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About the Institute

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.

Jackson - Fl. 330
11:25

The Computer and Taxonomy -

1. Dispell some of the mystery of the computers -

Formerly, Earlier, many over-enthusiastic, unrealistic words used to describe the machine, e.g. "electronic brain" artificial intelligence, etc. Still use the word "memory" but understand that it is only an electronic device, storing symbols, directed by humans, through sets of directions, called programs - Therefore, it is human intelligence at work, subject to all the human failings

Taxonomy
+
Systematics } Disc. which
orders,
classifies
& interprets
our knowledge

2. The interface between computers and taxonomy

A. Taxonomists, knowing their own discipline, working with

1. Mathematicians
2. Computer programmers

} Stored programs
accomplishing some
particular tasks -

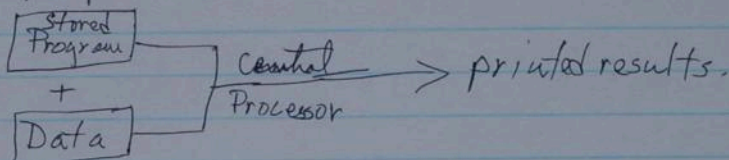
3. Purposes in using computers.

A. As aids or Tools of the taxonomist - just as microscopes, or gas-chromatographic devices -

B. To make more explicit the means by which we reach our conclusions - i.e. delineating of a species -

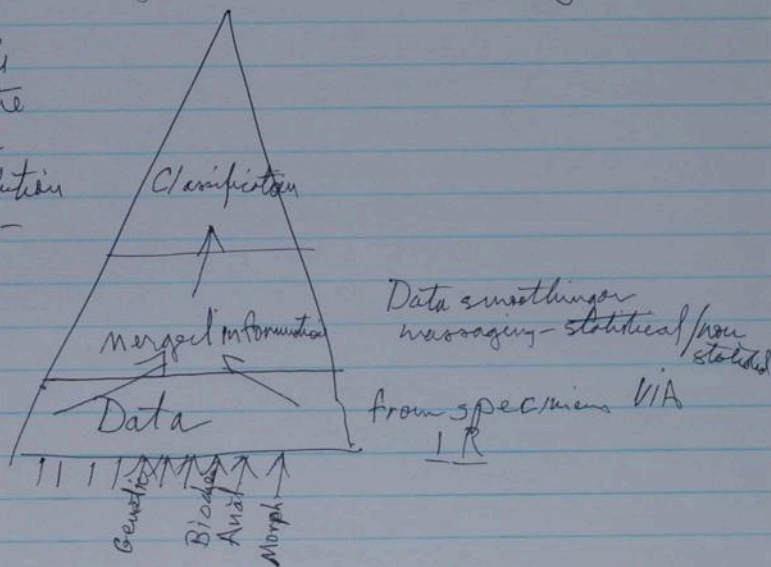
C. As retrieval devices, for ~~set~~ quick + accurate return (on demand from the taxonomist) of the multitudinous bits of information needed by the taxonomist.

4. Some ~~type~~ types of programs used -
- Statistical analyses - purpose is to make the data ~~use~~ accurate ~~the~~ or comprehensible -
 - Clustering program - to help in decisions of taxonomic relationship -
 - Structuring of evolutionary trees.
 - Information retrieval systems to aid in keeping track -
5. How programs work



6. Some new ways to think about taxonomy

The triangle represents the hierarchy of moving to solution of problems -



7. Taxonomy as the science of biological information mgmt.

1. The herbarium ^{or} museum specimens ~~or~~ ^{or} living samples a source of data -
2. The species is an abstract of information about the natural world.
3. The classification is a relating processing, to tell all interested, what we know about the living world around us.
4. Keys are mechanisms to quickly get to precise

8. Basically, the desires of the taxonomist and ecologist can be shown to be similar -

1. Both describe some aspect of the environment -
the units to a taxonomist is the species.
" " " an ecologist is cluster of similar habitats.
2. Both employ hierarchical classifications -
3. Both make analyses of their smallest units, and use these analyses to ~~of~~ synthesize the information gained from analyses to interpret the environments.

9. An example of employing computer aids in solving one taxonomic problem

Slides

March 10, 1972

Dr. Glen Peterson, Dean
Graduate School
Memphis State University
Memphis, Tennessee

Dear Pete:

Enclosed is the travel claim sheet, with attached receipts. I trust that it is in order.

It was a pleasure to be at MSU, even though it was too short a time. I think you've got a good group, and with some refreshing new ideas, which I trust you can get into operation.

As soon as I can, I will get in touch with Bill Reid, the graduate student I mentioned who has excellent training in both biology and computers, and ask him to send in his curriculum vitae. He may have already signed up for a post-doctoral position in Berkeley, but I don't at this moment know the status.

I mentioned your interest in coming down to the assistant to the president of GURC, and he suggested that it would be a good idea for you to be invited to the next council meeting of GURC. There you could get a better appreciation of the GURC operation and scope than you could by visiting here, where only a part of the GURC operation exists. I will see that you get an invitation. If possible, I hope you can visit here as well.

Thank you for inviting me to MSU. I thoroughly enjoyed it.

Sincerely,

David J. Rogers
Project Coordinator

| | | | | | | |
|-----------------|---------------|--------|---------|---------|----------|------------|
| 237 | LOGEN'S DAVID | | | 5/12 | 2 | A 36844 |
| ROOM | LAST (NAME) | FIRST | INITIAL | RATE | OUT DATE | FROM FOLIO |
| GULF. MISS. T-T | | FAMILY | | | | |
| CITY | | STATE | | IN DATE | | TO FOLIO |
| PNT J L W | | MISS | | | | |
| ROOM CLERK | STREET | | | R. | C. R. | N. R. |

| DATE | REFERENCE | CHARGES | CREDITS | BALANCE | PICKUP |
|-------------------------------------|-----------|------------------|----------|-----------------------|--------|
| MAR-17 | PAID | 23 ⁰⁰ | B* 12.72 | * 12.72 ⁰⁰ | |
| <i>Thank You For Your Patronage</i> | | | | | |

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GUEST'S SIGNATURE

CHARGE TO

STREET

CITY

STATE

MEMPHIS STATE UNIVERSITY
CLAIM FOR TRAVELING EXPENSES

FOR PERIOD FROM 3/2/72 TO 3/3/72

THIS CLAIM MUST BE PREPARED IN ACCORDANCE WITH THE UNIVERSITY COMPREHENSIVE TRAVEL REGULATIONS

| DATE | PLACE LEFT | TIME LEFT | PLACE ARRIVED | TIME ARRIVED | TRANSPORTATION | | | | SUBSISTENCE | | | | OTHER EXPENSES ITEMIZE AND EXPLAIN IN DETAIL | TOTAL |
|-----------------------------|-------------|-----------|---------------|--------------|----------------|-------------------------|--------------------------|---------|--|-----------|--------|--------|--|-------|
| | | | | | MILES | W WILLEAGE AMOUNT | AIR PLANE OR OTHER | PULLMAN | HOTEL | BREAKFAST | DINNER | SUPPER | | |
| 3/2 | Slidell | | NO Arpt | | 60 | | | | | 2.50 | 3.00 | | | |
| | New Orleans | | Memphis | | | | 70.00* | | | | | | | |
| 3/3 | | | Memphis | | | | | | 14.50 | | | | | |
| 3/3 | NO | | Slidell | | 60 | | | | | | | | | |
| * RT - N. Orleans - Memphis | | | | | Cost \$70.00 | | | | the enclosed ticket, for continuation to S.F. + return is not totally charged to this claim. | | | | | |

(Signatures)

Claimant (Please Print)

I HEREBY CERTIFY THAT THIS CLAIM IS TRUE AND CORRECT:

Department Name

Account Number

Claimant

Position

Travel Authorization Number

Approved

504-721-1244

601-688 3760

| DATE | Deptyng | | Arriving | | AIRLINE | Fl. No |
|-------------------|---------|----------------------------|---------------|--------------------------|---------|--------------------|
| | Airport | Time LV | Airport | Time AR | | |
| ²¹ 3/2 | NO | 12:10X 8:00A | Memp | 1:09 10:03 | Delta | 466 666 |
| ²¹ 3/3 | Memp | 10:00A | SF Intntl. | 2:03 | UA | 433 |
| 3/2 | SF | | NO | | | |

Cost

~~8A 10:03 Delta 666~~

131-SF-NO 10 - 3:03

124-Memp SF

35 OW M-

#290 Tax incl.

New Orleans
to
Memphis:
round trip -
70.⁰⁰-

SOME READINGS IN TAXIMETRICS

GENERAL

1. Rogers, D. J. 1963. Taximetrics--new name, old concept. *Brittonia* 15: 285-290.
Where "taximetrics" was first used and defined.
2. Rogers, D. J., H. S. Fleming and G. Estabrook. 1967. Use of computers in studies of taxonomy and evolution. In *Evolutionary Biology*, Vol. I, 169-196. Eds. Dobzhansky, T., M. K. Hecht, and W. C. Steere. Appleton-Century-Crofts.
This paper gives the general background for development of taximetrics, although the title is misleading. We give some historical background, rationale in mathematics, descriptions of computers and programming, and the various categories in evolutionary and taxonomic work where computers had been applied up to that time.
3. Rogers, D. J. and S. G. Appan. 1969. Taximetric methods for delimiting biological species. *Taxon* 18: 609-624.
Herein, we describe the integrated use of all of our methods to aid in the study of biological species. The methods themselves do not delimit the biological species, but point to the step-wise procedures which, if followed, are powerful techniques in guiding the discovery (or delimitation).

TAXIR

1. Estabrook, G. F. and R. C. Brill. 1969. The theory of the TAXIR accessioner. *Math. Biosciences*. 5: 327-340.
This paper gives the mathematical basis for the TAXIR Information retrieval system. A powerful method to store the information, address the information, and retrieve it is described.
2. Rogers, D. J. 1970. Theoretical and practical considerations on data structuring for a computerized information retrieval system. In *Archeologie et Calculateurs* (Marseille). pp. 145-159. Editions du Centre National de la Recherche Scientifique. 15, Quai Anatole-France. Paris VII^e.
I compare the information systems employed by systematic curators with the model we developed, and indicate some of the methods to prepare data for storage.

CHANAL

1. Hawksworth, F. G., G. F. Estabrook and D. J. Rogers. 1968. Application of an information theory model for character analysis in the genus Arceuthobium. (*Viscaceae*). *Taxon* 17: 605-619.
The methods of use of the character analysis program are described in biological terms, and the application of the findings made for the value of the characters to be employed in the classification of Arceuthobium.

2. Estabrook, G. F. 1967. An information theory model for character analysis. *Taxon* 16: 86-97. The mathematical arguments for this program are given.
3. Fleming, H. S. and D. J. Rogers. 1970. A classification of Manihot esculenta using the information carrying content of a character as a measure of its classificatory rank. *Proc. Int. Symp. Trop. Root Crops (Hawaii)*. pp. 66-70. This interesting application of the character analysis program indicates that it provides another method of classification, in addition to the power as a character analytic technique.

GRAPH

1. Wirth, M., G. F. Estabrook and D. J. Rogers. 1966. A graph theory model for systematic biology, with an example for the Oncidiinae (Orchidaceae). *Systematic Zoology* 15: 59-69. This paper describes in taxonomic terms the clustering methods developed in the Taximetrics Lab. The paper does not attempt to deal with the mathematical arguments.
2. Estabrook, G. F. and D. J. Rogers. 1966. A general method of taxonomic description for a computed similarity measure. *Bioscience* 16: 789-793. This paper describes the important process for structuring characters to be used in classification.
3. Estabrook, G. 1966. A mathematical model in graph theory for biological classification. *Jour. Theor. Bio.* 12: 297-310.
4. Irwin, H. S. and D. J. Rogers. 1967. Monographic studies in Cassia (Leguminosae-Caesalpinioideae). II. A taximetric study of section Apoucouita. *Mem. N.Y. Bot. Gard.* 16: 71-118. This is one of our first applications of the GRAPH clustering model. The section Apoucouita of Cassia contained some of the most complex classificatory problems in this large genus, and the computer model proved of great assistance in sorting out the specific and sub-specific taxa.
5. Prance, G. T., D. J. Rogers and F. White. A taximetric study of an angiosperm family: generic delimitation in the Chrysobalanaceae. *New Phytol.* 68: 1203-1234. Four computer methods were compared for their capacity to make classifications, and our GRAPH model came out on top. In this case, we were comparing genera within a family.
6. Arp, G. and D. J. Rogers. 1970. A computer-aided classification of the varieties of Pediocactus simpsonii (Engelm.) B. & R. *Cactus & Succ. Jour.* 42: 40-43. An intraspecific study of a cactus species.
7. Stearn, W. T. 1971. A survey of the tropical general Oplonia and Pailanthele (Acanthaceae). *Bull. Br. Mus. (Nat. Hist.) Botany.* IV (7): 259-323, plates 38-47. Stearn used our GRAPH model to aid in this study, particularly with the genus Oplonia.

8. Rogers, D. J. and H. S. Fleming. 1972 (In press) Economic Botany. A monograph of Manihot esculenta. The GRAPH model was our chief method to sort out the complex relationships within a cultivated species. The methods of use, and several suggestions on the intraspecific problems of cultivated plant taxonomy are described in sufficient detail so that workers can fully grasp our concepts.



MEMPHIS STATE UNIVERSITY
MEMPHIS, TENNESSEE 38111

Department of Biology

January 4, 1972

Dr. David Rogers
Food Research Institute
Stanford University
Stanford, California 94305

Dear Dr. Rogers:

Pete Peterson has completed the schedule for the Departmental Seminars for the second semester, 1971-72, and you are scheduled for a talk at 4 p.m. on the second of March. I hope that this time is all right and that you will be able to be with us then. As you can see from the inclosed copy of the schedule, there are several outside speakers in addition to yourself, and it has presented something of a problem fitting all the times together. I think Pete has done a fine job. My colleagues and I are looking forward to hearing your talk, and we are so glad that you can be with us.

Please let us know about your travel arrangements as the time approaches.

Sincerely yours,

Edward T. Browne, Jr.
Professor of Biology and
Curator of the Herbarium

cc: Dr. Glen E. Peterson

MEMPHIS STATE UNIVERSITY

Department of Biology

Seminar Schedule

Spring 1972

| <u>DATE</u> | <u>SPEAKER</u> | <u>TOPIC</u> |
|-------------|--|-----------------------------|
| Jan. 13 | Dr. Glen E. Peterson | Orientation |
| | Dr. Klaus Mampell Visiting Professor of Genetics University of Milan Milan, Italy | "Genetic Pollution" |
| Jan. 20 | Dr. Douglas James Professor of Zoology University of Arkansas Fayetteville, Arkansas | "Birds of West Africa" |
| Jan. 27 | Student Presentations | |
| Feb. 3 | Student Presentations | |
| Feb. 10 | Student Presentations | |
| Feb. 17 | Student Presentations | |
| Feb. 24 | Student Presentations | |
| March 2 | Dr. David Rogers Professor of Biology University of Colorado Boulder, Colorado | "The Computer and Taxonomy" |
| March 9 | Spring Holidays | |
| March 16 | Dr. Daniel Billen Professor, Institute of Nuclear Studies University of Florida Gainesville, Florida | "Radiation Biology" |
| March 23 | Dr. John G. Whitney Head, Fermentation Products Research Eli Lilly & Co. Indianapolis, Indiana | "Industrial Fermentations" |

| | | |
|----------|--|---|
| March 30 | Dr. A. W. Burger Professor of Agronomy University of Illinois Urbana, Illinois | "World Food Problems-- the Agronomist's Role in their Solution" |
| April 6 | Student Presentations | |
| April 11 | Dr. Frank Blair Head and Professor of Zoology University of Texas Austin, Texas | To be announced |
| April 13 | Student Presentations | |
| April 20 | Dr. Richard E. Blackwelder Professor of Zoology Southern Illinois University Carbondale, Illinois | "The Legend of Libbie Hyman" |
| April 29 | Student Presentations | |

Jan. 4, 1972

Prof. Glen E. Peterson
Department of Biology
Memphis State University
Memphis, Tennessee 38111

Dear Glen:

Thanks for your letter of the 27 December
The time schedule is fine, and the
title you chose is satisfactory.

I will probably have a few 2 x 2
slides to go along with the presentation.

Looking forward to seeing you. I
will let you know about arrival time later.

Sincerely,

David J. Rogers
Visiting Scholar



MEMPHIS STATE UNIVERSITY
MEMPHIS, TENNESSEE 38111

Department of Biology

December 27, 1971

Dr. David J. Rogers
Food Research Institute
Stanford University
Stanford, CA 94305

Dear Dr. Rogers:

We are very pleased and honored that you have agreed to speak to our departmental seminar during our Spring Semester, 1972, program. I have attached the tentative schedule for the entire semester. I hope the date and title listed for your presentation meets with your approval. If not, please let me know and we can make the change(s) that will be satisfactory to you.

We usually have about 100 faculty and graduate students from the department plus a few visitors from other units either on or off campus. The seminar meets from 4:00 - 5:00 P.M. in the auditorium of the Ellington Biology building. The room is well-supplied with routine projection and sound equipment (movies, lantern slides, microphone, etc.), but if you have special requirements in this area please let me know as the University Audio-Visual Center could perhaps be of use to us.

We look forward to seeing you and, in the meantime, if there is anything further we can do on this end to make your visit to Memphis and Memphis State University a most pleasant experience please contact me either by mail at the above address or by phone at (901) 321-1581 or (901) 321-1531. My home phone number is (901) 684-7271.

Kindest regards.

Very truly yours,

Glen E. Peterson

Glen E. Peterson, Professor
Director of Graduate Studies,
Acting Assoc. Dean of Graduate
School

GEP:cm

Enclosure

*Have,
I look forward to
seeing you again.
Regards,
Glen*

Dec. 28, 1971
2635 W. 2nd Ave.
Durango, Colo. 81301

Dear Dr. Rogers,

I have applied now for admission to the Biology Department. If I am accepted it would be beginning the summer session. This Spring Semester I can continue to take courses as a graduate student in math as I have been, thus ensuring future credit for graduate courses I take now. This fall I took Plant Physiology, Plant Ecology, Classification of Flowering Plants and will soon complete a correspondence course in genetics. I am registered for the following courses this spring: Morphology of Vascular Plants, Dynamics of Mountain Ecosystems, Molecular Genetics and Biosystematics. I feel I will have an adequate background to continue graduate work in Botany. I realize there will still be some deficiencies to be made up by reading or course work.

I find it hard to narrowly define a specific area in which I plan to concentrate my study. I'm not sure this is necessary at this time, although I often get the impression I'm to have a research program ready at hand as I apply. However, I believe it is the Population Biology section which covers the subjects in which I am most interested. I'm sure that after digesting the material for Dr. Löve's systematics course, I will be much closer to defining a goal.

Would it be possible for you to recommend me for admission? As Dr. Bock has explained to me, the selection procedure is essentially the faculty deciding who can use whom from among the applicants. The month of February is when this takes place. I would appreciate any help you could give me. Thank you.

Sincerely yours,

Pat McGuire



MEMPHIS STATE UNIVERSITY
MEMPHIS, TENNESSEE 38111

Department of Biology

November 24, 1971

Dr. David J. Rogers
Food Research Institute
Stanford University
Stanford, California 94305

Dear Dr. Rogers:

Thank you for your letter of November 22, and please accept my apologies for the delay in replying to your earlier letter. Dr. Peterson is in charge of the seminars, but he asked me to write you about coming here since my interest is taxonomy. There have been some difficulties scheduling the talks of various visiting speakers, and this has resulted in the delay occasioned in my reply. I apologize for this, and I hope that it has not caused you a great inconvenience.

When I asked Dr. Peterson about a date for your talk after reading ~~tyour~~ your letter to him over the telephone, he said that some Thursday in March would be the time. I will write you at once when the exact date has been set. I sincerely hope that you will be able to get here during March, and, again, I apologize for the delay encountered.

Very sincerely yours,

Edward T. Browne, Jr.
Professor of Biology

November 1, 1971

Dr. Edward T. Browne, Jr.
Department of Biology
Memphis State University
Memphis, Tennessee 38111

Dear Dr. Browne:

Your letter of October 21 was forwarded to me at the above address, where I am spending a faculty leave of absence. I expect to be here until about the first of February, 1972, and then to move over to southern Mississippi where I will be working with a group called the Gulf Universities Research Corporation.

I am happy to have your invitation to speak to your graduate seminar, but because of the above circumstances, would prefer changing the time until, say, March, if that is possible. There will be some time required for me to "settle in" to the work in Mississippi, and your suggested date of February 17, would be a hectic for me to make and still do a good job with the seminar.

If a date in March (or April, for that matter) can be arranged, I will be glad to accept your invitation. Let me know if you have available dates later, and I will send you a title and perhaps a summary, if you like. Thanks again for your invitation. Give my regards to Glen Peterson.

Sincerely yours,

David J. Rogers
Visiting Scholar

2nd Ltr written 11/22 -



MEMPHIS STATE UNIVERSITY
MEMPHIS, TENNESSEE 38111

Department of Biology

October 21, 1971

Dr. David Rogers
Department of Biology
University of Colorado
Boulder, Colorado 80302

Dear Dr. Rogers:

At the suggestion of Dr. Glen Peterson, Director of Graduate Studies in this department, I am writing to ask if you would be willing to present a seminar talk before our graduate seminar. This program meets once weekly, at 4 p.m. on Thursdays before our faculty and graduate students, and we would like to have you speak on your research in numerical taxonomy. The date of Thursday, February 17, 1972 has been suggested as a good time. However, if you could not come then, we could suggest another. We will pay your expenses for your trip here, and while arrangements are not yet complete in connection with this, we hope to be able to pay an honorarium as well.

We have a graduate seminar with attendance running between 75 and 100 persons each week. Each semester we ask prominent individuals in various areas of biology to speak on the subjects of their research, and the remainder of the periods are devoted to graduate student presentations. I hope that you will be able to participate in our program next semester.

Very sincerely yours,

Edward T. Browne, Jr.
Professor of Biology and
Curator of the Herbarium