearly demonstrable organelles. But these fibrils are also present as true homologues in the ciliated epithelium of Metazoa. Does that make ciliated epithelium any less cellular in organization? Cell specialization itself is in no way opposed to the cell theory.

The article further points out that chloroplastids metabolize, grow, and multiply, and therefore should be considered living units. In a sense they are living units and the same could be said for mitochondria, centrosomes and the nucleus itself. One could also say that the units in a brick wall are not the bricks, but the sand particles in the bricks. In none of these cases, however, are they the units of structure of the complete organism because no possible combination of them alone will form the whole. Just because the cell theory does not mention specifically all these cellular constituents should we discard it? Because these cell-parts have specific functions are the cells no longer units? Has the geneticist abandoned Mendel's principles just because new complications have been discovered which the original proposition did not fully explain?

Lastly, if we are to distinguish cellular organization on the basis of cell partitions, we must thereby admit that the syncytia of higher animal tissues are non-cellular as well as the plasmodium stage of Mycetozoa, etc. At the same time we must call *Amoeba proteus* cellular. Then is a binucleate amoeba cellular or non-cellular? And does a neutrophil in human blood transform itself from a cell into a non-cellular protoplast when one of the delicate strands connecting the polymorphous nucleus breaks? Where shall we draw the line? And will not the line be arbitrary and rather unimportant?

The "Case Against the Cell Theory" is an interesting study and has some obvious points, but are we not attacking straw men in the form of strict definitions of the cell, when we rise to demolish a theory that is thoroughly sound if a few very minor interpretations or revisions are made? We shall certainly have to make many apologies to Mr. Schleiden and Mr. Schwann if we write another theory that explains the amazing similarity throughout living organisms of their cellular (sub- or super-cellular) organization.

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[3] C. W. Rees, SCIENCE, 71: 369, 1930.
[4] J. P. Turner, *Biol. Bull.*, 64: 53, 1933.

"ELECTRICITY ELICITED BY AN ORGANIC CHEMICAL PROCESS"

UNDER this title Berzelius, in 1817, described the discharge of electric organs. He based his assumption on the fact that the organs have no resting current and that the discharge here is a voluntary process, in contrast to the ordinary electric pile.[1]

Electric organs have been compared with an accumulation of muscle end plates. When, at these end plates a concentration of choline esterase was found, as high as necessary to admit that acetylcholine might be involved in transmission of motor nerve impulses[2] a similar mechanism was envisaged for the action of the nerves supplying the electric organ. A concentration of choline esterase of the same order of magnitude as calculated for motor end plates was found in the electric organ of Torpedo.[3,5] 1 g organ splits 1.5–3.0 g acetylcholine in 60 minutes.

In contrast to this high concentration of the enzyme, that found in the electric organ of *Raja* which has a weak electromotive force is low: 1 g organ splits only 0.03–0.1 g acetylcholine in 60 minutes. 1 g of the powerful electric organ of Gymnotus splits 0.9–1.5 g acetylcholine.

If the electromotive force of these organs per cm of tissue (in the direction of the current) and the number

TABLE I

	Volt per cm	Plates per cm	Q.Ch.E.*
Raja	0.5	15	3–10
Gymnotus	5–10	60–80	90–150
Torpedo	8–15	100–200	150–300

* Q.Ch.E. = mg acetylcholine hydrolysed by 100 mg tissue in 60 minutes.

[1] J. J. Berzelius, *Laerbook i Kemien.*, 1: 126, 1817.
[2] A. Marnay and D. Nachmansohn, *C. R. Soc. Biol.*, 124: 942, 1937.
[3] A. Marnay, *C. R. Soc. Biol.*, 126: 537, Paris, 1937.
[4] D. Nachmansohn and E. Lederer, *C. R. Soc. Biol.*, 130: 321, 1939.
[5] D. Nachmansohn and E. Lederer, *Bull. Soc. Chim. Biol.*, 21: 797, 1939.

of electric plates per cm is compared with the enzyme concentration an interesting parallelism is found. The comparison is given in Table I.

In view of the difference in structure, size and arrangement of plates it is desirable to compare also the maximal discharge and the number of plates in series at such a discharge with the total amount of acetylcholine which can be split by the different organs. This is given in Table II.

TABLE II

	Number of plates in series	Maximum discharge in volt	Mg A.Ch. split by organ in 1 second
Raja	60–80	1–3	0.5–1.0
Torpedo	400–500	30–60	50–100
Gymnotus	5000–6000	300–800	500–1000

The concentrations of choline esterase found in electric organs suggested the cholinergic nature of the nerve supplying the organs. Recent experiments have brought further support for this assumption showing liberation of acetylcholine from the electric organ during stimulation of the nerve and the possibility of eliciting a discharge which is here the terminal event by injection of minute amounts of acetylcholine.[6]

The observations lend support to the concept which Berzelius formulated more than a century ago and apparently not noticed since then.

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AGAIN SCIENCE IN CHINA

RECENTLY a letter appeared in SCIENCE (March 8, 1940) describing some of the difficulties under which the Chinese scientist must work. Almost simultaneously the following plea came to my desk as secretary of the Union of American Biological Societies. Believing that there are many individual biologists as well as departments willing to send reprints and other scientific publications to the National Central Library, the original plea, signed by Chiang Fu-tsung, librarian of the National Central Library, outlining the situation, and giving the necessary instructions, is printed below.

With a view to supplying our science students with scientific publications to further their research, the National Central Library takes pleasure in soliciting your assistance and cooperation in the rebuilding of its collections by sending us your publications. Your courtesy and action in putting our name on your free mailing list will be highly appreciated by the Chinese people at large.

Word has it that assistance rendered at its time of great need will forever stand in the memories of those individuals who are craving for help. Owing to our hurried departure from Nanking, more than 200,000 volumes fell into the hands of the Japanese, who set them, together with the valuable collections of other institutions, on fire. With the bombing of Chinese educational institutions by Japanese airplanes, the destruction of Chinese culture is thus made complete. However, this library has managed to transport a large portion of our holdings out of Nanking to Chungking, the provisional capital. As a result, there are tens of thousands of students and scholars in China who are entirely devoid of means to advance their studies. Facing this intellectually hungry lot, it is my crusading responsibility and pleasure to write for complete sets of your publications to be made accessible in this library. Through a system of mail services, books thus acquired will be sent to any individual for stated periods in any part of free China. Your publications will be placed in our Chungking branch library building, which is now nearing completion.

In sending us your publications, please send them by book post *via* Haiphong, French Indo-China.

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THE PROGRAMS OF SCIENTIFIC MEETINGS

HAVING attended a number of the meetings of the American Association for the Advancement of Science held at Columbus, I wish to make two protests.

In the first place, it seems a waste of time on the part of any intelligent person to spend two hours per session listening to the reading of papers with little opportunity for comment. One and a half minutes per paper was the average time allowed in meetings I attended. Apparently the purpose of the meeting is not the advancement of science but the reading of papers. If the persons presenting papers knew that as many minutes would be spent in the discussion of papers as in their reading, the quality of the papers presented as well as the participation of the audience might be greatly improved.

In the second place, it certainly is a reflection on a learned profession when its representatives, selected as members of the panel set up to discuss the issues of a paper presented by a principal speaker: (a) ignore the issues; (b) give ten-minute prepared speeches composed in most part of personal anecdotes; (c) meet questions from the floor by "name calling"; (d) exhibit "authoritarian" attitudes toward "status" rather than "experimental" habits of mind.

I realize the difficulties involved in setting up panel discussion meetings. It seems, however, that a little more careful preparation on the part of participants plus a disposition to promote "attitudes of inquiry" rather than "smug acceptance of present practice" would be more in keeping with the purposes of a scientific body.

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[6] W. Feldberg, A. Fessard and D. Nachmansohn, *Jour. Physiol.*, 97: 3 p., 1940.