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HAMILTON
Amazon Basin as we do about the mallard duck.” “We” doubtless includes Raven, Berlin, and Breedlove, but does it include anyone else?

They continue, “It is often argued that, if we know about the systematics of a particular group of organisms in detail, we will be better able to utilize them in biological control programs. . . . What we have achieved in biological control . . . has been almost entirely the result of ad hoc studies of the problems when they become of interest. . . .” In fact, the vast majority of biological control programs have ended in partial or complete failure. A striking example of the importance of taxonomic discrimination in biological control is presented by DeBach (1).

Finally, Raven et al. conclude that “Taxonomic work has helped us only to a limited extent in understanding the functioning of ecosystems. . . .” Thinking that I may have been living in some sort of dream world, I re-examined the major works of such ecologists as Elton (2) and Odum (3), who confirm my own impression that determining the composition of the community in terms of organisms and their life histories and dispersal powers, and so forth, is a basic initial step in any analysis of ecosystems.

When new taxonomic methodologies are developed, as they surely will be, they will be more constructively realistic than those proposed by Raven et al.

HOWARD E. EVANS

Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138

References

Raven et al. describe the development of pre-Linnaean and Linnaean methods of naming organisms. But they have not written one word about modern taxonomy, or is it modern taxonomy stripped of all its essential character which they discuss under “Problems for modern taxonomy”? We hesitate to accept this. Modern taxonomy is no longer the science of “giving names and nomenclature”; the final result of taxonomy will not be a list of all organisms, with their names, pictures, and full description. The final result has to be the understanding of the species concept, the genre concept, the family concept, and so forth, and the understanding of the relation and interaction between species or between genera. The origin of the species and not the origin of species, the development of the taxon and not of taxa are the special interests of modern taxonomists. They do not study the difference between species, but the difference between the species concept in different groups of animals.

It is impossible to describe all the species existing today. However, it is possible to describe certain taxa and to come to the understanding of these taxa, which in the future will help us understand the concept and meaning of the taxon.

Modern electronic equipment can indeed assist the registration and distribution of data concerning the taxa, but taxonomy can do nothing without the help of other disciplines, such as ecology, physiology, genetics, and anatomy.

Raven et al. deal with plant taxonomy; there are differences between plant taxonomy and animal taxonomy, but both branches of modern taxonomy are part of biological science, while the old taxonomy was probably more closely related to philately. Biology, the life science, the understanding of the development, adaptation, variability, and diversity of the most natural and original of all matter, is not dependent on, but culminates in, the science of taxonomy. As our environment must be protected against man by Man, it seems essential that we understand development (and disappearance), adaptation, variation, and diversity.

S. VAN DER SPOEL
A. C. PIERROT-BULTS
R. W. M. VAN SOEST
Department of Marine Echinoderms, Institute of Taxonomic Zoology, Plantage Middenlaan 53, Amsterdam, Netherlands

The diverse points of view presented by the critics of our article bring into sharp focus the fundamental disagreements among taxonomists about classifying organisms, and even about what “taxonomy” comprises. Perhaps there are fewer than 10 million kinds of organisms in the world, but the order of magnitude is correct. Many of these organisms will become extinct, especially in the tropics, within the next 25 years, as the destruction of the tropical lowland forest becomes an event of global proportion. Some of these extinct organisms will have been named, others will not.
Only we, and not our successors, have the choice of what kinds of information to gather about a number of kinds of organisms, and the relations between them. The analysis of many tropical ecosystems will continue to be possible for only a few more decades, and the kind of monographic studies that might provide valuable comparative material for such analyses will not be completed for most groups of organisms in time.

There seems to us to be no a priori reason to assume that the taxonomic system we have inherited is the best or only one for dealing with this problem. It is a truism to say the world is changing rapidly, and the facts on which we should be basing our decisions are very different today from what they were a century, a decade, or even a year ago. Most of our decisions are based upon the implicit assumption that we live in a stable world, but we certainly do not.

Many modern tools are available for dealing with information, and we believe that systematists should, by virtue of the almost incalculable number of facts with which they are concerned, be among the first and not the last to adopt them. If, in the light of a careful consideration of the condition of the world as it is today, the magnitude of the task of the systematist, and the availability of many new tools for dealing with the diversity of nature, an individual taxonomist wants to keep on doing essentially what he and his predecessors have been doing for thousands of years, that is his decision; we, however, hope that at least some taxonomists will continue to seek more creative solutions to these problems. Special consideration should be given to gathering "unusual" kinds of data about particular aggregations of tropical organisms, rather than plodding ahead with the standard monographic approach for all groups regardless of size, importance in the ecosystem, or present knowledge of the group.

Perhaps sarcasm in the defense of the status quo is no vice, but if we want to consider the world as it is and make conscious, reasoned decisions about what kinds of information we shall gather and thus be able to transmit to our successors, it is not enough.

Peter H. Raven*
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*Both of my coauthors are currently in the tropics engaged in field work and could not therefore join me in commenting upon the responses to our article.
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cohort analysis, cross-cultural comparisons, and others. Each of these designs is clarified and illustrated by means of detailed case studies; scientific and practical problems distinctive to each design are noted and helpful suggestions presented. In addition, there are numerous illustrations of how secondary analysis has been used to enhance our understanding of the significance of social structure and social experience for human thought, feeling, and behavior.

Hyman deals also with the perennial problem of finding satisfactory indices for one's concepts, the inadequacy of data bearing on certain essential theoretical questions, the noncomparability of samples from which similar data have been collected, the very special difficulties involved in cross-cultural research, and so on. These problems are not easily solved, but Hyman is able to provide some sound and reasonable solutions. What is not a problem is the claim made by some social scientists that they have analyzed or should analyze "all their data," and that nothing is left for the secondary analyst. No analysis is ever completed; it just stops. It is always possible for others with different interests, different theories, different perspectives to find valuable new material in any reasonable survey study.

It would be excessive to claim that secondary analysis constitutes a comprehensive solution to all the problems of social science, but it is a powerful weapon in the social research armamentarium which has been unduly neglected. I believe it offers one of the most promising hopes for social science in the years to come. What has been needed all along is a systematization of the subject, and Hyman's excellent book fills this need in exemplary fashion.

**Morris Rosenberg**

Laboratory of Socio-environmental Studies, National Institute of Mental Health, Bethesda, Maryland

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**Kinetics**

**Reactions of Molecules at Electrodes.**


A general aim of kinetics is to gain an understanding of chemical reactions from molecular properties. In the liquid phase, however, the difficulty of describing the interaction of the reactants with the surrounding medium presents a serious obstacle to the achievement of this aim. The problem is even more complex in the case of electrode processes, where the reaction takes place at the interface between a solid and a liquid, the detailed structure of which is unknown.

Under these circumstances the possibilities of treating electrode reactions from a molecular point of view might appear to be rather limited. Fortunately, however, electrostatic interactions are sufficiently predominant in electrode processes that molecular models which chiefly emphasize this aspect can greatly contribute to the understanding of kinetic processes.

In the last decade the advance in experimental techniques has been paralleled by the development of theoretical models on a molecular basis for the description of electrode processes. The editor of this book has rendered a valuable service by conveying the usefulness of this new approach. This he has achieved by carefully selecting certain areas where the molecular approach has reached a satisfactory degree of sophistication and bringing together competent contributors in all these areas to give an account of them.

The electrostatic model can be applied with great success to the adsorption of molecules at electrodes and its dependence on the structure and charge distribution in the double layer (discussed by B. B. Damaskin and A. N. Frumkin). Furthermore the electrostatic model is invaluable for an understanding of ion solvation (reviewed by B. Case). A particularly valuable chapter (by R. R. Dogonadze) reviews the quantum mechanical description of electron transfer processes developed by the Russian school of Levich. In this treatment the activation of the electron acceptors or donors prior to electron transfer is assumed to be due to the electrostatic interaction with the polar solvent. This theoretical approach is accompanied by a comparison between calculated and measured rate constants for electron transfer in various redox reactions (worked out by J. M. Hale). In these calculations, which yield surprisingly good agreement with experimental values, the purely electrostatic approach is supplemented by the inclusion of the contribution of the vibrational modes of the ligands in the inner coordination sphere to the activation energy.

Organic redox reactions offer a wide field for the application of molecular concepts. Here the discussion must follow on the same lines as generally used in organic chemistry. A systematic analysis of the most important types of organic electrode reactions is given (by M. Fleischmann and D. Fletcher), and some particular systems, such as the aromatic hydrocarbons, which have been intensively investigated are described (M. E. Peover).

One chapter (by W. Mehl) is devoted to a discussion of organic semiconductor electrodes. The behavior of these solids can be adequately described by analogy with the properties of the isolated molecule. This makes it possible to include the role of electronically excited states in the molecular description of electrode processes.

This collection of examples of the application of molecular models will not only prove stimulating to electrochemists but also will give to others an indication of the degree of sophistication already achieved in the discussion of electrode processes. The information available in this field can find a place in the discussion of many other problems in reaction kinetics.

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...if the General Assembly acts favorably, as expected, the next crucial question for the environmental program will be the response of the United States, or, more specifically, of Congress. The new U.N. enterprise is being proposed at a time when the United States—the major “donor” country—has difficulties with both its international balance of payments and its balance of popularity. America’s foreign economic policy and the operations of U.S. companies have roused resentment, particularly in some developing countries with intractable economic problems. Criticism of the United States has become almost a ritual in U.N. proceedings, and anti-U.S. feeling reached a sort of apogee in the expulsion of Nationalist China from the United Nations. The hostility of developing nations toward the United States has found its reciprocal in Congress, and many legislators have cast a cold eye on U.S. funding of the United Nations.

...This autumn, the Administration has sought a reduction of the U.S. contribution to the U.N. operating budget, from about a third to a quarter of the annual budget. The recent acceptance of this adjustment at the United Nations had considerable significance, since rejection would have caused an exasperated reaction from Congress and would likely have prejudiced congressional attitudes toward the environmental program. The developing nations apparently recognized the relevance of the vote to the American contribution of about 45 percent of U.N. voluntary funds, which finance programs that are especially important to these nations.

American officials who handle dealings with the United Nations say that the congressional attitude toward the environmental program is by no means predictable. But they see encouraging signs in the fact that Strong has a good reputation and that the Nixon Administration apparently has a firm commitment to the idea; they also think the argument for an attack on global environmental problems is persuasive. Action on the U.N. environmental program will be a good indication of how Congress is reconciling itself to the evolving arrangements at the United Nations about paying the piper and calling the tune. —John Walsh

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