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showing affinity to the suborder Thecata. More recent authors were inclined to the view that the family should be included in the Athecata.

The Emperor obtained abundant specimens of two species of this family from Sagami Bay, and assigned one of them to Clathrozoan wilsoni Spencer, and the other to a new genus and species, Pseudoclathrozoan cryptolaroides. He describes these two species in detail with many illustrations including a color sketch of a specimen of the new species, many photographic figures of whole colonies of the two species and of sections of fixed specimens indicating zooids, skeletons, and coenosarcas, as well as fine diagrammatic figures of the structure of the colony, and a map of the part of Sagami Bay from which the specimens came.

The descriptions are given in both English and Japanese, in more detail in the former language. What is the most salient of the new discoveries made by the author is the presence of gonothecae containing gonosomes of the leptomedusan type. By this discovery the systematic position of the family Clathrozoanidae is settled as to be included in the suborder Thecata.

In the preface of this memoir, cordial appreciation is given to many who have given assistance to the author in one way or another. Outstanding among the scholars was the late Hirotaro Hattori, who was the Emperor’s tutor and consultant in biology for more than 50 years. The preface closes with the following words: “I should be more than happy if the present work of mine, subject to correction by interested scholars, could contribute even in the smallest way to the progress of academic studies.”

Taku Komai
Kyoto University,
Kyoto, Japan

The Fuzziness of “Fuzz”

The cynic has said that electron microscopes are adding more problems for the working biologists than they are helping to solve. On the plus side, more details of fine structure are being revealed as more varieties of cells are examined by improved methods of higher magnifications. Even if this is no more than extending the frontiers of our ignorance, as one skeptic puts it, whenever a new morphologic feature comes to the attention of the electron microscopist, a major problem is presented to him; he needs to give the newly discovered thing an identity—a name, and this problem is often resolved by the use of the word “fuzz.”

The outer surfaces of cells reveal complexities of structure when examined with high resolutions of the electron microscope. Often, fine filaments or thread-like structures extend outward from the cell membrane. First recognized on the surface of gall bladder epithelium by Yamada, the filaments were given the name of “Anten-
nullae microvilliars" (1). Bennett considered the evidence that the filaments and cell surface materials were carbohydrate to be substantial (2). He coined the term "Glycocalyx" (literally "sugar-cup" or "sugar-shell") for the cell surface structures, using glycocalyx in the sense of "sugar husk" or "sugar calyx," and analogous to the covering layers of seeds or flowers.

One of the first appearances of the word "fuzz" as a replacement for "antennullae microvilliars" and "glycocalyx" occurred in an article by Revel and Ito entitled "The surface components of cells" (3):

One extremely common type of surface coating consists of exceedingly fine filaments extending radially from the plasma-lamella. Such filaments were originally described by Yamada (1955) as "antennullae microvilliars" on the free surface of the gall-bladder epithelium. At present, this type of surface specialization is commonly referred to as "fuzz" since it imparts a hirsute appearance to the cell membrane. The thickness of the fuzzy coat and the amount of the surface membrane covered by it varies greatly. While some free living organisms such as the amoebae may be completely invested by such a layer, only the free surface of certain epithelial cells of higher organisms seem to have this layer. In certain cell types such as ova, erythroblasts, and Kupffer cells, a material similar to fuzz occupies small patches, or lines small invaginations of the cell surface. In other cells, while there is no visible surface coating, the presence of one can be inferred from the results of histochemical tests.

In reviewing a series of articles for a scientific journal in 1966, I encountered not only the word "fuzz," but also "fuzzy" and even "fuzz-like." At this point the threat of "fuzzoid" became real and I wondered whether electron microscopists were becoming a subculture (like teen-agers and musicians) and developing a language of their own by the use of ordinary words in extraordinary meanings. Webster defines "fuzzy" as (i) a puffball; (ii) a mass of fluffy particles or fibers, as the beard of an adolescent boy; (iii) a blurred effect; and (iv) slang, a policeman or officer of the law. In electron microscope use, the meaning closest is a mass of fluffy particles or fibers.

There is little serious objection to the introduction of new terms for new appearances, even a cumbersome term like "Antennullae microvilliars." The exuberant tropical jungle of intracellular inclusions has generated such terms as "autophagosomes," "cytosegrosomes" and "cytosomes" and other "-omes" ad infinitum if not ad nauseam. Such manufactured language seems reasonable although one can look forward to ad hoc study groups, and eventually national and international congresses to straighten out this nomenclature. What is objectionable in the use of the word "fuzz" by the electron microscopists is that it is taking over an ordinary word and using it in a very special meaning. My own belief is that the use of this word should be discouraged by editors because of the inappropriate application of a word describing something seen with the naked eye to structures visible only with the electron microscope.

Consider the future. I can imagine a conference given over to the study of such specializations of the cell surface and what can it be called except "The Conference on Fuzz"? As areas of study narrow, it is quite possible that enough investigators will make these specializations of the cell surface their own fields of study leading to the formation of a "Society for the Study of Fuzz" which in time might produce a Journal for the Study of Fuzz or the Fuzz Journal.

Such absurdities aside, the important point is that newly discovered structures require new descriptive terms. The "bonds of intelligibility" which link the past and the present with the future depend on special identifications of specific features or structures by the use of appropriate words. Any science is in a sense a language with a content of ideas, the language consisting of a mutually agreed upon set of meanings for the corresponding set of words. How does "fuzz" fit into this concept?

It is by no means certain that any sort of outcry or derision can remove the use of "fuzz" from the jargon of the electron microscopists. Indeed I am afraid that any serious criticism will only strengthen and reinforce its use. Still, one can wish that someone with an adequate vocabulary would devote enough time to find a suitable substitute. The word "fuzz" is unclear in meaning; one of its characteristics is "fuzziness."

J. F. A. McManus

Federation of American Societies for Experimental Biology, 9650 Rockville Pike, Bethesda, Maryland 20014

References

You don’t have to write your own computer programs to benefit from the PL/I programming system.

The performance of a computer installation is dependent upon the programming systems as well as upon the types and configurations of machines.

But, how do we measure installation performance?

In the past, throughput, the amount of work handled, was often used as a measurement of the performance. But it doesn’t measure the utilization of all of a computer installation’s resources. To do so requires the measurement of total problem-solving time. Simply defined, it’s the total amount of time it takes the installation to give you the answer you want after you’ve presented your problem.

In effect, it includes the entire sequence of man-machine actions: recognition and definition of the problem—testing and debugging of the program—execution (throughput) of the program—additions to the program—and, continued maintenance of the program.

In the past, it was also possible to describe an installation as either commercial or scientific/engineering.

Today, as the scope of both types of installations expands, their computing needs are beginning to overlap. This was why IBM SYSTEM/360 was designed with general-purpose capabilities to serve both. But what about the languages we use to communicate with computers? Don’t they have to serve both needs too if we are to shorten the total problem-solving time? This was the question we were faced with in 1963.

During the SHARE [an organization whose members use IBM systems] meeting in Miami in August 1963 a group got together informally to discuss what they were going to do about languages in the future. FORTRAN, for example, the first really successful scientific programming language had already gone through two major overhauls to increase its usefulness and extend its areas of application. Could it be extended further? A committee consisting of SHARE and IBM members was formed to survey the situation and recommend a course of action.

Its goal was to determine the state of the art, evaluate the existing language technology and to survey the work done in language development in both scientific and commercial areas during the previous five years. By no means a simple task!

As the committee studied the needs of computer users, it became apparent that existing languages like FORTRAN and COBOL had structural limitations.

But what would happen if we created a new language? Take the very best features of FORTRAN and COBOL and combine them in a general structure? The idea was attractive.

And so the committee recommended that such a language be developed. IBM then asked the committee to outline its structure.

The committee, now consisting of members of the SHARE and GUIDE user organizations and IBM, set several goals in its design of the new language.

First, it wanted to increase the range of problems which could be coded in this language.

Second, it wanted additional facilities which had rarely been considered for coding in a scientific/engineering compiler language. The reason for this is that as scientific and engineering applications become more sophisticated they require broader data manipulation capabilities.

Third, and extremely important as more and more scientists and engineers write their own programs, the committee wanted a clear and consistent language that could carry out more functions than existing languages yet have a simpler syntax.

The Basic level consists of a part of the language which is as easy to learn as any of the languages known today.

In effect, the committee designed a language that offered facility and promised less problem-solving time. That language, PL/I, has evolved with the help of the GUIDE and SHARE organizations and is now available to users of SYSTEM/360.

For a copy of a new booklet which describes the benefits of PL/I in more detail, write to: Director, Scientific Development, IBM Corporation, Department 805—352, 112 East Post Road, White Plains, New York 10601.
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is essentially a carefully engineered drain.

In view of the fact that the average natural low flow of the Ruhr is less than the volume of effluent discharged into the river, the Genossenschaften have done much in the cause of waste disposal and water supply in a very difficult situation. The associations have not, however, worked miracles. Water in some parts is not fit for drinking. Authorities have the power to shut down factories if their waste discharges rise above a certain level, but observers say that officials are hesitant to act when jobs and profits are at stake. During low-water periods it is necessary to pump water out of the Rhine into the Ruhr system. And while the inflow from the Rhine tributaries in the Ruhr does not, on balance, appreciably add to the already formidable pollution of the Rhine, the Emscher still poses such a serious problem that a biological treatment plant for the stream is planned.

There is little question, however, that the Genossenschaften prevent a bad situation from getting worse, and also that their operations are pertinent for Americans facing similar problems in maintaining supplies of usable water. Two aspects of the Genossenschaften activities seem particularly worthy of study. One is the coordination with land-use planning authorities and the other is the experience gained by the associations in allocating costs.

Methods differ among associations, but the general principle on effluent charges, as Kneese says, is that the discharging unit will be assessed on the basis of the quantity and quality of the effluent discharged into the system. One association determines the degree of pollution by the damage to a particular species of fish.

Virtually from the beginning, the associations have assessed costs for drainage operations necessitated by land subsidence caused by underground coal mining. The costs are divided between the beneficiaries of the drainage operations and the mines causing the subsidence.

In some respects the cost-assessment procedures are not highly refined or, in the case of pollution measurement, very sensitive to varying conditions in the rivers. But a good deal of experience has been gained in assigning monetary costs to damage to the environment, and fairly wide acceptance has been gained for the principle that the polluter should pay. Americans could learn from this German experience.

At the federal level in West Germany and the United States, officials are convinced that new and more effective measures are needed to correct abuses of the environment, abuses which may cause irreversible damage. In the United States, the Water Quality Act, the Clean Air Act, and the Solid Waste Disposal Act are evidence of governmental concern and, incidentally, of the broader aspirations of the Great Society program. But under the federal system in both countries the central governments are limited largely to a role of setting standards, giving advice and information, training personnel, and providing financial assistance for closely defined purposes. It is at the state and local level that essential laws must be enacted and administered, that costs must be paid, and that the political crunch ultimately comes. So a high-level agreement affecting federal governments, such as the one between West Germany and the United States, is, in a sense, another instrument of information and persuasion.—John Walsh

**APPPOINTMENTS**

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