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The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

- Taxonomy Laboratory

April 29, 1966

Dr. E. W. Kitajima
Virus Department
Secretaria Da Agricultura
Instituto Agronomico Do Estado De Sao Paulo
Caixa Postal, 28
Campinas, Brasil

Dear Dr. Kitajima:

Thank you very kindly for the reprints on virus diseases of Manihot. They are indeed a great contribution, and I am glad to have them.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

April 28, 1966

Dr. William J. Riemer
Biological and Medical Sciences
National Science Foundation
Washington, D.C. 20550

Dear Dr. Riemer:

On March 2, 1966 I wrote to you regarding the possibility of obtaining travel support to attend and participate in a symposium at the XXXVIIth International Congress of Americanists to be held in Argentina in September 1966. Since I have not heard from you, I was wondering if my letter could have been lost or misplaced.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

April 28, 1966

Dr. A. W. Crompton
Director, Peabody Museum of Natural History
Yale University
New Haven, Connecticut 06520

Dear Dr. Crompton:

I am pleased to accept yourkind invitation to participate in the ethnobotanical symposium next fall.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

April 26, 1966

Dr. Rowena Swanson
Directorate of Information Sciences
Air Force Office of Scientific Research
4th and Independence Avenue, S.W.
Washington, D.C. 20333

Dear Dr. Swanson:

I read your article "Tailoring Information Systems to People" in Research Review, for April. This leads me to ask whether you might possibly be interested in the work we are doing here at Colorado State University. Although we are primarily concerned with the problems of biological classification, we have discovered that our work has potential value for information retrieval problems. Let me present a summary of my thoughts along these lines, and perhaps you can see how we might contribute to the development of sound procedures for information retrieval.

General Considerations

There are many similarities between biological classification and scientific information retrieval:

1) A plant or animal must be placed in a classification before it may be identified; the same is true for a scientific document.

2) A plant or animal is best classified when the most descriptors are used; the same is true for literature, and as a corollary, the better the chances of identifying the organism or finding the precise document, no matter how described.

3) Biological classification employs a storage system for its input data, based on the classification system, much as libraries employ storage systems based on classifications.

4) The processes and methodologies of taxonomy have been largely intuitive, seldom bared or exposed to show how a particular classification was achieved; similarly, library classifications are derived by "intuitive" feelings about the literature.

5) Classifiers have seldom put their methodologies to rigorous, logical, and/or mathematical tests; and the same can be said for librarians in general.

6) "Theoretical" classification investigations seldom live up to the definition of the word because there has not been a clear separation between the thinking processes used and the manipulation of the data. Similarly, proposals to retrieve information are most frequently based upon some extant, pragmatic approach that is found useful in some particular application but cannot be generalized for all.

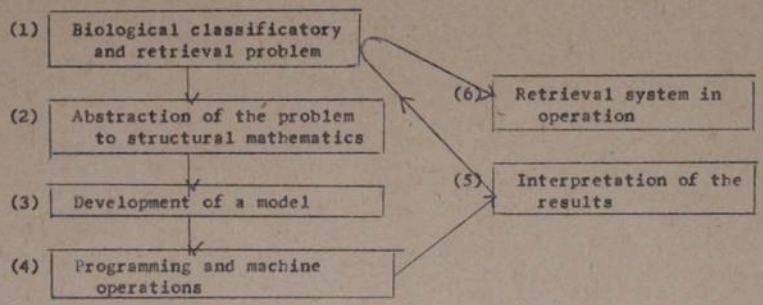
Given these conditions, it seems wise to expend some time, effort, and energy in attempting to build a sound theoretical base for these important activities. The results should pay off, not in a completed information system, but in a methodology suitable to do the job. It must be stressed that imbedded in classificatory procedures extant are some of the theoretical structures needed, but the discovery of these is a nontrivial job.

Procedures

The attack on problems of this nature is essentially fourfold. First, the taxonomic or classificatory problem needs individuals intimately associated with the discipline who can use their judgment, their experiences to discover the various parts and procedures, and to state these in some minimal fashion. Secondly, abstractions of the problems to structural mathematics are best handled by competent mathematicians; and they, in turn, develop models following the logic involved. Thirdly, the models must be converted to appropriate computer programs on equipment suitable to handle the task. Finally, the attack is the actual application of the developed models to test the value of the programs in a number of different conditions.

The diagram below gives the scope of work presently being developed at Colorado State University.

Scope of Work



The scope of the operation, the requirements, and the methodologies are developed in (1). Clearly, the important point is to define the problem in the context of the working classifier, biologist, and librarian. Just as clearly, this is a full-time job, requiring the best efforts of the disciplines. Therefore, (2) and (3) must be taken up by others (mathematicians) who are also full-time and well trained members in their disciplines. The algorithms developed in (3) must be given to individuals in area (4) to appropriately apply computers. Area (5) brings the individuals in (1) back into play, and area (6) is the desired results.

It is too early to define exact procedures in such an operation. One basic requirement is the development of a generalized compiler for computers with more flexibility than present-day languages (i.e., FORTRAN or COBOL or ALGOL). This type of compiler would facilitate the development of modular programs. These modular programs have the advantage of any structure built with the same idea--parts can be added, removed, modified, up-dated, etc., without damaging the whole program. Thus, any retrieval system in existence could be brought into later, more complex systems without complete revamping. Furthermore, such a compiler allows the development of user-oriented computer languages, an important feature considering the number of people who must participate in the generation of complex retrieval systems.

Along with colleagues in California, we have under development a compiler fitting these specifications. Details and descriptions can be supplied upon request.

Needs for Further Work

At Colorado State University, we have been working along the lines outlined previously. However, we are limited by the lack of hands to carry on in a more meaningful manner. Four of us (two biologists, a mathematician, and a programmer) are generating programs for parts of the classificatory process, developing the models, and through collaboration with other selected individuals, are testing our output on a variety of problems. These problems cover an interesting diversity--from basic botanical classificatory problems to problems in classification of psychological information. In addition, we are teaching methodologies following the diagram on page 2. Results so far indicate that our approach has already justified the work on the theoretical aspects, followed by the practical procedures for computer programs.

We would like, however, to enlarge our capability by the addition of important disciplines that can contribute to the overall development of sound procedures. For example, we need another biological taxonomist, a person trained in library classification, a mathematician whose major efforts have been in structural (as opposed to analytical or statistical) mathematics, a behavioral psychologist with interests in learning and/or communications processes, and certain types of computer specialists whose interests lie in the area of programming of generalized information retrieval programs.

These types of individuals will help in two directions: They will bring more insight into the scope of overall information retrieval problems, will aid in the development of a generalized classification procedure, and will focus on specific problems to assure the applicability of their systems for biology and for information retrieval.

One of the most important features needed for such research procedures is that representatives of the different disciplines be placed in close proximity with a common goal. If such an environment can be created, then communication problems are cut to a minimum; and a greater potential for successful output can be developed.

These statements briefly summarize our interests, procedures, and aspirations. There are many points needing greater emphasis and more detailed information. I will be glad to furnish any information that may help make these statements more understandable. I hope, however, that you can make some headway with this. I will be glad to hear from you.

Sincerely yours,

David J. Rogers, Professor
Department of Botany and
Plant Pathology

Taxonomy Lab.
April 21, 1966

Dr. William C. Steere
The New York Botanical Garden
Bronx, New York

Dear Bill:

Perhaps the generalities in the enclosed paper will be grist for the mill. I put it together as an opening wedge for a grant to do some work, but there may be something useful in it for you.

I was glad to have a chance to hear of your meeting, and further developments on information retrieval on a national level. It was also pleasing to know of Mr. Harding's interest in this type of thing.

The ride out to the airport was much appreciated. Hope you and Dorothy can stop by to see us. We'd love to have you.

Sincerely,

David J. Rogers
Professor of Botany

- Taxonomy Laboratory

April 20, 1966

Control Data Corporation
Data Centers Division
P.O. Box 9817
Chicago, Ill. 60690

Gentlemen:

Enclosed is a copy of invoice No. 500687, for $452.30. We have not paid this in hopes that some clarification would be made by this time. Since it has not been straightened out, let me review the situation.

We have had no computing done, no programming, or other charges to us since December, 1965. At that time, we received, and paid invoice No. B8935D, month of December. The following data from that invoice is as follows: Project D12413, Area 3004, Customer No. 4675, Tax 300. The total bill was $516.00.

I hope you will be able to review and correct this situation.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

Enc.

Department of Botany and Plant Pathology
Taxonomy Laboratory
April 20, 1966

TO WHOM IT MAY CONCERN:

Please allow Mrs. Cleo Hepworth to pick up books from the Colorado State University Library for our use.

Dr. David J. Rogers

- Taxonomy Laboratory

April 19, 1966

Mr. Hal Williams
Graduate School Computer Center
University of Colorado
Boulder, Colorado

Dear Mr. Williams:

A situation arose on the enclosed job 12409 which seems to be exactly like the one encountered recently on job 11069--that is, the run was terminated as the result of what seems to be an operator error in positioning tape 4.

I refer you to the enclosed Memory Map from job 12409. We are in the process of checking out decks PINE through ELM. We run decks CALDEK through TEMP in order to generate input to PINE. You may remember checking these source programs last time this occurred to see if tape 4 was properly handled and you concluded that all was well with the program, especially since it has run a considerable number of times with this data. Your conclusion was that the operator did not reset the tape after a read error and consequently you did not charge us for the job. I think you will probably draw the same conclusion again and I hope that you will handle it the same way.

If you would like to see the source program listings for decks CALDEK through TEMP or any other documents that I can provide, I will be glad to send them to you.

Sincerely,

Robert C. Brill

RCB:chh

Enc.

cc: Dr. D. J. Rogers

- Taxonomy Laboratory

April 15, 1966

Mr. Harold K. Voris
Division of Reptiles
Chicago Natural History Museum
Roosevelt Road and Lake Shore Drive
Chicago, Illinois 60605

Dear Harold:

Some time has passed since our discussions this past January. I am very interested in the progress that you have made on your problem since that time. Perhaps you would care to send me a copy of the characters and states which you have established for the description of your snakes, together with any problems that might have arisen since our last meeting. In this way we might be able to expedite your work and conceivably get a preliminary run on the computer before I leave for Mexico this June. Otherwise, this initial step must be put off until late summer.

I look forward to hearing from you soon.

Yours very truly,

George F. Estabrook

GFE:ch

— Taxonomy Laboratory

April 6, 1966

Dr. T. H. Barkley
Department of Botany
Kansas State University
Manhattan, Kansas

Dear Ted:

Enclosed is a letter and application form to Voeltz. Most of it is self-explanatory. This institution is not overly loaded with assistantship monies, and it is so late in the season that most application places for graduate assistance are closed. I suggest that you read the letter to Voeltz because it gives some types of advice which might seem to be a compromising of ideals in the mind of a young and impressionable graduate student, and it may not be understood by him what I am trying to get across, namely, that in this cold, cruel world we cannot be as idealistic as we might like to be. So if you will read the letter anc help Voeltz interpret my meaning, it might fly better with him. I hope we can get this done in a big hurry and maybe you will need to give him some help!

Best of all,

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

enc.

Madison Copy

• Botany Laboratory

April 6, 1966

Mr. Richard E. Voeltz
Department of Botany
Kansas State University
Manhattan, Kansas

Dear Mr. Voeltz:

Ted Barkley recently called to tell me of your interest in pursuing Ph.D. graduate work here with me. From his recommendation, I can say that I will be glad to have you. Because of the shortage of funds for teaching assistanceships in this department this year, I am forwarding an application blank for the National Institutes of Health for you to fill out and send back to me. Unfortunately, deadlines for NSF fellowships have passed, and this enclosed set of applications is the only one still open for the coming school year. I have no funds in my own budget which might tide you over, but expect that I will be after such funds shortly.

There are several places in the enclosed application form that you will probably need some advice to fill in. I will give you my suggestions, and hope that you can proceed from them through the complete form. It is a big job, but I hope one that will pay off.

First of all, recall that the goal in NIH is some health-related problem., and that you must "give the devil his due." This means merely, that when you get to page three of the application form, item 31, that you bend your discussion of career goals towards health-oriented type words. As a suggestion, think of your interest in the systematics of cultivated plants as being oriented to the discovery of better systems to help understanding of problems in better supplies of important food substances (or drug plants, or other such things for health). You can say that man is still dependent on plant materials for the major elements in his diet, and that in this connection, some of the most poorly classified organisms are those upon which man is most dependent. You can further point yourself at work in this particular institution because you realize that to accomplish the classificatory job with the cultivated plants, the proper use of the computer in classification is an absolute "must"--that to understand the use of the computer, you must turn your energies and interests to the areas which undergird the proper use of these complex machines.

You can further point out that there are very few institutions where instruction is given for plant taxonomists in the use of computers in classification--indeed no other botany school in the country is offering courses which leads to proper understanding of your role as a systematic biologist in using the machinery. You can "wave the flag" for your choice of schools--here at CSU is the only group known to you where a large scale effort is being made in the basic research underlying proper application of computers to biological classification.

What has been said above will help when you summarize your scientific and/or research experience in item 32.

You will not need to fill in anything in item 33.

Item 34. Again, keep the health-orientation in mind. Courses needed will probably be in the areas of some of the modern algebras, in Graph Theory, in Linear Algebras, Boolean algebra, mathematical probability, with perhaps one or two statistics courses (unless you have these already). In the botany department, you will want to take our courses in introduction to taximetric methods, cluster analytic methods, character and pattern analysis, methods of information retrieval in the biological sciences, and advanced, individual courses in methodologies for computer taxonomy. You will want to take Dr. Ward's courses for ecologists in computer-oriented ecological methods, etc. It will be well to take a course in modern analytic methods for chemotaxonomy--thin-layer chromatography, gas chromatographic methods, etc., in courses labelled as biochemistry.

These courses are suggested to bolster your position with the NIH, which looks with favor upon such courses, particularly when you orient them to health-related problems and (as background) to your major interest in computer systematics. (Note that I use "systematics" and "taxonomy" as synonymous). Perhaps you will be better advised ton use the word systematics rather than taxonomy as much as you can. Somehow, systematics sounds more "scientific" than plain old-fashioned taxonomy.

For your research interest, you can say that you want to work in problems of objective character (or pattern) analysis. I suggest that this is one of the most difficult areas for any taxonomist--what is a character, how do you establish them "objectively", etc. This is a problem whether you are working in disease diagnosis or making a classification of plants. You may wish to indicate that you chose the computer classification of plants, rather than work in diagnosis because you recognize the close similarity of one to the other, and that because we are working at a very basic level of biology, that plant material gives you a better research tool than will diseased humans or animals. The plants won't die on you (or get well) and leave you without any very good method to refer back to some set of documenting materials for the goodness of your results.

As a taxonomist, you probably already realize the importance of words. Remember that you must use the "in" words in science today to make the reviewers of your application know that you are really at the forefront of science, rather than stuck back in the 19th century with "orthodox" or "classical" taxonomy. In this field, some of the words that attract attention are " pattern recognition" (= character selection), "information retrieval" (= diagnostic keys) , "data correlation" (= discovery of key characters), "hierarchical clustering" (= construction of categories in monographs, floras), etc., etc.

You are asked in item 34 to give special emphasis to any research in which you will participate. I do not remember what Ted said about your particular plant group, but do I recall Ribes? May I ask if you expect to continue with this group? Can you change, or would you be interested in changing? I can suggest one or two good groups with drug potential which might be more of a health-type oriented group. But were I you, I would stress methodology as much as the anticipated output. That is, how to discover the best means of data correlation between such disparate pieces of information as external morphology, biochemical data, and other types of information from cytology or genetics. You may wish to think in terms of fine-structure anatomy, using the electron microscope, etc.

There are a few other pointers which may aid in getting this thing through. In the part where you must select four people as references, you will note that they ask for statements about "health-relatedness." Pick your references very carefully for two reasons: (1) they must not, under any circumstances, be adversely critical of computer taxonomy (and there are more critical than admiring), and (2) they should be a range of different disciplines besides purely botanical (but obviously, should include Barkley).

Now, with all this, please remember that we are still interested in plant taxonomy. All we are attempting here is to show how to be a successful "grantsman." You obviously cannot compromise yourself, but at the same time, remember that the readers of your application have their own ideals and goals, and you should phrase your statements so that they, too, can understand some of the reasons and importance for doing what you want to do.

You should get right to work on this--and return it to me as soon as you can. We think that the deadline for September awards has actually passed, but that, with a covering letter, they will consider late applications. What you should do is get your requests for recommendations out right away, then fill in the blue copy only. We will have the other copies filled in by our secretaries from your blue copy.

Wherever your signature is required, you should sign the forms that are to be submitted, but otherwise, do not fill out anything else on those forms that will be submitted.

You will probably have other questions about filling out the form. If you do, call me. Do not wait on the mails.

Incidentally, the stipend is $2,800.00 annually, with no costs to you for tuition. If you have dependents, they get additional monies.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

Enc.

- Taxonomy Laboratory

May 24, 1966

Dr. Richard W. Holm, Editor
EVOLUTION
Division of Systematic Biology
Stanford University
Stanford, California 94305

Dear Dick:

In EVOLUTION 19:311-326, 1965, Camin and Sokal published a paper "A method for deducing branching sequences in phylogeny." The following is a quote from that paper: "An analytical mathematical solution which would give the single-most parsimonious cladogram is a difficult mathematical problem."

We have a solution to a somewhat more general problem (which contains the problem in question), and have found, as pointed out by Camin and Sokal, that it is indeed nontrivial. We feel that this work contributes much to the theoretical basis of numerical phylogenetic studies, and should be published.

Our difficulty, however, lies in the fact that the solution and its discussion is rather mathematical in nature, and we fear that it would be difficult for some biologists to read and understand the arguments easily. It would seem appropriate to continue the discussions of this phylogeny problem in your journal, but we are not certain that the mathematical exposition will be acceptable to you or to the readers of EVOLUTION. Would you be kind enough to let us know your own reactions to the publication of such a paper?

I recognize that you cannot judge in advance precisely what we have in mind without seeing the paper, so we have included a sample (few pages) of one of the preliminary manuscripts for your examination. This is, of course, in rough draft, not the finished product. I hope this sample gives you sufficient insight into the nature of the paper and what it will contain.

I'll be glad to have your comments.

Best regards,

David J. Rogers
Professor of Botany

DJR:ch
Enc.

I. Introduction

Camin and Sokal (1965) present a mathematical analogue which serves to define very precisely one interpretation of the problem of inducing the evolutionary history for some particular collection of organisms (or collection of collections of organisms). Where as this work excellently formulates a difficult problem with the objective precision necessary for its unambiguous discussion, it does not provide a solution. Concerning the actual discovery of these desired evolutionary histories, these are the author's words: "An analytical mathematical solution which would give the single most parsimonious cladogram is a difficult problem." (p. 235). The problem suggested to me a somewhat more general formulation. The discussion to follow describes this generalization and presents the solution for which the quoted authors call.

II. General Formulation of the Problem

Definition 1, CHARACTER. A character is a finite collection of states together with a relation $\prec$ which has the following properties:

i. Not both $a \prec b$ and $b \prec a$.

ii. There is a unique state, 0, for which no other state satisfies $a \prec 0$.

iii. $a \prec b$ and $c \prec b$ implies $a = c$.

iv. $a \prec b$ implies $a \neq b$.

Biological note: A character corresponds to some feature of the organisms under study. The states of the character are in correspondence with possible descriptions of that feature.

For each organism under study and for each character, a unique state of that character can be associated with that organism. The relation $\prec$ describes how the states of a character are thought to have evolved. The state, 0, (definition 1:ii) is the primitive state for the character. The relation $\prec$ can be read as "immediately ancestoral to."

Definition 2, UNIVERSE, U. For some specified collection of N characters (identified as characters 1 through N), the universe will be the collection of all ordered N-tuples where the i^{th} entry is some state of the i^{th} character. If $p \in U$ then p can also be noted as $(p_1, p_2, .. p_i .. p_N)$.

Biological note: The universe can be thought of as the set of all distinct organisms describable and distinguishable by means of the N characters in question. Many of the points in the universe may not exist in reality. In general, a subset of the universe (called hereafter the study) will correspond with the specific collection of organisms (or collection of collections of organisms) whose evolutionary history is under study.

Definition 3, the relation A. (A should be read "is ancestoral to") A is defined for the set U. pAq if for $i = 1 \ldots N$ either

i. $p_i = q_i$ or

ii. $p_i \prec q_i$ or

iii. there exists a sequence of states in character i, $s_1, s_2 \ldots s_j$, such that $p_i \prec s_1$ and $s_1 \prec s_2$ and so forth until $s_j \prec q_i$.

Biological note: Whenever $p\underline{A}q$ then it is possible for organism q to have evolved (according to the characters) from organism p and conversely.

Mathematical note: $\underline{A}$ is reflexive, i.e., always $p\underline{A}p$.

$\underline{A}$ is antisymetric, i.e., $p\underline{A}q$ and $q\underline{A}p$ only if $p = q$.

$\underline{A}$ is transitive, i.e., $p\underline{A}q$ and $q\underline{A}r$ implies $p\underline{A}r$.

Convention: Whenever $\forall q \varepsilon Q$ $p\underline{A}q$ we will write $p\underline{A}Q$.

Theorem 1. There exists a unique function $\underline{RA}$ from the subsets of U to the members of U defined as follows:

For $S \subset U$ RA(S) will be called the recent ancestor of S.

i. $p \varepsilon S \rightarrow \underline{RA}(S)\underline{A}p$.

ii. If $\forall p \varepsilon S$ $q\underline{A}p$ then $q\underline{ARA}(S)$.

Proof:

a. At least one point, $\underline{RA}(S)$, exists which satisfies i.

b. Consider the subset of points which are ancestoral to no other member of the set of points satisfying i. This subset must contain at least one member as the relation $\prec$ is antisymetric. If it contained exactly one member, then it contains more than one member. Let p and q be two members of this subset. For any member s of S and for any character (call it the i^{th} one), there must exist two sequences of states in character i, call them $a_1, a_2, \ldots, a_j$ and $b_1, b_2, \ldots, b_k$ such that:

- Taxonomy Laboratory

May 26, 1966

Commercial Paper Corp.
300 Brannan St.
San Francisco, California 94107

Gentlemen:

I would appreciate it if you would check upon the receipt and filling of purchase order number F-13563 dated May 18 from Colorado State University. I trust that you can expedite the delivery of this order. Thank you for your attention.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 25, 1966

Mr. Homer N. Metcalf
c/o Rancho Santa Ana Botanic Garden
1500 N. College Ave.
Claremont, California 91711

Dear Homer:

I am answering your letter in lieu of Dave. We have the bug out of the internal connections. It was minor, but one never knows until the program actually runs correctly.

I have been waivering back and forth as to whether or not to have the data run again and obtain the correct internals or to wait and see if you want to alter some of the characters. My present feeling is to run it now and get a new printout. If you are inclined to the contrary, let me know by return mail. Your old print-out is being mailed to you.

Also let me know if you expect to return to Montana by way of Denver on or about the 22 of June. Dave and the boys will be away to Mexico, but I will be here. If you come, arrange to stay with us at Loveland for as long as you wish.

C. Jorgenson (Hort. Dept., at dinner with us the first time you visited) stopped by the house last night and said your Iris was in bloom in front of the Student Center.

Dave says that you don't owe anything (we'll let him starve a bit searching for Manihot or eat the specimens). However, we earnestly hope that we can get a joint paper out with you on the Iris study.

Best of luck on the "prelims" and waiting to hear from you.

Sincerely,

Henry S. Fleming
Professor of Botany

HSF:ch

- Taxonomy Laboratory

May 25, 1966

Dr. Rowena Swanson
Information Sciences
Department of the Air Force
Air Force Office of Scientific Research (OAR)
Washington, D.C. 20333

Dear Dr. Swanson:

Thank you for your prompt reply to my preliminary and general letter of 26 April. You have come precisely to the point in trying to determine our needs. In as much as these needs are at the moment only very generally known, even to us, I am going to take some time to prepare my real answer to your letter.

Now that I know that I have struck a responsive note with you, it behooves me to prepare a statement which has meaning all the way through. I also know that we will have to be rather precise in our definitions of requirements. Frankly, our most pressing need is for hands and not for hardware. Generally, the hardware that will be useful is available to us. I am not sure how long it will take us to prepare the precise statements required, but it probably will take at least a couple of months. So if you don't hear from us right away, it is not because of lack of interest—we are still doing our homework.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 25, 1966

Wenner-Gren Foundation
For Anthropological Research
14 E. 71st St.
New York, N.Y. 10021

Gentlemen:

I have been invited to participate in the XXXVIIth International Congress of Americanists to be held in Argentina. Specifically, I have been invited to participate in the Symposium on Ethnobotany of the Americas. The organizer of this symposium, Ing. Agr. Julian Camara-Hernandez, invited me on the 26th of February.

This invitation came too late for me to formally apply to the National Science Foundation for assistance in travel funds. I wonder if it is possible to apply to you for travel monies for this particular congress?

I realize that it is very late, and I am sorry that I was not aware of any deadlines.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 25, 1966

Division of Behavioral Sciences
National Academy of Sciences-National Research Council
2101 Constitution Ave.
Washington, D.C. 20418

Gentlemen:

I have been invited to participate in the XXXVIIth International Congress of Americanists to be held in Argentina. Specifically, I have been invited to participate in the Symposium on Ethnobotany of the Americas. The organizer of this symposium, Ing. Agr. Julian Camara-Hernandez, invited me on the 26th of February.

This invitation came too late for me to formally apply to the National Science Foundation for assistance in travel funds. I wonder if it is possible to apply to you for travel monies for this particular congress?

I realize that it is very late, and I am sorry that I was not aware of any deadlines.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 25, 1966

Dr. William C. Steere
The New York Botanical Garden
Bronx Park
Bronx, New York 10458

Dear Bill:

Thanks for your suggestion that I attempt to get on the committee for the use of electronic computers in the life sciences. I looked up the names of the men whom you listed and discovered that not only did I not know any of these fellows except by name, but I also discovered there wasn't a real biologist in the "classical sense" listed amongst them. Surely we need someone to represent these areas. I'll see what I can do. Thanks again.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 25, 1966

Professor C. J. Hickman
Department of Botany
The University of Western Ontario
London, Canada

Dear Professor Hickman:

I am sorry I have not responded to your letter of the 29th of April requesting assistance for finding a second taxonomist in your department. Unfortunately, the number of people trained these days in numerical taxonomy is very limited. We are doing our best here at Colorado State University to correct this situation, but it will take some years before we will have any person whom we will be confident enough to recommend in this area. I am sorry that I have no suggestions for you.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 23, 1966

Dr. William T. Stearn
Department of Botany
British Museum (Natural History)
Cromwell Road
London, S.W. 7, England

Dear Dr. Stearn:

Since some time has passed since we returned the results of our computer analysis of Oplonia, I wonder if you have any comments to make upon this subject?

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 23, 1966

Dr. Clark T. Rogerson, Editor
Memoirs of the New York Botanical Garden
New York Botanical Garden
Bronx Park
Bronx, New York 10458

Dear Clark:

I have just looked over the copy of the paper by Howard and me and discovered that I do not have the Lit. Cit. either. As a matter of fact, I probably do not have the final draft as sent to you, so I am out of luck in even answering the question you asked about the cites of Rogers and Fleming (196_) supposedly on page 9. Page 9 of my copy has nothing to do with anything of Rogers and Fleming. It might be profitable if you could send me a Xerox copy of the manuscript as you have it (or at least that portion where there is talk about the computer).

Sorry not to be any help on this. I know it will take some time to communicate with Howard. It might be profitable to ask Ean Prance to see whether he has a copy of the final m.s.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 23, 1966

Dr. P. F. Knowles
Agronomy Department
College of Agriculture
Agricultural Experiment Station
University of California
Davis, California

Dear Paul:

Let's arrange to meet in Pullman on Monday, July 18. Tell me where I should go when I get there. I'll stick around with you long enough to aid in setting up the data for computing. This might give us a chance also to talk to S. M. Dietz on his retrieval system.

Looking forward to seeing you then.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

May 20, 1966

Dr. George S. Bass
301 East 66th Street
New York, N.Y.

Dear George:

Thanks for your offer to help out with the Brazilian trip. Unfortunately, it is so close to the time that I had to cancel out earlier. However, let us think a little bit ahead. I have another invitation to appear at a South American symposium in September. Would it be possible to get together with you in September? This might be more appropriate. Let me know how this grabs you.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 17, 1966

Dr. Howard Irwin
Department of Botany
Universidide de Brasilia
Brasilia, F.D., Brazil

Dear Howard:

I am very pleased to have received last week two packets of Manihot. We have already put these into germinating chambers and hope that they will become growing plants some day. All the people I have talked to seem to be quite ignorant about the requirements for germinating of Manihot seeds. We will go on the assumption that Manihot will not be too different from castor-oil seeds. Here is hoping.

At any rate, I am very pleased to have these. I wish I had seeds of all my plants because there seems to be some excellent characters in them. Unfortunately, a very small percentage of the specimens have them.

Life continues to be pleasant here in Colorado. Spring has come and at least on the foothills there is a marvelous spring flora. I must admit that it takes a bit of adjustment after experiencing the spring in the mesic conditions of the East. Perhaps the thing that impresses me is this difference. I don't know whether I told you that we have bought a house that overlooks a lake and the mountains. The lake, to be sure, is an impounded reservoir, but so what, it has water in it! We now have as a second car a jeep with which to get to places we may not otherwise be willing to take our Chevy. This makes for good field work.

I am planning a little 3-week trip down into northwestern Mexico this summer to fill out some holes in Manihot distribution and types of variation to be found in that area. Being continually optimistic, I am hoping that this will give me the knowledge that I need to finish off the monograph of the genus.

I recently had a post card from Bob Breach saying that the grant for publication of our paper has been approved and that it should make the memoirs this summer. I will certainly be glad to see that paper published.

Our computer work goes on apace. Most of this year has been recouping and rewriting of our programs. As you might expect, we had trouble in getting to the right machine and getting the right machine to speak our

language. When we came we had high hopes that we could use a computer in Los Angeles to which we were tied by a teleprocessing line. This has proved to be not at all satisfactory and we have settled on the use of an IBM 7044 which has much the same capacity as the 7094 but just a little slower. This machine is on the campus of the University of Colorado at Boulder, and we have to commute back and forth to use it. While this is an inconvenience, we are glad to put up with it because we have found the people who run these 7044 to be extremely helpful and knowledgeable.

I am teaching a course in taximetrics this quarter. I think it is very exciting and that the students who have been exposed to it will not be the same as other groups of taxonomists. Two of the students have shown very good progress in understanding what we are attempting to do, and I hope that they will continue as taxonomists.

I spent a day at NYBG last month and saw most of the people there. It still looks like the same place, and I still get the same feeling I had while there. That is, McGuire is still the same character and all the rest are the same with their problems with McGuire. I was pleased to find that Prance is now more independent and will pursue his interests in Brazil next year.

Give my best to Mary and the kids. I hope your work progresses according to your expectations and that local politics haven't bugged you too much.

Best regards,

David J. Rogers

May 16, 1966

Dr. F. A. Stafleu
106 Lange Nieuwstraat
Utrecht, Netherlands

Dear Dr. Stafleu:

I wish to congratulate you on the sensitive, accurate and appreciative review of the publication "Authors of plant genera" by Gould. Yours is a much more objective attitude than the more frequent emotion-filled reactions we have come to fear when we say anything about computers for taxonomy.

There are a few observations I should like to place before you, however, for there are still many misunderstandings involved that we as taxonomists must overcome before we can really put the complex devices generally known as electronic data processing machinery (EDP) to work. I think that I am somewhat qualified to make the following comments, having been deeply immersed in this type work for some eight years. In this time, we (I speak of myself, my assistants Henry Fleming, George Estabrook and Robert Brill) have made much progress from complete naivete to something of a sophistication relative to computers not to be found in the large body of taxonomic scientists.

First of all, there must be a clear understanding of the various devices which generally, mistakenly, get lumped together under the term "computer." There are many levels of complexity of the machinery. There are less complex devices which will punch cards, sort the cards, rearrange the data contained on the cards, and print the information contained on the cards in any specified manner. These types of devices are so-called "peripheral" machinery to the main computer: They are the hand-maidens to the central machine. They are frequently designated as automatic data processing (ADP) machines, and as the designation implies, process the input data, but seldom do any computation on the data. The methods of directing these devices are quite simple, much as an automatic loom is directed with a Holerith system to weave certain patterns of cloth. These ADP devices have been used exclusively by Gould in his work. In a real sense, Mr. Gould has never used a computer. As a result, he has had to limit his format and capability to the capacity of these essentially limited devices. These devices cannot cope with the variable word length of botanical epithets, largely because the set of instructions which the peripheral equipment can follow is extremely limited. It is unfortunate that Mr. Gould

has not recognized these shortcomings, and furthermore, has done nothing to remedy the situation. He is not only limited in his knowledge of the biological problems, but is, as well, limited in his knowledge of computers.

Second, if we are to achieve any sort of acceptable application of the computers, we must resort to the "main frame" of the computer, the device where most of the excitement of the computer is. The major advantages of computers are their extreme speed and accuracy, but these are available to us only because of the concept of a stored program. The stored program is a set of predetermined instructions which directs the action to be taken by the computer on our biological data. Even with the computer, we are not requesting computation to be done with names, authors and bibliographies, but we want to have sufficient flexibility to permit us to see the results of computer manipulation in a usable fashion, without resort to standardization on an artificial basis. With the stored program, such flexibility is available because the stored program is first established by biologically knowledgeable people in collaboration with computer programmers.

Our own naivete has unfortunately led to such as Mr. Gould's stepping into the picture. I hope that we can forget this infortunate episode. I trust that taxonomists will not continue fighting against something that is not worth their efforts to fight against. The best treatment (though I do not advocate this because of a desire to hurt the individual) is to totally ignore the man and his work.

We must get on with efforts to apply these marvelous devices, but we must recognize that we are the masters, the directors, and not the machine. Our fear of machine direction is fear based on ignorance, and this is not tolerable if we are to call ourselves scientists.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 16, 1966

Dr. Harold C. Conklin
Department of Anthropology
Yale University
New Haven, Connecticut

Dear Hal:

See if you can help me. I have been invited to prepare a paper on new world enthnobotany at the International Meeting of the Americanists in Buenois Aires next September. Unfortunately, because I am not on the list for receiving anthropological news notices, I did not know the deadline for applying to the National Science Foundation for travel money. This deadline was March 1.

Where can I go for funds? Does the Werner-Grenn Foundation support this sort of thing? Let me know as soon as you know of any suggestions you have.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 16, 1966

Mr. Sammie Sides
Department of Biology
Pan American College
Edinburg, Texas

Dear Mr. Sides:

Mr. Earl Camp of Texas Tech was kind enough to recommend that we write to you. In my monographic studies of the genus Manihot, one intriguing species, described as Manihot walkerae, has a very few number of collections. The only localities that we know of are along the Rio Grande, one at Mission, Texas and the other at LaJoya. These old collections, unfortunately, gave little, if any, data about these particular plants.

I wonder if I may trouble you to discover if you have any specimens of these plants already collected, or if you are familiar with them. From the material I have, it seems that the plants are about one to two feet tall. They probably grow rather sporadically. They grow from a tuberous root. Other than this I can't really describe much about them.

If you or your students have an opportunity to be in the field in the area near where these earlier collections were made and have an opportunity to dig up a plant, I would very much appreciate the opportunity to see them and to have at least a root or two such that I may cultivate them here in our greenhouses.

Incidentally, it may be that another name given to the species is M. angustilobia. You might even find this plant listed as Janipha. It is not certain in my mind how the plants might be identified in your local flora.

Whatever you may be able to help me with in this direction, will be very much appreciated.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 16, 1966

Mr. Robert R. Gulick
BioSciences Information Service
3815 Walnut Street
Philadelphia, Pa. 19104

Dear Bob:

Thank you very much for sending the little booklet on "How to use biological abstracts" plus the big yellow sheet of the subject classification outline. I am sure that many folk do not fully benefit from all the various ways that you have organized the literature for searching.

I am sending along herewith a couple of statements that I have made that I thought you might be interested in. We hope to use our classificatory methods and discover better means of classifying information for rapid retrieval. This is not to say that what you folks have done is not a good job. What I am suggesting is that we probably need to take a new look at the classification of the subject material in biology, and perhaps if we can get a new look at it, we may even shift some of our categories of classification. If this be the case using some sort of procedure such as we dimly outline in the enclosed statements, we may come to some more fruitful methodology. As you will see from the enclosed booklets, we are interested in trying to discover methodologies more than the actual output.

As you might suspect, these are preliminary words to be used in the going after grants from the National Science Foundation. I will be interested to know what comments you have about the papers included. I will be interested to have any reactions that you wish to share with me. I have already sent copies of this to Bill Steere and to people in the National Academy of Sciences who seem to have something to do with this new committee. I hope that this will stir something, and at least give us a chance to get going on an interesting project.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

Enc.

- Taxonomy Laboratory

May 16, 1966

Dr. Robert L. Dressler
Associacao De Biologia Tropical
Oficina Central
Museu Nacional
Quinta Da Boa Vista
Rio De Janeiro, GB
Brazil

Dear Bob:

I am sorry that I will not be able to participate in the Belem symposium. Time and funds just do not permit, even with the generous assistance now being offered. I wish you the best of luck for an outstanding meeting, and hope you will continue as director of ATB.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

May 13, 1966

Harold Voris
Division of Reptiles
Chicago Natural History Museum
Chicago, Illinois 60605

Dear Arnold:

It is a pleasure to learn of the continuing computing machine applications to biology. I am sure we would be able to make a number of computor runs with different codings if you think it would be profitable. The detailed description of character coding is presently being prpared for publication and we would be interested in seeing the resuts of different codings. Changing computers, is indeed a major processin some instances. There is no question but what it is desirable to run your data here with us.

I leave for Mexico June 2, 1966. You have three weeks to get me data. The theoretical limits of our programs are 750 objects, 120 characters, 31 characters states per character. However, I strongly (very strongly) advise that you try to keep the objects below 200 or so for two reasons. 1. Machine time varies roughly with the square of the number of objects and 2. your own ability to make sense from the output i.e. organize the computer results in a way meningful to you in most cases seems to vary inversely with roughly the cube of the number of objects. Feel free to use up to the maximum 120 characters if you wish although I suggest that unless something very unusual is being described the number of states be kept below 7 or 8 or so.

I will expect to receive data from you soon.

Very truly yours,

George Estbrook

GE:cr

May 10, 1966

Mr. G. H. Kisbany
ONR Representative
Office of Naval Research, New York
207 West 24th St.
New York, N.Y. 10011

Dear Mr. Kisbany:

Enclosed find 4 copies of DD form 1473, for final report on contract Nonr 3640(00).

I trust that this completes the necessary information.

Sincerely yours,

David J. Rogers
Professor of Botany

Encl.

May 10, 1966

Mr. R. F. Kokkebeck
New York Botanical Garden
Bronx, New York

Dear Bob:

Enclosed is your copy of the DD form 1473, requested to go with the final technical report to the ONR for contract Nonr 3640(00). I hope this is the end, but I'm sure the thing will drag on for more stupid papers for another six months.

Sorry to cause all this trouble in collecting the money. Hope this does it.

Sincerely,

David J. Rogers

Encl.

May 9, 1966

Dr. Jose de Js. Jimenez
Calle Maximo Gomez 34
Santiago de los Caballeros
Republica Dominicana

Dear Dr. Jimenez:

Please forgive my long delay in answering your letter of March 9th. I have made no final decision regarding the herbarium name Manihot domingensis, but I fear that it will not be kept as a separate species. I am of the opinion that these plants belong to a complex of species with wide and sporadic distribution, of which the plants from Samana form the northernmost extension. The oldest valid name for the species is M. brachyloba, described by Mueller von Argau in Flora Brasiliensis. Muell. Arg.'s plants came from the state of Para, in Brazil, but his specimens and descriptions fits the plants from Samana very well.

Perhaps the plants from the Dominican Republic will stand as a subspecies of M. brachyloba, but I have not yet made a final decision in this respect. At any rate, I shall be certain to inform you when I have made the appropriate decision.

With respect to your question concerning Quantitative Taxonomy, I fear that you will find it difficult to locate any descriptive work in this area precisely defined as Quantitative Taxonomy. There are, however, many papers which essentially deal with this area although not under these terms. You will find references to "numerical taxonomy," to "taximetrics" and other similar terms. I am enclosing a reprint which will give you some ideas about what is intended by these terms. We are attempting to discover means by which we can make the science of taxonomy more precise. We must do this if we are to use the computational devices known as computers to aid us in our studies. Computers do not think, but will follow a set of instructions given to it. If we want to determine a classification, with an appropriate set of instructions (written as a set of mathematical statements) we can put in the data about the plants, and get out of the computer a much more precise classification than we would have been able to, if we did not have the computers available to us.

In many genera and families, we have never achieved a good classification because of the complexity of the species. The genus Manihot

is a good example of a genus of plants that has never been well classified. We are attempting to use computers to aid us in the formation of a classification which can be useful to taxonomists. In Manihot, the species M. esculenta is one which is very difficult to classify because of its wide cultivation, and extreme variability. We hope the computer will aid us in making a good classification of this cultivated species.

This is the sense of the terms "quantitative taxonomy." It merely is a set of works for which many synonyms exist. I trust that this description is meaningful to you.

Very sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

Enc.

- Taxonomy Laboratory

May 9, 1966

Dr. Peter Abramoff
Department of Biology
Marquette University
530 North Fifteenth Street
Milwaukee, Wisconsin 53233

Dear Dr. Abramoff:

I am pleased to write in support of Dr. Richard Klein, a colleague and friend for eight years at the New York Botanical Garden.

There were opportunities to observe Dr. Klein in several capacities, as teacher, researcher, editor, and administrator. Dr. Klein seemed to attract excellent young people to work with him as graduate students or assistants. He worked equally well with male and female students, but his demand for precision, and adherence to his instructions seemed to be more acceptable to female than male students. He provided a very exciting general physiology course for outstanding senior high school students from the New York area in NSF-sponsored summer science programs that I administered. He could lecture to laymen on complex biological topics at just the right level to catch the students up in his enthusiasm without overpowering them with technical jargon. Thus, as a teacher, Dr. Klein performs at the top of the list, at several levels.

Dr. Klein's range of research interest constantly amazed me. He seemed to know the plant kingdom so intimately that he could pick just the right organism to elucidate some problem connected with plant function. He worked with organisms in nearly every phyllum, (or do you call them classes?) with outstanding success. His list of papers indicates that he carries through on most, if not all his projects. Recently, with Dr. Arthur Cronquist, he completed a very exhaustive study of the lower plants to try to elucidate a more modern evolutionary pathway for them. Their combined study included the classic morphology, integrated with modern fine structure studies, with biochemical and cytological informatinn, correlated for the purposes of establishing a more precise evolutionary tree. I am certain that the vast quantity of literature which the two of them evaluated for this study is the equivalent of several post-doctoral endeavors. This, then, leads me to recommend him highly as a person exceptionally well qualified to teach a course in the Biology of the Non-vascular Plants, at any level required. I might add parenthetically that Dr. Klein's wife has a Ph.D. from Chicago in microbiology, and that this gives Dr. Klein an advantage seldom available in one's spouse.

In an editorial capacity, Dr. Klein has had much varied experience. He and I are collaborating (as finders and editors) with the Natural History Press of Doubleday in a new set of works called the Plant Science Series. This series is intended to attract exceptionally interested high school biology students, their teachers, and laymen. The books in this series are invited, from the top workers in a particular specialty. The books now "in the mill" range from classical to modern biology of plants. Dr. Klein regularly assisted me when I was editor of Economic Botany, reviewing and editting works related to that subject. There are many other works in which Dr. Klein has had a hand through the editorial process, a process which in my mind is one of the most valuable (and thankless) tasks that any teacher or researcher could participate in.

Dr. Klein has been successful in grantsmanship with a wide variety of governmental and nongovernmental agencies. He has had influential positions in various scientific societies, and in all of these, he does an outstanding job.

With all this, I find Dr. Klein a very stimulating personal friend. I think you will do no better than put this man on your staff.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 5, 1966

Dr. C. E. Sunderlin
National Academy of Sciences
2101 Constitution Avenue
Washington, D.C. 20418

Dear Dr. Sunderlin:

Dr. Steere recently sent you a copy of a few of my ideas on combining biological classificatory procedures with information retrieval methods. I am forwarding to you one or two copes of the same paper plus another which has much of the same ideas but expressed somewhat differently. I hope you will find these useful.

Having spent some time in becoming acquainted with the basic problem, methodologies and applications of computers to biological classification, I am confident that we have something to offer to the overall problem of biological information retrieval. If more information along these lines is desired, and if more detail is required, we will be glad to answer any questions you might have.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

Enc.

cc: Dr. W. C. Steere

Taxonomy Laboratory

May 5, 1966

Dr. William C. Steere, Director
New York Botanical Garden
Bronx Park
Bronx, New York 10458

Dear Bill:

Thank you very much for sending my little blurb onto Dr. Sunderlin. Enclosed herewith is another copy for your files. In addition, there is another statement which does essentially the same thing with a few different words. If you feel that these two papers have any usefulness, I have had them both mimeographed and can supply the number you may wish. As a matter of fact, I will take the liberty of sending the second one of these write-ups to Dr. Sunderlin directly. As you say, I hope the seeds will sprout. Thanks again.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

Enc.

- Taxonomy Laboratory

May 5, 1966

Miss Lynn Lewis
Bennington College
Bennington, Vermont 05201

Dear Miss Lewis:

I am sorry I am not in a position to offer you summer work. We have moved to Colorado State University and there is nothing available.

Sincerely yours,

David J. Rogers

DJR:ch

- Taxonomy Laboratory

May 4, 1966

Professor H. N. Metcalf
c/o Rancho Santa Ana Botanic Garden
1500 N. College Ave.
Claremont, California 91711

Dear Homer:

We are remiss in not even responding to the receipt of your data. You have surmised correctly that we let pressing matters push out even post card acknowledgement.

We have looked at your data, it is in good order. We had questions about the possibility of ordering some of the states, but we feel that we can make some educated guesses about how to do it. I think that a good way to proceed is for us to make the appropriate statements about characters, run the data, and have available for you when you come (sometime at your convenience near May 16) a print out for you to examine. Then if we have goofed in our assessment of the characters and how they may be ordered, you will have the opportunity to straighten us out and get another run very quickly. Thanks for your patience. We hope this procedure will be useful, and we look forward to seeing you on whatever date near May 16 is best for you.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 4, 1966

Dr. Carl Moh
IICA Centro De Ensenanza E Investigacion
Turrialba, Costa Rica

Dear Dr. Moh:

The cuttings of the 3 cultivars of Manihot esculenta arrived in excellent condition yesterday. It is hard for me to tell you how much I appreciate your endeavors in this work. I hope that I may be of some assistance to you in the future.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

May 4, 1966

Dr. George W. Byers
Dept. of Entomology
310 Snow Hall
University of Kansas
Lawrence, Kansas 66045

Dear Dr. Byers:

Could you please tell me when we might expect the reprints of our paper entitled "A Graph Theory Model for Systematic Biology, with an Example of the Oncidiinae (Orchidaceae)"?

Thank you for your trouble.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 24, 1966

Registrar
The University of Adelaide
Adelaide, South Australia

Dear Sir:

This letter supports the application of Dr. R. C. Jancey for a position as Lecturer in Botany. Dr. Jancey worked in my laboratory for one year, from 1964 to 1965. While in this position, he assisted me in the systematic studies and computer analyses for the purposes of classification. In this position he was a willing and able worker. He seemed to be well instructed in the fundamentals of botany and had available to him most of the needed knowledge to proceed as an independent individual. Dr. Jancey had a certain reticence which at times was provoking, but more to the point the reticence was caused by his own lack of desire to "butt in" when he felt he should not.

Dr. Jancey's personality is outstanding. He is amiable and well adjusted. We were pleased to know him and his wife socially as well as officially in New York.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 24, 1966

Dr. Jerry S. Kidd
Program Director for
Special Projects Program
National Science Foundation
Washington, D.C. 20550

Dear Dr. Kidd:

In response to your letter of June 13, we will be very pleased to see you sometime in August. We would like to show you what is going on here, what our potentialities are, etc., and maybe even get a view of our mountains.

Would you be kind enough to suggest a date in August which might please you? We are hoping to have with us in the early part of August a man from the west coast who is collaborating with us on the establishment of our hoped-for universal compiler. If we could have this conference under our belt before your arrival, we will be a little bit farther along on our knowledge. Therefore, if you could come towards the last two weeks in August, this would probably be more satisfactory in terms of information from us than earlier in the month.

However, if this is inconvenient to you and an earlier date seems better, please do not hesitate.

I expect to be in northwestern Mexico for the first three weeks of July. If anything comes up in the meantime, my assistant Mr. Henry Fleming, at the same address, will be able to answer any questions that you may have.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 24, 1966

Dr. Robert S. Leisner
Editor, BioScience
3900 Wisconsin Ave. N.W.
Washington, D.C. 20016

Dear Bob:

Enclosed please find manuscript for publication as an article. I think it is sufficiently discursive to warrant that category. We will appreciate your consideration.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

Enc. manuscript (2 copies, one original and one carbon)

- Taxonomy Laboratory

June 20, 1966

Dr. William C. Steere
New York Botanical Garden
Bronx Park
Bronx, N. Y. 10458

Dear Bill:

With reference to your suggestion that I become a member of the National Academy of Sciences National Research Committee on the Use of Computers in the Life Sciences, I have the following report of activities going on. Bob Johnson on the staff here is a friend of John Olive. Bob asked John to see what he could do to help in this direction. John spoke to Russell Stevens of the National Academy and Russell Stevens seems to be aware of what I am doing. It may be possible that Russell will make the suggestion that I get on the committee, but it might not hurt a bit if sometime you could drop a word for me there too. I wrote Phyllis Parkins recently and asked her if she would mind putting a word in the right places at the same time. This may be possible, then, to push it from several angles.

I have looked at the outfit that you recommended to me, namely the Institute in Technical Industrial Communications to be held here. Most of the people it seems in this outfit are newspaper types or English types, and whether or not they have any suggestions in this connection or influence, I do not know. We will follow through on it.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 20, 1966

Dr. Wm. Bridge Cooke
1135 Wilshire Ct.
Cincinnati, Ohio 45230

Dear Dr. Cooke:

My home telephone number is 667-7286. The area code is 303 which covers the whole of Colorado. Since your time of arrival is indefinite, it is somewhat superfluous to give you my lab number but here it is anyhow--491-5326. Let the home number ring as we are likely to be out in the garden working. We live just north of Loveland on the only road going east and west north of Horseshoe Lake (a westerly adjunct of Boyd Lake). Horseshoe Lake is northeast by north of Loveland and the road is the first east west road north of Loveland city limits on the road 287 from Loveland to Fort Collins.

I'll alert Lawrence Durrell that you are likely to come through on the 4th p.m.

Motels should not be a problem between Loveland (your entrance town to Rocky Mountain National Park) and Fort Collins.

In the time available, we won't be able to do more than sketch out the program in broad outlines and give you some idea of what it does. The time will probably be best spent in dealing with the nature and manner of entering the taxonomic information into the computer for analysis. A list of your characters and character states as you have coded them will be far more pertinent to the discussions than your data cards.

Will be waiting upon your arrival.

Sincerely yours,

Henry S. Fleming
Professor of Botany

HSF:ch

- Taxonomy Laboratory

June 20, 1966

Dr. Julian Steyermark
Instituto Botanica
Apartado 2156
Caracas, Venezuela

Dear Julian:

We are starting up a long-term investigation which we hope to end up with a monograph of Cinchona. We hope to correlate the information from the various analyses of the bark which have been made and to put together geographic and typical taxonomic information. We will, of course, use our computers to help us in the analyses. In this project, I hope to hire a young taxonomist who has some knowledge of chemistry so that we can wrap up as many details as possible of the complicated group.

I know that there is much about this group of organisms and related ones about which you have a tremendous store of knowledge. For this reason we would be very much appreciative if you would act as consultant on this work. If you are willing to do this, would you please let me know your usual rates for consultation so that we may apply for funds to cover this in our grant request?

We are all very pleased to be here in Colorado and are enjoying our life very much. Things are much less hectic here than they were in New York. I hope things are going along well with you and Cora.

Very Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 20, 1966

Dr. Heber Youngkin, Jr.
Dean, College of Pharmacy
University of Rhode Island
Kingston, Rhode Island

Dear Heber:

Would you be willing to serve as a consultant on our Cinchona program? We feel that your advice along the pharmacognostic lines would be valuable in trying to correlate the interesting information about the alkaloid contents of these plants.

We are going to NIH for funds for just a classification of the genus. We will use pretty much the same argument on this application as we used in the army one. Let us know your usual rates for consulting. I will be glad to put it in.

Very sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 16, 1966

Graduate School Computer Center
University of Colorado
Boulder, Colorado

Attention: Mrs. Duff, Secretary

Re: Project Z030
Rogers, D. J.
Tax. Lab. Bot. Dept.
Colo. State Univ.
Ft. Collins, Colo.

Dear Mrs. Duff:

In response to your query concerning our remaining balance for computer time on 7044, we will use up the time already paid for, and then continue the charges. Thank you for your inquirey.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

MEMORANDUM

June 14, 1966

TO: Colorado State University Library
Attention: Mrs. Gilson
Circulation Librarian

FROM: David J. Rogers
Dept. of Botany and Plant Pathology, CSU

SUBJECT; Permission to sign books out in my name.

Mr. Robert C. Brill has permission to sign books out in my name. This permission expires December 31, 1966.

David J. Rogers
Professor of Botany

- Taxonomy Laboratory

June 14, 1966

Mr. L. J. Holland
President, Colorado Cactophiles
2082 S. Paseo Way
Denver, Colorado 80219

Dear Jack:

We were very surprised to hear that Edgar Sherman died. We had no idea that he was so ill.

On the other hand, it is very gratifying to hear that the Heacocks are "up and at it."

My office number at the University is 491-5326. Our number at home is 667-7286. The address: R.F.D. 1, Box 281 B, Loveland, Colo. You will notice from the address that we have moved. We have one area that we have been preparing that should make an ideal cactus garden.

We are very pleased to have heard from you and trust you are well.

Sincerely,

Henry S. Fleming
Professor of Botany

HSF:ch

- Taxonomy Laboratory

June 14, 1966

Miss Beryl Robichaud
Vice President
McGraw-Hill, Inc.
Hightstown, N.J. 08520

Dear Miss Robichaud:

Let me get some dates arranged with you before answering your various questions on the yellow violets.

We have had to shift our time for collecting in Mexico from this month til July, largely because our areas of interest receive rain during that month, and apparently no sooner. Therefore, to make our trip successful, we've had to change our earlier date projections. Does your time in Denver coincide with other activities there to such an extent that you could not delay your visit to, say, July 27-30? We plan to be back here on July 22, and therfore should be available from the 25th onward, but would like to have a few days leeway at the end of our trip, just in case we can't make it back on the stated date. I hope that you can make this rearrangement, because we are quite interested in your project, and want to help out, if we can.

We have discovered that there are many problems involved in readying classificatory data for successful computer runs. Some of these problems are quite subtle, and it is much easier to work them out on a face-to-face basis rather than try to do it by correspondence. So, if you can come on the dates indicated, we will all profit. Bring with you the full set of data, unless you have to have a small truck to carry them. Though you have read our paper in Systematic Zoology, there are other things about our procedures that you should appreciate. Explanation of these can be given during your visit.

Now, to answer specific questions on page 2 of your letter.

1. Yes, the computer has been used for intra-specific studies. This is my own particular problem (with Manihot esculenta), and our programs have shown much merit for such studies.

2. The programs have been designed to accept data of a much larger order than you have indicated has been collected for each violet specimen. The number of pieces of descriptive data for each specimen

is, practically speaking, unlimited. There are obviously theoretical upper bounds, but I do not think any botanist will ever approach the upper boundary.

3. Yes, hybridization will have some effect on the classification, but you can decide what classificatory categories (taxa) you wish to recognize much more readily with the results of a computer analysis than you could by any other means of data correlation. Let us be clear on one point, however. The print-out does not tell you what a particular cluster must be called (i.e., what hierarchical category you wish to assign it). This decision is the professional botanist's and no computer can abrogate it.

4. Our clustering program has a maximum number of objects (specimens) of about 720. Having made this flat statement, however, let me say that there may be ways to overcome this difficulty. First, there are probably many objects with identical descriptors. We have a small program to identify these, and could easily determine whether or not you could eliminate some of them from the study. Secondly, while you may feel that 1500 specimens is a minimum, it might be possible to restrict the number by using your own knowledge of the materials--it is likely that some of the objects lack considerable amounts of information--damaged, badly prepared, failure to include some pertinent data with specimen, etc. These specimens lacking information probably should not be included in the computer study, for lacking information is something the computer cannot do anything with or about.

Computer time is not the really critical element. Suppose with our program you use the computer for 3 hours. Average cost of such computation is $150.00/hour. $450 is not absolutely beyond reach for research projects, and this amount can be "found" somewhere. Print-out from 3 hours' run will keep you occupied for months in determining what interpretation you wish to make of it. I might say that we have never run over 230 objects in a single run. This run took about 45 minutes with a much less efficient program than is now running, so would reduce to not more than 20 minutes.

We have not ourselves attempted to do any ecological studies with our program. We are interested to see if there are possibilities, and how they will work, but since we have to depend upon the competence of others for know-how ecologically, we will not attempt to derive and use our own input. Working with those trained in ecology, however, we can suggest useful methods of data handling. There is a group of ecologists working for the Rocky Mountain Forest Experiment Station here, whose interest is in forest ecology, and who are attempting to work with our programs. Their efforts should be of interest to you.

In response to your last paragraph, I think there is definite profit in attempting to use our programs for your work. As earlier stated,

we need to get together to make the project successful. If you could somehow get the rain in the plain in Mexico to come a little earlier, we would have no problems. I hope you can rearrange your schedule.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 14, 1966

Mr. H. N. Metcalf
c/o Rancho Santa Ana Botanic Garden
1500 N. College Ave.
Claremont, California 91711

Dear Homer:

Congratulations! Will set a bottle aside for you in case you have sufficiently recovered to imbibe when you reach here.

Everybody will probably be on deck here when you arrive. The trip has been delayed to coincide with Manihot flowering time.

Saw I. missouriensis just north of Laos, N. M. about 3 weeks ago and think I saw some last Saturday at North Park (Walden) Colorado. (Last identification made at 60 miles per hour!)

Sincerely,

Henry S. Fleming
Professor of Botany

HSF:ch

- Taxonomy Laboratory

June 14, 1966

Dr. Richard Klein
New York Botanical Garden
Bronx Park
Bronx, N.Y. 10458

Dear Dick:

I like Gentile's manuscript very much and pretty much as is. I can see that the suggestions you have made are worth his consideration, but I frankly would go slow in making any major changes. I think that what we want in these books is pretty much what Art has furnished, and that while he may not have completely covered the water front, he surely has done it in a style which is readable and fascinating.

I think that in contrast Frank Salisbury tried to cover too much ground because he wanted to be sure that the story was complete. In so doing, he made the manuscript so long that it might be that a reader would say to himself, "I don't want to know that much about the flowering process," and not read through it. Gentile has left some unexplained facets to be sure, but in our audience is this a critical element?

Now I am getting to the monster written by a couple of characters by the name of Klein. The size of it is almost enough to make me a little afraid to get at it, but I will.

The latest thing on the chairmanship is that the three people so far looked at have turned the job down, and the administration has decided that they will look farther but let the problem lie for the summer. The other day I had a chance to put in another word for you "where the action is," so hang on if you can.

Best regards,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 14, 1966

Allen Press Incorporated
1041 New Hampshire St.
Lawrence, Kansas

Gentlemen:

Could you please tell me the status of reprint supplies for an article by Wirth, Estabrook, and Rogers entitled "A graph theory model for systematic biology, with an example for the Oncidiinae (Orchidaceae)" published in the first issue of Systematic Zoology? We would like to have these as soon as possible.

Sincerely yours,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 13, 1966

Dr. Phyllis V. Parkins
Director, Biological Abstracts
3815 Walnut Street
Philadelphia, Pennsylvania 19104

Dear Phyllis:

Bill Steere recommended recently that I make an effort to get onto the National Academy of Science's - National Research Council Committee on the Use of Electronic Computers in the Life Sciences. After looking over a list of the members of that committee, I highly agree that it should have representation from one of the members of biology for the more or less classical schools. As presently constituted, there are nothing but physicists and chemists on that committee, and apparently no member who represents taxonomy or ecology, or any of the "classical" parts of biology.

I wonder if there is any possibility of your putting a word in the right place to help out in getting me onto that committee? If there is any embarrassment about this to you, please do not hesitate to let me know, but I will certainly appreciate it if there is anything that you can do to put a word in the right place. Thank you very much.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 13, 1966

Dr. P. F. Knowles
Agronomy Department
University of California
Davis, California 95616

Dear Paul:

I have had to shift my work around because I had to be in Mexico to coincide with rains as they occur in the northwestern part of that country. This precludes any possibility of my coming to Pullman to be with you during that particular time.

However, Mr. Henry Fleming, my assistant, will be in Pullman on that date, and he and I will go over in detail whatever I know already about the project such that he will be able to assist you, perhaps in even more detail than I would be able to. I trust this is satisfactory to you.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 13, 1966

Dr. Albert E. Radford
Director of the Herbarium
The University of North Carolina
Chapel Hill, North Carolina 27515

Dear Dr. Radford:

I am returning express prepaid the Uvularia specimens which arrived towards the end of May. I am sorry that we were not able to use these specimens at all--they came too late to be of any value to us for our study.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 13, 1966

Dr. Wm. Bridge Cooke
1135 Wilshire Ct.
Cincinnati, Ohio 45230

Dear Bridge:

Although I do not plan to be here during the time that you will be, I suggest very strongly that you come along anyway because Henry Fleming will be here and will be able to go over your work as well or better than I could anyway. So please make arrangements to stop by, we will be happy to see you.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch

- Taxonomy Laboratory

June 13, 1966

Professor L. Wolpert
Department of Biology
Middlesex Hospital Medical School
London, W.1
England

Dear Professor Wolpert:

Enclosed corrected partial galleys for G. F. Estabrook "A Mathematical Model in Graph Theory for Biological Classifications." Will you please have all further correspondence concerning this paper sent to me, David J. Rogers, at the same address as Mr. Estabrook's? This will facilitate the handling of any further activities.

Unfortunately, we received only partially completed galleys and the most critical element of the whole was not included, namely, the flowchart for this paper. I trust that this will be forthcoming shortly.

Sincerely,

David J. Rogers
Professof of Botany

DJR:ch

Enc.

- Taxonomy Laboratory

June 2, 1966

Mr. Harold K. Voris
Division of Reptiles
Chicago Natural History Museum
Roosevelt Road and Lake Shore Drive
Chicago, Illinois 60605

Dear Harold:

I received your packet today. I hurry to tell you that because of new information concerning flowering times in Manihot, our trip has been postponed until 1 July, 1966. This would conceivably give you a chance to get one or both of your two runs in before we left, if you still desire. We should be back from Mexico toward the end of July to continue with your work (and ours).

Feel free to run as many matrices as you need to. They were designed for just the purpose you wish to apply them to. I notice one small detail from your example, namely; don't name any state "zero" unless an organism coded into that state lacks the information (through incomplete specimens) necessary to code it into a "real" state for that character. Zero names the missing information state, any other state must be named with a positive integer.

I look forward to hearing from you real soon.

Very truly yours,

George F. Estabrook

GFE:ch

P.S. Are you going to the AIBS meetings in Maryland this August? If you are, I would appreciate any "drum beating" you would be willing to do for the methods we are using for your snakes.

- Taxonomy Laboratory

June 20, 1966

Mr. George F. Freytag
Head, Agronomy Dept.
Escuela Agricola Panamericana
Tegucigalpa, Honduras

Dear George:

In response to your letter of June 17 on the setup of an information system for your seed storage activities, I have the following comments.

First of all, I myself do not have an information system going. There are several reasons for this. One, we find that we have to do considerable amount of research before we can adequately establish a big and workable generalized system. This requires a considerable amount of effort, not only from the biological input standpoint but from the organization and development of sufficient and adequate models.

If I were you and if you plan to have an IBM punch and sorter, I would write directly to IBM and ask them for all the publications that they have available on information retrieval systems using a punch and sorter. I would send my inquiry into IBM to their offices on East Post Road, White Plains, N.Y., suggesting your problem, the nature of your problem, the kind of hardware or equipment you have and ask them for a publication of all sorts which will help you to get started.

You can also gain assistance in this respect by writing to Dr. S. M. Dietz, Regional Plant Introduction Station, Johnson Hall 59, Washington State University, Pullman, Washington 99163. From Dietz' address you can see that he is in the introduction business for USDA. He has been attempting for sometime and has done quite a bit of work towards some sort of a punchcard retrieval system for entries or introductions and has written a number of pamphlets which may be useful to you in trying to sort yourself out for which way you want to go. I just talked to Dr. James who is the head of the National Seed Storage here at Colorado State University. I understand that you have corresponded with him previously. I asked him what sort of system they used for their work and discovered that he uses an edge punch-card, I believe the Royal McBee cards. In his conversation it is pretty well indicated that his system is too small to do a really bang-up job of automatic data retrieval, but he seems to be satisfied with what

he's got. I would suggest that you write to him asking him about how much information about each of your accessions you should have and how to establish that.

Frankly, the most important part of an information retrieval system is for you yourself to decide how big the thing is going to eventually be. You have to be the one who directs how much information will be kept. I must, at the same time, try to warn you that once you get into one of these systems using any kind of IBM equipment, you open up Pandora's box, because the methods and procedures used are frantic in numbers and apparently none of them entirely satisfactory. However, as a biologist you should stick to your guns primarily and not try to delve into the business of how to set up your cards and so forth. You can get plenty of information about that sort of thing from the IBM literature.

Whatever you decide on, you are going to have to do an awful lot of homework in order to establish this thing in a way which will be meaningful to you. As I indicated earlier, we are ourselves beginning the study of information retrieval systems for biology. As I also indicated, this is something which is requiring a considerable amount of investigation in the procedures themselves, not on the data but on how to take care of the frantic amount of information that biologists want to stash away and then find again some day. I hope that we can get funds ourselves from somebody to make a big investigation along these lines. Our investigations, of course, deal not with just the punch machine and the sorter but with the main frame of the computer itself. These devices, the computers, will be the only answer to a large information system. This is the problem that we work on.

Good luck on your project and let me know how you are proceeding. I know I haven't answered many of your questions, but I hope you have gotten some leads from where I've started.

Sincerely,

David J. Rogers
Professor of Botany

DJR:ch