ICSEB IV

FOURTH INTERNATIONAL CONGRESS OF SYSTEMATIC AND EVOLUTIONARY BIOLOGY

CO-HOSTED BY THE SMITHSONIAN INSTITUTION

PROGRAM

ICSEB IV

THE UNITY OF EVOLUTIONARY BIOLOGY

INTERNATIONAL CONGRESS FOR SYSTEMATIC AND EVOLUTIONARY BIOLOGY

UNIVERSITY OF MARYLAND
(College Park, Maryland, USA)

and

THE SMITHSONIAN INSTITUTION
(Washington, D.C., USA)

JUNE 30 - JULY 7, 1990

CONTENTS

The University of Maryland:

The University of Maryland is located within the metropolitan Washington, D.C. area. The campus, located in the Maryland county of Prince Georges, is approximately 10 miles from the White House and the capitol of the United States. Since its founding the University has earned a reputation as an institution of international stature.

The facilities and resources on the campus are among the best to be found anywhere. The A. Stamp Student Union will serve as the meeting headquarters. Located in the midst of campus, the Union is within walking distance of the on-campus housing facilities and meeting rooms. The Union houses varied dining facilities and the campus is near many small local restaurants.

The Smithsonian Institution:

The Smithsonian Institution is a complex of museums, galleries, research centers and a zoological park. Nine of the museums are located on the National Mall between the U.S. Capitol and the Washington Monument. Research projects in the arts, history, and science are carried out all over the world by the Smithsonian staff.

The National Museum of Natural History/National Museum of Man is responsible for the largest natural history research collections in the world. The natural history collection increases by up to a million new specimens annually. Research conducted by the staff is largely based upon these extensive national reference collections, which the museum maintains not only for its own use, but as a resource for the international scientific community.

BADGES OR TICKETS ARE REQUIRED FOR ADMISSION TO ALL

CONGRESS SESSIONS AND EVENTS

International Congress of Systematic and Evolutionary Biology

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CO-SPONSORING SOCIETIES HOLDING ANNUAL MEETING WITH ICSEB IV:

Willi Hennig Society is an international society dedicated to the application of phylogenetic techniques. Meeting annually, the society publishes the journal *Cladistics*.

The American Society of Naturalists has as its objective to advance and disseminate the knowledge of organic evolution and other broad biological principles, and to enhance the conceptual unification of the biological sciences. The official journal of the Society is *The American Naturalist*.

The Society of Numerical Taxonomy organizes an annual meeting at which members exchange ideas on approaches and techniques for use in numerical taxonomy.

The Society for the Study of Evolution, through its journal, meetings and working committees promotes the study of organic evolution and the integration of the various fields of science concerned with evolution.

The Society of Systematic Zoology supports the advancement of all aspects of the science of systematic zoology and emphasizes areas of common interest to all taxonomists. *Systematic Zoology* is published quarterly by the society.

CO-SPONSORING SOCIETIES NOT HOLDING ANNUAL MEETING WITH ICSEB IV:

Entomological Society of America is a professional society of entomologists and others interested in the study of insects. The society publishes several journals including *Annals of Entomology*.

Linnaean Society of London was established in 1788 and as stated in its Royal Charter of 1802 is "a Society for the Cultivation of the Science of Natural History in all its branches." As the world's oldest active biological society it has long provided opportunity for exchange for both botanists and zoologists and has counted among its Fellows many distinguished naturalists. The Society currently has approximately 2,000 elected Fellows from throughout the world.

The Association of Systematics Collections serves the needs of systematics collections that are used for research. It provides communications links between the various systematics disciplines, and educates policy-makers as to the importance of systematics collections and research.

The International Union of Biological Sciences was founded in 1919 as a union of national organizations, international associations and commissions engaged in the study of biological sciences. The aims are to promote the study of biological sciences and to initiate, facilitate and coordinate international research and other scientific activities.

The International Union of Microbiological Societies is an independent union of microbiological societies founded in 1930. There are three divisions: bacteriology, mycology and virology. Several journals are published, including *Intervirology* and *International Journal of Systematic Bacteriology*.

The Phycological Society of America was founded to promote research and teaching in all fields of phycology. The society publishes the quarterly *Journal of Phycology*, as well as sponsoring books and symposium proceedings of particular interest to phycologists.

CORPORATE SPONSORS:

ICSEB IV wishes to acknowledge the following Corporate Sponsors who have made contributions:

American Type Culture Collection, 12301 Parklawn Drive, Rockville, Maryland 20852

Biospherics, 12501 Indian Creek Court, Beltsville, Maryland 20705

SPECIAL ACKNOWLEDGEMENT:

ICSEB IV wishes to especially acknowlege the following agencies and organizations that have provided funds to support the participation of individuals in the Congress:

Alfred P. Sloan Foundation
Commission of European Communities
The Smithsonian Institution
The Nature Conservancy
United Nations Educational, Scientific and Cultural Organization
United States Fish and Wildlife Service Office of International Affairs
The United States National Science Foundation
The University of Maryland

Congress *Proceedings*:

We are pleased to announce that, in keeping with the Congress theme, "The Unity of Evolutionary Biology," a *Proceedings* will be published, including Plenary lectures, Congress Symposia, and results of Discussion Groups. The anticipated date of publication by Dioscorides Press of the two or three volume *Proceedings* is late summer 1991.

EXHIBITS

For three days, Sunday July 1 - Tuesday July 3, there will be exhibits of books and products of interest to participants in the Congress. The exhibiting area is in the Grand Ballroom of the Stamp Student Union (next to the Congress Registration area). Please plan to vist the exhibitors during the Congress.

Academia Book Exhibits

Organizes and arranges book and journal displays at scientific congresses and symposia in the United States as well as in Europe. A catalog, listing full addresses of participating publishing houses and bibliographic information on their titles sent for display, is prepared for each meeting, and is available to all participants.

Academic Press Inc.

Academic Press publishes books and journals in all areas of biology. Special meeting discounts are available at the booth which will feature books such as Spencer's Chemical Mediation and Coevolution, Fleagle's Primate Adaption and Evolution, and the journal, Cladistics. Visit our booth and see our broad selection of scholarly books.

American Type Culture Collection

Biological Reference Cultures: Microorganisms, cell lines, viruses, and recombinant genetic materials (clones, probes, libraries, oncogenes, vectors, hosts, molecularly cloned viruses) from the SOURCE for biological cultures. The ATCC is a nonprofit organization dedicated to the preservation and world-wide distribution of biological cultures for industry, research and education. Catalogues with extensive information are available on all ATCC cultures.

Cambridge University Press

Stop by our booth to review our new and recently published books and journals on biological diversity and evolution.

Endangered Cats

Oxford University Press

Please see announcement.

Princeton University Press

Princeton University Press will feature books on evolutionary theory, ecology and behavior, nonlinear dynamical systems, biomechanics, conservation and public policy, molecular and cell biology, as well as our series on Monographs in Population Biology, Monographs in Behavior and Ecology, and the Princeton Science Library.

Sinauer Associates, Inc.

On display will be Molecular Systematics, edited by Hillis and Mortiz; MacClade 3, a computer program by Maddison and Maddison; Evolutionary Biology, Second edition, by Futuyma; Speciation and Its Consequences, edited by Otte and Endler, and other books of interest to systematists and evolutionary biologists.

University of Chicago Press

Scholarly books in the biological sciences and related fields, including new research and classic texts focussed on evolution and other topics of interest.

Yale University Press

Yale University Press is exhibiting scholarly books in the area of evolutionary biology.

GENERAL INFORMATION

Registration:

Registration will be in the A. Stamp Student Union, Prince Georges Room. The registration area will open during the following hours:

Saturday June 30, 1990	10:00 AM - 8:00 PM
Sunday July 1, 1990	8:00 AM - 6:00 PM
Monday July 2, 1990	8:00 AM - 6:00 PM
Tuesday July 3, 1990	8:00 AM - 6:00 PM
Wednesday July 4, 1990	8:00 AM - 6:00 PM
Thursday July 5, 1990	8:00 AM - 6:00 PM
Friday July 6, 1990	8:00 AM - 6:00 PM
Saturday July 7, 1990	8:00 AM - NOON

Messages and Program Changes:

There will be a message board located in the registration area. Messages may be left or picked up at the message board. See Emergency Telephone Numbers for instructions on how urgent messages can be received at the Congress.

Resaurants and Meals: Meals are available on campus through the Congress meal plans and at several cash-operated restaurants in the Stamp Student Union. During the summer the restaurants in the Stamp Student Union are closed on Sundays. Two meal plans are available: lunch and breakfast, and lunch only. **There will be no breakfast or lunch available on campus Wednesday, July 4, other than through the Congress meal plan.** Individually purchased meals (breakfast and lunch) can be bought at the South Campus Dining Hall.

There are restaurants nearby, some within walking distance, others requiring a car or taxi.
Some local restaurants are the following (The name, address and telephone number are given.):

94th AERO SQUADRON, 5240 Calvert Road, College Park, MD 20740 699-9400
(car or taxi required)

BENNIGANS, 6002 Greenbelt Road, Greenbelt, MD 20770 982-9780
(car or taxi required)

BOB'S BIG BOY RESTAURANT, 7150 Baltimore Avenue, College Park, MD 20740 577-4011
(car or taxi required)

CALVERT INN, 6311 Baltimore Avenue, Riverdale, MD 20737 864-5220
(car or taxi required)

CHEF'S SECRET, 5810 Greenbelt Road, Greenbelt, MD 20770 345-6101
(car or taxi required)

CHESAPEAKE BAY SEAFOOD HOUSE, Beltway Plaza, Greenbelt Road, Greenbelt, MD 20770
(car or taxi required) 441-4777

CHI-CHI'S MEXICAN RESTAURANT, 5910 Greenbelt Road, Greenbelt, MD 20770 441-6048
(car or taxi required)

EL TORITO, 7607 Greenbelt Road, Greenbelt, MD 20770) 474-6122
(car or taxi required)

HAWTHORNE'S CHICAGO EATERY, 8145 G Baltimore Avenue, College Park, MD 20740
(walking distance, sandwiches and light fare) 345-3161

SIR WALTER RALEIGH INN, 6232 Greenbelt Road, Greenbelt, MD 20770 474-6500
(car or taxi required)

SIZZLER, 8424 Baltimore Avenue, College Park, MD 20740 474-1216
(car or taxi required)

THE GARDEN RESTAURANT, Center of Adult Education, College Park, MD 20742 965-7326
(walking distance)

THE GOLDEN BULL, 9107 Riggs Road, Adelphi, MD 20783 439-4800
(car or taxi required)

Local Transportation: By means of the subway, there is access not only to downtown Washington, D.C., but also to much of the metropolitan area. Trains operate approximately every 10 minutes Monday-Friday, 6:00 AM to Midnight; Saturday, 8:00 AM to Midnight; Sunday 10:00 AM to Midnight. Subway fares vary depending upon the time of day and the distance traveled. The minimum fare in one direction is $0.85 US and the maximum is $2.80. During rush hours, 5:30-9:30 AM and 3:00-7:00 PM weekdays, fares are higher than during the weekend and nonrush hours. It is planned to have special buses on a regular schedule to and from the university campus to the nearest subway station during most of the Congress. The schedule for the special Congress buses will be available at the meeting. The regular Metro bus R-2 follows a route from the campus to the Brookland Station (red line, $1.35 nonrush hour, $1.75 rush hour). Traveling to the center of Washington, D. C., by the combination of bus and subway will take 1-2 hours.

Congress Shuttle:

During the Congress there will be limited shuttle service between the University of Maryland Campus and the nearest Metro Subway Stations. Scheduled hours will be posted.

A shuttle service between several sites on the University of Maryland campus and the motels housing Congress participants is being provided. The hours and the route followed will be posted.

Air Transportation: Upon arriving at one of the regional airports the following options are available to reach the University of Maryland campus.

Baltimore Washington International Airport:

Shuttle: Transportation to College Park can be arranged through the Airport Connection at a cost of $15.00. Shuttles leave every 15 minutes past the hour from 6:00 AM to Midnight. To purchase a ticket upon arrival at the airport, descend to the lower level to the Airport Connection counter. Return to the airport from College Park can be arranged by making a reservation the day

before departure. The cost for a return trip is $15.00. Telephone: 1-301-441-2345 (from College Park 441-2345).

Taxi: The cost is approximately $35-40. Taxis are available at the airport.

Washington Dulles International Airport:

Shuttle: The Washington Flyer: service has become limited since the final announcement. A shuttle from College Park, Areo Shuttle Vans, will provide one way transportation to or from Dulles with 24 hr. notice for $45. For reservations call 441-8267.

Taxi: The cost is approximately $40-45.00. Taxis are available at the airport. In addition to taxis at the airport, Barwood Cab offers a free reservation service. To reserve a Barwood Cab, call the same day as your flight (toll free number 1-800-831-2323) to arrange for a cab to meet you at the airport.

National Airport:

Shuttle: The Washington Flyer: service has become limited since the final announcement. A shuttle from College Park, Areo Shuttle Vans, will provide one way transportation to or from Dulles with 24 hr. notice for $25. For reservations call 441-8267.

Taxi: Same arrangements as from Washington Dulles International Airport, but the cost is approximately $30-35.00.

Washington Metro subway: The cost will depend upon the time of day. The maximum is $2.80. From National Airport, take either the blue or orange line to Metro center and change to the red line for Silver Spring or take the yellow line to Gallery Place and change to the red line for Silver Spring. At the Brookland Station, exit the red line. Please see local transportation for subway hours and prices. You may take a taxi (about $10.00 one way) or a Metro bus (R-2, $1.35 nonrush hour, $1.75 rush hour) from the Metro Station to the University of Maryland.

Transportation by Train: Trains (Amtrak) service the Washington Metropolitan area. Upon arrival at Union Station in Washington, D.C., one can reach the campus either by taxi or by the combination of using the Metro red line to Brookland station and then taxi or Metro Bus to the campus. To use the subway, take the Red line to Silver Spring. Please see local transportation for subway hours and prices. You may take a taxi (about $15-20.00 one way) or a Metro bus (R-2, $1.35 nonrush hour, $1.75 rush hour) from the Metro Station to the University of Maryland.
posted.

Official Congress Travel Agency and Airlines:

The official travel agency for ICSEB IV is Travel-On, a multibranch Maryland travel agency that is also under contract to provide travel services for the University of Maryland.

In ICSEB IV's behalf, Travel-On has negotiated service agreements for ICSEB IV air transportation with two major US carriers: USAir for flights originating in Canada or the United States, and Pan Am for transatlantic flights. Participants from elsewhere also may contact Travel-On for the lowest available fares from their localities.

ICSEB IV participants purchasing their air tickets from Travel-On will benefit from fare discounts or other special provisions. In addition, all tickets purchased from Travel-On produce credits and income to help pay for Congress expenses.

To obtain information about flights and fares and to order airline tickets contact Travel-On directly by telephone toll free at 1-800-333-1225 between 8:30 AM and 5:00 PM Eastern Time; by FAX 1-301-897-5268; or by mail addressed to Travel-On, 6903 Rockledge Drive, Bethesda, Maryland 20817-1818, USA. Inquiries should be specific about proposed travel dates, routings, and destinations. Travel-On will research each request, quote fares, and, upon authorization by the traveler, send the ordered tickets by mail or other secure means. Tickets may be paid for by any of several major credit cards or

by bank draft in US dollars.

Money Exchange/Travelers Checks Cashed:

Congress participants from outside the United States are advised that currency should be converted into US dollars prior to traveling. Citizens Bank of Maryland, which has an office in the Student Union, will cash either American Express or Visa Travelers checks in **US dollars.** Banking hours are: Lobby 9:00 AM to 2:00 PM Monday-Friday, Friday 4:30-7:30 PM, and Saturday 9:00 AM till noon; Walk-up Windows 2:00-7:00 PM Monday-Thursday, Friday 2:00-4:30 PM. Canadian dollars (cash only) will be converted by Citizens Bank of Maryland into US dollars. Since only some banks located in Washington, D.C. will immediately convert foreign currency, it is advised that all other non-US currency should be converted into US dollars at international airports. Please also note that **Wednesday July 4, 1990 is a legal bank holiday and all banks will be closed.**

IMPORTANT TELEPHONE NUMBERS:

University Telephone Information	454-3311
A. Stamp Student Union Information Center	454-2807
Campus Guest Services	454-8723
University Police Department	454-3555
POLICE OR FIRE EMERGENCY	454-3333 or 911
Medical Emergency (Holy Cross Hospital)	565-0100
EMERGENCY MESSAGE TO CONGRESS PARTICIPANT (When a person is not present a tape machine will record message.)	(301)-454-3618

Weather:

Summer days and evening are warm and can be humid. In July the average temperature usually ranges from 74°F/ 23°C to 91°F/ 33°C. Light clothing is appropriate; however, there are rainy days, and an umbrella or a light rain coat is advisable. Sunny days allow for sightseeing and most outdoor sports. Participants on campus will have access to the excellent university athletic facilities.

Official Language:

The official language of the Congress is English. Translation services will not be provided.

Smoking policy: The University of Maryland College Park is designated a nonsmoking campus. Smoking is not permitted in university buildings other than in individual dormitory rooms and a designated room in the student union.

Whenever feasible activities of the Congress will not be damaging to the environment.

About the Region:

The University of Maryland at College Park is located in the metropolitan Washington, D.C. area about 45 minutes from downtown Washington, D. C., the second site of the Congress. The Smithsonian Institution is located on what is known as "The Mall," an area of museums, monuments, and government buildings. There are a variety of sightseeing and cultural opportunities available. In addition to the Smithsonian Institution, there are other museums and galleries such as the Phillips Gallery, the Women's Museum, and the Children's Museum. In all, there are over 50 museums and art galleries within the region. Many historic houses, such as the White House, Mt. Vernon (home of George Washington, the first US President), Decatur House, Arlington House (home of General John Lee) and Gunston Hall (home of George Mason), are open to the public.

The National Zoo, which can easily be reached by subway, houses animals from around the world and even has a collection of invertebrate organisms. The National Arboretum is internationally known. Its living collections of Asian plants, conifers, hollies, azaleas, and bonsai are particularly noted.

North of the university campus is Baltimore. One of the oldest and largest cities in the state of Maryland, Baltimore is one of the great port cities in the country. The Inner Harbor is an area of small shops and ethnic restaurants, and is the site of the National Aquarium.

Special Regional Events:

No tours have been organized. However, tourist information will be available at the Congress.

On July 4, 1776 in Philadelphia, Pennsylvania, independence from England was declared by the thirteen English colonies. Each year the 4th of July is celebrated as a national holiday. Traditionally the celebration involves such activities as picnics, baseball and other outdoor games, and in the evening, the watching of firework displays. The Congress will recess and enjoy the holiday.

The nation's capital celebrates the 4th of July (Independence Day) in grand style, beginning with a National Independence Day Parade that follows a route down Constitution Avenue. In the evening the National Symphony Orchestra plays a free concert on the west lawn of the Capitol building, followed by a spectacular fireworks display over the Washington Monument. During the day there are free musical programs on the Washington Monument grounds. Usually half a million people participate in these events. Celebration on the Mall is for adventurous individuals who enjoy crowds.

For those interested in a less crowded celebration there will be a traditional Maryland Picnic on campus (Chesapeake Bay seafood, chicken and ham will be served) for members of the Congress. In the evening there will be a free concert and fireworks display on campus.

During the Congress, the 24th Annual Festival of American Folklife, sponsored by the Smithsonian Institution, will be taking place near the museums in the area known as the Mall on June 27 - July 1 and July 4 - 8, 1990. Traditional music, crafts, ethnic foods, folk heritage and occupational folklife are on demonstration. This annual event features performances and demonstrations such as Appalachian fiddling, native American dancing, quilting, or coal mining. The theme for 1990 will be "The American Farm."

Several receptions will occur during the Congress. The Congress Opening Reception will be at the Smithsonian National Museum of Natural History and the Botany, Microbiology and Zoology Receptions will be held at the University of Maryland. The receptions include one free drink (cash bar will be available) and a selection of food.

Events at the Smithsonian Institution:

The Smithsonian Institution would like to announce that there will be an Open House, Congress Reception, and Plenary Lecture at the National Museum of Natural History. Bus transportation will be available from the University of Maryland. Limited parking will be available on the street and at the Museum.

OPEN HOUSE. Saturday, June 30, from 6:00 to 8:00 PM. Participants and their families are welcome to a behind-the-scenes look at the facilities and collections of the scientific departments. Enter through the Constitution Avenue entrance. Participants should wear their registration badges. Admission is free of charge.

CONGRESS RECEPTION. Saturday, June 30, 7:00 to 9:00 PM in the Rotunda. Please note that the reception location has been changed from the National Zoological Park to the National Museum of Natural History. The cost of the Reception is $10 per person and must be paid in advance. Confirmation of payment made with preregistration will be provided with your registration materials. Tickets will not be available at the door.

PLENARY LECTURE BY RICHARD LEAKEY. Sunday, July 1, 8:00 PM, Baird Auditorium, National Museum of Natural History. This lecture is open to the public, but seating is limited. Persons will be admitted only by ticket. Ticket must be obtained (free of charge) from the Smithsonian Desk at Registration for participants and family members. Seats will be available to the general public at the door on a first come, first served basis. (Richard Leakey also will speak to Congress members on Monday, July 2, at 12:30 PM at the University of Maryland.)

PROGRAM

Theme and Major Topics

Except during the interlude of the New Synthesis, there historically has been limited communication among the disciplines of evolutionary biology, particularly between students of evolutionary history (paleontologists and systematists) and those of molecular, population, and organismal biology. There has been an increasing realization that the barriers between these subfields must be overcome if a complete theory of evolution and systematics is to be forged. While embracing the diversity of evolutionary biology and systematics, ICSEB IV will seek to further its integration. The program, designed to foster the overall theme **"The Unity of Evolutionary Biology,"** features a number of major symposia, workshops, discussion groups, and plenary lectures aimed at synthesizing historical and mechanistic approaches to evolutionary and systematic problems.

Congressional events will center around three major topics: (1) **Evolution in perspective: biodiversity, conservation, biotechnology and global change,** (2) **Evolutionary mechanisms and processes,** and (3) **Systematics and phylogenetic reconstruction.** These process-oriented topics were selected to foster exchange among researchers using different approaches on different groups of organisms, as well as to emphasize currently important issues, re-evaluate previous concepts, and target, to the best of our ability, emerging ideas that are likely to play an important role in the future of the field.

Goals of the Congress

ICSEB IV seeks to promote a re-synthesis of systematic and evolutionary biology across disciplines (molecular and population genetics, ecological and behavioral approaches, biogeographical and paleontological analyses, and traditional and numerical approaches to phylogenetic reconstruction). We have attempted to target not only currently important conceptual issues and ideas that need re-evaluation, but also emerging areas that may be especially important in the future of this field. This meeting explicitly will include prokaryotes and protistans, and therefore will encompass all living organisms. One of our major goals is to reverse the 20 year trend of declining participation in the study of systematics and evolution; one of the primary mechanisms for attaining this goal is to increase the participation of under-represented groups (women, minorities, graduate and post-doctoral students, and scientists from developing countries) in the field. We have structured the program specifically to maximize accessibility, interaction and synthesis during the meeting. Our final goal is to disseminate the results of this Congress by producing a published volume of abstracts (available at the meeting) and a multi-volume *Proceedings* of the Congress (to be published in 1991). The Congress Program will include 29 Congress Symposia, three Congress Special Interest Symposia/Workshops, and 19 Round Table Discussion Groups. Eleven scientific societies and organizations are co-sponsoring the Congress, five of which will be meeting in conjunction with the Congress. Ten Society Sponsored Symposia, one Special Sponsored Symposium, one Society Sponsored Workshop, 29 Contributed Paper Sessions, and 8 Poster Sessions will further enrich the Congress Program.

PROGRAM SUMMARY

SATURDAY JUNE 30, 1990

10:00 AM - 8:00 PM
REGISTRATION, A. Stamp Student Union, Prince Georges Room

Saturday June 30, 1990, 4:00 PM - 4:15 PM

CONGRESS OPENING
Hoff Theater, A. Stamp Student Union

Presiding: **Dr. James Reveal,** Co-President, Department of Botany, Unveristy of Maryland, College Park, Maryland 20742, USA.

Saturday June 30, 1990, 4:15 PM

PLENARY LECTURE
Hoff Theater, A. Stamp Student Union

Dr. Peter Raven, Director, Missouri Botanical Garden, P. O. Box 299, St. Louis, Missouri 63166, USA.

Biodiversity in an age of extinction: what is our responsibility?

Saturday June 30, 1990, 7:00 PM - 9:00 PM

CONGRESS OPENING RECEPTION
National Museum of Natural History, The Smithsonian Institution (Ticket required)

Transportation from the University of Maryland campus to the National Museum of Natural History and return will be provided for individuals who have purchased a ticket to the opening reception. Buses will begin leaving from the university at 5:00 PM. The full schedule of times will be posted.

SUNDAY JULY 1, 1990

8:00 AM - 6:00 PM
REGISTRATION, A. Stamp Student Union, Prince Georges Room

Sunday July 1, 1990, 8:00 AM - 12:15 PM

Congress Symposium No. 1
CRITICAL ISSUES IN BIOLOGICAL DIVERSITY
Architecture, Room 0204

Congress Symposium No. 12
LONG AND SHORT-TERM VIEWS OF ECOSYSTEM STABILITY: IMPLICATIONS FOR EVOLUTION
Tydings Lecture Hall, Room 0130

Congress Symposium No. 16
GENETIC CONSTRAINTS IN EVOLUTION: DO THEY OCCUR AND HOW DO THEY WORK?
Art and Sociology, Room 2203

Congress Special Interest Symposium/Workshop No. 31
21ST CENTURY DATA AND KNOWLEDGE BASES IN SYSTEMATICS AND EVOLUTIONARY BIOLOGY
A. Stamp Student Union, Tortuga Room

Discussion Group No. 6
CO-EVOLUTION: SYMBIOSIS IN EVOLUTION
Art and Sociology, Room 3207

Discussion Group No. 13
HOMEOSIS AND THE EVOLUTION OF PLANTS
LeFrak, Room 2205

Contributed Paper Session No. 1
SEX AND SEX RATIOS
Art and Sociology, Room 3203

Contributed Paper Session No. 2
MOLECULAR AND MORPHOLOGICAL RELATIONSHIPS AMONG POPULATIONS I
Art and Sociology, Room 3211

Contributed Paper Session No. 3
FUNCTIONAL MORPHOLOGY, AND PATTERNS OF NATURAL SELECTION
Art and Sociology, Room 2309

Sunday July 1, 1990, 9:00 AM - 5:00 PM

Poster Session No. 1
EVOLUTIONARY ECOLOGY
A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

Poster Session No. 2
SEX, BREEDING SYSTEMS, SEXUAL AND NATURAL SELECTION
A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

Poster Session No. 3
LIFE HISTORY EVOLUTION
A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

Poster Session No. 4
EVOLUTIONARY GENETICS
A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

EXHIBITS
Grand Ballroom, A. Stamp Student Union

Sunday July 1, 1990, 12:30 PM - 1:30

PLENARY LECTURE
Tydings, Lecture Hall, Room 0130

Professor Robert M. May, FRS, Department of Pure and Applied Biology, Imperial College, Prince Consort Road, London SW7 2BB, England, United Kingdom.

Community patterns and their importance for understanding and conserving diversity.

Sunday July 1, 1990, 1:45 PM - 6:00 PM

Congress Symposium No. 8
BIOTIC EXCHANGE: HOW HAS IT INFLUENCED SUBSEQUENT EVOLUTION?
Lefrak, Room 2205

Congress Symposium No. 24
MOLECULAR AND PALEONTOLOGICAL PERSPECTIVES ON THE EVOLUTION OF MODERN HUMANS
Architecture, Room 0204

Congress Symposium No. 28
EARLY LIFE
Tydings Lecture Hall, Room 0130

Congress Special Interest Symposium/Workshop No. 31 (continued)
21ST CENTURY DATA AND KNOWLEDGE BASES IN SYSTEMATICS AND EVOLUTIONARY BIOLOGY (continued)
Tortuga, A. Stamp Student Union

Affiliated Society Symposium No. 8
HOST-PARASITE INTERACTIONS AND THE EVOLUTION OF REPRODUCTIVE CHARACTERS (THE SOCIETY FOR THE STUDY OF EVOLUTION)
Art and Sociology, Room 2203

Affiliated Society Workshop No. 11
LINNAEAN PLANT NAME TYPIFICATION PROJECT (LINNAEAN SOCIETY)
Art and Sociology, Room 3207

Affiliated Session No. 14
NT-24 (NUMERICAL TAXONOMY ASSOCIATION)
Art amd Sociology, Room 2309

Contributed Paper Session No. 4
PLANT MATING SYSTEMS
Art and Sociology, Room 3219

Contributed Paper Session No. 5
DEVELOPMENTAL AND MORPHOLOGICAL PATTERNS IN EVOLUTION
Art and Sociology, Room 3211

Sunday July 1, 1990 1:45 PM

DOBZHANSKY LECTURE
Art and Sociology, Room 3211

Dr. Erick Greene, Department of Avian Sciences, University of california, Davis, California 95616, USA.

Evolutionary aspects of a developmental polymorphism in a caterpillar.

Contributed Paper Session No. 6
MOLECULAR AND MORPHOLOGICAL RELATIONSHIPS AMONG POPULATIONS II
Art and Sociology, Room 3203

Contributed Paper Session No. 7
GENETIC CONSTRAINTS, AND LEVELS OF SELECTION
Art and Sociology, Room 3221

Sunday July 1, 1990 6:30 PM - 7:30 PM

NUMERICAL TAXONOMY ASSOCIATION MIXER (Ticket required)
Atrium, A. Stamp Student Union

Sunday July 1, 1990, 8:00 PM

PLENARY LECTURE (Open to the Public. Ticket required)

Dr. Richard Leakey, Baird Auditorium, National Museum of Natural History, Smithsonian Institution, Washington, D. C..

Auditorium seating is limited. A ticket for free admission may be obtained in the Registration area for this lecture, which is open to the general public.

SOCIETY FOR THE STUDY OF EVOLUTION COUNCIL MEETING
A. Stamp Student Union, Room 1139

MONDAY JULY 2, 1990

8:00 AM - 5:00 PM
REGISTRATION, A. Stamp Student Union, Prince Georges Room

Monday July 2, 1990, 8:00 AM - 12:15

Congress Symposium No. 11
EXTINCTION AND EVOLUTION
Architecture, Room 0204

Congress Symposium No. 15
HYBRID ZONES AND THE EVOLUTIONARY PROCESS
A. Stamp Student Union, Tortuga Room

Congress Symposium No. 19
DEVELOPMENTAL PROCESSES AND EVOLUTIONARY CHANGE
Art and Sociology, Room 2203

Congress Special Interest Symposium/Workshop No. 30
RESOURCES, TRAINING AND JOB PLACEMENT OF SYSTEMATISTS AND EVOLUTIONISTS ON A WORLD-WIDE SCALE: THEIR SIGNIFICANCE IN THE GLOBAL BIODIVERSITY CRISIS
Tydings Lecture Hall, Room 0130

Affiliated Society Symposium No. 7
MOLECULAR EVOLUTION OF ULTRASELFISH GENES (THE SOCIETY FOR THE STUDY OF EVOLUTION)
H. J. Patterson, Room 0226

Discussion Group No. 5
CO-EVOLUTION: INSECTS/PARASITOIDS
Art and Sociology, Room 3207

Contributed Paper Session No. 8
EVOLUTION ON ISLANDS
Art and Sociology, Room 2309

Contributed Paper Session No. 9
GENETIC STRUCTURE OF POPULATIONS I
Art and Sociology, Room 3203

Contributed Paper Session No. 10
RATES OF EVOLUTION, AND ANALYSIS OF PHYLOGENETIC PATTERNS I
Art and Sociology, Room 3211

<u>Monday July 2, 1990, 9:00 AM - 5:00 PM</u>

EXHIBITS
Grand Ballroom, A. Stamp Student Union

Poster Session No. 5
MOLECULAR AND CHROMOSOMAL EVOLUTION
A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

Poster Session No. 6
PHYLOGENETIC RELATIONSHIPS AND DIVERSITY
A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

Poster Session No. 7
THE ROLE OF ENVIRONMENTAL, GENETIC, DEVELOPMENTAL AND MORPHOLOGICAL FACTORS IN EVOLUTION
A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

Poster Session No. 8
HISTORICAL PROCESSES AND BIOGEOGRAPHY
A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

Monday July 2, 1990, 12:00 PM

AMERICAN SOCIETY OF NATURALISTS Executive Committee Meeting
A. Stamp Student Union, Room 2144

Monday July 2, 1990, 12:30 AM - 1:30 PM

PLENARY LECTURE
Hoff Theater, A. Stamp Student Union

Dr. Richard Leakey, Director, Kenya Wildlife Service, P. O. Box 40241, Nairobi, Kenya.

An overview of the evidence for African origins.

Monday July 2, 1990, 1:45 PM - 6:00 PM

Congress Symposium No. 11 (continued)
EXTINCTION AND EVOLUTION
Architecture, Room 0204

Congress Symposium No. 15 (continued)
HYBRID ZONES AND THE EVOLUTIONARY PROCESS
A. Stamp Student Union, Tortuga Room

Congress Symposium No. 26
ORIGIN AND EVOLUTION OF MITOCHONDRIAL AND PLASTID GENOMES
Tydings Lecture Hall, Room 0130

Special Workshop No. 13
TOWARD MORE STABLE BIOLOGICAL NOMENCLATURE: PROPOSED LISTS OF 'NAMES IN CURRENT USE.'
Art and Sociology, Room 3207

Affiliated Society Symposium No. 6
QUANTITATIVE APPROACHES TO THE STUDY OF EVOLUTION (NUMERICAL TAXONOMY ASSOCIATION; CO-SPONSORED BY THE SOCIETY FOR THE STUDY OF EVOLUTION)
H. J. Patterson, Room 0226

Discussion Group No. 9
THE RELATIONSHIP OF DEVELOPMENT TO MORPHOLOGICAL EVOLUTION
Art and Sociology, Room 2203

Contributed Paper Session No. 11
ANALYSIS OF PHYLOGENETIC PATTERNS II
Art and Sociology, Room 2309

Contributed Paper Session No. 12
GENETIC STRUCTURE OF POPULATIONS II
Art and Sociology, Room 3203

Monday July 2, 1990, 5:00 PM - 6:00 PM

AMERICAN SOCIETY OF NATURALISTS PRESIDENTIAL ADDRESS
Hoff Theater, A. Stamp Student Union

Dr. Lee Erhman

Monday July 2, 1990, 6:00 PM - 8:00 PM

AMERICAN SOCIETY OF NATURALISTS RECEPTION
Atrium, A. Stamp Student Union

Monday July 2, 1990, 6:30 PM

SOCIETY OF SYSTEMATIC ZOOLOGY EXECUTIVE COMMITTEE MEETING
A. Stamp Student Union, Room 1139

Monday July 2, 1990, 6:30 PM - 8:30 PM

BOTANY AND MICROBIOLOGY CONGRESS RECEPTION
A. Stamp Student Union, Grand Ballroom Lounge

Monday July 2, 1990, 7:00 PM - 8:00 PM

SOCIETY FOR THE STUDY OF EVOLUTION PRESIDENTIAL ADDRESS
Hoff Theater, A. Stamp Student Union

Dr. Stephen J. Gould

The contingent and the lawful in evolution.

Monday July 2, 1990, 8:00 PM - 9:00 PM

PLENARY LECTURE
Tydings Lecture Hall, Room 0130

Dr. Margaret B. Davis, Regent's Professor of Ecology, Department of Ecology, Evolution and Behavior, University of Minnesota, Minneapolis, Minnesota 55455, USA.

New understanding of the Ice Age: implications for the study of evolution.

Monday July 2, 1990, 9:00 PM

Graduate Student Discussion Group No. 15
EVOLUTIONARY CONSEQUENCES OF GENETIC ENGINEERING AND CONSERVATION PRACTICES
Tydings Lecture Hall, Room 0130

Monday July 2, 1990, 9:00 PM - 10:00 PM

SOCIETY FOR THE STUDY OF EVOLUTION PRESIDENTIAL RECEPTION
Atrium, A. Stamp Student Union

TUESDAY JULY 3, 1990

8:00 AM - 5:00 PM
REGISTRATION, A. Stamp Student Union, Prince Georges Room

Tuesday July 3, 1990, 8:00 AM - 12:15 PM

Congress Symposium No. 18
FUNCTIONAL MORPHOLOGY, BIOMECHANICS AND EVOLUTIONARY PROCESS
Art and Sociology, Room 2203

Congress Symposium No. 22
NATURAL SELECTION IN MOLECULAR EVOLUTION
LeFrak, Room 2205

Congress Symposium No. 27
TOWARD A PHYLOGENY OF THE PROTISTANS
Tydings Lecture Hall, Room 0130

Affiliated Society Symposium No. 4
YOUNG INVESTIGATOR SYMPOSIUM (AMERICAN SOCIETY OF NATURALISTS)
H. J. Patterson, Room 0226

Discussion Group No. 3
HYBRID ZONES
A. Stamp Student Union, Tortuga Room

Discussion Group No. 11
EVOLUTION ON ISLANDS AND CONSERVATION: PHILIPPINES
Art and Sociology, Room 3207

Contributed Paper Session No. 13
ANALYSIS OF PHYLOGENETIC PATTERNS III, AND LIFE HISTORY EVOLUTION I: REPRODUCTION AND ALLOCATION
Art and Sociology, Room 3203

Tuesday July 3, 1990, 9:00 AM - 12:15 PM

Congress Symposium No. 14
DIVERSIFICATION: PATTERNS, RATES, CAUSES, AND CONSEQUENCES
Architecture, Room 0204

Tuesday July 3, 1990, 9:00 AM - 5:00 PM

EXHIBITS
Grand Ballroom, A. Stamp Student Union

Tuesday July 3, 1990, 12:00 PM

AMERICAN SOCIETY OF NATURALISTS BUSINESS MEETING
Atrium, A. Stamp Student Union

Tuesday July 3, 1990, 12:30 PM -1:30 PM
SPECIAL LECTURE: THE WILHELMINA E. KEY 1990 INVITATIONAL LECTURE OF THE AMERICAN GENETICS ASSOCIATION
Atrium, A. Stamp Student Union

Dr. William B. Provine, Section of Ecology and Systematics, Cornell University, Ithaca, New York, USA. (Introduced by Professor Bruce Wallace, Department of Genetics, Virginia Polytechnic and State University, Blacksburg, Virginia, USA.)

Motoo Kimura, the Neutral Theory of Molecular Evolution and the Disunity of Modern Evolutionary Biology

Tuesday July 3, 1990, 1:45 PM - 6:00 PM

Congress Symposium No. 2
EVOLUTION IN A RAPIDLY CHANGING ENVIRONMENT: GLOBAL WARMING
Art and Sociology, Room 2309

Congress Symposium No. 14 (continued)
DIVERSIFICATION: PATTERNS, RATES, CAUSES, AND CONSEQUENCES
Architecture, Room 0204

Congress Symposium No. 22 (continued)
NATURAL SELECTION IN MOLECULAR EVOLUTION
LeFrak, Room 2205

Affiliated Society Symposium No. 1
RATES AND WEIGHTS: RATES OF EVOLUTION AND CHARACTER WEIGHTING (WILLI HENNIG SOCIETY)
A. Stamp Student Union, Tortuga Room

Affiliated Society Symposium No. 5
SENSORY DRIVE: DOES SENSORY BIOLOGY BIAS OR CONSTRAIN THE DIRECTION OF EVOLUTION? (VICE-PRESIDENTIAL SYMPOSIUM, AMERICAN SOCIETY OF NATURALISTS)
H. J. Patterson, Room 0226

Discussion Group No. 1
EVOLUTION AND PHYLOGENY OF PROTISTAN GROUPS
Tydings Lecture Hall, Room 0130

Discussion Group No. 4
THE IMPACT OF BIOMECHANICS AND FUNCTIONAL MORPHOLOGY ON STUDIES OF EVOLUTION
Art and Sociology, Room 2203

Discussion Group No. 10
EVOLUTION ON ISLANDS AND CONSERVATION: WEST INDIES
Art and Sociology, Room 3207

Contributed Paper Session No. 14
HYBRID ZONES AND SPECIATION
Art and Sociology, Room 3203

Tuesday July 3,1990, 6:30 PM

ZOOLOGY CONGRESS RECEPTION
Atrium, A. Stamp Student Union

Tuesday July 3, 1990, 7:00 PM

SOCIETY FOR THE STUDY OF EVOLUTION BUSINESS MEETING
Atrium, A. Stamp Student Union

Tuesday July 3, 1990, 8:00 PM - 9:00 PM,

PLENARY LECTURE
Tydings, Lecture Hall, Room 0130

Dr. Douglas J. Futuyma, Department of Ecology and Evolution, Division of Biological Sciences, State University of New York, Stony Brook, New York 11794, USA.

Systematics and the study of evolutionary processes.

Tuesday July 3, 1990, 9:00 PM

Graduate Student Discussion Group No. 16
BIODIVERSITY, CONSERVATION, AND GLOBAL CHANGE
Tydings Lecture Hall, Room 0130

WEDNESDAY JULY 4, 1990

8:00 AM - 5:00 PM
REGISTRATION, A. Stamp Student Union, Prince Georges Room

Wednesday July 4, 1990, 9:30 AM - 6:30 PM

Affiliated Society Workshop No. 12
MOLECULAR EVOLUTION OF ARCHAEBACTERIA (UNIVERSITY OF MARYLAND CENTER FOR MARINE BIOTECHNOLOGY; CO-SPONSORED BY THE ASSOCIATION OF SYSTEMATIC COLLECTIONS)
Center of Marine Biotechnology, Baltimore, Maryland

Wednesday July 4, 1990, 7:00 PM

MARYLAND-STYLE PICNIC (Ticket required)
Outside near South Campus Dining Hall

Wednesday July 4, 1990 8:00 PM

FIREWORKS (Open Admission)
Byrd Stadium

THURSDAY JULY 5, 1990

8:00 AM - 5:00 PM
REGISTRATION, A. Stamp Student Union, Prince Georges Room

Thursday July 5, 1990, 8:00 AM - 12:15 PM

Congress Symposium No. 5
SYSTEMATICS, BIOGEOGRAPHY AND EVOLUTIONARY SIGNIFICANCE OF HYDROTHERMAL VENTS AND VENT-RELATED SEEPS: THE EMERGING GLOBAL PATTERN.
Architecture, Room 0204

Congress Symposium No. 9
THE EVOLUTION AND ECOLOGY OF SMALL POPULATIONS
A. Stamp Union, Tortuga Room

Congress Symposium No. 13
THE ROLE OF SYSTEMATICS AND EVOLUTION IN BIOTECHNOLOGY
Art and Sociology, Room 2203

Congress Symposium No. 21
THE ROLE OF MULTIGENE FAMILIES IN MOLECULAR EVOLUTION
Tydings Lecture Hall, Room 0130

Congress Symposium No. 25
A CRITICAL REAPPRAISAL OF THEORIES OF CHARACTER EVOLUTION IN PHYLOGENETIC INFERENCE
H. J. Patterson, Room 0226

Congress Special Interest Symposium/Workshop No. 32
THE LATEST TOOLS FOR CLADISTIC ANALYSIS
LeFrak, Room 2205

Contributed Paper Session No. 15
SEXUAL SELECTION
Art and Sociology, Room 2309

Contributed Paper Session No. 16
MECHANISMS OF ISOLATION, SPECIATION AND HYBRIDIZATION
Art and Sociology, Room 3203

Thursday July 5, 1990, 12:30 PM - 1:30 PM

PLENARY LECTURE
Tydings, Lecture Hall, Room 0130

Professor John Maynard Smith, FRS, School of Biological Sciences, University of Sussex, Falmer, Brighton BN1 9QG, England, United Kingdom

The evolution of prokaryotes: does sex matter?

Thursday July 5, 1990, 1:45 - 6:00 PM

Congress Symposium No. 5 (continued)
SYSTEMATICS, BIOGEOGRAPHY AND EVOLUTIONARY SIGNIFICANCE OF HYDROTHERMAL VENTS AND VENT-RELATED SEEPS: THE EMERGING GLOBAL PATTERN.

Congress Special Interest Symposium/Workshop No. 32 (continued)
THE LATEST TOOLS FOR CLADISTIC ANALYSIS
Art amd Sociology, Room 1116

Congress Symposium No. 9 (continued)
THE EVOLUTION AND ECOLOGY OF SMALL POPULATIONS
A. Stamp Union, Tortuga Room

Congress Symposium No. 17
MATERNAL EFFECTS IN EVOLUTIONARY BIOLOGY
LeFrak, Room 2205

Congress Symposium No. 23
PHYLOGENETIC ANALYSIS OF NUCLEOTIDE SEQUENCE DATA: METHODS, COMPARISONS, AND APPLICATIONS
Art and Sociology, Room 2203

Discussion Group No. 2
THE ORIGIN OF THE METAZOA
Art and Sociology, Room 3207

Contributed Paper Session No. 17
BEHAVIOR AND EVOLUTION
Art and Sociology, Room 3203

Contributed Paper Session No. 18
SPECIATION AND DIVERSIFICATION
Art and Sociology, Room 3211

Thursday July 5, 1990, 6:30 PM

SOCIETY OF SYSTEMATIC ZOOLOGY BUSINESS MEETING
A. Stamp Student Union, Room 1139

Thursday July 5, 1990, 8:00 PM - 9:00 PM

PLENARY LECTURE
Tydings Lecture Hall, Room 0130

Dr. Peter H. A. Sneath, Department of Microbiology, University of Leciester, P. O. Box 138, Medical Sciences Building, University Road, Leicester LE1 9HN, England, United Kingdom.

Leeuwenhoek in Lilliput.

Thursday, July 5, 1990, 9:00 PM

Graduate Student Discussion Group No. 17
CONCEPTUAL ISSUES IN SYSTEMATICS AND PHYLOGENETIC RECONSTRUCTION
Tydings Lecture Hall, Room 0130

FRIDAY JULY 6, 1990

8:00 AM - 5:00 PM
REGISTRATION, A. Stamp Student Union, Prince Georges Room

Friday July 6, 1990, 8:00 AM - 12:15 PM,

Congress Symposium No. 7
EVOLUTION IN ISLAND ARCHIPELAGOS: THE EMERGING PICTURE
Architecture, Room 0204

Congress Symposium No. 20
MULTIPLE LEVELS OF SELECTION IN RELATION TO EVOLUTIONARY THEORY
Tydings Lecture Hall, Room 0130

Congress Symposium No. 4
SYSTEMATICS AND THE RELEASE OF GENETICALLY ENGINEERED ORGANISMS
Art and Sociology, Room 2203

Affiliated Society Symposium No. 2
THE PHYLOGENY OF BEHAVIOR (WILLI HENNIG SOCIETY)
A. Stamp Student Union, Tortuga Room

Affiliated Society Symposium No. 9
PATTERN VERSUS PROCESS: CAUSAL EXPLANATION IN EVOLUTIONARY BIOLOGY (THE SOCIETY OF SYSTEMATIC ZOOLOGY)
H. J. Patterson, Room 0226

Contributed Paper Session No. 19
EVOLUTION OF GENES AND GENOMES I
Art and Sociology, Room 3203

Contributed Paper Session No. 20
PHENOTYPIC PLASTICITY AND QUANTITATIVE GENETICS
Art and Sociology, Room 2309

Contributed Paper Session No. 21
HISTORICAL PROCESSES, BIOGEOGRAPHY, COMMUNITY STABILITY AND DIVERSITY
Art and Sociology, Room 3211

Contributed Paper Session No. 22
EVOLUTIONARY INTERACTIONS BETWEEN SPECIES I
LeFrak, Room 2205

Friday, July 6, 1990, 8:30 AM - 12:15 PM

UNESCO and IUBS/IABO Sponsored Discussion Group No. 8
HIGH DIVERSITY MARINE ECOSYSTEMS: ADVANCED RESEARCH ASPECTS
Art and Sociology, Room 3207

Friday July 6, 1990, 12:30 PM - 1:30 PM
PLENARY LECTURE
A. Stamp Student Union, Grand Ballroom

Dr. Eugenie Clark, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

Sea monsters and deep sea sharks.

Friday July 6, 1990, 1:45 PM - 6:00 PM

Congress Symposium No. 7 (continued)
EVOLUTION IN ISLAND ARCHIPELAGOS: THE EMERGING PICTURE
Architecture, Room 0204

Congress Symposium No. 20 (continued)
MULTIPLE LEVELS OF SELECTION IN RELATION TO EVOLUTIONARY THEORY
Tydings Lecture Hall, Room 0130

Affiliated Society Symposium No. 3
COMPARING TREES: MEASURES OF CONGRUENCE AND COEVOLUTION (WILLI HENNIG SOCIETY)
A. Stamp Student Union, Tortuga Room

Affiliated Society Symposium No. 10
EVOLUTIONARY GENETICS OF AGING (THE SOCIETY FOR THE STUDY OF EVOLUTION)
H. J. Patterson 0226

Discussion Group No. 7
NOMENCLATURE
Art and Sociology, Room 3203

Discussion Group No. 12
ENERGY AND COMMUNITY EVOLUTION
Art and Sociology, Room 3207

Contributed Paper Session No. 23
EVOLUTIONARY INTERACTIONS BETWEEN SPECIES II, AND EVOLUTIONARY ECOLOGY
Art and Sociology, Room 2309

Contributed Paper Session No. 24
EVOLUTION OF GENES AND GENOMES II
Art and Sociology, Room 2203

Contributed Paper Session No. 25
CHARACTER ANALYSIS, PHYLOGENETIC INFERENCE AND METHODOLOGY I
LeFrak, Room 2205

Thursday July 5, 1990, 6:30 PM

CONGRESS BANQUET (Ticket required)
A. Stamp Student Union, Colony Ballroom

Friday July 6, 1990, 8:00 PM - 9:00 PM

PLENARY LECTURE
A. Stamp Student Union, Grand Ballroom

Dr. Stephen J. Gould, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

Darwin's unrecognized appeal to species selection.

SATURDAY JULY 7, 1990

8:00 AM - Noon
REGISTRATION, A. Stamp Student Union, Prince Georges Room

Saturday July 7, 1990, 8:00 AM - 12:15 PM

Congress Symposium No. 3
UV-B RADIATION AS AN EVOLUTIONARY STRESS FACTOR
A. Stamp Student Union, Tortuga Room

Congress Symposium No. 10
CONSERVATION IN EVOLUTIONARY PERSPECTIVE: MADAGASCAR, A NEW ARENA
Architecture, Room 0204

Congress Symposium No. 29
MODE AND TEMPO OF VIRAL EVOLUTION
Art and Sociology, Room 2203

Contributed Symposium No. 33
A THERMODYNAMIC PERSPECTIVE OF EVOLUTION
Art and Sociology, Room 2309

Discussion Group No. 14
THE INFLUENCE OF MOLECULAR BIOLOGY ON EVOLUTIONARY THEORY
Tydings Lecture Hall, Room 0130

Saturday July 7, 8:30 AM - 12:15 PM

UNESCO and IUBS/IABO Sponsored Discussion Group No. 19 (continued)
HIGH DIVERSITY MARINE ECOSYSTEMS: ADVANCED RESEARCH ASPECTS
Art and Sociology, Room 3207

Contributed Paper Session No. 26
EVOLUTION OF THE PROKARYOTES AND MULTICELLULAR EUKARYOTES: MOLECULAR APPROACHES
LeFrak, Room 2205

Contributed Paper Session No. 27
EVOLUTIONARY GENETICS OF POPULATIONS
H. J. Patterson, Room 0226

Contributed Paper Session No. 28
CHARACTER ANALYSIS AND METHODOLOGY II; EDUCATION AND POLICY
Tydings, Room 1101

Contributed Paper Session No. 29
LIFE HISTORY EVOLUTION II: GROWTH, GENERATION TIME AND NATURAL SELECTION
Tydings, Room 1102

Saturday July 7, 1990, 12:30 PM - 1:30 PM

CONGRESS CLOSING
Presentation of the Engler Medal
Tydings Lecture Hall, Room 0130

Saturday July 7, 1990, 1:30 PM - 3:30 PM

AMERICAN SOCIETY OF NATURALISTS EXECUTIVE COMMITTEE MEETING
A. Stamp Student Union, Room 1139

PROGRAM

SATURDAY JUNE 30, 1990

CONGRESS OPENING

Saturday June 30, 1990, 4:00 PM - 4:15 PM, Hoff Theater, A. Stamp Student Union

Presiding: **Dr. James L. Reveal**, Co-President, Department of Botany, University of Maryland, College Park, Maryland 20742, USA.

PLENARY LECTURE

Saturday June 30, 1990, 4:15 PM, Hoff Theater, A. Stamp Student Union

Dr. Peter Raven, Director, Missouri Botanical Garden, P. O. Box 299, St. Louis, Missouri 63166, USA.

Biodiversity in an age of extinction: what is our responsibility?

CONGRESS OPENING RECEPTION
(Ticket required)

Saturday June 30, 1990, 7:00 PM - 9:00 PM, National Museum of Natural History, The Smithsonian Institution

Transportation from The University of Maryland campus to the National Museum of Natural History and return will be provided for individuals who have purchased a ticket to the opening reception. Buses will begin leaving from the university at 5:00 PM. The full schedule of times will be posted.

SUNDAY JULY 1, 1990

Congress Symposium No. 1

CRITICAL ISSUES IN BIOLOGICAL DIVERSITY

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Architecture, Room 0204

Organizers: **Dr. V. A. Funk** and **Dr. Stanwyn Shetler**, Department of Botany and Office of the Director, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA.

Part I. Biological diversity: are we asking the right questions?

8:00 **Stanwyn Shetler**, Office of the Director, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA.

Part II. Investigating biological diversity: four research perspectives.

8:30 Using morphology to study biological diversity. **V. A. Funk,** Department of Botany, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA.

9:00 Estimating diversity. **Jonathan Coddington,** Department of Entomology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA.

9:30 Ecological diversity. **Marjorie L. Reaka-Kudla,** Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

10:00 Break

10:15 Biological diversity from the perspective of molecular biology. **V. R. Ferris and J. M. Ferris,** Department of Entomology, Purdue University, West Lafayette, Indiana 47907, USA.

Part III. Protecting biological diversity: the roles of basic research and conservation.

10:45 **Michael Robinson,** Director, National Zoological Park, Washington, D.C. 20008, USA.

Part IV. The pros and cons of a programmatic approach.

11:15 The structure of biodiversity management in Coast Rica. **Rodrigo Gamez,** Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, 3100, Costa Rica.

Part V. The politics of a national biological diversity policy.

11:45 Speaker from the United States Congress.

Congress Symposium No. 12

LONG AND SHORT-TERM VIEWS OF ECOSYSTEM STABILITY: IMPLICATIONS FOR EVOLUTION

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Tydings Lecture Hall, Room 0130

Organizers: **Dr. William A. DiMichele and Dr. Scott L. Wing,** Department of Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA.

8:00 Introduction: **William A. DiMichele and Scott L. Wing,** Department of Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA.

8:05 Ecosystem stability: illusion and reality. **James A. MacMahon,** Department of Biology and Ecology Center, Utah State University, Logan, Utah 84322, USA.

8:35 Organization and dynamics of Pennsylvanian-age peat swamps. **William A. DiMichele,** Department of Paleobiology, Smithsonian Institution, Washington, D.C. 20560, and **Tom L. Phillips,** Department of Plant Biology, University of Illinois, Champaign-Urbana, Illinois 61801, USA.

9:05 Stability in the composition of Paleogene forests. **S. L. Wing,** Department of Paleobiology, Smithsonian Institution, Washington, D.C. 20560, and **M. B. Farley,** Exxon Production Research Co., Houston, Texas 77252, USA.

9:35 Late-Quaternary vegetational dynamics in eastern North America: individualistic species responses and ephemeral communities. **Thompson Webb III** and **Stephen T. Jackson,** Department of Geological Sciences, Brown University, Providence, Rhode Island 02912, USA.

10:05 Break

10:15 The community drift hypothesis and the structure and dynamics of tropical forest tree communities. **Stephen P. Hubbell,** Department of Biology, Princeton University, Princeton, New Jersey, USA, and Smithsonian Tropical Research Institute, Box 2072, Balboa, Republic of Panama.

10:45 Stability in marine communities at different temporal scales. **Richard K. Bambach, Alan Hubbard** and **J. Bret Bennington,** Department of Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA.

11:15 Determinants of community persistence on ecological and evolutionary scales. **Richard B. Aronson,** Paleobiology Department, Smithsonian Institution, Washington, D.C. 20560, USA.

11:45 Stability of coral reef communities. **Jeremy B. C. Jackson,** Smithsonian Tropical Research Institute, Box 2072, Balboa, Republic of Panama.

Congress Symposium No. 16

GENETIC CONSTRAINTS IN EVOLUTION: DO THEY OCCUR AND HOW DO THEY WORK?

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2203

Organizer: **Dr. Stephen C. Stearns,** Director, Zoological Institute, University of Basel, Basel, Switzerland.

8:00 Quantitative genetic constraints on evolution. **J. M. Cheverud,** Department of Anatomy and Neurobiology, Washington University School of Medicine, St. Louis, Missouri 63110, USA.

8:40 Genetic constraints and the evolution of sex. **P. H. Gouyon,** Evolution et Systematique des Vegetaux, Universite Paris-Sud, 91405 Orsay Cedex, France.

9:20 The role of reaction norms in the determination of genetic convariances. **Gerdien de Jong,** Population Biology and Evolution, University of Utrecht, The Netherlands.

10:00 Break

10:20 Pleiotropic effects: their population genetic consequences and epigenetic underpinnings. **G. P. Wagner,** Institute of Zoology, University of Vienna, A-1090 Vienna, Austria.

11:00 Genetic constraints and phenotypic variation in heterogeneous environments. **Arie J. van Noordwijk,** Zoologisches Institut, Basel, Switzerland.

11:40 The pleiotropic effects of new polygenic mutations. **Trudy F. C. MacKay**, Department of Genetics, North Carolina State University, Raleigh, North Carolina 27695, USA.

12:00 The role of constraints in evolutionary explanation. **Stephen C. Stearns**, Zoology Institute, University of Basel, CH-4051 Basel, Switzerland.

Congress Special Interest Symposium/Workshop No. 31

21ST CENTURY DATA AND KNOWLEDGE BASES IN SYSTEMATICS AND EVOLUTIONARY BIOLOGY

Sunday July 1, 1990, 9:00 AM - 12:15 PM, A. Stamp Student Union, Tortuga Room

Organizers: **Dr. Theodore J. Crovello**, Graduate Studies and Research Office, California State University, Los Angeles, California 90032; and **Dr. Candace McManus**, Microbial Systematics Section, National Institute of Dental Research, National Institutes of Health, Bethesda, Maryland 20892, USA.

9:00 Electronic research collections: perspectives and an example from the evolution of terrestrial ecosystems consortium. **John Damuth**, Department of Biological Sciences, University of California, Santa Barbara 93106, USA.

9:45 Flora of North America today and tomorrow. **Nancy R. Morin**, Flora of North America Project, Missouri Botanical Garden, St. Louis, Missouri 63166, USA.

10:30 Break

10:45 Geographic information systems: do biologists know where they're going? **Warren U. Brigham**, Center for Biogeographic Information, Illinois Natural History Survey, Champaign, Illinois 61820, USA.

11:30 From data to knowledge bases. **T. J. Crovello**, Dean of Graduate Studies and Research, California State University, Los Angeles, California 90032, USA.

Discussion Group No. 6

CO-EVOLUTION: SYMBIOSIS IN EVOLUTION

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3207

Organizer: **Dr. Mary Beth Saffo**, Institute of Marine Sciences, University of California, Santa Cruz, California 95064, USA.

Questions

Is symbiosis a source of evolutionary innovation?

Co-evolution theory, mutualizm theory, and endosymbiotic interactions: do mutualistic interactions listen to evolutionary theorists?

Discussants will include: **Lynda J. Goff**, University of California, Santa Cruz, California 95064; **John Thompson**, Washington State University, Pullman, Washington, USA; and others.

Discussion Group No. 13

HOMEOSIS AND THE EVOLUTION OF PLANTS

Sunday July 1, 1990, 8:00 AM - 11:00 AM, LeFrak, Room 2205

Organizers: **Dr. U. Posluszny**, Department of Botany, College of Biological Sciences, University of Guelph, Guelph, Canada, and **Dr. Rolf Sattler**, Biology Department, McGill University, Montreal, Quebec, Canada.

Questions

What is homeosis?

What morphogenetic (or morphological) alterations may occur in homeotic plant mutants?

What are the genetic and developmental mechanisms of homeosis in plants?

What role has homeosis played in the evolution of varieties, species, genera, families, orders, etc.?

What is the impact of homeosis on evolutionary thinking and basic notions such as homology?

Contributed Paper Session No. 1

SEX AND SEX RATIOS

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203

Co-chairs:
Dr. Lin Chao, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

Dr. Curtis M. Lively, Department of Biology, Indiana University, Bloomington, Indiana 47405, USA.

8:00 An experimental test of the tangled bank/frozen niche-variation models. **Stephen C. Weeks**, Center of Theoretical and Applied Genetics, P. O. Box 231, Rutgers University, New Brunswick, New Jersey 08903, USA (SSE).

8:15 Maintenance of sex in a heterogeneous environment. **O. E. Gaggiotti**, Center for Theoretical and Applied Genetics (CTAB), Cook College/Rutgers University, New Brunswick, New Jersey 08903 USA (SSE).

8:30 Clonal diversity and environmental heterogeneity in the population frequency of a parthenogenetic fish (Dace: Phoxinus). **C. Anna Toline** and **Mart R. Gross**, Department of Zoology, University of Toronto, Toronto, Ontario, Canada M5S 1A1 (SSE).

8:45 Helminths and the genetic diversity of North American fish and mammals. **J. Da Silva,** Department of Biology, McGill University, Montreal, P.Q., Canada H3A 1B1.

9:00 Genetic variation in thelytokous nothroid mites. **S. C. Palmer,** Cazenovia College, Cazenovia, New York 13305, and **R. A. Norton,** State University of New York, College of Environmental Science and Forestry, Syracuse, New York 13210, USA.

9:15 Digenean parasitism and the origin and consequences of apomictic parthenogenesis in a North American freshwater snail, Campeloma decisum. **Steven G. Johnson,** Museum of Natural History and Department of Systematics and Ecology, The University of Kansas, Lawrence, Kansas 66045, USA (SSE).

9:30 Identifying the functional domains on the "selfish" psr chromosome causing paternal genome loss. **Leo W. Beukeboom,** Department of Biology, University of Rochester, Rochester, New York 14627, USA (SSE).

9:45 A social spider perspective on the evolution of sex ratio in structured populations. **L. Aviles,** Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA and Department of Integrative Biology, University of California, Berkeley, California 94720, USA (SSE).

10:00 Break

10:15 Female-predominant sex ratios in Rumex acetosa and R. acetosella. **H. Korpelainen,** Department of Genetics, University of Helsinki, Arkadiankatu 7, SF-00100 Helsinki, Finland.

10:30 A test of the evolutionary significance of environmental sex determination in reptiles. **Fredric J. Janzen,** Department of Ecology and Evolution, University of Chicago, Chicago, Illinois 60637, USA (SSE).

10:45 Influences of incubation temperature on sex and growth of the diamondback terrapin, Malaclemys terrapin. **W. M. Roosenburg,** Department of Biology, University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA (SSE).

11:00 Evolution of sex determining mechanisms: the transition from environmental to genetic sex determination across a latitudinal gradient in Menidia menidia. **I. V. Lagomarsino and D. O. Conover,** Marine Sciences Research Center, State University of New York, Stony Brook, New York 11794, USA.

11:15 Levels of selection and the evolution of sex in RNA viruses. **Lin Chao,** Department of Zoology, University of Maryland, College Park, Maryland 20742, USA (SSE).

Contributed Paper Session No. 2

MOLECULAR AND MORPHOLOGICAL RELATIONSHIPS AMONG POPULATIONS I

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3211

Co-chairs:
Mr. F. X. Villablanca, Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA.

Dr. Richard Highton, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

8:00 Mitochondrial DNA variation: genes, species and phylogenies. **F. X. Villablanca,** Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA (SSE, SSZ).

8:15 Relationships between retroposons and retroviruses - more on the evolution of the retroid family. **M. McClure,** Department of Ecology & Evolutionary Biology, University of California, Irvine, California 92717, USA.

8:30 Comparison of the 5' exon and intron region of the hsp70A gene in the nematode Bursaphelenchus spp. using PCR. **K. A. Beckenbach** and **J. M. Webster,** Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia Canada V5A 1S6.

8:45 Historical zoogeography and the evolution of spawning mode in capelin, Mallotus villosus, in the North Atlantic based on mtDNA polymorphisms. **J. J. Dodson, C. Ouellet, L. Bernatchez,** Departement de biologie, Universite Laval, Quebec, Canada, and **J. E. Carscadden,** Department of Fisheries and Oceans, Northwest Atlantic Fisheries Centre, St. John's, Newfoundland, Canada (SSE).

9:00 Mitochondrial DNA differentiation of stickleback (Gasterosteus aculeatus) from the Queen Charlotte Islands, Canada. **P. O'Reilly** and **T. E. Reimchen,** Zoology Department, University of Alberta, Edmonton, Alberta, Canada T6G 2E9.

9:15 Mitochondrial DNA phlyogeographic structure of the lake whitefish, Coregonus clupeaformis complex (L.). **L. Bernatchez** and **J. J. Dodson,** Department de Biologie, Universite Laval, Quebec, Canada (SSE).

9:30 Mitochondrial DNA analyses and the origins and relative ages of unisexual lineages of the genus Poeciliopsis. **J. M. Quattro** and **R. C. Vrijenhoek,** Center for Theoretical and Applied Genetics, Rutgers University, New Brunswick, New Jersey 08903, USA and **J. C. Avise,** Department of Genetics, University of Georgia, Athens, Georgia 30602, USA (SSE).

9:45 Geographic variation in Fundulus heteroclitus: allozymes, mtDNA, and morphological shape. **M. E. Douglas,** Department of Zoology, Arizona State University, Tempe, Arizona, USA, and **M. W. Smith,** Department of Biological Sciences, University of California, San Diego, California, USA (SSE).

10:00 **Break**

10:15 The use of molecular biology to study the structural basis of genetic variation of the Ldh-B locus in the fish Fundulus heteroclitus. **T. Lauerman, D. Crawford and D. Powers,** Biological Sciences Department, Hopkins Marine Station of Stanford University, Pacific Grove, California 93950, USA.

10:30 Environmental adaptation by transcriptional regulation of the Ldh-B locus in the teleost fish Fundulus heteroclitus. **Douglas L. Crawford and Dennis A. Powers,** Hopkins Marine Station, Stanford University, Pacific Grove, California 93950, USA.

10:45 Character evolution and phylogenetic relationships among populations of the yellow warbler (Dendroica petechia). **Nedra K. Klein,** Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109, USA (SSE).

11:00 High mitochondrial DNA sequence divergence between geographic regions of Macaca mulatta despite few differences in allozyme polymorphisms. **G. A. Hoelzer, R. Absher and D. J. Melnick,** Department of Anthropology, Columbia University, New York, New York 10027, USA (SSE).

11:15 Population differentiation decreases with depth in deep-sea gastropods. **R. J. Etter,** Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543, and **M. A. Rex,** Biology Department, University of Massachusetts, Boston, Massachusetts 02125, USA.

Contributed Paper Session No. 3

FUNCTIONAL MORPHOLOGY, AND PATTERNS OF NATURAL SELECTION

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2309

Co-chairs:
Dr. Sharon Emerson, Department of Biology, University of Utah, Salt Lake City, Utah 84112, USA.

Dr. D. W. McShea, Committee on Evolutionary Biology, University of Chicago, Hinds Geophysical Sciences Building, 5734 South Ellis Avenue, Chicago, Illinois 60637, USA.

8:00 Natural selection on bill characters in the two bill morphs of the African finch Pyrenestes ostrinus. **T. B. Smith,** Department of Integrative Biology, University of California, Berkeley, California 94720, USA (SSE).

8:15 Patterns of size-selective mortality with and without predators in sailfin mollys. **J. C. Trexler,** Department of Biology, University of Mississippi, University, Mississippi 38677, **J. Travis and M. McManus,** Biological Sciences Department, Florida State University, Tallahassee, Florida 32306, and **R. Tempe,** Natural Sciences, Eckerd College, P.O. Box 12560, St. Petersburg, Florida 33733, USA (SSE).

8:30 The dynamics of selection on body size in the bruchid beetle, Acanthoscelides alboscutellatus. **J. R. Ott,** Zoology Department, University of Maryland, College Park, Maryland 20742, USA (SSE).

8:45 Experimental character displacement in the Adzuki bean weevil, Callosobruchus chinensis. **Mark L. Taper,** Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA (SSE).

9:00 Character displacement among sympatric East African jackals. **B. Van Valkenburgh** and **R. K. Wayne,** Biology Department, University of California, Los Angeles, California 90024, USA (SSE).

9:15 Patterns of correlations among morphological traits in wild radish, Raphanus raphanistrum. **J. Conner** and **S. Via,** Cornell University, Ithaca, New York, USA (SSE).

9:30 A graphical analysis of genetic correlations as evidence for selection. **R. W. Jernigan,** Department of Mathematics and Statistics, **D. C. Culver** and **D. W. Fong,** Department of Biology, The American University, Washington, D.C. 20016, USA (SSE).

9:45 Specialists and generalists in a variable environment: the evolution of thermal sensitivity. **G. W. Gilchrist,** Department of Zoology (NJ-15), University of Washington, Seattle, Washington 98195, USA (SSE).

10:00 Break

10:15 Regressive evolution in Gammarus minus: field measurement of selection. **D. C. Culver,** Department of Biology, The American University, Washington, D.C. 20016, and **T. C. Kane,** Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221, USA (SSE).

10:30 Effects of genetic selection on population growth. **Robert A. Desharnais,** Biology Department, California State University, Los Angeles, California 90032, USA (ASN).

10:45 Biomechanical analysis of the forelimbs of Tyrannosaurus rex. **Matt B. Smith,** Museum of the Rockies, Montana State University, Bozeman, Montana 59717, and **Kenneth Carpenter,** Denver Museum of Natural History, Denver, Colorado 80205, USA.

11:00 Adaptation and the relative lengths of the skeletal wing elements in the Sulidae (Aves: Pelecaniformes). **Kenneth I. Warheit,** Department of Integrative Biology, University of California, Berkeley, California 94720, USA (SSE).

11:15 Threshold effects and the evolution of functional complexes. **S. Emerson,** Department of Biology, University of Utah, Salt Lake City, Utah 84112, **M. A. R. Koehl,** Department of Integrative Biology, University of California, Berkeley, California 94720, and **J. Travis,** Department of Biological Science, Florida State University, Tallahassee, Florida 32306, USA (SSE).

11:30 Morphological evolution in Incirrate octopods and the colonization of shallow water habitats. **J. R. Voight,** Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA (SSE).

11:45 A hypothesis of the functional and adaptive significance of lappets in Neoteredo reynei (Bivalvia - Teredinidae). **H. J. Severeyn,** Zoology Department, University of Maryland, College Park, Maryland 20742, USA; **J. J. Ewald** and **Y. J. Garcia de Severeyn,** Dpto. de Biologia, Fac. de Ciencias, Universidad del Zulia, Maracaibo, Venezuela.

12:00 Measuring complexity change in evolution. **D. W. McShea,** Committee on Evolutionary Biology, University of Chicago, Hinds Geophysical Sciences Building, 5734 S. Ellis Avenue, Chicago, Illinois 60637, USA (SSE).

EXHIBITS

Sunday July 1, 1990, 9:00 AM - 5:00 PM, Grand Ballroom, A. Stamp Student Union

PLENARY LECTURE

Sunday July 1, 1990, 12:30 PM - 1:30 PM, Tydings Lecture Hall, Room 1030

Professor Robert M. May, FRS, Department of Pure and Applied Biology, Imperical College, Prince Consort Road, London SW7 2BB, England, United Kingdom.

Community patterns and their importance for understanding and conserving diversity.

Congress Symposium No. 8

BIOTIC EXCHANGE: HOW HAS IT INFLUENCED SUBSEQUENT EVOLUTION?

Sunday July 1, 1990, 1:45 PM - 6:00 PM, LeFrak, Room 2205

Organizer: **Dr. Geerat Vermeij,** Department of Geology, University of California, Davis, California 95616, USA.

1:45 Introductory remarks. **Geerat Vermeij,** Department of Geology, University of California, Davis, California 95616, USA.

1:50 The great American interchange: who invaded and who did not? **S. David Webb,** Florida Museum, University of Florida, Gainesville, Florida, USA.

2:20 Faunal interchange and the Middle and Late Miocene terrestrial vertebrates of southern Asia. **John C. Barry** and **Michelle E. Morgan,** Department of Anthropology, Harvard University, Cambridge, Massachusetts 02138; and **Alisa J. Winkler,** Department of Geological Sciences, Southern Methodist University, Dallas, Texas 75275, USA.

2:50 Late Neogene faunal stability in North China. **L. J. Flynn** and **R. H. Tedford,** Department of Vertebrate Paleontology, American Museum of Natural History, New York, New York 10024, USA; and **Qui Zhanxiang,** Institute of Vertebrate Paleontology and Paleoanthropology, Academia Sinica, Box 643, Beijing, People's Republic of China.

3:20 Break

3:30 Patterns of high latitude, Mesozoic terrestrial biogeography. **W. A. Clemens,** Museum of Paleontology, University of California, Berkeley, California 94720, USA.

4:00 Late Paleozoic-early Mesozoic tetrapod distributions: patterns and mechanisms. **N. H. Shubin,** Department of Biology, University of Pennsylvania, Philadelphia, Pennsylvania 19104, and **H. D. Sues,** Department of Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA.

4:30 Marine biotic interchange between the northern and southern hemispheres. **D. R. Lindberg,** Department of Paleontology, University of California, Berkeley, California 94720, USA.

5:00 Anatomy of an invasion: the trans-Arctic interchange. **G. J. Vermeij,** Department of Geology, University of California, Davis, California 95616, USA.

5:30 The evolution of the Antarctic biota. **Jere H. Lipps,** Department of Integrative Biology and Museum of Paleontology, University of California, Berkeley, California 94720, USA.

Congress Symposium No. 24

MOLECULAR AND PALEONTOLOGICAL PERSPECTIVES ON THE EVOLUTION OF MODERN HUMANS

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Architecture, Room 0204

Organizer: **Dr. G. Phillip Rightmire,** Department of Anthropology, State University of New York, Binghamton, New York, USA.

1:45 Opening remarks. **G. Phillip Rightmire,** Department of Anthropology, State University of New York, Binghamton, New York, USA.

2:00 Mitochondrial DNA and the origin of modern humans. **Rebecca Cann,** Department of Genetics, University of Hawaii, Honolulu, Hawaii, USA, and **Olga Rickards,** Universita Delgi Studi di Roma, Italy.

2:30 DNA polymorphisms at two levels in the evolution of the human genome. **K. K. Kidd, J. Rogers** and **J. R. Kidd,** Department of Human Genetics, Yale University School of Medicine, New Haven, Connecticut 06510, USA.

3:00 Relationships among living human populations determined from DNA and classical polymorphisms. **J. L. Mountain** and **L. L. Cavalli-Sforza,** Department of Genetics, Stanford University, Stanford, California 94305, USA.

3:30 Break

4:00 Fossil evidence for the evolution of modern humans in Africa. **G. Phillip Rightmire,** Department of Anthropology, State University of New York, Binghamton, New York 13901, USA.

4:30 Continuity vs. replacement in the evolution of modern humans. **C. B. Stringer,** Department of Paleontology, British Museum (Natural History), Cromwell Road, London SW7 5BD, United Kingdom.

5:00 The behavior and ecology of early people in southern Africa. **Richard G. Klein,** Department of Anthropology, University of Chicago, Chicago, Illinois 60637, USA.

5:30 Discussion/closing remarks

Congress Symposium No. 28

EARLY LIFE

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Tydings Lecture Hall, Room 0130

Organizer: **Dr. J. William Schopf,** Center for the Study of Evolution and the Origin of Life, Institute of Geophysics and Planetary Physics, Geology Building, University of California, Los Angeles, California 90024, USA.

1:45 Origin of life. **Cyril Ponnamperuma,** Laboratory of Chemical Evolution, University of Maryland, College Park, Maryland 20742, USA.

2:15 Discussion

2:25 Evolution of the Precambrian environment. **Heinrich D. Holland,** Department of Earth and Planetary Sciences, Harvard University, Cambridge, Massachusetts 02138, USA.

2:55 Discussion

3:05 Evolution of early life: molecular biology. **W. Ford Doolittle,** Department of Biochemistry, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4H7, and Canadian Institute for Advanced Research Program in Evolutionary Biology.

3:35 Discussion

3:45 Break

4:00 Evolution of early life: microfossils and stromatolites. **J. William Schopf,** Department of Earth and Space Sciences and IGPP Center for the Study of Evolution and the Origin of Life, University of California, Los Angeles, California 90024, USA.

4:30 Discussion

4:40 The Precambrian carbon cycle. **David J. Des Marais,** Ames Research Center, NASA, Moffett Field, California, USA.

5:10 Discussion

5:20 The rise of the multicellular eukaryotes. **Bruce Runnegar,** Department of Earth and Planetary Sciences, University of California, Los Angeles, California 90024, USA.

5:50 Discussion

Congress Special Interest Symposium/Workshop No. 31 (continued)

21ST CENTURY DATA AND KNOWLEDGE BASES IN SYSTEMATICS AND EVOLUTIONARY BIOLOGY

Sunday July 1, 1990, 1:45 PM - 6:00 PM, A. Stamp Student Union, Tortuga Room

1:45 Literature data bases. **M. C. Kelly,** BIOSIS, 2100 Arch Street, Philadelphia, Pennsylvania 19103, USA.

2:30 Molecular biological databases. **C. Burks,** Theoretical Biology and Biophysics Group, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA.

3:15 Break

3:30 Microbiological databases. **M. I. Krichevsky,** Microbial Systematics Section, Epidemiology and Oral Disease Prevention Program, National Institute of Dental Research, National Institutes of Health, Bethesda, Maryland 20892, USA.

4:15 Standardized nomenclature and terminology in biological data bases. **L. D. Blaine,** Bioinformatics Department, American Type Culture Collection, Rockville, Maryland 20852, USA.

5:00 General discussion and proposed future actions

Affiliated Session No. 14

NT-24 (NUMERICAL TAXONOMY ASSOCIATION)

Sunday, July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2309

Part I. Featured Address

Chair: **Richard Jensen,** Saint Mary's College, Notre Dame, Indiana 46556, USA.

1:45 The effect of history on genetic population structure in humans. **R. R. Sokal,** Ecology and Evolution Department, State University of New York, Stony Brook, New York 11794, USA.

Part II. Contributed Papers

3:00 Evaluating the undirected congruence of individual taxa when two phylogenetic trees have been estimated for the same group of taxa. **George F. Estabrook,** Herbarium and Department of Biology, The University of Michigan, Ann Arbor, Michigan 48109, USA.

3:15 Combining data sets for cladistic analysis. **Bernard R. Baum,** Biosystematics Research Centre, Agriculture Canada, Central Experimental Farm, Ottawa, Ontario, Canada K1A 0C6.

3:30 Developmental variability and heterochronic evolution in poeciliid fishes (Cyprinodontiformes). **Richard E. Strauss,** Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA.

3:45 The limitation of using ecological characters in the phylogenetic study - an example of damselfishes' feeding habits. **Kwang-Tsao Shao,** Institute of Zoology, Academia Sinica, Nankang 11529, Taipei, Taiwan, Republic of China.

4:00 Break

4:15 Origin, speciation and self-compatibility in Vaccinium section Macropelma. **S. P. Vander Kloet,** Biology Department, Acadia University, Wolfville, Nova Scotia, Canada B0P 1X0.

4:30 Fractal dimensionality of gorgonian colonies. **Michele Scardi,** Stazione Zoologica "A. Dohrn", Villa Comunale, 80121 Napoli, Italy.

4:45 Comparing sets of landmarks: affine resistant-fit analyses. **Richard J. Jensen,** Department of Biology, Saint Mary's College, Notre Dame, Indiana 46556, USA.

5:00 Artificial life: ecology and evolution in digital organisms. **Thomas S. Ray,** University of Delaware, Newark, Delaware 19716, USA.

5:30 Business meeting

Affiliated Society Symposium No. 8

HOST-PARASITE INTERACTIONS AND THE EVOLUTION OF REPRODUCTIVE CHARACTERS (THE SOCIETY FOR THE STUDY OF EVOLUTION)

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2203

Organizers: **Dr. Samuel W. Skinner** and **Dr. Keith Clay,** Biology Department, Indiana University, Bloomington, Indiana 47405, USA.

1:45 Implications of a floral disease for the reproductive biology of Silene alba. **H. M. Alexander,** Departments of Botany, and Systematics and Ecology, University of Kansas, Lawrence, Kansas 66045, USA.

2:15 Plant parasites that suppress sex of hosts: the Red Queen dethroned? **Keith Clay,** Department of Biology, Indiana University, Bloomington, Indiana 47405, USA.

2:45 Sex ratio dynamics: cause and consequence in an insect-pathogen interaction. **Samuel W. Skinner,** Biology Department, Indiana University, Bloomington, Indiana 47405, USA.

3:15 Break

3:30 **Lori Stevens,** Department of Zoology, University of Vermont, Burlington, Vermont, USA.

4:00 Cultural vectors and the evolution of disease virulence. **Paul Ewald,** Department of Biology, Amherst College, Amherst, Massachusetts 01002; and **Matthew Parker,** Department of Biological Sciences, State University of New York, Binghamton, New York, USA.

4:30 Parasitic castration and selection for biparental reproduction in a freshwater snail. **Curtis Lively,** Biology Department, Indiana University, Bloomington, Indiana 47405, USA.

5:00 **Joseph Schall,** Department of Zoology, University of Vermont, Burlington, Vermont, USA.

5:30 Parasitism in sexual and clonal fish supports assumptions of the Red Queen hypothesis. **C. M. Lively,** Biology Department, Indiana University, Bloomington, Indiana 47405; and **C. Craddock** and **R. C. Vrijenhoek,** Center for Theoretical and Applied Genetics (CTAG), Cook College, Rutgers University, New Brunswick, New Jersey 08903, USA.

Affiliated Society Workshop No. 11

LINNAEAN PLANT NAME TYPIFICATION PROJECT (LINNAEAN SOCIETY)

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3207

Organizers: **Dr. Charles Jarvis,** Department of Botany, The Natural History Museum, London, England, and **Dr. James L. Reveal,** Department of Botany, University of Maryland, College Park, Maryland 20742, USA.

1:45 Overview of the Linnaean typification project. **Charles E. Jarvis,** Department of Botany, The Natural History Museum, Cromwell Road, London SW7 5BD, England, United Kingdom.

2:45 Typification of Linnaeus' temperate North American plants. **James L. Reveal,** Department of Botany, University of Maryland, College Park, Maryland 20742, USA.

3:45 Typification, a stabilizer of names? **Dan H. Nicolson,** Department of Botany, NHB166, Smithsonian Institution, Washington, D.C. 20560, USA.

Contributed Paper Session No. 4

PLANT MATING SYSTEMS

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3219

Co-chairs:
Dr. Paul R. Neal, Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA.

Dr. Linda F. Delph, Department of Biology, Indiana University, Bloomington, Indiana 47405, USA.

1:45 Evidence for a genetic basis to gender in a subdioecious shrub. **L. F. Delph,** Department of Biology, Indiana University, Bloomington, Indiana 47405, USA (SSE).

2:00 Phenotypic and genetic correlations among floral traits for males and females of Silene alba. **T. R. Meagher,** Department of Biological Sciences, Rutgers University, Piscataway, New Jersey, USA (SSE, ASN).

2:15 The reproductive biology of the dioecious shrub, Lindera benzoin, in shade and sun habitats. **R. A. Niesenbaum,** Department of Biology, University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA.

2:30 Multiple paternity and selfing throughout the lifespan of individual flowers in Mimulus. **Michele R. Dudash,** Department of Botany, University of Maryland, College Park, Maryland 20742, USA, and **Kermit Ritland,** Department of Botany, University of Toronto, Toronto, Ontario, Canada M5S 3B2 (SSE).

2:45 The influence of variation in herkogamy on outcrossing rates in Turnera ulmifolia var. angustifolia. **S. Belaoussoff and J. S. Shore,** Department of Biology, York University, North York, Ontario, Canada M3J 1P3 (SSE).

3:00 The evolution of selfing and the phylogeny of the mustard genus Leavenworthia. **E. E. Lyons,** Biology Department, Amherst College, Amherst, Massachusetts 01002, USA (SSE).

3:15 Genetics of sex allocation in an andromonoecious plant. **Paul R. Neal,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (ASN).

3:30 Break

3:45 Asymmetric pollen flow and morph specific pollen limitation in the tristylous plant Lythrum salicaria. **P. O'Neil,** Department of Biology and Medicine, Brown University, Providence, Rhode Island 02912, USA (SSE).

4:00 An experimental evaluation of the functional significance of heterostyly in Eichhornia paniculata (Pontederiaceae). **J. R. Kohn and S. C. H. Barrett,** Department of Botany, University of Toronto, Toronto, Ontario, Canada M5S 3B2 (SSE).

4:15 Molecular phylogenetics and mating system evolution in the Pontederiaceae. **J. R. Kohn, B. R. Morton and S. C. H. Barrett,** Botany Department, University of Toronto, Toronto, Ontario, Canada M5S 3B2 (SSE).

4:30 Self-incompatibility and effective population size in rare plant species. **D. L. Byers and T. R. Meagher,** Department of Biological Sciences, Rutgers University, Piscataway, New Jersey, USA.

4:45 Intrapopulation variation in fitness consequences of mating types in Phacelia dubia. **R. F. Del Castillo,** Department of Botany, Duke University, Durham, North Carolina 27706, USA.

5:00 Pollen limitation in the facultatively autogamous annual, Lupinus nanus. **K. Karoly,** Committee on Evolutionary Biology, The University of Chicago, Chicago, Illinois 60637, USA (SSE).

5:15 The influence of self versus outcrossed mating on progeny success in natural and greenhouse populations of Aquilegia caerulea James (Ranunculaceae). **Arlee M. Montalvo,** Department of Biology, University of California, Riverside, California 92521, USA (SSE).

5:30 The effects of inbreeding depression and maternal sex on offspring fitness components in Sidalcea oregana ssp. spicata. **Tia-Lynn Ashman and Maureen Stanton,** Department of Botany, University of California, Davis, California 95616, USA (SSE).

Contributed Paper Session No. 5

DEVELOPMENTAL AND MORPHOLOGICAL PATTERNS IN EVOLUTION

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3211

Co-chairs:
Dr. Erick Greene, Department of Avian Sciences, University of California, Davis, California 95616, USA.

Mr. Andres Collazo, Museum of Vertebrate Zoology and Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

1:45 DOBZHANSKY LECTURE. Evolutionary aspects of a developmental polymorphism in a caterpillar. **Erick Greene,** Department of Avian Sciences, University of California, Davis, California 95616, USA.

2:00 Development and evolution of leaf shape in Begonia dregei. **Tracy McLellan,** University of California, Santa Barbara, California 93106, USA (SSE)

2:15 Homology of vertebrate morphology: contributions and limitations of developmental data. **T. Miyake,** Department of Genetics, North Carolina State University, Raleigh, North Carolina 27695, USA, and **B. K. Hall,** Department of Biology, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4J1 (SSE).

2:30 Identification of the plesiomorphic developmental pattern in the salamander family Plethodontidae. **A. Collazo and S. B. Marks,** Museum of Vertebrate Zoology and Department of Integrative Biology, University of California, Berkeley, California 94720, USA (SSE).

2:45 Ontogenetic patterns and phylogenetic trends in the mechanoreceptive lateral line system of fishes. **J. F. Webb,** Department of Anatomy, New York State College of Veterinary Medicine, Cornell University, Ithaca, New York 14853, USA (SSE).

3:00 Evolution of embryonic cell lineage in Heliocidaris erythrogramma, a direct-developing echinoid. **Gregory A. Wray and Rudolf A. Raff,** Department of Biology, Indiana University, Bloomington, Indiana 47405, USA.

3:15 Heterochronic bottlenecks in cladogenesis: the "reappearance" of Aristotle's lantern in the sand dollars. **Rich Mooi,** Department of Invertebrate Zoology, NHB-163, Smithsonian Institution, Washington, D. C. 20560, USA (WHS).

3:30 Break

3:45 Evolution and ontogenetic trajectories in arthropods. **H. M. Andre,** Musee Royal de l'Afrique Centrale, Section d'Entomologie, B-1980 Ervuren and Universite Catholique de Louivain, Unite d'Ecologie et de Biogeographie, place Croix du Sud 5, B-1348 Lousvain-la-Neuve, Belgium (LSL).

4:00 Heterochrony and the evolution of sexual dimorphism in a genus of blennioid fishes. **Philip A. Hastings,** Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA (SSE, SSZ, WHS).

4:15 Sexual size dimorphism in spiders. **G. Head,** Program in Ecology, Evolution and Behavior, Department of Biology, Princeton University, Princeton, New Jersey 08544, USA.

4:30 Polymorphism in arctic charr, Salvelinus alpinus. **S. Skulason,** Department of Zoology, University of Guelph, Guelph, Ontario, Canada N1G 2W1.

4:45 Evidence from chloroplast DNA variation for parallel floral evolution in the subfamily Cypripedioideae, an unterbauplan within the Orchidaceae. **Victor A. Albert** and **Mark W. Chase,** Department of Biology, University of North Carolina, Chapel Hill, North Carolina 27599, USA (SSE)

5:00 Fluctuating asymmetry of morphometric variables in inbred and hybrid house mice of different ages. **Larry Leamy,** Department of Biology, University of North Carolina, Charlotte, North Carolina 28223, USA (SSE).

5:15 Fluctuating asymmetry in hybridizing fishes. **James D. Felley,** OIRM, A&I Building, Smithsonian Institution, Washington, D. C. 20560, USA.

Contributed Paper Session No. 6

MOLECULAR AND MORPHOLOGICAL RELATIONSHIPS AMONG POPULATIONS II

Sunday, July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3203

Co-chairs:
Dr. Nancy Knowlton, Smithsonian Tropical Research Institute, APO Miami 34002, USA.

Dr. Darryll Felder, Department of Biology, University of Southwestern Louisiana, Lafayette, Louisiana 70504, USA.

1:45 Evolutionary diversification of a polytypic species?: the case of the North American tiger salamander, Ambystoma tigrinum. **H. Bradley Shaffer,** Zoology Department, University of California, Davis, California 95616, USA (SSE, SSZ).

2:00 Relationships among symbiotic snapping shrimp in the genus Alpheus: sibling species, host shifts, and founder events. **N. Knowlton** and **L. Weigt,** Smithsonian Tropical Research Institute, APO Miami

2:15 Genic and morphological evolution in Atlantic Slope populations of the greenside darter, Etheostoma blennioides (Teleostei: Percidae). **R. L. Raesly** and **J. H. Howard,** Department of Biology, Frostburg State University, Frostburg, Maryland 21532; **J. R. Stauffer, Jr.,** School of Forest Resources, Pennsylvania State University, University Park, Pennsylvania 16802; and **R. P. Morgan II,** University of Maryland, Appalachian Environmental Laboratory, Frostburg, Maryland 21532, USA (SSE, SSZ).

2:30 Phylogeny and phenotypic evolution of the Drosophila virilis species group. **G. S. Spicer,** Linus Pauling Institute of Science and Medicine, 440 Page Mill Road, Palo Alto, California 94306, USA (SSE).

2:45 Genetic relationships among the Portuguese Chondrostoma (Pisces, Cyprinidae). **M. M. Coelho** and **M. J. Alves,** Departmento de Zoologia e Antropologia, Faculdade de Ciencias de Lisbon, Bloco C2 3oPiso Campo Grande, 1700 Lisbon, Portugal (SSZ).

3:00 An electrophoretic study of geographic variation in Chrysomya bezziana. **K. L. Strong** and **R. J. Mahon,** C.S.I.R.O., Division of Entomology, Canberra, Australia, 2601.

3:15 Genetic structure in western Atlantic crustaceans: biogeographic diversity in disjunct populations of Callichirus major, Sesarma reticulatum, and Uca minax. **J. L. Staton** and **D. L. Felder,** Department of Biology, University of Southwestern Louisiana, Lafayette, Louisiana 70504, USA.

3:30 Break

3:45 Phylogenetic relationships within the genus Tisbe (Copepoda, Harpacticoida) as deduced on the basis of naupliar characters. **H.-U. Dahms** and **H. K. Schminke,** Fachbereich 7 (Biologie), Arbeitsgruppe Zoomorphologie, Universitat Oldenburg, Postfach 2503, D-2900 Oldenburg, Federal Republic of Germany (SSZ).

4:00 Allozyme variation within geographically widespread and restricted species of Polygonella and its biogeographical implications. **Paul O. Lewis,** Department of Botany, Ohio State University, 1735 Neil Avenue, Columbus, Ohio 43210, USA (SSE).

4:15 Isozyme variation and species boundaries in North American Puccinellia species complexes (Poaceae). **Jerrold I. Davis** and **Paul S. Manos,** L. H. Bailey Hortorium, Cornell University, Ithaca, New York 14853, USA (SSE, SSZ).

4:30 A possible genetic division between migratory and non-migratory populations of the common free-tailed bat, Tadarida brasiliensis. **R. D. Owen,** Department of Biology, University of Missouri, Kansas City, Missouri 64110; **R. K. Chesser,** Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29801; and **D. C. Carter,** The Museum, Texas Tech. University, Lubbock, Texas 79409, USA (SSE, SSZ, WHS).

4:45 Electrophoretic evidence for a progenitor taxon and region of origin for the Galapagos shrub snapdragon, Galvezia leucantha. **Wayne J. Elisens,** Department of Botany and Microbiology, University of Oklahoma, Norman, Oklahoma 73019, USA (SSE).

5:00 Rapid chromosomal diversification in an ancient frog, Leiopelma hochstetteri: does the ratchet click faster for univalents? **David M. Green,** Redpath Museum, McGill University, Montreal, Quebec, Canada H3A 2K6 (SSE, SSZ).

Contributed Paper Session No. 7

GENETIC CONSTRAINTS, AND LEVELS OF SELECTION

Sunday, July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3221

Co-chairs:
Dr. Mark Dybdahl, Friday Harbor Laboratories, University of Washington, Friday Harbor, Washington 98250, USA.

Mr. Sean H. Rice, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA.

1:45 Do genetic constraints prevent local adaptation in Tigriopus californicus life-histories? **M. Dybdahl,** Friday Harbor Laboratories, University of Washington, Friday Harbor, Washington 98250, USA.

2:00 Genetic correlations among traits determining migratory tendency in the sand cricket, Gryllus firmus. **D. J. Fairbairn,** Department of Biology, Concordia University, 1455 de Maisonneuve Boulevard West, Montreal, Quebec, Canada H3G 1M8, and **D. A. Roff,** Department of Biology, McGill University, 1205 Dr. Penfield Avenue, Montreal, Quebec, Canada H3A 1B1.

2:15 Genetic architecture and epistasis. **Gabriel Moreno,** State University of New York, Stony Brook, New York 11794, USA (SSE).

2:30 Kin versus family selection in plants. **D. G. Lloyd,** Department of Plant and Microbial Sciences, University of Canterbury, Christchurch, New Zealand (ASN).

2:45 Hierarchical selection in modular organisms. **Timo Vuorisalo,** Department of Biology, Indiana University, Bloomington, Indiana 47405, USA.

3:00 Group and interdemic selection in the dynamics of t-haplotypes in house mice. **L. Nunney,** Department of Biology, University of California, Riverside, California 92521, USA (SSE, ASN).

3:15 An alternative species concept. **J. Gonzalez-Gonzalez** and **M. Gold-Morgan,** Laboratorio de Ficologia, Facultad de Ciencias, Universidad Nacional Autonoma de Mexico, A. P. 70620, Coyoacan 04510, Mexico, D. F.

3:30 Break

3:45 The nature of the species concept: the relationship between the unit of evolution and the unit of taxonomy. **M. B. Williams,** Center for Science and Culture, University of Delaware, Newark, Delaware 19716, USA (SSE, SSZ).

4:00 Levels of selection and evolutionary dynamics. **Sean H. Rice,** Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA.

Poster Session No. 1

EVOLUTIONARY ECOLOGY

Sunday July 1, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

1. PopDyn: A simulation program to explore ecological interactions. **R. J. Etter,** Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543, and **D. R. Maddison,** Museum of Comparative Zoology, Harvard University, Cambridge 02138, USA.

2. Some of the influences of porcupine consumption and diggings on the perennial and annual vegetation of the Negev Desert of Israel: as a function of a disturbance and cover-over of a porcupine digging. **Yitzchak Gutterman,** the Jacob Blaustein Institute for Desert Research and Department of Biology, Sde Boker Campus, Ben-Gurion University of the Negev, Israel 84993 (SSE).

3. Effect of flower and fruit predators on the reproductive success of Ptilotrichum spinosum. **J. M. Gomez** and **R. Zamora,** Departamento de Biologia Animal, Universidad de Granada, 18001 Granada, Spain.

4. Variations in the pollinator assembly of Ptilotrichum spinosum: interpopulation and interindividual comparisons. **J. M. Gomez** and **R. Zamora,** Departamento de Biologia Animal, Universidad de Granada, 18001 Granada, Spain.

5. Evolutionary trends in the floral structure of Tambourissa (Monimiaceae). **David H. Lorence,** National Tropical Botanical Garden, P.O. Box 340, Lawai, Kauai, Hawaii 96765, USA (LSL).

6. The floral display: architectural model of pollinator attraction and florivore defense. **K. H. Burgess,** Department of Organismic and Evolutionary Biology, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA (SSE).

7. Adaptive zones and atitudinal variation in Arianta. **E. Gittenberger,** Systematic Zoology Section, Population Biology Department, NL-2300 RA Leiden, The Netherlands.

8. When islands are continents: orb-weaving spider richness area relations in Amazonian forest fragments. **H. G. Fowler,** Departamento de Ecologia, Instituto de Biociencias, UNESP, 13500 Rio Claro, Sao Paulo, Brazil (ASN).

Poster Session No. 2

SEX, BREEDING SYSTEMS, SEXUAL AND NATURAL SELECTION

Sunday July 1, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

9. Measuring the cost of sex: a simulation model. **M. J. Heilbrunn,** Ecology Department, University of Delaware, Newark, Delaware 19716, USA (SSE).

10. Occurrence and frequency of gametophytic apomixis in Crataegus douglasii Lindl. (Rosaceae: Maloideae). **S. Belaoussoff,** Biology Department, York University, North York, Ontario, Canada M3J 1P3; **T. A. Dickinson,** Department of Botany, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario, Canada M5S 2C6; and **R. M. Love,** 393 FulVue Drive, Eugene, Oregon 97405, USA (SSE).

11. Breeding system evolution in Mimulus (Scrophulariaceae). **C. B. Fenster,** Department of Botany, The University of Maryland, College Park, Maryland 20742, USA, and **K. Ritland,** Department of Botany, The University of Toronto, Toronto, Ontario, Canada M5S 1A1, (SSE).

12. Genetic evidence for multiple origin of selfing within Eichhornia paniculata (Pontederiaceae). **C. B. Fenster,** Department of Botany, The University of Maryland, College Park, Maryland 20742, USA and **S. C. H. Barrett,** Department of Botany, The University of Toronto, Toronto, Ontario, Canada M5S 1A1 (SSE).

13. Size hierarchy effects on flower phenology and genetic transmission. **T. W. Mully and E. E. Lyons,** Biology Department, Amherst College, Amherst, Massachusetts 01002, USA (SSE).

14. From domestic foxes to evolutionary implications of selection vector. **L. N. Trut,** Institute of Cytology and Genetics of the Academy of Sciences of the USSR, Novosibirsk, USSR.

15. Causal relations of selection events at multiple hierarchial levels. **Lindley Darden,** Department of Philosophy, and **Kevin Bach,** Program in General Biology, University of Maryland, College Park, Maryland 20742, USA.

Poster Session No. 3

LIFE HISTORY EVOLUTION

Sunday July 1, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

16. Relative fitness of atrazine resistant and atrazine susceptible biotypes of Abutilon theophrasti Medic. **B. A. Bailey and K. Garbutt,** Department of Biology, West Virginia University, Morgantown, West Virginia 26506, USA (SSE).

17. Phenotypic selection on growth rate and its components in Abutilon theophrasti Medic. **C. C. Bennington, K. Garbutt and J. B. McGraw.** Department of Biology, West Virginia University, Morgantown, West Virginia 26506, USA (SSE).

18. Life history evolution in guppies: the impact of prawn predation on guppy life histories. **F. H. Rodd,** Biology Department, York University, North York, Ontario, Canada M3J 1P3, and **D. N. Reznick,** Biology Department, University of California, Riverside, California 92521, USA.

19. Comparative evolutionary ecology of host exploitation for two parasites of freshwater fishes. **J. M. Kirby,** Biology Department, Millersville University, Millersville, Pennsylvania 17551, USA.

20. Voltinism differences in two adjacent populations of water striders (Gerris remigis; Heteroptera: Gerridae) inhabiting cold and warm streams: phenotypic plasticity or heritable components? **Wolf Blanckenhorn,** Department of Biology, State University of New York, Albany, New York 12222, USA (SSE).

Poster Session No. 4

EVOLUTIONARY GENETICS

Sunday July 1, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

21. Lake Michigan and other barriers to gene flow between grasshopper populations: an update. **R. B. Willey, R. L. Willey and S. Horton,** Department of Biological Sciences, m/c 066, University of Illinois, P.O. Box 4348, Chicago, Illinois 60680, USA (SSE).

22. Differential selection and gene flow: the evolution of host use patterns in Papilio glaucus. **J. L. Bossart and J. Mark Scriber,** Department of Entomology, Michigan State University, East Lansing, Michigan 48824, USA.

23. A genetic discontinuity in a continuously distributed species: mitochondrial DNA in the American oyster, Crassostrea virginica. **Carol A. Reeb,** Department of Zoology, University of Hawaii at Manoa, Honolulu, Hawaii 96822, and **John C. Avise,** Department of Genetics, University of Georgia, Athens, Georgia 30602, USA.

24. Population genetics of aquatic oligochaetes (Family Tubificidae) in the Laurentian Great Lakes. **L. J. Weider,** Department of Biological Sciences, Great Lakes Institute, University of Windsor, Windsor, Ontario N9B 3P4, Canada (SSE).

25. Genetic population structure of American plaice (Hippoglossoides platessoides) in the Gulf of St. Lawrence. **W. Stott and M. Ferguson,** Department of Zoology, University of Guelph, Guelph, Ontario, Canada, N1G 2W1; and **R. Tallman,** DFO Gulf Region, Science Branch, Moncton, New Brunswick, Canada E1C 9B6.

26. Geographic variation in mtDNA polymorphisms in the Trinidad guppy. **A. Fajen and F. Breden,** Division of Biological Sciences, University of Missouri, Columbia, Missouri 65211, USA.

27. Comparative mtDNA phylogeny of four sympatric morphs of Arctic charr from Lake Thingvallavatn, Iceland. **R. G. Danzmann,** Department of Zoology, University of Guelph, Guelph, Ontario, Canada N1G 2W1 (SSE).

28. Rapid DNA sequence evolution in the control region of birds. **T. W. Quinn and A. C. Wilson,** Division of Biochemistry and Molecular Biology, University of California, Berkeley, California 94720, USA (SSE).

29. Genetic variability in coyotes and wolves. **N. Lehman and R. K. Wayne,** Department of Biology, University of California, Los Angeles, California 90024, USA (SSE).

30. Closely related species of pines show different amounts of chloroplast DNA variability. **J. A. Matos and B. A. Schaal,** Department of Biology, Washington University, St. Louis, Missouri 63130, USA (SSE).

31. Relative fitness resulting from frequency-dependent selection. **L. D. Brooks,** Division of Biology and Medicine, Brown University, Providence, Rhode Island, USA.

32. Mutation rates in metazoa and their relationship to germ line characteristics. **J. B. Drost,** Department of Zoology and Physiology, Louisiana State University, Baton Rouge, Louisiana 70803, USA (SSE).

33. Estimating the number of segregating genes using divergent selection. **D. Houle, Z. B. Zeng** and **C. C. Cockerham,** Department of Statistics, North Carolina State University, Raleigh, North Carolina 27695, USA (SSE).

34. Precocial sexual maturation and enzyme heterozygosity in rainbow trout. **M. Ferguson,** Department of Zoology, University of Guelph, Guelph, Ontario, Canada N1G 2W1 (SSE).

35. Genetic comparisons between allopatric and sympatric populations of Elimia livescens and Elimia virginica (Mesogastropoda: Pleuroceridae). **Thomas S. Bianchi,** Institute of Ecosystem Studies, Millbrook, New York 12545; **George M. Davis,** Academy of Natural Sciences of Philadelphia, Pennsylvania 19103; and **David Strayer,** Institute of Ecosystem Studies, Millbrook, New York 12545, USA (SSE).

36. Geographic variation and the potential for genetic exchange within and between natural populations of Bacillus subtilis. **M. S. Roberts** and **F. M. Cohan,** Department of Biology, Wesleyan University, Middletown, Connecticut 06457, USA (SSE).

37. Molecular population genetics of hobo transposable elements in Drosophila. **Gail M. Simmons,** Department of Biology, City College of New York, New York 10031, USA (SSE).

38. Large scale size variation of mitochondrial DNA in scallops. **B. Gjetvaj** and **E. Zouros,** Department of Biology, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4J1 (SSE).

NUMERICAL TAXONOMY ASSOCIATION MIXER
(Ticket required)

Sunday July 1, 1990, 6:30 PM - 7:30 PM, Atrium, A. Stamp Student Union

PLENARY LECTURE
(Open to the Public, ticket required)

Sunday July 1, 1990, 8:00 PM, Baird Auditorium, National Museum of Natural History, Smithsonian Institution, Washington, D. C.

Dr. Richard Leakey, Director, Kenya Wildlife Service, P.O. Box 40211, Nairobi, Kenya.

Auditorium setting is limited. A ticket for free admision may be obtained at the Registration area for this lecture which is open to the general public.

SOCIETY FOR THE STUDY OF EVOLUTION
Council Meeting

Sunday July 1, 1990, 8:00 PM, A. Stamp Student Union Room, 1139

MONDAY JULY 2, 1990

Congress Symposium No. 11

EXTINCTION AND EVOLUTION

Monday July 2, 1990, 8:00 AM - 12:15 PM, Architecture, Room 0204

Organizer: **Dr. David Jablonski,** Department of Geophysical Sciences, University of Chicago, Chicago, Illinois 60637, USA.

8:00 Evolution and extinction: an overview, and new evidence from the end-Cretaceous mass extinction. **David Jablonski,** Department of Geophysical Sciences, University of Chicago, Chicago, Illinois 60637, USA.

8:30 Taxonomy and extinction patterns: a discussion. **R. A. Fortey,** Department of Paleontology, British Museum (Natural History), Cromwell Road, London SW7 5BD, United Kingdom.

9:00 Extinction, faunal replacements, and clade interactions. **Michael J. Benton,** Department of Geology, University of Bristol, Bristol B58 1RJ, England.

9:30 Macroevolution and synecologic reorganization following mass extinctions of marine invertebrates. **P. M. Sheehan,** Geology Section, Milwaukee Public Museum, 800 West Wells Street, Milwaukee, Wisconsin 53233, USA.

10:00 Break

10:15 Scaling background and mass extinction. **D. M. Raup,** Department of Geophysical Sciences, University of Chicago, Chicago, Illinois 60637, USA.

10:45 Mass extinctions evaluated in relation to characteristic extinction intensities of families within orders. **N. L. Gilinsky** and **A. E. Hubbard,** Department of Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA.

11:15 Extinction in the tropical marine biota. **Brian R. Rosen,** Department of Paleontology, British Museum (Natural History), Cromwell Road, London SW7 5BD, United Kingdom.

11:45 General Discussion

Congress Symposium No. 15

HYBRID ZONES AND THE EVOLUTIONARY PROCESS

Monday July 2, 1990, 8:30 AM - 12:15 PM, A. Stamp Student Union, Tortuga Room

Organizer: **Dr. Richard Harrison,** Section of Ecology and Systematics, Cornell University, Ithaca, New York 14853, USA.

8:30 Introduction. **Richard Harrison,** Section of Ecology and Systematics, Cornell University, Ithaca, New York 14853, USA.

8:40 Genetic analysis of hybrid zones. **N. H. Barton,** Department of Genetics and Biometry, University College, London NW1 2HE, United Kingdom.

9:25 The role of ecological selection gradients in maintaining hybrid zones. **William S. Moore** and **Jeff Price,** Department of Biological Sciences, Wayne State University, Detroit, Michigan 20037, USA.

10:00 Break

10:30 Molecular markers as tools in the analysis of hybrid zone pattern and process. **R. G. Harrison,** Section of Ecology and Systematics, Cornell University, Ithaca, New York 14853, USA.

11:15 Reinforcement: the origin, dynamics and fate of an evolutionary theory. **D. J. Howard,** Department of Biology, New Mexico State University, Las Cruces, New Mexico 88003, USA.

Congress Symposium No. 19

DEVELOPMENTAL PROCESSES AND EVOLUTIONARY CHANGE

Monday July 2, 1990, 8:00 AM - 12:45 PM, Art and Sociology, Room 2203

Organizer: **Dr. Jerome C. Regier,** Center for Agricultural Biotechnology, Maryland Biotechnology Institute, and Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

8:00 Major themes in the study of development and evolution. **Jerome C. Regier,** Center for Agricultural Biotechnology, Maryland Biotechnology Institute and Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

8:30 Developmental processes and phenotypic change in archosaur limb evolution. **G. B. Muller,** Department of Anatomy, University of Vienna A-1090, Wein, Austria.

9:00 Evolutionary changes in modes of sea urchin development. **Rudolf A. Raff,** Department of Biology, Indiana University, Bloomington, Indiana 47405, USA.

9:30 Molecular basis of segment patterning in insects. **Michael Akam,** Department of Genetics, University of Cambridge, Cambridge CB2 3EH, United Kingdom.

10:00 Break

10:15 Heterochrony, morphogenesis and evolution in maize. **R. Scott Poethig,** Plant Science Institute, Department of Biology, University of Pennsylvania 19104, USA.

10:45 The genetic basis for the evolution of multicellularity in the volvocine green algae. **David L. Kirk, Marilyn M. Kirk** and **Allan Larson,** Department of Biology, Washington University, St. Louis, Missouri 63130, USA.

11:15 Regulatory evolution in Drosophila. **W. J. Dickinson,** Department of Biology, University of Utah, Salt Lake City, Utah 84112, USA.

Congress Special Interest Symposium/Workshop No. 30

RESOURCES, TRAINING AND JOB PLACEMENT OF SYSTEMATISTS AND EVOLUTIONISTS ON A WORLD-WIDE SCALE: THEIR SIGNIFICANCE IN THE GLOBAL BIODIVERSITY CRISIS

Monday July 2, 1990, 8:00 AM - 12:15 PM, Tydings Lecture Hall, Room 0130

Organizer: **Dr. K. Elaine Hoagland,** Executive Director, Association of Systematics Collections, 730 11th Street, N.W., Washington, D.C. 20001, USA.

8:00 Introduction: **K. Elaine Hoagland,** Executive Director, Association of Systematics Collections, 730 11th Street, N.W., Washington, D.C. 20001, USA.

Panel 1. The status of resources, training, and job placement in systematics/evolution in developing countries.

8:05 Brazil: **P. E. Vanzolini,** Director, Museu de Zoologia, University de Sao Paulo, Sao Paulo, Brazil.

8:15 Peru: Opportunities for training and job placement for systematists and evolutionists in developing countries: the case of Peru. **Gerardo Lamas M.,** Director, Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Apartado 14-0434, Lima-14, Peru.

8:25 Mexico: The status of resources, training and job placement in systematics/evolution in Mexico. **Tila M. Perez,** Universidad Nacional Autonoma de Mexico, Mexico City, Mexico, and Visiting Scholar, Department of Invertebrates, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

8:35 Pakistan: **Nasima M. Tirmizi,** Professor of Zoology and Director, Marine Biology Institute, University of Karachi, Karachi, Pakistan.

8:45 Discussion and questions from the audience

Panel 2. The status of resources, training, and job placement in systematics/evolution in Europe, the United States and Canada.

9:00 United Kingdom: **Bryan C. Clarke,** Department of Genetics, School of Biological Sciences, Queens Medical Centre, University of Nottingham, Nottingham, England, United Kingdom.

9:10 USSR: **Vladimir Y. Sakolov,** Institute of Evolutionary Animal Morphology and Ecology, USSR Academy of Sciences, 33 Leninsky Prospek, Moscow 117071, USSR.

9:20 USA: **Robert Hoffman,** Assistant Secretary for Research, Smithsonian Institution, Washington, D. C. 20560, USA.

9:30 International: **Walter Reid,** Associate, Program in Forests and Biodiversity, World Resources Institute, Washington, D.C., USA.

9:40 International: **Michael Mares,** University of Oklahoma Fulbright Fellowship Program.

9:50 Discussion and questions from the audience

10:00 Break

10:15 Roundtable Discussion Part 1: Worldwide needs for institutional/job development, training, and job placement (Leader: **Robert S. Hoffman.** All participants).

11:15 Roundtable Discussion Part 2: Potential new programs for international collaboration and financial support (Leader: **K. Elaine Hoagland.** All participants).

Affiliated Society Symposium No. 7

MOLECULAR EVOLUTION OF ULTRASELFISH GENES (THE SOCIETY FOR THE STUDY OF EVOLUTION)

Monday July 2, 1990, 8:00 AM - 12:15 PM, H. J. Patterson, Room 0226

Organizer: **Dr. Chung-I Wu,** Department of Biology, University of Rochester, Rochester, New York 14627, USA.

8:00 Ultraselfish genes in Drosophila: The segregation distorter and sex-ratio meiotic drive systems. **Chung-I Wu,** Department of Biology, University of Rochester, Rochester, New York 14627, USA.

9:00 Molecular evolution of mouse t haplotypes. **Michael F. Hammer,** Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

10:00 Break

10:15 Mean genes and sex ratio distortion: evolution of the paternal sex ratio (psr) chromosome. **John H. Werren,** Department of Biology, University of Rochester, Rochester, New York 14627, USA.

11:15 Selfish organelle genomes. **C. William Birky,** Department of Molecular Genetics, Ohio State University, Columbus, Ohio, USA.

Discussion Group No. 5

CO-EVOLUTION: INSECTS/PARASITOIDS

Monday July 2, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3207

Organizers: **Dr. Peter C. Chabora,** The Graduate School and University Center, City University of New York, New York 10036, and **Dr. H. Roberta Koepfer,** Department of Biology, Queens College, CUNY, Flushing, New York 11367, USA.

In the broadest sense, co-evolution is said to result when two or more species influence the rate or direction of each other's evolution. The characteristic of one species thus is evolving in response to the trait(s) of another species which itself is responding to the characteristics of the first species. Hence we have a cycle of defense and counter-defense escalation of highly specific traits both evolving at similar rates - possibly at the same time. In a more practical sense, less stringent requirements reduce the adherence to such definitions.

Parasitoid/host interactions, by their very nature, fit the theoretical and empirical requirements for explorations into the mechanisms and process of co-evolution. Thus, the following questions are posed to guide and focus this discussion of Co-evolution: Insects/Parasitoids.

Questions

What is the basis for invoking concepts of co-evolution in explaining the interactions between parasitoids and their host species? Why are parasitoid-host interactions envisioned as theoretically satisfying and empirically proper for the development of co-evolutionary thought?

What is the strength and nature of the evidence supporting the theory of co-evolution? Has the development of co-evolutionary theory rested on interpretations of certain biological phenomena which appeared so appropriate that to seek verification appears almost heretical?

Is it valid to ascribe special co-evolutionary mechanisms to interactions between parasitoids and their hosts? Might these putative co-evolutionary processes simply represent the action of natural selection on each of the interacting species?

Consider the broad aspects of the biology of endo-and ectoparasites and their hosts, the forms of their interactions and the types of co-evolutionary patterns which could be predicted for each parasitoid type. Since ectoparasitoids can escape host immune responses, can we postulate differences between endo- and ectoparasitoids in their patterns of co-evolutionary adaptation? Is there any evidence to substantiate speculation that co-evolutionary processes have yielded parallel patterns within each type of parasitoid? Would we expect stronger co-evolutionary responses between endo- or ectoparasitoids and their hosts?

Host immune responses which result in the encapsulation of parasitoid egg and larval stages, and thereby inhibit parasitoid success, have been considered an important illustration of parasitoid/host co-evolution. Are the available data sufficient to differentiate between encapsulation as a co-evolutionary response and encapsulation as a response to natural selection on the individual species? Can modification of an immune response by a third species (e.g., virus in calyx fluid) be interpreted as a co-evolutionary response?

Co-evolution is usually inferred to result from interactions between a single parasitoid species and a given host species. However, natural systems usually consist of several parasitoids (a guild) which are not necesssarily host specific, and which attack a variety of host species which may or may not be related. Can we also define such a multifaceted complex of exploiter and victim species as a co-evolving system? Is there any evidence that evolutionary pressures from the interaction of one pair of parasitoid-host species can induce parallel and concurrent responses when in combination with another species? Could one speculate co-evolutionary adaptation at the generic level? At the deme or family level? Or are such interspecific interactions taxonomically neutral?

From a theoretical perspective, can the different reproductive biologies of endo- and ectoparasitoids (schedule of offspring production, offspring sex ratio, development time, etc.) be interpreted as an integral component of co-evolutionary responses? Is there any evidence to support this line of inquiry?

Sex ratios, particularly among parasitoids, have been the focus of numerous theoretical and empirical investigations. Mechanisms invoking natural selection at the single species level (the parasitoid) have been used to explain extraordinary sex ratios due to female bias among the offspring. Aspects of host biology, other than size, have usually been neglected in these investigations. Can we infer co-evolutionary aspects from sex-ratio phenomena, and is it parsimonious to do so? Are secondary level causes for sex ratio modification, such as bacteria and viruses, also attributable to co-evolutionary mechanisms?

Both similarities and differences in numerous behavior patterns have been demonstrated within and between related parasitoid groups. Is there any evidence that behaviors such as host habitat finding, host searching, and oviposition are co-evolutionary responses to the host species? Is there evidence that genetic and/or behavioral changes on the part of either parasitoid or host have altered the level of interspecific interaction?

Population dynamical aspects of parasitoid-host systems usually have focused on features of parasitoid reproductive success (net reproductive rates and schedules, longevity) and their effect on evolving host populations. Empirical evidence suggests that selected host populations show markedly higher rates of "evolution" than do parasitoid populations, thus resulting in lowered parasitoid reproductive success. Other lines of investigation, including electrophoretic and molecular techniques, suggest that parasitoids exhibit low levels of genetic variability. It is our contention that parasitoids are, in fact, genetically and evolutionarily conservative. This conservatism partially explains the highly stereotyped parasitic life-style, which is reinforced through the system of arrhenotoky (diploid females, haploid males), complex courtship and mating behaviors involving chemical, visual, auditory, and tactile components, and the prevalence of parthenogenetic species. Thus, from a co-evolutionary point of view, parasitoid-host systems consist of one partner (the host) which exhibits a set of labile characteristics, while the other is evolutionarily stable and conservative. Given that the generation times of interacting species are of similar orders of magnitude, is this apparent dichotomy in evolutionary rates paradoxical in view of co-evolutionary explanations?

Discussants will include: **J. J. M. van Alphen,** Department of Population Biology, Division of Animal Ecology, Zoological Laboratory of the University of Leiden, 2300 RA Leiden, The Netherlands; **M. Bouletreau,** Genetique des Populations, CNRS-Universite Lyon 1, 69622 Villeurbanne, France; **Paula Brunner,** G.I.B.E., Depto. de Cs. Biologicas, Fac. de Cs. Exactas e Naturales, Universitad de Buenos Aires, Cuidad Universitaria, PAB.2 (1428), Buenos Aires, Argentina; **Yves Carton,** Laboratoire de Biologie et Genetic Evolutives, C.N.R.S., 91190 Gif-sur-

Yvette, France; **Douglas Futuyma,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA; **S. F. Hubbard** (and colleagues), Department of Biological Sciences, The University, Dundee DD1 4 HN, Scotland; **Arne Janssen,** Department of Population Biology, University of Amsterdam, 1098 SM Amsterdam, The Netherlands; **Arthur M. Kopelman,** Department of Science and Mathematics, F.I.T., 7th Avenue at 27th Street, New York, New York 10001, USA; **Anthony Nappi,** Department of Biology, Loyola University of Chicago, Chicago, Illinois 60626, USA; **Jan G. Sevenster,** Department of Population Biology, Division of Animal Ecology, Zoological Laboratory of the University of Leiden, 2300 RA Leiden, The Netherlands; **Samuel W. Skinner,** Biology Department, Jordan Hall, Indiana University, Bloomington, Indiana 47405, USA; **Giuseppina Simbolotti,** Dipartimento de Scienze Ambientali, Universita dell' Aquila, Localita Coppito, 67100 L'Aquila, Italy; and **John Werren,** Department of Biology, University of Rochester, Rochester, New York 14627, USA.

Contributed Paper Session No. 8

EVOLUTION ON ISLANDS

Monday July 2, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2309

Co-chairs:
Dr. Jonathan B. Losos, Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA.

Dr. Thomas E. Reimchen, Department of Zoology, University of Alberta, Edmonton, Alberta, Canada T6G 2E9.

8:00 Evolutionary and ecological aspects of genetic endemism, gene flow, and mating system evolution in species of native Hawaiian ferns. **T. A. Ranker,** Hawaiian Evolutionary Biology Program, University of Hawaii, Honolulu, Hawaii 96822, USA (SSE, ASN, SSZ).

8:15 Molecular systematics and geographic variation in the Hawaiian swordtail cricket genus Laupala (Orthoptera: Gryllidae). **K. L. Shaw,** Department of Biology, Washington University, St. Louis, Missouri 63130, USA (SSE).

8:30 Adaptive radiation of the spider genus Tetragnatha in Hawaii. **R. G. Gillespie, H. B. Croom** and **S. R. Palumbi,** Department of Zoology, University of Hawaii at Manoa, Honolulu, Hawaii 96822, USA.

8:45 Genetic relationships of endangered Hawaiian ducks. **R. A. Browne, M. J. Hubley** and **A. E. Martin,** Department of Biology, Wake Forest University, Winston-Salem, North Carolina 27109; and **C. R. Griffin** and **P. Chang,** Department of Forestry and Wildlife Management, University of Massachusetts, Amherst, Massachusetts 01003, USA (SSE).

9:00 Roots of the nene, Nesochen sandvicensis: analysis of mitochondrial DNA. **G. F. Shields,** Institute of Arctic Biology, University of Alaska, Fairbanks, Alaska 99775; and **Thomas W. Quinn,** Department of Biochemistry, University of California, Berkeley, California 94720, USA (SSE).

9:15 Patterns of phenotypic variability in island and continental populations of a passerine bird species, the chaffinch (Fringilla coelebs). **M. D. Dennison and A. J. Baker,** Zoology Department, University of Toronto, Ontario M5S 1A1, and Ornithology Department, Royal Ontario Museum, Toronto, Ontario M5S 2C6, Canada.

9:30 Preliminary investigation of the call characteristics of the Australian tree frog Litoria ewingi introduced into New Zealand. **G. F. Watson and M. J. Littlejohn,** Department of Zoology, University of Melbourne, Parkville, Victoria 3052, Australia.

9:45 Memes, genes and geography. **A. J. Baker and A. Lynch,** Department of Zoology, University of Toronto, Toronto, Ontario M5S 1A1, and Department of Ornithology, Royal Ontario Museum, Toronto, Ontario M5S 2C6, Canada.

10:00 Break

10:15 Genetic differentiation among isolated populations of Aneides lugubris (Caudata: Plethodontidae). **Todd R. Jackman,** Museum of Vertebrate Zoology and Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

10:30 Evolutionary radiation of stickleback from the Queen Charlotte Islands, Canada. **T. E. Reimchen and P. O'Reilly,** Zoology Department, University of Alberta, Edmonton, Alberta, Canada T6G 2E9 (SSE).

10:45 Disjuncts, endemism and evolution on the Queen Charlotte Islands, British Columbia. **G. G. E. Scudder,** Department of Zoology, University of British Columbia, Vancouver, British Columbia, Canada V6T 2A9.

11:00 Adaptation, constraint, and niches in West Indian Anolis lizards. **J. B. Losos,** Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA (SSE, SSZ).

11:15 Biogeography of the West Indian butterfly fauna: a comparative study of the Bahamas and the Virgin Islands. **J. Y. Miller and L. D. Miller,** Jallyn Museum of Entomology, Florida Museum of Natural History, University of Florida, 3621 Bay Shore Road, Sarasota, Florida 34234, USA.

Contributed Paper Session No. 9

GENETIC STRUCTURE OF POPULATIONS I

Monday July 2, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203

Co-chairs:
Ms. Sabine S. Loew, Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA.

Dr. Joseph E. Neigel, Biology Department, University of Southwestern Louisiana, Lafayette, Louisiana 70504, USA.

8:00 Heterogeneity in pollen allele frequencies among cones and trees of Pinus pungens Lam. **J. P. Gibson and J. L. Hamrick,** Department of Botany, The University of Georgia, Athens, Georgia 30602, USA (SSE).

8:15 Population structure and linkage disequilibrium in Palaemonetes kadiakensis from Texas. **D. K. Garcia and S. K. Davis,** Texas A & M University, College Station, Texas 77843, USA (SSE).

8:30 Genetic population structure of Gerris remigis. **R. F. Preziosi and D. J. Fairbairn,** Department of Biology, Concordia University, 1455 de Maisonneuve West, Montreal, Quebec, Canada H3G 1M8 (SSE, ASN).

8:45 Analysis of dispersal from geographic variation in animal mitochondrial DNA. **J. E. Neigel,** Biology Department, University of Southwestern Louisiana, Lafayette, Louisiana 70504, USA (SSE).

9:00 Association of an allozyme polymorphism with nonmigratory behavior in the blackcap (Sylvia atricapilla). **F. Pulido,** Department of Zoology, University of Frankfurt, Siesmayerstrasse 70, D-6000 Frankfurt/M. 11, West Germany, and **P. Berthold,** Max-Planck-Institut fur Verhaltensphysiologie, Schloss Moggingen, D-7760 Radolfzell, West Germany.

9:15 Clonal diversity in a unisexual fish related to Fundulus heteroclitus, as estimated by allozyme variability and DNA fingerprinting. **Robert M. Dawley,** Ursinus College, Collegeville, Pennsylvania 19426; **John F. Elder and Bruce J. Turner,** Virginia Polytechnic and State University, Blacksburg, Virginia 24061, USA.

9:30 Sex-biased dispersal, mating behavior and inbreeding avoidance in the eastern chipmunk. **S. S. Loew,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (SSE).

9:45 Searching for inbreeding depression in captive stocks of Poeciliopsis. **R. J. Schultz and E. Fielding,** Department of Ecology and Evolutionary Biology, The University of Connecticut, Storrs, Connecticut, 06269, USA (SSE).

10:00 Break

10:15 Interpretation of breeding structure by fixation indices. **R. K. Chesser,** University of Georgia, Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29801, USA (SSE).

10:30 Molecular genetic determination of kinship in African lions. **C. Packer and A. E. Pusey,** Department of Ecology, Evolution and Behavior, University of Minnesota, Minneapolis, Minnesota 55455; **D. Gilbert,** Program Resources Inc., BCDP/NCI-FCRF, Frederick, Maryland 21701; and **S. J. O'Brien,** National Cancer Institute, Frederick, Maryland 21701, USA.

10:45 The interdependence of migration patterns and mating structures in subdivided populations. **R. B. Campbell,** Department of Mathematics and Computer Science, University of Northern Iowa, Cedar Falls, Iowa 50614, USA (SSE, ASN).

11:00 Microgeographic genetic structure of morphological and life history traits in a natural population of Impatiens capensis. **A. Argyres and J. Schmitt,** Graduate Program in Ecology and Evolutionary Biology, Brown University, Providence, Rhode Island 02912, USA.

11:15 Patterns of spatial and temporal variation in carrying capacities and the evolution of dispersal. **M. A. McPeek,** Archbold Biological Station, Lake Placid, Florida 33852, and **R. D. Holt,** Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA (SSE).

11:30 Predictions for structuring: temporal vs. microgeographic. **G. E. Svendsen and M. M. White,** Department of Zoological and Biomedical Sciences, Ohio University, Athens, Ohio 45701, USA (SSE, ASN).

11:45 Spatial and temporal genetic variation in a white-tailed deer herd. **M. H. Smith, K. B. Willis and P. E. Johns,** Savannah River Ecology Laboratory, University of Georgia, Aiken, South Carolina 29802, USA (SSE, ASN).

Contributed Paper Session No. 10

RATES OF EVOLUTION, AND ANALYSIS OF PHYLOGENETIC PATTERNS I

Monday July 2, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3211

Co-chairs:
Dr. Harilaos A. Lessios, Smithsonian Tropical Research Institute, Apartado 2072, Balboa, Republic of Panama.

Dr. Margaret F. Smith, Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA.

8:00 Rates of MtDNA evolution in transisthmian geminate species. **T. M. Collins, E. Bermingham and H. A. Lessios,** Smithsonian Tropical Research Institute, Apartado 2072, Balboa, Republic of Panama (SSE, SSZ).

8:15 A test of the mitochondrial and protein molecular clocks using organisms separated by the Isthmus of Panama. **H. A. Lessios and E. Bermingham,** Smithsonian Tropical Research Institute, APO Miami 34002, USA (SSE).

8:30 Molecular evidence for a shared history between Hydractinia and its hermit crab hosts. **C. W. Cunningham, L. W. Buss and C. Anderson,** Department of Biology, Yale University, New Haven, Connecticut 06511, USA (SSE, SSZ).

8:45 The fossil record, divergence times and extremely rapid rates of single copy DNA evolution in sand dollars. **Charles R. Marshall,** Department of Biology, Indiana University, Bloomington, Indiana 47405, USA (SSZ, SSE).

9:00 Rate of mitochondrial DNA sequence evolution in sharks. **A. P. Martin,** Department of Zoology, University of Hawaii, Honolulu, Hawaii 96822, and Pacific Biomedical Research Center, Kewalo Marine Lab, 41 Ahui Street, Honolulu, Hawaii 96813, USA (SSE).

9:15 A comparison of bird nuclear and mitochondrial DNA rates of evolution by solution DNA hybridization. **F. H. Sheldon, E. Slikas and F. B. Gill,** Academy of Natural Sciences, Logan Square, Philadelphia, Pennsylvania 19103, USA (SSZ, WHS, SSE).

9:30 Phylogenetic and taxonomic implications of variation in mitochondrial DNA, morphology, behavior, and ecology of francolins (Galliformes: Phasianidae). **Timothy M. Crow and Anna A. Crow,** Fitzpatrick Institute, University of Cape Town, Rondesbosch 7700, South Africa; **Eric H. Harley and Mariola Jakutowicz,** Department of Chemical Pathology, University of Cape Town, South Africa; and **Joris Komen,** Department of Birds, National Museum of Namibia, Box 1203, Windhoek 9000, Namibia (WHS).

9:45 Cercopithecine divergence estimates as determined from mitochondrial DNA sequence. **T. R. Disotell,** Department of Anthropology, Harvard University, Cambridge, Massachusetts 02138; **R. L. Honeycutt,** Department of Wildlife and Fisheries Science, Texas A & M University, College Station, Texas 77843; and **W. M. Brown and L. Szura,** Department of Biological Sciences, University of Michigan, Ann Arbor, Michigan 48109, USA.

10:00 Break

10:15 Resolution of the African hominoid trichotomy using a mitochondrial gene sequence. **M. Ruvolo and T. Disotell,** Department of Anthropology, Harvard University, 11 Divinity Avenue, Cambridge, Massachusetts 02138; **M. W. Allard,** Department of Organismal and Evolutionary Biology, Harvard University, Cambridge, Massachusetts 02138; **W. M. Brown,** Division of Biological Sciences, Natural Science Building, University of Michigan, Ann Arbor, Michigan 48109; and **R. L. Honeycutt,** Department of Wildlife and Fisheries Science and Genetics, Texas A & M University, College Station, Texas 77843, USA.

10:30 Ribosomal RNA gene sequences and hominoid phylogeny. **I. L. Gonzalez and J. E. Sylvester,** Hahnemann University, Pathology Department MS 435, Broad & Vine, Philadelphia, Pennsylvania 19102, USA (SSE).

10:45 Investigation of the phylogenetic relationship of humans and the great apes by analysis of restriction fragment length variations in nuclear DNA. **K. I. Zeller and M. J. Braun,** Laboratory of Molecular Systematics, Smithsonian Institution, Washington, D. C. 20560; and Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221, USA.

11:00 DNA sequence cladograms of the Bovidae and the evolution of African antelopes. **J. Gatesy and E. Vrba,** Department of Geology and Geophysics, Yale University, New Haven, Connecticut 06511; and **D. Yellon and R. DeSalle,** Department of Biology, Yale University, New Haven, Connecticut 06511, USA.

11:15 Molecular phylogeny of some Bovidae using restriction endonuclease mapping. **E. H. Harley, M. F. Essop and I. Baumgarten,** Department of Chemical Pathology, University of Cape Town, Cape Town, South Africa.

11:30 Variation in mitochondrial cytochrome b sequence in South American akodontine rodents [Muridae: Sigmodontinae]. **M. F. Smith and J. L. Patton,** Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA.

11:45 Systematics and evolution of the Bathyergidae. **M. W. Allred,** Museum of Comparative Zoology and Department of Organismic and Evolutionary Biology, Harvard University, 26 Oxford Street, Cambridge, Massachusetts 02138, and **R. L. Honeycutt,** Department of Wildlife and Fisheries Sciences, 210 Nagle Hall, Texas A & M University, College Station, Texas 77843, USA (WHS, SSZ, SSE).

EXHIBITS

Monday July 2, 1990, 9:00 AM - 5:00 PM, Grand Ballroom, A. Stamp Student Union

Poster Session No. 5

MOLECULAR AND CHROMOSOMAL EVOLUTION

Monday, July 2, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

39. Markovian aspects of molecular evolution and the Dayhoff Mutation Data Matrix. **G. Y. Srinivasarao, D. G. George and W. C. Barker,** National Biomedical Research Foundation, Washington, D.C., USA.

40. Restriction site variation in Hyla and Pseudacris. **D. L. Jameson,** Molecular Systematics, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118, and **Nese Muderrisoglu,** Room 2C-109, Orea(151), 1400 VFW Parkway, W. Roxbury, Massachusetts 02132, USA (SSE).

41. Is mitochondrial genome conformation uniform at the family, genus or species level in the Volvocales? **A. W. Coleman,** Department of Biology and Medicine, Brown University, Providence, Rhode Island 02912; and **L. J. Moore** and **L. J. Goff,** Department of Biology, University of California, Santa Cruz, California 95064, USA.

42. Phylogeny, rates and type of DNA change of the Adh gene and the origin of the Hawaiian Drosophila. **John A. Hunt** and **Richard H. Thomas,** Department of Genetics, University of Hawaii, Honolulu, Hawaii 96822, USA.

43. Isolation and characterization of chorion cDNAs from gypsy moth, and their comparison with sequences from two bombycoids. **R. F. LeClerc** and **J. C. Regier,** Center for Agricultural Biotechnology and Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

44. Organisation and evolution of ribosomal RNA genes in Lathyrus. **S. D. Ahmad** and **R. K. J. Narayan,** Department of Agricultural Sciences, University College of Wales, Aberystwyth, Wales SY23 3DD, United Kingdom.

45. Evolution of Ribosomal DNA in Salmonid Fishes. **R. B. Phillips, K. A. Pleyte** and **M. R. Brown,** Department of Biological Sciences, University of Wisconsin, Milwaukee, Wisconsin 53201, USA (SSE).

46. Evolutionary rates of group II introns in the inverted repeat and single copy regions of chloroplast genomes. **G.H. Learn** and **M.T. Clegg,** Department of Botany and Plant Sciences, University of California, Riverside, California 92521, USA (SSE).

47. Genomic distribution of rapidly evolving heterochromatic sequences in the equids. **H. A. Wichman,** Department of Biological Sciences, University of Idaho, Moscow, Idaho 83843; **O. A. Ryder,** Research Department, San Diego Zoo, San Diego, California 92112; and **M. J. Hamilton, M. Maltbie** and **R. J. Baker,** Department of Biology, Texas Tech. University, Lubbock, Texas 79409, USA.

48. Host-independent evolution of the hepadnavirus family. **Y. Ina,** National Institute of Genetics*, Mishima 411, Japan, **M. Mizokami, E. Orito, N. Kameshima** and **M. Yamamoto,** Nagoya City University Medical School, Nagoya 467, Japan; and **E. N. Moriyama*** and **T. Gojobori*.**

49. Hybrid zone dynamics between two chromosome races of the Sceloporus grammicus complex: the nature and behavior of chromosome 2. **K.M. Reed,** Department of Biology, Texas A & M University, College Station, Texas 77843; **J. W. Sites, Jr.,** Department of Zoology, Brigham Young University, Provo, Utah 84602; and **I.F. Greenbaum,** Department of Biology, Texas A & M University, College Station, Texas 77843, USA.

50. In situ hydridization analysis of chromosomal homologies in Drosophila and related genera. **D. E. Jeffery, Y. Su, J. L. Farmer, J. H. Whiting, Jr., K. Hatch** and **S. Stallings,** Zoology Department, Brigham Young University, Provo, Utah 84602, USA (SSE).

51. Meiotic and evolutionary consequences of chromosomal polymorphisms in deer mice (Peromyscus). **I. F. Greenbaum, D. W. Hale** and **P. D. Sudman,** Department of Biology, Texas A & M University, College Station, Texas 77843, USA (SSE).

52. Modification of meiotic pairing behavior by addition of homologous heterochromatic segments to the X and Y chromosomes in Peromyscus. **D. W. Hale, P. D. Sudman, M. C. Hedin, S. A. Smith, and I. F. Greenbaum,** Department of Biology, Texas A & M University, College Station, Texas 77843, USA (SSE).

Poster Session No. 6

PHYLOGENETIC RELATIONSHIPS AND DIVERSITY

Monday, July 2, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

53. A revision of the taxonomists community in Spain. **E. Bello and A. Garcia-Valdecasas,** Museo Nacional de Ciencias Naturales, Jose Gutierrez Abascal, 2 Madrid-28006, Spain.

54. Using taxonomical numerical systems for biological data bases. **J. M. Becerra and A. Garcia-Valdecasas,** Museo Nacional de Ciencias Naturales, Jose Gutierrez Abascal, 2 Madrid-28006, Spain.

55. Consistency indices and random data sets, or, how low can you get? **G. Klassen, R. D. Mooi and A. Locke.** Department of Zoology, University of Toronto, Toronto, Ontario, Canada M5S 1A1 (SSE).

56. A name-checker and data source for the world's Leguminosae: a demonstration of the ILDIS Phase 1 Database. **Frank A. Bisby and Susan Hollis,** ILDIS Co-ordinating Centre, Biology Department, The University, Southampton S09 5NH, United Kingdom; **James L. Zarucchi,** Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166, USA; **Roger M. Polhill** and **Bob Allkin,** Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, United Kingdom; and **Peter J. Winfield,** Department for Agriculture and Fisheries for Scotland, East Craigs, Edinburgh EH12 8NJ, Scotland, United Kingdom.

57. Examples supporting a polyphasic approach to microbial systematics: a study of the Vibrionaceae. **Sue E. Steven,** Naval Medical Research Institute, Bethesda, Maryland 20814; **Rita R. Colwell,** Microbiology Department, University of Maryland, College Park, Maryland 20742; and **Rose Coty and Robert Gherna,** American Type Culture Collection, Rockville, Maryland 20852, USA.

58. Phylogeny of marine bacteria based on 16S rRNA partial sequence. **K. Kita-Tsukamoto,** Ocean Research Institute, University of Tokyo, Minamidai, Nakano, Tokyo 164; **H. Oyaizu,** Department of Biology, College of Liberal Arts, Toyama University, Toyama 930; **K. Nanba and U. Simidu,** Ocean Research Institute, University of Tokyo, Minamidai, Nakano, Tokyo 164, Japan.

59. Taxonomical study in culture of Oscillatoriaceae strains (Cyanophyceae, Cyanobacteria): joint use of morphological, autoecological and molecular characterizations. **A. Wilmotte,** Department of Biochemistry, University of Antwerp (UIA), Universiteitsplein, 1, B-2610 Antwerp, Belgium.

60. Codium systematics as delineated by restriction fragment analysis. **L. B. Liddle,** Long Island University, Southampton, New York 11968, and **L. J. Goff,** Department of Biology, University of California, Santa Cruz, California 95064, USA.

61. Phylogenetic analysis of the Micromonadophyceae and Pleurastrophyceae based on cytoplasmic rRNA sequence analysis. **T. S. Kantz, R. L. Chapman,** Department of Botany, and **E. A. Zimmer,** Department of Biochemistry, Louisiana State University, Baton Rouge, Louisiana 70803, USA.

62. Are ancient divergences clearly recorded in nuclear-encoded ribosomal RNA gene sequences in the green algae (Chlorophyta)? **R. L. Chapman, M. A. Buchheim, T. S. Kantz, F. W. Zechman,** Department of Botany, and **E. A. Zimmer,** Department of Biochemistry, Louisiana State University, Baton Rouge, Louisiana 70803, USA.

63. Further development of a ribosomal RNA phylogeny for the grasses. **L. E. Issel, R. K. Hamby,** Department of Biochemistry, and **E. A. Zimmer,** Department of Botany and Biochemistry, Louisiana State University, Baton Rouge, Louisiana, 70803.

64. Genetic divergence in the Marshallia graminifolia complex (Asteraceae): a previously hypothesized progenitor-derivative species-pair. **Linda W. Watson, Wayne J. Elisens and James R. Estes,** Oklahoma Biological Survey and Department of Botany and Microbiology, University of Oklahoma, Oklahoma 73019, USA (SSE).

65. Phylogenetic analyses of the Polemoniaceae using cpDNA sequence data. **K. P. Steele,** Department of Biology, Appalachian State University, Boone, North Carolina 28608; and **R. Vilgalys, S. Rehner and P. Thrall,** Department of Botany, Duke University, Durham, North Carolina 27706, USA (SSZ).

66. Evolutionary relationships in Hormogaster (Oligochaeta, Hormogastridae): biochemical variation and palaeogeography. **M. Cobolli Sbordoni and E. De Matthaeis,** Dipartimento di Biologia Animale e dell'Uomo, Universita di Roma "La Sapienza", 00185 Roma, Italy; and **M. Mattoccia, P. Omodeo and E. Rota,** Dipartimento di Biologia, Universita di Roma "Tor Vergata", 00173 Roma, Italy.

67. Allozyme studies on the evolution of "glacial relict" crustaceans. **R. Vainola,** Department of Genetics, University of Helsinki, Finland.

68. Biomass of the coral rubble cryptofaunal community of St. Croix. **D. J. Morrin,** Department of Zoology, Program in Marine-Estuarine Environmental Sciences, University of Maryland, College Park, Maryland 20742, USA.

69. Biochemical systematics of the Pteronarcyidae (Plecoptera). **M. M. White,** Department of Zoological and Biomedical Sciences, Ohio University, Athens, Ohio 45701, USA.

70. Phylogenetic analysis of Great Lakes ictalurids based on mitochondrial DNA and allozyme differentiation. **M. H. Murdoch, R. G. Danzmann, L. J. Weider and P. D. N. Hebert,** Department of Biological Sciences, Great Lakes Institute, University of Windsor, Windsor, Ontario, and Department of Zoology, University of Guelph, Guelph, Ontario, Canada (SSE).

71. A molecular perspective on the evolutionary relationships of the salamander families. **Allan Larson,** Department of Biology, Washington University, St. Louis, Missouri 63130, USA (SSE).

72. Patterns in the evolution of tiger snakes. **Terry D. Schwaner,** Virginia Museum of Natural History, 1001 Douglas Avenue, Martinsville, Virginia 24112, USA.

73. Phylogenetic and geographic relations of North American colubroid snakes. **Herndon G. Dowling,** Department of Biology, New York University, New York, New York 10003, USA (SSE).

74. "Relic" colubroid snakes of North America. **Theodora Pinou,** Department of Biology, New York University, New York, New York 10003, USA.

75. A phylogenetic analysis of the Alligatoridae based on mitochondrial DNA nucleotide sequence data. **G. D. Amato,** New York Zoological Society, Bronx Zoo, Bronx, New York 10460; **J. Gatesy,** Department of Geology and Geophysics, Yale University, New Haven, Connecticut 06511; and **M. A. Norell,** Department of Vertebrate Paleontology, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024, USA (SSE).

76. Evolution and systematics of cetaceans: a serum albumin immunological, and biochemical perspective. **Don Lint,** Department of Zoology, University of Manitoba, Winnipeg, Manitoba, Canada, and **Jim Clayton, Margaret Friesen, Ross Lillie** and **Lianne Postma,** Canada Department of Fisheries and Oceans, Winnipeg, Manitoba, Canada (SSE).

77. Phylogenetic relationships among neotropical primates. **T. Fanning** and **A. Reid,** Department of Cellular Pathology, AFIP/WRAMC, Washington, D.C. 20306 (SSE); and **H. Seuanez,** Laboratory of Viral Carcinogenesis, NCI/NIH, Frederick, Maryland 21701, USA (SSE).

Poster Session No. 7

THE ROLE OF ENVIRONMENTAL, GENETIC, DEVELOPMENTAL AND MORPHOLOGICAL FACTORS IN EVOLUTION

Monday, July 2, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

78. Environmental and genetic influences on the behavior of Drosophila tripunctata and D. robusta on a temperature/humidity gradient. **R. D. Seager, R. Dutkowski** and **E. E. Hostert,** Department of Biology, University of Northern Iowa, Cedar Falls, Iowa 50614, USA.

79. The priority of linear over volumetric caudal regeneration rate in the plethodontid salamander Plethodon cinereus. **Reid N. Harris** and **Joressia Jamison,** Department of Biology, James Madison University, Harrisonburg, Virginia 22807, USA.

80. Constraints on brain growth. **R. L. Dunbrack,** Department of Biology, Memorial University, St. John's, Newfoundland A1B 3X9, and **M. A. Ramsay,** Department of Biology, University of Saskatchewan, Saskatoon, Saskatchewan S7N OWO, Canada.

81. Effects of ecology and phylogeny on brain structure in the anurans. **G. M. Taylor** and **E. Nol,** Biology Department, Queen's University, Kingston, Ontario, Canada K7L 3N6; and **D. Boire,** Department de Sciences Biologiques, C. P. 6128, "A", Montreal, Quebec, Canada H3C 3J7 (SSE).

82. A quantitative approach to analysis of tissue fabric. **W. E. Stein, Jr.** and **C. L. Hotton,** Department of Biological Sciences and Center for Evolution and the Paleoenvironment, State University of New York, Binghamton, New York 13901, USA.

83. Constructional morphology of some erect Bryozoa: contributions of phylogeny and functional constraints. **F. K. McKinney,** Department of Geology, Appalachian State University, Boone, North Carolina 28608, USA.

84. Exaptation of basement membrane in an unusual organ in the Echiniscidae (Tardigrada). **Ruth Ann Dewel** and **William C. Dewel,** Appalachian State University, Boone, North Carolina 28608, USA.

85. The role of scale in species frequency-body size distributions. **R. J. Harris,** Department of Biology, University of Oregon, Eugene, Oregon 97403, USA.

86. Stability of skull size in insular martens. **S. Reig,** Museo Nacional de Ciencias Naturales (CSIC), Jose Gutierrez Abascal 6, 28006 Madrid, Spain.

87. Allometry and heterochrony in the evolution of the Neotropical pygmy squirrel, Sciurillus pusillus. **V. Louise Roth** and **William R. A. Velhagen, Jr.,** Zoology Department, Duke University, Durham, North Carolina 27706; and **Louise H. Emmons,** Division of Mammals, Smithsonian Institution, Washington, D.C. 20560, USA.

Poster Session No. 8

HISTORICAL PROCESSES AND BIOGEOGRAPHY

Monday, July 2, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

88. Corals and coral associates in the Oligocene - Miocene regional mass extinction of Caribbean reef corals. **Evan N. Edinger** and **J. Michael Risk,** Department of Geology, McMaster University, Hamilton, Ontario, Canada L8S 4M1.

89. The pattern of evolution of the mammoth in Europe. **A. M. Lister,** Department of Zoology, University of Cambridge, Cambridge CB2 3EJ, United Kingdom.

90. Evolution of the genus Stephanomys during the Middle and Upper Pliocene. **C. Castillo Ruiz,** Departamento de Estratigrafia y Paleontologia, Facultad de Ciencias, Universidad de Granada, 18002 Granada, Spain.

91. The evolution of the diversity of the southern South America land mammals throughout the last 12 million years: a systematic and ecological approach. **E. Ortiz Jaureguizar** and **J. L. Prado,** Laboratorio de Sistematica y Biologia Evolutiva (LASBE), Facultad de Ciencias Naturales y Museo, Paseo del Bosque s/n, 1900, La Plata, Argentina.

92. Pattern of land mammal extinction throughout the middle late Miocene-Recent in southen South America. **J. L. Prado** and **E. Ortiz Jaureguizar,** Laboratorio de Sistematica y Biologia Evolutiva (LASBE), Facultad de Ciencias Naturales y Museo, Paseo del Bosque s/n, 1900, La Plata, Argentina.

93. Analyses of phylogeny and biogeography of the genus Hologymnetis (Coleoptera: Scarabaeidae: Cetoniinae). **Brett C. Ratcliffe,** Systematics Research Collections, W436 Nebraska Hall, University of Nebraska State Museum, Lincoln, Nebraska 68588, USA, and **Cuauhtemoc Deloya,** Instituto de Ecologia, Apartado 63, 91000 Xalapa, Veracruz, Mexico.

94. Four levels of pattern recognition in paleontology using SIMCA-MACUP. **K.-Y. Wei,** Department of Geology and Geophysics, Yale University, New Haven, Connecticut 06511, USA.

AMERICAN SOCIETY OF NATURALISTS
Executive Committee Meeting

Monday July 2, 1990, 12:00 PM, A. Stamp Student Union, Room 2144

PLENARY LECTURE

Monday July 2, 1990, 12:30 AM - 1:30 PM, Hoff Theater, A. Stamp Student Union

Dr. Richard Leakey, Director, Kenya Wildlife Service, P. O. Box 40241, Nairobi, Kenya.

An overview of the evidence for African origins.

Congress Symposium No. 11 (continued)

EXTINCTION AND EVOLUTION

Monday July 2, 1990, 1:45 PM - 6:00 PM, Architecture, Room 0204

Organizer: **Dr. David Jablonski,** Department of Geophysical Sciences, University of Chicago, Chicago, Illinois 60637, USA.

1:45 Modelling extinction using recent marine bivalve molluscs. **Karl W. Flessa,** Department of Geosciences, University of Arizona, Tucson, Arizona 85721, and **David Jablonski,** Department of Geophysical Sciences, University of Chicago, Chicago, Illinois 60637, USA.

2:15 Articulate brachiopod phylogeny: reinterpreting the Permo-Triassic mass extinction. **Sandra J. Carlson,** Department of Geology, University of California, Davis, California 95616, USA.

2:45 Extinction, invasion, and productivity: Neogene marine faunal history and its implications for marine conservation. **Geerat Vermeij,** Department of Geology, University of California, Davis, California 95616, USA.

3:15 Break

4:00 Extinction in an extinction-resistant clade: evolutionary history of the Gastropoda. **P. W. Signor,** Department of Geology, University of California, Davis, California 95616, and **D. H. Erwin,** Department of Geological Sciences, Michigan State University, East Lansing, Michigan 48824, USA.

4:30 Long-term biotic effects of major climatic perturbations: the plant fossil record. **Jack A. Wolfe,** U.S. Geological Survey, MS-919, Denver, Colorado 80225, USA.

Congress Symposium No. 15 (continued)

HYBRID ZONES AND THE EVOLUTIONARY PROCESS

Monday July 2, 1990, 1:45 PM - 6:00 PM, A. Stamp Student Union, Tortuga Room

Organizer: **Dr. Richard Harrison,** Section of Ecology and Systematics, Cornell University, Ithaca, New York 14853, USA.

1:45 Natural hybridization in Louisiana irises: genetic variation and ecological determinants. **B. D. Bennett** and **M. L. Arnold,** Department of Genetics, University of Georgia, Athens, Georgia 30602, USA.

2:20 The genomic and environmental determinants of a narrow hybrid zone - cause or coincidence? **D. D. Shaw, A. D. Marchant, M. L. Arnold, F. Groeters, B. Kohlmann** and **N. Contreras,** Population and Molecular Genetics Group, Research School of Biological Science, The Australian National University, Canberra, Australia.

2:55 After the ice - Chorthippus parallelus meets erythropus in the Pyrenees. **G. M. Hewitt,** School of Biological Sciences, University of East Anglia, Norwich NR4 7TJ, United Kingdom.

3:30 Break

3:50 Heliconius butterflies: hybridization, raciation, and speciation. **James Mallet,** Department of Entomology, Mississippi State University, University, Mississippi 39762, USA.

4:25 Analysis of hybrid zones in Bombina. **J. M. Szymura,** Department of Comparative Anatomy, Jagiellonion University, Krakow, Poland, and School of Biological Sciences, University of East Anglia, Norwich NR4 7TJ, United Kingdom.

5:00 Genetic analysis of avian hybrid zones. **Michael J. Braun,** Laboratory of Molecular Systematics, Smithsonian Institution, Washington, D.C. 20560, USA.

Congress Symposium No. 26

ORIGIN AND EVOLUTION OF MITOCHONDRIAL AND PLASTID GENOMES

Monday July 2, 1990, 1:45 PM - 6:00 PM, Tydings Lecture Hall, Room 0130

Organizer: **Dr. Michael W. Gray,** Department of Biochemistry, Sir Charles Tupper Medical Building, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4H7.

1:45 Chloroplast DNA evolution and phylogenetic relationships in Chlamydomonas. **M. Turmel,** Department de Biochemie, Faculte des Sciences et de Genie, Universite Laval, Quebec, Canada G1K 7P4.

2:25 Lives and deaths of chloroplast genes and genomes. **Jeffrey D. Palmer, Sandie Baldauf, Claude Depamphilis, Maria Kuhsel and Clifford Morden,** Department of Biology, Indiana University, Bloomington, Indiana 47405; **James Manhart,** Department of Biology, Texas A & M University, College Station, Texas 77843; and **Steve Gantt,** Department of Plant Sciences, University of Minnesota, St. Paul, Minnesota 55108, USA.

3:05 Some evolutionary problems concerning plant mitochondrial DNA. **M. B. Coulthart,** Department of Biochemistry, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4H7.

3:45 Break

4:00 Evolution of mitochondrial DNA within an order of fungi: new perspectives and potentials. **T. D. Bruns and T. M. Szaro,** Department of Plant Pathology, University of California, Berkeley, California 94720, USA.

4:40 Evolution of genome organization and gene regulation in animal mitochondrial DNA. **H. T. Jacobs, A. G. Mayhook, D. J. Elliott, D. T. Segreto and L. R. Ritchie,** Institute of Genetics, University of Glasgow, Church Street, Glasgow G11 5JS, Scotland, United Kingdom.

5:20 Comparing organellar phylogenies based on gene sequence and genome organization. **R. Cedergren,** Department de Biochimie, Universite de Montreal, Montreal, Quebec, Canada H3C 3J7.

Affiliated Society Symposium No. 6

QUANTITATIVE APPROACHES TO THE STUDY OF EVOLUTION (NUMERICAL TAXONOMY ASSOCIATION; CO-SPONSORED BY THE SOCIETY FOR THE STUDY OF EVOLUTION)

Monday July 2, 1990, 1:45 PM - 6:00 PM, H. J. Patterson, Room 0226

Organizer: **Dr. George Estabrook,** Herbarium and Department of Biology, University of Michigan, Ann Arbor, Michigan 48109, USA.

1:45 Measuring levels of homoplasy in phylogenetic systematic data and its consequences. **J. W. Archie,** Department of Biology, California State University, Long Beach, California 90940, USA.

2:30 Spatial autocorrelation. **N. L. Oden,** Division of Epidemiology, Department of Preventative Medicine, Medical School, State University of New York, Stony Brook, New York 11794, USA.

3:15 Break

3:30 A review of advances in automatic acquisition of morphometric data by image analysis. **Christopher A. Meacham,** University Herbarium, University of California, Berkeley, California 94720, USA.

4:15 The evolution of parental investment in temporally varying environments. **David L. Schultz,** University of Georgia, Savannah River Ecology Laboratory, Aiken, South Carolina 29801, USA.

5:00 Quantitative approaches to evolutionary classification. **George F. Estabrook,** Herbarium and Department of Biology, The University of Michigan, Ann Arbor, Michigan 48109, USA.

Special Workshop No. 13

TOWARD MORE STABLE BIOLOGICAL NOMENCLATURE: PROPOSED LISTS OF 'NAMES IN CURRENT USE.'

Monday, July 2, 1990, 1:45 PM - 5:45 PM, Art and Sociology, Room 3207

Organizers: **D. L. Hawksworth,** CAB International Mycological Institute, Kew, United Kingdom, **W. Greuter,** Botanischer Garten and Botanisches Museum, Berlin, Germany, and **J. McNeill,** Royal Ontario Museum, Toronto, Canada.

1:45 Introduction and general discussion

3:45 Break

4:00 Further development of proposals

Discussion Group No. 9

THE RELATIONSHIP OF DEVELOPMENT TO MORPHOLOGICAL EVOLUTION

Monday July 2, 1990, 1:45 - 6:00 PM, Art and Sociology, Room 2203

Organizer: **Dr. David B. Wake,** Museum of Vertebrate Zoology, University of California, California 94720, USA.

Questions

How do developmental systems become decoupled, and how does this decoupling provide opportunities for evolutionary change?

What developmental mechanisms are involved in the generation of both morphological order (e.g., phyllotaxis, homeosis, vertebrate limb patterns) and novelty?

How do developmental constraints restrict evolutionary change, and to what degree do they channel (or direct) any morphological change that occurs?

What developmental components of homology can be identified, and can homologous structures have very different ontogenies?

How do developmental constraints interact with, and differ from, genetic structural and functional constraints in giving direction to and restricting morphological evolution?

How important is heterochrony, and how does it relate to taxic and transformational aspects of morphological evolution?

Can hierarchical approaches (both ontogenetic and phylogenetic) contribute to our understanding of the relationship between development and morphology in evolution?

What can evolutionary morphology and systematics offer to students of development?

Discussants will include: **Paula Mabee,** Department of Biology, Dalhousie University, Halifax, Nova Scotia, Canada; **James Hanken,** Department of Biology, University of Colorado, Boulder, Colorado, USA; **Gunter Wagner,** University of Vienna, Vienna, Austria; and others.

Contributed Paper Session No. 11

ANALYSIS OF PHYLOGENETIC PATTERNS II

Monday July 2, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2309

Co-chairs:
Dr. C. Riley Nelson, Department of Zoology, University of Texas, Austin, Texas 78712, USA.

Dr. Daphne G. Fautin, Department of Systematics and Ecology, University of Kansas, Lawrence, Kansas 66045; and Kansas Geological Survey, University of Kansas, Lawrence, Kansas 66046, USA.

1:45 Phylogeny of the species within the Drosophila melanogaster subgroup and their relationships with the oriental subgroup. **L. Nigro,** Dipartimento di Biologia, Universita' di Padova, 35121 Padova, Italy, and **M. Solignac,** Laboratoire de Biologie et Genetique Evolutives, 92298 Gif-sur-Yvette, France.

2:00 Vitellogenin gene evolution in Hawaiian Drosophila. **E. M. Craddock,** Division of Natural Sciences, State University of New York, Purchase, New York 10577; and **K.-W. Dong, M. Parisi, K. F. Ho, V. C. Bromleigh** and **M. P. Kambysellis,** Department of Biology, New York University, New York, New York 10003, USA (SSE).

2:15 Phylogenetics of North American winter stoneflies (Insecta: Plecoptera: Capniidae). **C. R. Nelson,** Department of Zoology, University of Texas, Austin, Texas 78712, USA.

2:30 Cladistic analysis of the Ochrotrichia shawnee group (Trichoptera: Hydroptilidae) including a new member from the Interior Highland region of northwestern Arkansas. **Kenneth S. Frazer and Steven C. Harris,** Aquatic Biology Program, University of Alabama, Tuscaloosa, Alabama 35487, USA (SSZ).

2:45 On the monophyly and the sister group of polygyrid land snails. **K. C. Emberton,** Department of Malacology, Academy of Natural Sciences, 19th and the Parkway, Philadelphia, Pennsylvania 19103, USA (SSZ, SSE).

3:00 Phylogenetic relationships among scleractinians, actinians, and corallimorpharians. **D. G. Fautin,** Department of Systematics and Ecology, University of Kansas, Lawrence, Kansas 66045; Kansas Geological Survey, University of Kansas, Lawrence, Kansas 66046, and Department of Invertebrate Zoology, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118; and **J. M. Lowenstein,** University of California, San Francisco, California 94143, and California Academy of Sciences, Golden Gate Park, San Francisco, California 94118, USA (SSZ).

3:15 Fossil planktonic foraminiferal amino acid compositions as a chemotaxonomic character. **L. Stathoplos,** Graduate School of Oceanography, University of Rhode Island, Narragansett, Rhode Island 02882, USA.

3:30 Break

3:45 Origin of tetrapods inferred from their mitochondrial DNA affiliation to lungfish. **Axel Meyer** and **Allan C. Wilson,** Division of Biochemistry and Molecular Biology, University of California, Berkeley, California 94720, USA (SSE).

4:00 Genetic biogeography of anchovies in the genus Engraulis. **W. Stewart Grant,** Department of Genetics, University of the Witwatersrand, 2050 Johannesburg, South Africa, and **Robin W. Leslie,** Sea Fisheries Research Institute, 8012 Cape Town, South Africa.

4:15 Smelt phylogeny and the pattern of reductive evolution. **D. P. Begle,** Division of Fishes, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109, USA (SSZ).

4:30 Convergent evolution of nasal structure in sedentary Elasmobranchs. **Michael A. Bell,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (SSE).

4:45 Evolution of length polymorphisms and heteroplasmy in the D-loop region of sturgeon mitochondrial DNA. **J. R. Brown, A. T. Beckenbach** and **M. J. Smith,** Institute of Molecular Biology and Biochemistry, Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, Canada V5A 1S6 (SSE).

Contributed Paper Session No. 12

GENETIC STRUCTURE OF POPULATIONS II

Monday, July 2, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3203

Co-chairs:
Dr. James L. Hamrick, Department of Botany, University of Georgia, Athens, Georgia 30602, USA.

Dr. David C. Culver, Department of Biology, American University, Washington, D.C. 20016, USA.

1:45 Population biology and genetic structure of longleaf pine (Pinus palustris). **William J. Platt**, Department of Botany, Louisiana State University, Baton Rouge, Louisiana 70803; **James L. Hamrick and Mark B. Hessing**, Department of Botany, University of Georgia, Athens, Georgia 30602, USA (SSE).

2:00 Fine-scale genetic structure of an old-growth long leaf pine (Pinus palustris Mill.) population. **J. L. Hamrick**, Departments of Botany and Genetics, University of Georgia, Athens, Georgia 30602; **William J. Platt and Mark B. Hessing**, Department of Botany, Louisiana State University, Baton Rouge, Louisiana 70803 USA (SSE).

2:15 Regressive evolution in Gammarus minus: genetic structure of populations. **T. C. Kane**, Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221, and **D. C. Culver**, Department of Biology, American University, Washington, D.C. 20016, USA.

2:30 Non-equilibrium population genetics and genetic variation among populations. **Michael C. Whitlock**, Department of General Biology, Vanderbilt University, Nashville, Tennessee 37235, USA.

2:45 The adaptive significance of ADH variants in white clover. **J. W. Y. Chan**, Leidy Labs, University of Pennsylvania, Philadelphia, Pennsylvania 19143, and **R. S. Burton**, Department of Biology, University of Houston, Houston, Texas 77004, USA (SSE).

3:00 Genetic variation in responses to neighboring plants in Nemophila menziesii, a native California annual. **R. G. Shaw and G. A. J. Platenkamp**, Department of Botany and Plant Sciences, University of California, Riverside, California 92521, USA (SSE).

3:15 Genetics of a fungal pathogen on native and introduced Silene. **D. A. Stratton**, Biology Department, Princeton University, Princeton, New Jersey 08544, USA (SSE).

3:30 Break

3:45 Epistasis and the average effect of an allele. **Charles J. Goodnight**, Department of Zoology, University of Vermont, Burlington, Vermont 05405, USA (SSE).

4:00 Effect of gene conversion on variances of digenic descent measures. **C. J. Basten and B. S. Weir**, Department of Statistics, North Carolina State University, Raleigh, North Carolina 27695, USA.

4:15 Genetic mutation: development of the concepts and their evolutive implications. **Ana Barahona Echeverria,** Departamento de Biologia, Facultad de Ciencias, UNAM, Mexico, D.F. 04510.

AMERICAN SOCIETY OF NATURALISTS
Presidential Address
Dr. Lee Erhman

Monday July 2, 1990, 5:00 PM - 6:00 PM, Hoff Theater, A. Stamp Student Union

AMERICAN SOCIETY OF NATURALISTS RECEPTION

Monday July 2, 1990, 6:00 PM - 8:00 PM, Hoff Theater, A. Stamp Student Union

BOTANY AND MICROBIOLOGY CONGRESS RECEPTION

Monday July 2, 1990, 6:30 PM - 8:30 PM, A. Stamp Student Union, Grand Ballroom Lounge

SOCIETY OF SYSTEMATIC ZOOLOGY
Executive Committee Meeting

Monday July 2, 1990, 6:30 PM, A. Stamp Student Union, Room 1139

SOCIETY FOR THE STUDY OF EVOLUTION
Presidential Address
Dr. Stephen J. Gould

The contingent and the lawful in evolution.

Monday July 2, 1990, 7:00 PM - 8:00 PM, Hoff Theater, A. Stamp Student Union

PLENARY LECTURE

Monday July 2, 1990, 8:00 PM - 9:00 PM, Tydings, Lecture Hall, Room 0130

Dr. Margaret B. Davis, Regent's Professor of Ecology, Department of Ecology, Evolution and Behavior, University of Minnesota, Minneapolis, Minnesota 55455, USA.

New understanding of the Ice Age:
implications for the study of evolution.

Graduate Student Discussion Group No. 15

EVOLUTIONARY CONSEQUENCES OF GENETIC ENGINEERING AND CONSERVATION PRACTICES

Monday July 2, 1990, 9:00 PM, Tydings Lecture Hall, Room 0130

Organizer: **Alison E. L. Colwell,** Department of Biology, Washington University, St. Louis, Missouri 63130, USA.

The genetic engineering of organisms and the management of populations and ecosystems are practices that may be used to alleviate environmental degradation.

Questions

What are the evolutionary and genetic consequences of these practices?

Can they be predicted?

What types of biological information (e.g., genetic, population, etc.) are needed to provide appropriate management solutions and at what cost?

SOCIETY FOR THE STUDY OF EVOLUTION
Presidential Reception

Monday July 2, 1990, 9:00 PM - 10:00 PM, Atrium, A. Stamp Student Union

TUESDAY JULY 3, 1990

Congress Symposium No. 14

DIVERSIFICATION: PATTERNS, RATES, CAUSES, AND CONSEQUENCES

Tuesday July 3, 1990, 9:00 AM - 12:15 PM, Architecture, Room 0204

Organizers: **Dr. Alan Kohn,** Department of Zoology, University of Washington, Seattle, Washington 98195; **Dr. Charles Mitter and Brian Farrell,** Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

9:00 Introductory comments by Moderator. **Alan J. Kohn,** Department of Zoology, University of Washington, Seattle, Washington 98195, USA.

9:05 Overview of Phanerozoic diversity patterns. **J. John Sepkoski, Jr.,** Department of Geophysical Sciences, University of Chicago, Chicago, Illinois 60637, USA.

9:40 Estimating probabilities of origination and extinction. **N. L. Gilinsky,** Department of Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA.

10:15 **Break**

10:30 Gastropod morphology and durophagous predation through geologic time: the Mesozoic marine revolution reconsidered. **P. W. Signor,** Department of Geology, University of California, Davis, California 95616, USA.

11:05 Diversification patterns in the most diverse marine snail genus. **Alan J. Kohn,** Department of Zoology, University of Washington, Seattle, Washington 98195, USA.

Congress Symposium No. 18

FUNCTIONAL MORPHOLOGY, BIOMECHANICS AND EVOLUTIONARY PROCESS

Tuesday July 3, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2203

Organizer: **Dr. Marvalee Wake,** Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

8:00 Introduction: the inter-relationships of functional morphology, biomechanics, and evolution. **M. H. Wake,** Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

8:10 Getting past Cuvier: a biophysical explanation for the form of sea urchins. **C. J. Baron,** Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

8:40 Biomechanics and adaptive significance of multicellularity in plants. **K. J. Niklas,** Section of Plant Biology, Cornell University, Ithaca, New York 14853, USA.

9:10 Comparative biomechanics and the evolutionary diversification of flying insect morphology. **Robert Dudley,** Smithsonian Tropical Research Institute, Box 2072, Balboa, Republic of Panama.

9:40 Complexity and a coupled system: flight and echolocation in bats. **J. M. V. Rayner,** Department of Zoology, University of Bristol, Woodland Road, Bristol BS8 1UG, United Kingdom.

10:10 **Break**

10:30 Phenotypic plasticity in complex biomechanical systems: effects of the environment on the feeding mechanism in fishes. **P. C. Wainwright,** Department of Ecology and Evolutionary Biology, University of California, Irvine, California 92717, USA.

11:00 Evolution of avian pecking, probing and filter feeding mechanisms. **G. A. Zweers,** Zoological Laboratory, Leiden University, 2300 RA Leiden, The Netherlands.

11:30 Functional analysis and the power of the fourth dimension in comparative evolutionary studies. **C. S. Hickman,** Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

12:00 Summary. **Dr. Marvalee Wake,** Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

Congress Symposium No. 22

NATURAL SELECTION IN MOLECULAR EVOLUTION

Tuesday July 3, 1990, 8:00 AM - 12:15 PM, LeFrak, Room 2205

Organizers: **Dr. Morris Goodman,** Department of Anatomy and Cell Biology, Wayne State University School of Medicine, Detroit, Michigan 48201, and **Dr. Martin Kreitman,** Biology Department, Princeton University, Princeton, New Jersey, USA.

8:00 Overview of ideas on natural selection in evolution from the view of a population geneticist. **James Crow,** Department of Genetics, University of Wisconsin, Madison, Wisconsin, USA.

8:40 Natural selection and neutral mutations in genome evolution. **Giorgio Bernardi, Dominique Mouchiroud, Christian Gautier** and **Giacomo Bernardi,** Laboratoire de Genetique Moleculaire Institut Jacques Monod, Paris, France, and Universite Claude Bernard Lyon I, 69622 Lyon, France.

9:20 An hypothesis on molecular evolution that combines neutralist and selectionist views. **Morris Goodman,** Department of Anatomy and Cell Biology, Wayne State University School of Medicine, Detroit, Michigan 48201, USA.

10:00 Break

10:15 Selection in ADH genes of Drosophila. **Martin Kreitman,** Biology Department, Princeton University, Princeton, New Jersey, USA.

10:55 Distinguishing the forces controlling genetic variation in Drosophila. **M. A. Riley,** Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

11:35 Distinguishing between selection and drift in the evolution of proteins. **Michael Laskowski, Jr.,** Department of Chemistry, Purdue University, West Lafayette, Indiana 47907, USA.

Congress Symposium No. 27

TOWARD A PHYLOGENY OF THE PROTISTANS

Tuesday July 3, 1990, 8:00 AM - 12:15 PM Tydings Lecture Hall, Room 0130

Organizer: **Dr. Mitchell L. Sogin,** Center for Molecular Evolution, Marine Biology Laboratory, Woods Hole, Massachusetts 02543, USA.

8:00 Protistan evolution inferred from ribosomal RNA sequences. **J. H. Gunderson,** Department of General Biology, Vanderbilt University, Nashville, Tennessee 37235; and **M. L. Sogin,** Marine Biological Laboratory, Woods Hole, Massachusetts 02543, USA.

8:30 Making phylogenetic sense of biochemical diversity among the protists. **Mark Ragan,** Atlantic Research Laboratory, National Research Council of Canada, 1411 Oxford Street, Halifax, Nova Scotia, Canada B3H 321 and **Rev. Arthur R. Lee III,** Episcopal Church of the Holy Spirit, P.O. Box 817, Safety Harbor, Florida 34695, USA.

9:00 Evolution of chromophyte algae. **Robert A. Andersen,** Center for Culture of Marine Phytoplankton, Bigelow Laboratory for Ocean Science, W. Boothbay Harbor, Maine 04575, USA.

9:30 Dinoflagellate evolution. **Max Taylor,** Department of Oceanography, University of British Columbia, Vancouver, British Columbia, Canada.

10:00 Break

10:15 Molecular evolution in ciliates. **M. Schlegel,** Department of Zoology, University of Tubingen, Federal Republic of Germany.

10:45 Ultrastructure and evolution in ciliates. **C. F. Bardele,** Department of Zoology, University of Tubingen, Federal Republic of Germany.

11:15 Evolution of flagellar and ciliary systems. **M. Melkonian,** Universitat zu Koln, Botanisches Institut, Lehrstuhl I, Gyrhofstrasse 15, D-5000 Koln 41, Federal Republic of Germany.

Affiliated Society Symposium No. 4

YOUNG INVESTIGATOR SYMPOSIUM (AMERICAN SOCIETY OF NATURALISTS)

Tuesday July 3, 1990, 8:00 AM - 12:15 PM, H. J. Patterson, Room 0226

Organizer: **Dr. Barbara Bentley,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA.

8:00 Direct, indirect and combined effects of three herbivores on sumac: implications for plant defense. **Sharon Y. Strauss,** Department of Entomology, University of California, Davis, California 95616, USA.

9:00 Morphological relationships among carnivore and rodent guilds: putting a bite into character displacement. **Tamar Dayan,** Department of Biological Science, Florida State University, Tallahassee, Florida 32306, USA.

10:00 **Break**

10:15 A multidisciplinary approach to the question of species diversity in cichlid fishes. **Axel Meyer,** Department of Ecology and Evolution, State University of New York at Stony Brook, Stony Brook, New York 11794, USA.

11:15 Aerial predation and butterfly design: how palatability, mimicry, and the need for evasive flight constrain mass allocation. **James H. Marden,** Department of Zoology, University of Vermont, Burlington, Vermont 05405, USA.

Discussion Group No. 3

HYBRID ZONES

Tuesday July 3, 1990, 8:00 AM - 12:15 PM, A. Stamp Student Union, Tortuga Room

Organizer: **Dr. Richard Harrison,** Section of Ecology and Systematics, Cornell University, Ithaca, New York 14853, USA.

Discussion Group No. 11

EVOLUTION ON ISLANDS AND CONSERVATION: PHILIPPINES

Tuesday July 3, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3207

Organizer: **Dr. S. H. Sohmer,,** Assistant Director, Research and Scholarly Studies, Bishop Museum, P.O. Box 1900A, Honolulu, Hawaii 96817, USA.

Topics

Introduction: necessity for rapid study, the need for knowledge. **S. H. Sohmer,** Assistant Director, Research and Scholarly Studies, Bishop Museum, P.O. Box 1900A, Honolulu, Hawaii 96817, USA.

The vegetation of the Philippines and the situation of the flowering plants. **E. S. Fernando,** Museum of Natural History, University of the Phillipines at Los Banos, College, Laguna 4031, Philippines.

The mosses of the Philippines: an often overlooked group in the Philipppines. **B. Tan,** University of the Phillipines (Los Banos), and Fellow of the Farlow Herbarium, Harvard University, 22 Divinity Avenue, Cambridge, Massachusetts 02138, USA.

The fern flora. **Dr. Michael G. Price,** Herbarium NUB, University of Michigan, Ann Arbor, Michigan 48108, USA.

The insects of the Philippines - a cornucopia of diversity and evolution. **V. P. Gapud,** Department of Entomology, University of the Philippines at Los Banos, College of Agriculture, College, Laguna 4031, Philippines.

The diversity and conservation of the social insects in the Philippines. **C. Starr,** Biosystematics Research Centre, Research Branch, Agriculture Canada, Ottawa, Ontario, Canada K1A 0C6.

Diversity and conservation of the mammalian fauna of the Philippines. **L. Heaney,** Division of Mammals, Field Museum of Natural History, Roosevelt Road at Lakeshore Drive, Chicago, Illinois 60605, USA.

Philippine bird life: a ready-made group of conserve. **R. Kennedy,** Deputy Director for Collections and Research, Museum of Natural History, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

Conservation issues in the Philippines: the basis for saving examples of biological diversity. **D. Madulid,** Supervising Museum Researcher, O.I.C., Department of Botany, National Museum, Old Congress Building, P. Burgos St., P.O. Box 2659, Manila, Philippines.

Contributed Paper Session No. 13

ANALYSIS OF PHYLOGENETIC PATTERNS III, AND LIFE HISTORY EVOLUTION I: REPRODUCTION AND ALLOCATION

Tuesday July 3, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203

Co-chairs:
Mr. Keith Karoly, Committee on Evolutionary Biology, University of Chicago, Chicago, Illinois 60637, USA.

Ms. Louisa A. Stark, Department of Environmental, Population and Organismic Biology, University of Colorado, Boulder, Colorado 80309, USA.

8:00 Evolution and phylogenetic affinities of Afrotropical species of Crocidura (Mammalia; Insectivora). **L. J. McLellan,** National Museum of Natural History, Room 390, Smithsonian Institution, Washington, D. C. 20560, USA.

8:15 Evolutionary relationships among species in the North American mallard duck complex. **J. M. Rhymer and M. J. Braun,** Laboratory of Molecular Systematics, Smithsonian Institution, Washington, D. C. 20560, USA (SSE).

8:30 Phylogenetic status of the endangered Kemp's Ridley sea turtle. **B. W. Bowen and J. C. Avise,** Department of Genetics, University of Georgia, Athens, Georgia 30602, and **A. B. Meylan,** Florida Marine Research Institute, 100 Eighth Avenue S. E., St. Petersburg, Florida 33701, USA (SSE).

8:45 Lacertid lizard relationships from mitochondrial DNA sequences. **R. H. Thomas,** Department of Zoology, The Natural History Museum, Cromwell Road, London, SW7 5BD, United Kingdom (SSE).

9:00 Molecular phylogeny of the Magnoliidae based on ribosomal RNA. **Y. Suh,** Department of Biochemistry, Louisiana State University, Baton Rouge, Louisiana 70803; **L. B. Thien,** Department of Biology, Tulane University, New Orleans, Louisiana 70118; **S.-M. Chaw,** Institute of Botany, Academia Sinica, Nankang, Taipei, Taiwan; and **E. A. Zimmer,** Departments of Botany and Biochemistry, Louisiana State University, Baton Rouge, Louisiana 70803, USA.

9:15 Initial seed weight and flower age at pollination affect reproductive fitness in rapid-cycling Brassica campestris. **Louisa A. Stark,** Department of Environmental, Population and Organismic Biology, University of Colorado, Boulder, Colorado 80309, USA (SSE).

9:30 Fruit and seed characters and dispersal syndromes associated with single-seededness in a woody tropical flora. **B. B. Casper, S. B. Heard** and **V. Apanius,** Department of Biology, University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA (SSE).

9:45 A polar r-strategist. **M. Bergmans, H.-U. Dahms** and **H. K. Schminke,** Fachbereich Biologie, Universitat Oldenburg, Postfach 2503, D-2900 Oldenburg, Federal Republic of Germany (ASN, SSE).

10:00 Break

10:15 Genetic and environmental variation affecting fledgling size in the great tit. **Sabine G. Henrich,** Zoologisches Institut, Rheinsprung 9, CH-4051 Basel, Switzerland (present address: University of Georgia, Livestock-Poultry Bldg., Athens, Georgia 30602, USA) (SSE).

10:30 The influence of egg size and food abundance on maternal fitness in the brook trout, Salvelinus fontinalis. **Jeffrey A. Hutchings and Douglas W. Morris,** Department of Biology, Memorial University of Newfoundland, St. John's, Newfoundland A1B 3X9, Canada (SSE).

10:45 Genetic and ration-level effects on egg size and number in Daphnia magna: implications for models of life history evolution. **D. S. Glazier,** Department of Animal and Plant Sciences, University of Sheffield, Sheffield S10 2TN, United Kingdom, and Department of Biology, Juniata College, Huntington, Pennsylvania 16652, USA (ASN, SSE, SSZ).

11:00 Hybridizing strains and facultative parthenogenesis in a tetraploid freshwater pulmonate. **T. Stadler,** Department of Zoology, University of Frankfurt, Siesmayerstrasse 70, D-6000 Frankfurt am Main 11, West Germany.

11:15 Twinning, parent-offspring conflict, and the cost of sex. **Scott K. Gleeson,** T. H. Morgan School of Biological Sciences, University of Kentucky, Lexington, Kentucky 40506, and **Anne B. Clark,** Department of Biological Sciences, State University of New York, Binghamton, New York 13901, USA (SSE, ASN).

EXHIBITS

Tuesday July 3, 1990, 9:00 AM - 5:00 PM, Grand Ballroom, A. Stamp Student Union

AMERICAN SOCIETY OF NATURALISTS
Business Meeting

Tuesday July 3, 1990, 12:00 PM, Atrium, A. Stamp Student Union

SPECIAL LECTURE

Tuesday July 3, 1990, 12:30 PM - 1:30 PM, Tydings, Lecture Hall, Room 0130

THE WILHELMINA E. KEY 1990 INVITATIONAL LECTURE of the AMERICAN GENETICS ASSOCIATION

Motoo Kimura, the Neutral Theory of Molecular Evolution and the Disunity of Modern Evolutionary Biology

Dr. William B. Provine, Section of Ecology and Systematics, Cornell University, Ithaca, New York, USA.

(Introduction will by given by **Professor Bruce Wallace**, Department of Genetics, Virginia Polytechnic and State University, Blacksburg, Virginia, USA)

Summary

The neutral mutation theory of molecular evolution, first presented by Motoo Kimura in 1968, is a strikingly new theory of evolution unrelated to earlier theories of random genetic drift except in certain formal respects. If true even in part, Kimura's neutral theory demands a bifurcation of the evolutionary process. Molecular evolution dominated by random genetic drift is dramatically different from phenotypic evolution dominated by natural selection. This bifurcation of molecular evolution from phenotypic evolution signifies the end of the constantly expressed hope that evolutionary biology is a unity. If the neutral theory is true, the title of this conference, "The Unity of Evolutionary Biology," is a shattered dream.

Congress Symposium No. 2

EVOLUTION IN A RAPIDLY CHANGING ENVIRONMENT: GLOBAL WARMING

Tuesday July 3, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2309

Organizer: **Dr. Robert Buddemeier**, Chief, Geohydrology Section, Kansas Geological Survey, University of Kansas, Lawrence, Kansas 66046, USA.

1:45 Climate change and biology: past, present and future. **Robert W. Buddemeier**, Kansas Geological Survey, 1930 Constant Avenue, Campus West, University of Kansas, Lawrence, Kansas 66046, USA.

2:15 Evolution and biogeography of reef-building corals during periods of rapid global change. **D. C. Potts**, Institute of Marine Sciences, University of California, Santa Cruz, California 95064, USA.

2:45 Potential effects of global warming on marine foodwebs at low temperature. **W. J. Wiebe and L. R. Pomeroy**, Departments of Microbiology and Zoology, University of Georgia, Athens, Georgia 30602, USA.

3:15 Break

3:30 Climate and man-induced ecosystem changes in prehistoric Central America. **D. R. Piperno,** Smithsonian Tropical Research Institute, Box 2072, Balboa, Panama; **M. B. Bush** and **P. A. Colinvaux,** Zoology Department, The Ohio State University, Columbus, Ohio 43210, USA.

4:00 Quaternary sea level fluctuations and the diversity and species composition of insular shallow water marine faunas. **Gustav Paulay,** Department of Paleobiology, National Museum of Natural History, Washington, D.C. 20560, USA.

4:30 Rapid change in a patchy environment - the 'world' from a plant's-eye-view. **Roy Turkington,** Botany Department, University of British Columbia, Vancouver, British Columbia, Canada.

5:00 Discussion

Congress Symposium No. 14 (continued)

DIVERSIFICATION: PATTERNS, RATES, CAUSES, AND CONSEQUENCES

Tuesday July 3, 1990, 1:45 PM - 6:00 PM, Architecture, Room 0204

Organizers: **Dr. Alan Kohn,** Department of Zoology, University of Washington, Seattle, Washington 98195; **Dr. Charles Mitter** and **Brian Farrell,** Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

1:45 Reconvene: **C. Mitter,** Moderator

1:50 A model for calculating rates of species divergence on oceanic islands. **Gustav Paulay,** Department of Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA.

2:25 Speciation patterns in Hawaiian crickets. **Daniel Otte,** Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania 19103, USA.

3:00 Diversification and the plant/insect interface. **B. D. Farrell, C. Mitter** and **B. Wiegmann,** Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

3:35 Break

3:55 The causes of the diversification of life. **Michael J. Benton,** Department of Geology, University of Bristol, Bristol BS8 1RJ, England, United Kingdom.

4:30 Darwin on diversification and species selection. **Stephen J. Gould,** Museum of Comparative Zoology, Harvard Unversity, Cambridge, Massachusetts 02138, USA.

5:05 Roundtable discussion

Comparative diversification patterns and rates in the land snail faunas of Australia and Polynesia. **Alan Solem,*** Field Museum of Natural History, Chicago, Illinois 60605, USA.

*deceased

Congress Symposium No. 22 (continued)

NATURAL SELECTION IN MOLECULAR EVOLUTION

Tuesday July 3, 1990, 1:45 PM - 6:00 PM, LeFrak, Room 2205

Organizers: **Dr. Morris Goodman,** Department of Anatomy and Cell Biology, Wayne State University School of Medicine, Detroit, Michigan 48201, and **Dr. Martin Kreitman,** Biology Department, Princeton University, Princeton, New Jersey, USA.

1:45 Positive Darwinian selection at the MHC and other immune system loci. **M. Nei,** Population Genetics Center, University of Texas, Houston, Texas 77225, USA.

2:25 Evolutionary analysis of sequence polymorphism in the class II genes of the major histocompatibility complex of primates. **U. B. Gyllensten,** ,Department of Medical Genetics, Biomedical Center, University of Uppsala, S-751 23 Uppsala, Sweden, and **H. A. Erlich,** Department of Human Genetics, Cetus Corp., Oakland, California 94608 USA.

3:05 Neutral and adaptive evolution of eye lens crystallins. **Nicolette H. Lubsen,** Department of Molecular Biology, University of Nijmegen, Nijmegen, The Netherlands.

3:45 Break

4:00 Selective amino acid replacements in pancreatic ribonucleases. **Jaap J. Beintema** and **Henk J. Bat,** Biochemisch Laboratorium, Nijenborgh 16, 9747 AG Groningen, The Netherlands.

4:40 Selection in the descent of the carbonic anhydrase gene family. **David Hewett-Emmett,** University of Texas Health Science Center, Houston, Texas 77225, USA.

5:20 Functional characteristics of the calcium modulated proteins seen from an evolutionary perspective. **Robert H. Kretsinger, Susumu Nakayama** and **Nancy Moncrief,** Department of Biology, University of Virginia, Charlottesville, Virginia 22901, USA.

Affiliated Society Symposium No. 1

RATES AND WEIGHTS: RATES OF EVOLUTION AND CHARACTER WEIGHTING (WILLI HENNIG SOCIETY)

Tuesday July 3, 1990, 1:45 PM - 6:00 PM, A. Stamp Student Union, Tortuga Room

Organizer: **Dr. Christopher J. Humphries,** Botany Department, British Museum, Cromwell Road London SW7 5BD, United Kingdom.

Affiliated Society Symposium No. 5

SENSORY DRIVE: DOES SENSORY BIOLOGY BIAS OR CONSTRAIN THE DIRECTION OF EVOLUTION? (VICE-PRESIDENTIAL SYMPOSIUM, AMERICAN SOCIETY OF NATURALISTS)

Tuesday July 3, 1990, 1:45 PM - 6:00 PM, H. J. Patterson, Room 0226

Organizer: **Dr. John A. Endler,** Department of Biological Sciences, University of California, Santa Barbara, California, USA.

1:45 Introduction to the symposium: **John A. Endler,** Department of Biological Sciences, University of California, Santa Barbara, California, USA.

1:50 Sexual selection for sensory exploitation. **Michael Ryan and Anne Keddy-Hector,** Department of Zoology, University of Texas, Austin, Texas, USA.

2:20 Neurobiological restraints on chorus behavior in neotropical treefrogs. **Peter M. Narins,** Department of Biology, University of California, Los Angeles, California, USA.

2:50 Sensory influences on the design of visual displays in anoline lizards. **Leo J. Fleishman,** Department of Biological Sciences, Union College, Schenectady, New York, USA.

3:20 Sensory and environmental constraints on the evolution and design of chemical communication systems. **Allison Alberts,** Department of Biology, University of California, San Diego, La Jolla, California, USA.

3:50 **Break**

4:00 How does ontogeny, morphology, and physiology of sensory systems constrain and direct the evolution of amphibians? **Gerhard Roth,** Brain Research Institute, Universitat Bremen, Bremen, West Germany.

4:30 The evolution of sexual signals: how is individual variation converted into species differences? **Christine R. B. Boake,** Department of Zoology, University of Tennessee, Knoxville, Tennessee, USA.

5:00 The interaction and joint evolution of signals, signal receptors, and microhabitat choice, with special reference to vision. **John A. Endler,** Department of Biological Sciences, University of California, Santa Barbara, California, USA.

5:30 Summing up. **John A. Endler,** Department of Biological Sciences, University of California, Santa Barbara, California, USA.

Discussion Group No. 1

EVOLUTION AND PHYLOGENY OF PROTISTAN GROUPS

Tuesday July 3, 1990, 1:45 PM - 6:00 PM, Tydings Lecture Hall, Room 0130

Organizers: **Dr. Robert A. Andersen,** Center for Culture of Marine Phytoplankton, Bigelow Laboratory for Ocean Sciences, McKown Point, West Booth Bay Harbor, Maine 04575, USA, and **Dr. John O. Corliss,** P.O. Box 53008, Albuquerque, New Mexico 87153, USA.

1:45 Opening remarks: **Robert A. Andersen,** Center for Culture of Marine Phytoplankton, Bigelow Laboratory for Ocean Sciences, McKown Point, West Booth Bay Harbor, Maine 04575, USA.

Session I. Chair: **Robert A. Andersen,** Center for Culture of Marine Phytoplankton, Bigelow Laboratory for Ocean Sciences, McKown Point, West Booth Bay Harbor, Maine 04575, USA.

Topic A: The molecular biology prospective

1:50 **Mitchell L. Sogin,** Marine Biological Laboratory, Woods Hole, Massachusetts 02543, USA.

2:00 **Rose Ann Cattolico,** Department of Botany, University of Washington, Seattle, Washington 98195, USA.

2:10 Discussion Leader: **Annette W. Coleman,** Biology Department, Brown University, Providence, Rhode Island 02912, USA.

Questions

In the absence of a geological record, what is the current "best bet" among molecular biology aspects for resolving any apparent conflicts between observed diversity and expected clock consistency? How might such conflicts arise (known molecular mechanisms and examples)?

Analysis of which subportion of nuclear rDNA repeat sequencing will be most useful for: a) derivation of class/division/kingdom taxa, and b) determining species level or lower taxa?

In addition to rDNA sequences, what other aspects (gene sequencing, gene content, etc.) will be most useful for: a) derivation of class/division/kingdom taxa, and b) determining species level or lower taxa?

From a molecular biology viewpoint, how congruent are molecularly-based protistan phylogenies when compared to morphologically-based phylogenies?

Topic B: The ultrastructural prospective

2:30 **Michael Melkonian,** Botanisches Institut, Universitat Koln, 0-500 Koln 41, Federal Republic of Germany.

2:40 **Michael A. Sleigh,** Biology Department, University of Southampton, Southampton SO9 3TU, England.

3:00 Discussion Leader: **Fred Spiegel,** Department of Botany and Microbiology, University of Arkansas, Fayetteville, Arkansas 72701, USA.

Questions

Is evolutionary change in the ultrastructure of the flagellar apparatus more rapid in organisms with a flagellar vegetative stage when compared to protists where the flagellar stage is limited to the zoospore or gamete stage?

Does the substantial body of ultrastructural evidence on, for example, mitochondrial structure still have value alongside sequence data, or will it eventually have to be abandoned as imprecise evidence of relationships?

From an ultrastructural viewpoint, how congruent are morphologically-based protistan phylogenies when compared to molecularly-based phylogenies?

Session II. Chair: **John 0. Corliss,** P.O. Box 53008, Albuquerque, New Mexico, USA.

Topic C: Cytoterminology and homology problems

3:45 **Keith Roberts,** Department of Biology, University of Southwestern Louisiana, Lafayette, Louisiana 70504, USA.

3:55 **Fred Spiegel,** Department of Botany and Microbiology, University of Arkansas, Fayetteville, Arkansas 72701, USA.

4:05 Discussion Leader: **Dennis H. Lynn,** Department of Zoology, University of Guelph, Guelph, Ontario, Canada NIGB ZW1.

Questions

How can we resolve the cytoterminology problems that plague the phylogenetic classification of protists?

What can we do about entrenched terminology and fixed conventional usages? Should we use a semi-conservative approach or choose a single term, and who decides?

How can we establish homology in protists?

Topic D: Kingdom(s) classification

4:25 **T. Cavalier-Smith,** Department of Botany, University of British Columbia, Vancouver, British Columbia, Canada V6T 2B1.

4:35 **David J. Patterson,** Department of Zoology, Bristol University, Bristol BS8 1UG, England.

4:45 Discussion Leader: **F. J. R. Taylor,** Department of Oceanography, University of British Columbia, Vancouver, British Columbia, Canada V6T 2B1.

Questions

How many protist kingdoms are there, and why?

It appears that contributors to this discussion accept that if the Fungi, Animalia and Plantae (green land plants) are given the rank of kingdoms of organisms, then the Protista comprise many kingdoms of organisms at least as distinct in organization as these multicellular kingdoms. How then do we define the rank of kingdom?

Must the definition of a protist kingdom be consistent with the definition of a prokaryote kingdom and a plant or animal kingdom?

The phylogeny of all living things is surely like a genuine forest tree. Each substantial branch of the tree that is recognizable as distinctly different and separate from other main branches should be recognized as a kingdom. But these will have different sizes, for small branches and even little twigs also emerge from the main trunk of the tree. They too can be distinctly different from any of the main branches, but recognizing them as kingdoms is not likely to be readily accepted by other biologists. How many clear kingdoms (large branches) can we recognize (neglecting, for the present, small groups of only one or a few genera)?

5:05 Closing remarks: **J. O. Corliss**, Albuquerque, New Mexico 87153, USA.

Discussion Group No. 4

THE IMPACT OF BIOMECHANICS AND FUNCTIONAL MORPHOLOGY ON STUDIES OF EVOLUTION

Tuesday July 3, 1990, 1:45 PM - 4:00 PM, Art and Sociology, Room 2203

Organizer: **Dr. Marvelee Wake**, Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

Questions and Topics

What is the impact of studies in biomechanics and functional morphology on current thought in evolutionary biology?

Have studies in biomechanics and functional morphology contributed to evolutionary theory?

Ghiselin has stated that morphologists did not contribute to the evolutionary synthesis. Do you agree, or disagree? Why?

How can an evolutionary biologist use data and theory from biomechanics and/or functional morphology?

How can a functional morphologist or biomechanician use data or theory from evolutionary biology?

When is an evolutionary framework useful in biomechanics and functional morphology?

When is an evolutionary framework not necessary in biomechanics and functional morphology?

Biomechanics emphasizes analysis of biological systems in terms of physical principles. How can we best train students?

How can we address concerns about sample sizes, experimental replication, and quantification in functional morphology and evolution? (Of course, do it - but how?).

Perspectives on experimental design in functional morphology and biomechanics.

The time dimension in studies in evolutionary morphology.

The ecological dimension in evolutionary morphology: ecological consequences of organismal design, and the ways that the environment shapes organismal design.

Analysis of morphological and physiological plasticity.

The vocabularies of form and function.

Use of functional studies to identify convergences.

The functional significance of morphological evolution.

How does an evolutionary morphologist examine the generation of organic form?

What principles of biomechanics and functional morphology can be applied to the evolutionary biology of both plants and animals?

Discussion Group No. 10

EVOLUTION ON ISLANDS AND CONSERVATION: WEST INDIES

Tuesday July 3, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3207

Organizer: **Dr. Gregory Mayer,** Division of Amphibians and Reptiles, National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA.

Contributed Paper Session No. 14

HYBRID ZONES AND SPECIATION

Tuesday July 3, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3203

Co-chairs:
Ms. Patricia L. Sawaya, Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221, USA.

Dr. Thomas Parsons, Laboratory of Molecular Systematics, Museum Support Center, Smithsonian Institution, Washington, D.C. 20560, USA.

1:45 Natural hybridization in Louisiana irises: genetic variation and ecological determinants. **B. D. Bennett and M. L. Arnold,** Department of Genetics, University of Georgia, Athens, Georgia 30602, USA.

2:00 The effect of competitive interactions on the zonation of two parapatric species of Iris and their natural hybrids. **B. D. Bennett,** Genetics Department, University of Georgia, Athens, Georgia 30602, USA (ASN).

2:15 Evolutionary relationships between the Asian and North American Trillium species. **I. Fukuda,** Biology Department, College of Liberal Arts and Sciences, Tokyo Woman's Christian University, Zempukuji, Suginami, Tokyo 167, Japan (SSE).

2:30 Relationships of Lamium amplexicaule, L. purpureum and L. hyridum, the last (?) word. **R. J. Taylor,** Department of Biology, Western Washington University, Bellingham, Washington 98225, USA.

2:45 Pattern of quantitative genetic variation in a 3 species hybrid zone in the Mimulus guttatus complex. **Jefferey A. Dole,** Botany Department, University of California, Davis, California 95616, USA.

3:00 Variation in nuclear and mitochondrial DNA markers in stone crabs (genus Menippe): discordant geographic patterns may be the result of the disparate effects of different evolutionary forces. **T. M. Bert,** Florida Marine Research Institute, St. Petersburg, Florida 33701, and **S. M. Bogdanowicz** and **R. G. Harrison,** Section of Ecology and Systematics, Cornell University, Ithaca, New York 14853, USA (SSE).

3:15 A comparative study of two transects of the hybrid zone between the chickadees Parus atricapillus and P. carolinensis. **Gene D. Sattler** and **Michael J. Braun,** Laboratory of Molecular sytematics, Smithsonian Institution, Washington, D. C. 20560, USA.

3:30 Break

3:45 The genetic interaction across an avian hybrid zone as revealed by nuclear and mitochondrial DNA restriction fragment length variation. **P. L. Sawaya,** Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221, and **M. J. Braun,** Laboratory of Molecular Systematics, Smithsonian Institution, Washington, D. C. 20560, USA.

4:00 Mitochondrial DNA variation indicates extensive gene flow between subspecies of the brown-headed cowbird. **R. C. Fleischer, L. S. Miller,** Department of Biology, University of North Dakota, Grand Forks, North Dakota 58202; and **S. I. Rothstein,** Department of Biological Sciences, University of California, Santa Barbara, California 93106, USA (SSE).

4:15 Parapatric hybridization between chromosome races of the Sceloporus grammicus complex (Iguanidae). I. Structure of the Ajusco transect. **J. W. Sites, Jr., E. Arevalo,** Zoology Department, Brigham Young University, Provo, Utah 84602; and **S. K. Davis,** Department of Animal Sciences, Texas A & M University, College Station, Texas 77843, USA (SSE).

4:30 Parapatric hybridization between chromosome races of the Sceloporus grammicus complex (Iguanidae). II. Structure of the Tulancingo transect. **S. K. Davis,** Department of Animal Sciences, Texas A & M University, College Station, Texas 77843, and **J. W. Sites, Jr.** and **E. Arevalo,** Zoology Department, Brigham Young University, Provo, Utah 84602, USA (SSE).

4:45 A model to estimate the frequencies of genetically distinct first and second generation classes of individuals in hybrid swarms. **J. D. Nason** and **N. C. Ellstrand,** Department of Botany and Plant Sciences, University of California, Riverside, California, 92521, USA (SSE).

5:00 Molecular analysis of the "rare allele phenomenon" in a natural hybrid zone. **S. M. G. Hoffman** and **W. M. Brown,** Department of Biology, University of Michigan, Ann Arbor, Michigan 48109, USA (SSE).

5:15 Hybrid sterility genes in a mouse hybrid zone. **R. D. Sage,** Division of Biological Sciences, University of Missouri, Columbia, Missouri 65211, and **A. C. Wilson,** Department of Biochemistry, University of California, Berkeley, California 94720, USA (SSE).

5:30 Systematics, evolution and biogeography of Notropis chlorocephalus and N. lutipinnis (Teleostei: Cyprinidae). **R. M. Wood** and **R. L. Mayden,** Department of Biology, University of Alabama, Tuscaloosa, Alabama 35487, USA.

5:45 Evidence for displacement of the contact zone between Notropis cornutus and N. chrysocephalus. **T. E. Dowling,** Department of Zoology, Arizona State University, Tempe, Arizona 85287, USA (SSE).

ZOOLOGY CONGRESS RECEPTION

Tuesday July 3,1990, 6:30 PM, Atrium, A. Stamp Student Union

SOCIETY FOR THE STUDY OF EVOLUTION
Business Meeting

Tuesday July 3, 1990, 7:00 PM, Atrium, A. Stamp Student Union

PLENARY LECTURE

Tuesday July 3, 1990, 8:00 PM - 9:00 PM, Tydings, Lecture Hall, Room 0130

Dr. Douglas J. Futuyma, Department of Ecology and Evolution, Division of Biological Sciences, State University of New York, Stony Brook, New York 11794, USA.

Systematics and the study of evolutionary processes

Graduate Student Discussion Group No. 16

BIODIVERSITY, CONSERVATION, AND GLOBAL CHANGE

Tuesday July 3, 1990, 9:00 PM, Tydings Lecture Hall, Room 0130

Organizer: **John Ware**, Department of Zoology, Unviersity of Maryland, College Park, Maryland 20742, USA.

To provide a focal point, we will assume that global climate change is a likely scenario. The discussion will center around the following questions.

Questions

Is biodiversity important? If so, how can biodiversity be preserved? Can the answer to these questions be explained in terms that laymen (who provide the funding for science) can understand and relate to?

The traditional role of the scientist is as observer and reporter. Given the potential effects of global climate change, should scientists act in a new role, i.e., in an "unscientific" manner?

WEDNESDAY JULY 4, 1990

Affiliated Society Workshop No. 12

MOLECULAR EVOLUTION OF ARCHAEBACTERIA
(UNIVERSITY OF MARYLAND CENTER FOR MARINE BIOTECHNOLOGY;
CO-SPONSORED BY THE ASSOCIATION OF SYSTEMATIC COLLECTIONS)

Wednesday July 4, 1990, 9:30 AM - 6:30 PM, Center of Marine Biotechnology, Baltimore, Maryland
(By invitation. Limited space available, see Registration Desk)

Organizer: **Dr. Frank Robb**, Center of Marine Biotechnology, University of Maryland, Baltimore, Maryland.

9:30 Introduction and review of workshop format. **Frank Robb**, Center for Marine Biotechnology, University of Maryland, Baltimore, Maryland.

9:45 The natural history of archaebacteria. **J. Baross.**

10:50 Molecular genetics of archaebacteria: An overview. **W. F. Doolittle.**

11:55 The phylogency of archaebacteria. **L. Archenbach.**

1:00 Lunch at Harrison's Inner Harbor.

3:00 Description of facilities, computer terminals, sofetware and round table assignments. **A. Place.**

Concurrent sessions:

3:15 Hands on: the RNA database. **L. Achenbach** and **V. Erdmann.**

3:15 Hands on: Kingdom-specific labelling of single bacterial cells. **D. Stahl** and **E. DeLong.**

5:00 Round table discussion: Molecular approaches to determine phylogeny. **D. Stahl, L. Achenbach, V. Erdmann** and **W. F. Doolittle.**

5:30 Round table discussion: Back to the future: renaming archaebacteria. **All attendees.**

6:00 Concluding remarks. **Rita R. Colwell,** Director, Maryland Biotechnology Institute.

6:30 Return to University of Maryland, College Park, for Maryland-style picnic.

MARYLAND STYLE PICNIC
(Ticket required.)

Wednesday July 4, 1990, 7:00 PM, Outside near South Campus Dining Hall

FIREWORKS
(Open Admission)

Wedesday July 4, 1990 8:00 PM, Byrd Stadium

In celebration of the Declaration of independence the city of College Park provides a program of music and a fireworks display. The event is held in Byrd Stadium on the University of Maryland campus and is open to the public.

THURSDAY JULY 5, 1990

Congress Symposium No. 5

SYSTEMATICS, BIOLOGICAL AND EVOLUTIONARY SIGNIFICANCE OF HYDROTHERMAL VENTS AND VENT-RELATED SEEPS: THE EMERGING GLOBAL PATTERN

Thursday July 5, 1990, 8:00 AM - 12:15 PM, Architecture, Room 0204

Organizer: **Dr. Meredith Jones,** 2283 Mitchell Bay Road, Friday Harbor, Washington 98250.

Part I. Community structure

8:00 Macrofaunal community structure and zoogeography of hydrothermal vents at the Galapagos Rift and 21°N on the East Pacific Rise. **I. P. Williams** and **H. L. Sanders,** Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543, USA.

8:30 Biogeography of soft-sediment hydrothermal vent communities. **J. F. Grassle,** Institute of Marine and Coastal Sciences, Cook College, Rutgers University, P. O. Box 231, New Brunswick, New Jersey 08903, USA.

9:00 Petroleum seep chemosynthetic communities associated with salt tectonism and authigenic carbonate structures on the Gulf of Mexico continental slope. **R. S. Carney,** Coastal Ecology Institute, Louisiana State University, Baton Rouge, Louisianan 70803; and **I. R. MacDonald,** Geochemical and Environmental Research Group, Texas A & M University, College Station, Texas 77843, USA.

Part II. Faunal components

9:30 Allozyme variation in vestimentiferan populations from Northeast Pacific hydrothermal vents. **M. B. Black,** Biology Department, University of Victoria, British Columbia, Canada V8 W2Y.

10:00 Break

10:15 Archaeogastropod limpets at deep-sea hydrothermal vents: a 13-year overview of discoveries. **J. H. McLean,** Los Angeles County Museum of Natural History, Los Angeles, California 90007, USA.

10:45 Gastropods from vents and seeps. **Anders Waren,** Swedish Museum of Natural History, Box 50007, S-10405 Stockholm, Sweden.

11:15 Observations on decapod crustaceans from hydrothermal vent/cold seep sites in the Pacific and Atlantic. **A. B. Williams** and **J. W. Martin,** National Marine Fisheries Service Systematics Laboratory, National Museum of Natural History, Washington, D.C. 20560; and Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, California 90007, USA.

Part III. Microbiology

11:45 Metabolic diversity of microflora of vent sites at 13°N on the East Pacific rise. **Daniel Prieur,** CNRS, LP 4601, Station Biologique, Place G. Teissier, BP 74, 29682 Roscoff, France.

Congress Symposium No. 9

THE EVOLUTION AND ECOLOGY OF SMALL POPULATIONS

Thursday July 5, 1990, 8:00 AM - 12:15 PM, A. Stamp Union, Tortuga Room

Organizer: **Dr. Fred W. Allendorf,** Division of Biological Sciences, University of Montana, Missoula, Montana 59812, and Population Biology and Physiological Ecology, National Science Foundation, 1800 G Street, Washington, D.C. 20550, USA.

8:15 Introductory remarks. **Fred W. Allendorf,** Division of Biological Sciences, University of Montana, Missoula, Montana 59812, and Population Biology and Physiological Ecology, National Science Foundation, 1800 G Street, Washington, D.C. 20550, USA.

8:30 Effects of bottlenecks on genetic variation, fitness, and quantitative traits in the housefly. **E. H. Bryant** and **L. M. Meffert,** Department of Biology, University of Houston, Houston, Texas 77204, USA.

9:00 Effects of inbreeding on insular and central populations of Peromyscus mice: is inbreeding depression predictable? **R. C. Lacy,** Department of Conservation Biology, Chicago Zoological Park, Brookfield, Illinois 60513, USA.

9:30 Management of genetic variation in captive populations. **Jonathan D. Ballou,** Department of Zoological Research, National Zoological Park, Smithsonian Institution, Washington, D.C. 20008, USA.

10:00 Break

10:30 Using DNA fingerprinting to assess kinship in avian populations. **P. P. Rabenold, K. N. Rabenold** and **W. H. Piper,** Department of Biological Sciences, Purdue University, West Lafayette, Indiana 47907, USA.

11:00 Kinship and inbreeding in two populations of African lions: a molecular genetic analysis. **C. Packer** and **A. E. Pusey,** Department of Ecology, Evolution and Behavior, University of Minnesota, Minneapolis, Minnesota 55455; **D. Gilbert** and **S. J. O'Brien,** National Cancer Institute, Frederick, Maryland 21701, USA.

11:30 Evolutionary significance of retroviral-like transposable elements in small populations. **J. F. McDonald, A. K. Csink** and **A. J. Cuticchia,** Department of Genetics, University of Georgia, Athens, Georgia 30602, USA.

Congress Symposium No. 13

THE ROLE OF SYSTEMATICS AND EVOLUTION IN BIOTECHNOLOGY

Thursday July 5, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2203

Organizer: **Dr. Rita Colwell,** Director, Maryland Biotechnology Institute, University of Maryland, College Park, Maryland 20742, USA.

8:00 Molecular phylogenetic studies of the rumen microbial ecosystem. **D. A. Stahl, R. Key** and **B. Flesher,** University of Illinois, Urbana, Illinois 61801; **L. Montgomery,** University of Michigan, Ann Arbor, Michigan 48109, USA; and **R. I. Amann,** Technische Universitat Munchen, 8000 Munchen Z, Federal Republic of Germany.

8:30 Molecular evolution of l5s ribosomal RNA. **Hiroshi Hori,** Department of Genetics, Hiroshima University, Hiroshima, Japan.

9:00 Molecular genetics and systematics of the Enterobacteriaceae. **Patrick Grimont,** Institut Pasteur, Paris, France.

9:30 Nucleic acid probes in microbial systematics. **Gary Olson,** Department of Microbiology, University of Illinois, Urbana, Illinois, USA.

10:00 Break

10:15 5s rRNA sequences and the structure of ribosomal RNA in systematics. **Volker A. Erdmann,** Freie Universitat Berlin, Berlin, West Germany.

10:45 Phylogenetic analysis of marine picoplankton diversity by ribosomal RNA gene cloning and sequencing. **T. B. Britschgi, C. L. Moyer, K. G. Field** and **Steve Giovannoni,** Department of Microbiology, Oregon State University, Corvallis, Oregon 97331, USA.

(Contributed Paper)

11:15 The role of systematics in drug discovery: predicting trends in bioactivity of marine natural products. **S. A. Pomponi,** Harbor Branch Oceanographic Institution, Inc., Division of Biomedical Marine Research (HBOI/DBMR), Fort Pierce, Florida 34946, USA; **R. D. McCauley, P. T. Murphy** and **R. H. Willis,** Australian Institute of Marine Science, Townsville, Australia; **J. K. Reed,** HBOI/DBMR and **K. M. Snader,** National Cancer Institute, Division of Cancer Treatment, Natural Products Branch, Frederick, Maryland 21701, USA.

Congress Symposium No. 21

THE ROLE OF MULTIGENE FAMILIES IN MOLECULAR EVOLUTION

Thursday July 5, 1990, 8:00 AM - 12:15 PM, Tydings Lecture Hall, Room 0130

Organizers: **Dr. Gabriel A. Dover,** Department of Genetics, University of Cambridge, Cambridge CB2 3EH, United Kingdom, and **Dr. Russell Doolittle,** Center for Molecular Genetics, University of California, La Jolla, California 91238, USA.

8:00 The role of gene families in molecular evolution. **Russell Doolittle,** Center for Molecular Genetics, University of California, La Jolla, California 91238, USA.

8:45 The phenomenon of 'molecular coevolution' and the interactions between natural selection and molecular drive in multigene families. **Gabriel A. Dover,** Department of Genetics, University of Cambridge, Cambridge CB2 3EH, United Kingdom.

9:30 Evolution of the chorion multigene family in silk-moth species. **Thomas Eickbush,** Department of Biology, University of Rochester, Rochester, New York 14627, USA.

10:15 Break

10:30 G-protein associated receptors. **Craig Venter,** Biochemistry and Molecular Biology, N.I.N.D.S., National Institutes of Health, Bethesda, Maryland 20892, USA.

11:15 The family of eukaryotic protein kinases. **S. K. Hanks,** Molecular Biology Laboratory, The Salk Institute, La Jolla, California 92307, USA.

Congress Symposium No. 25

A CRITICAL REAPPRAISAL OF THEORIES OF CHARACTER EVOLUTION IN PHYLOGENETIC INFERENCE

Thursday July 5, 1990, 8:00 AM - 12:15 PM, H. J. Patterson, Room 0226

Organizers: **Dr. Mary Mickevich,** Department of Entomology, University of Maryland, College Park, Maryland 20742, and **Dr. Richard Holmquist,** Space Sciences Laboratory, University of California, Berkeley, California 94720, USA.

8:00 The interaction between theories of character evolution and phylogenetic inference. **M. F. Mickevich,** Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

8:30 Phylogenetic coding of ontogenies as characters. **Paula Mabee,** Department of Biology, Dalhouise University, Halifax, Nova Scotia, Canada.

9:00 The effects of developmental constraints on character evolution. **Pere Alberch,** Museo Nacional de Ciencias Naturales (CSIC), 28006 Madrid, Spain.

9:30 The analysis of sequence data: an historical overview. **Richard Holmquist,** Space Sciences Laboratory, University of California, Berkeley, California, USA.

9:45 Break

10:00 Measurement of genetic distances. **Cecilia Lanave, Graziano Pesole and Cecilia Saccone,** Dipartmento di Biochimica e Biologia Molecolare e CSMMME-CNR, Universita' di Bari, Italy.

10:30 The analysis of nucleic acid sequence characters and the construction of empirical transformation models. **Ward Wheeler,** American Museum of Natural History, New York, New York, USA.

11:00 Intrinsic positional and transformational weighing of molecular sequence data using capability and congruence approaches. **Jorn Wolters,** Institut fur Allegemeine Mikrobiologie and **Helge Neurath,** Institut fur Informatik und Pratische Mathematik, Christian-Albrechts-Universitat Kiel, Olshausentr. 40, D-2300 Kiel 1, Federal Republic of Germany.

11:30 Tracing deep eukaryotic origins with molecular sequences: evolutionary parsimony. **James Lake,** Molecular Biology Institute and Biology Department, University of California, Los Angeles, California 90024, USA.

Congress Special Interest Symposium/Workshop No. 32

THE LATEST TOOLS FOR CLADISTIC ANALYSIS

Thursday July 5, 1990, 8:00 AM - 12:15 PM, LeFrak, Room 2205

Organizers: **Dr. Estelle Russek-Cohen,** Department of Animal Sciences, University of Maryland, College Park, Maryland; **Dr. James M. Carpenter,** Department of Entomology, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA; **Dr. Wilentina H. deWeerdt,** Institute of Taxonomic Zoology, Zoologische Museum, University of Amsterdam, Amsterdam, The Netherlands; and **Dr. Roderic Page,** Department of Zoology, University of Auckland, Private Bag, Auckland, New Zealand.

Session I. Cladistic Analysis

8:00 MacClade. **David R. Maddison,** Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA.

8:25 CLADOS. **Kevin C. Nixon,** Bailey Hortorium, Cornell University, Ithaca, New York, USA.

8:50 Hennig86. **James S. Farris,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York, USA.

9:15 Phylip. **Joseph Felsenstein,** Department of Genetics, University of Washington, Seattle, Washington, USA.

9:40 PAUP. **David L. Swofford,** Illinois Natural History Survey, Urbana, Illinois, USA.

10:05 Discussion

Session II. Cladistic Biogeography Software

10:30 Introduction. **Wilentina H. de Weerdt,** Institute of Taxonomic Zoology, Zoologische Museum, University of Amsterdam, Amsterdam, The Netherlands.

10:32 An overview of cladistic biogeography. **Edward O'Connor,** Department of Enviornmental Sciences, University of Virginia, Charlottesville, Virginia, USA.

11:00 Complement. **Roderic Page,** Department of Zoology, University of Auckland, Private Bag, Auckland, New Zealand.

11:25 CAFCA. **Rino Zandee,** Institute of Theoretical Biology, University of Leiden, The Netherlands.

11:55 Discussion

Contributed Paper Session No. 15

SEXUAL SELECTION

Thursday, July 5, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2309

Co-chairs:
Dr. Gerald Borgia, Department of Zoology, University of Maryland, College Park, Maryland 20742.

Dr. Anne E. Houde, Department of Biology, Program in Ecology, Evolution and Behavior, Princeton University, Princeton, New Jersey 08544, USA.

8:00 Natural and sexual selection: investigating the nature of their interaction. **D. M. Oliveras,** Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA.

8:15 Natural and sexual selection: the divergence of hatchery and wild coho salmon. **Ian A. Fleming** and **Mart R. Gross,** Department of Zoology, University of Toronto, Toronto, Ontario, Canada M5S 1A1 (SSE).

8:30 Rapid evolution of bower structure and courtship display in bowerbirds of the genus Chlamydera: adaptation or accident? **G. Borgia,** Department of Zoology, University of Maryland, College Park, Maryland 20742; **R. Kusmierski and R. Crozier,** Department of Zoology, University of New South Wales, Kensington NSW 2033, Australia (SSE).

8:45 Multiple curves of equilibria in diploid models of evolution by female choice sexual selection. **Richard Gomulkiewicz,** Department of Zoology, University of Texas, Austin, Texas 78712, USA (SSE).

9:00 Dynamics of sexual selection and differential mating success in the Mediterranean fruit fly, Ceratitis capitata. **K. Y. Kaneshiro and T. S. Whittier,** Hawaiian Evolutionary Biology Program, University of Hawaii at Manoa, 3050 Maile Way, Honolulu, Hawaii 96822, USA (SSE).

9:15 Sexual selection in the Gulf Coast toad, Bufo valliceps: female choice based on variable traits. **William E. Wagner, Jr.,** Department of Zoology, University of Texas, Austin, Texas 78712, and **Brian K. Sullivan,** Department of Arts and Sciences, Arizona State University, Phoenix, Arizona 85069, USA (ASN).

9:30 Proximate components of mate choice by females in three bufonids. **B. K. Sullivan,** Department of Arts and Sciences, P. O. Box 37100, Arizona State University, Phoenix, Arizona 85069, and **W. E. Wagner, Jr.,** Department of Zoology, University of Texas, Austin, Texas 78712, USA (SSE).

9:45 Female choice and the formation of leks in sage grouse (Centrocercus urophasianus). **Robert M. Gibson,** Department of Biology, University of California, Los Angeles, California 90024, USA.

10:00 Break

10:15 Correlation between female preference and attractive male character in the Trinidad guppy. **Felix Breden,** Division of Biological Sciences, University of Missouri, Columbia, Missouri 65211, USA (SSE).

10:30 Preliminary evidence for genetic correlation between female mating preference and a preferred male character in the Trinidad guppy, Poecilia reticulata. **A. E. Houde,** Department of Biology, Program in Ecology, Evolution and Behavior, Princeton University, Princeton, New Jersey 08544, USA (SSE).

10:45 Sensory bias and sexual selection: female preference and the evolution of the sword in the genus Xiphophorus. **Alexandra L. Basolo,** Department of Zoology, University of Texas, Austin, Texas 78712, USA (SSE, ASN).

11:00 Female mate choice and sexual selection in a marine isopod crustacean, Paracerceis sculpta. **S. M. Shuster** and **M. J. Wade,** Department of Ecology and Evolution, Whitman Laboratory, University of Chicago, 915 East 57th Street, Chicago, Illinois 60637, USA (SSE).

Contributed Paper Session No. 16

MECHANISMS OF ISOLATION, SPECIATION AND HYBRIDIZATION

Thursday, July 5, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203

Co-chairs:
Ms. Nancy L. Reagan, Department of Ecology and Evolution, University of Chicago, 940 East 57th Street, Chicago, Illinois 60637, USA.

Dr. Judy Rhymer, Laboratory of Molecular Systematics, Museum Support Center, Smithsonian Institution, Washington, D.C. 20560, USA.

8:00 The role of natural selection in the acquisition of isolating mechanisms. **Rosaura Ruiz G.,** Departamento de Biologia, Facultad de Ciencias, Universidad National Autonoma de Mexico, Ciudad Universitaria, 04510, Mexico, D. F. Mexico.

8:15 The evolution of sexual isolation within the Desmognathus ochrophaeus complex. **P. A. Verrell,** Department of Ecology and Evolution, University of Chicago, Chicago, Illinois 60637, USA.

8:30 Evolution of sexual isolation in salamanders: Plethodon jordani, P. tevahalee and their hybrids. **Nancy L. Reagan,** Department of Ecology and Evolution, University of Chicago, 940 East 57th Street, Chicago, Illinois 60637, USA (SSE).

8:45 Cricket calling song displacement in a zone of overlap and hybridization. **J. H. Benedix, Jr.,** Division of Biology, Kansas State University, Manhattan, Kansas 66506, and **D. J. Howard,** Department of Biology, New Mexico State University, Las Cruces, New Mexico 88003, USA (SSE).

9:00 Courtship songs, reproductive isolation, and hybridization in green lacewings (Neuroptera: Chrysopidae: Chrysoperla). **Marta M. Wells and Charles S. Henry.** Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut 06268, USA (SSE).

9:15 Sympatric fireflies (Col.: Lampyridae) in a temperate Guatemalan site: fenological and behavioral differences. **Jack C. Schuster,** Biology Department, Universidad del Valle de Guatemala, Apartado Postal No. 82, Guatemala.

9:30 Reproductive isolating mechanisms in two host-associated strains of a noctuid moth, Spodoptera frugiperda. **D. P. Pashley,** Entomology Department, Louisiana State University, Baton Rouge, Louisiana 70803, USA (SSE).

9:45 Host plant-induced assortative mating in Encenopa treehoppers. **T. K. Wood,** Department of Entomology and Applied Ecology, University of Delaware, Newark, Delaware 19717, and **M. C. Keese,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (SSE).

10:00 Break

10:15 The ecology and genetics of Rhagoletis pomonella host races. **Jeffrey L. Feder,** Biology Department, Princeton University, Princeton, New Jersey 08544, and **Guy L. Bush,** Zoology Department, Michigan State University, East Lansing, Michigan 48824, USA (SSE).

10:30 Families vs. phenology: the conversion of Orgyia vetusta from a generalist to a specialist. **Barbara L. Bentley** and **Nelson D. Johnson,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (ASN).

10:45 Botanical ecotones and butterfly hybrid zones. **J. M. Scriber, R. C. Lederhouse** and **R. H. Hagen,** Department of Entomology, Michigan State University, East Lansing, Michigan 48824, USA (SSE, ESA).

11:00 Sex chromosomes and speciation in tiger swallowtails (Papilio glaucus group [Lepidoptera: Papilionidae]). **Robert H. Hagen** and **J. Mark Scriber,** Department of Entomology, Michigan State University, East Lansing, Michigan 48824, USA.

11:15 Gamete incompatibility between closely related Hawaiian sea urchins, genus Echinometra. **E. C. Metz** and **S. R. Palumbi,** Department of Zoology, University of Hawaii, Honolulu, Hawaii 96822, USA (SSE).

11:30 Molecular evidence for the origin of Gossypium bickii via homoploid reticulate speciation. **J. F. Wendel,** Department of Botany, Iowa State University, Ames, Iowa 50011; **J. McD. Stewart,** Department of Agronomy, University of Arkansas, Fayetteville, Arkansas 72701; and **J. H. Rettig,** Department of Biology, Texas A & M University, College Station, Texas 77843, USA (SSE).

11:45 The potential for genetic exchange by transformation within a natural population of Bacillus subtilis. **F. M. Cohan, M. S. Roberts** and **E. C. King,** Department of Biology, Wesleyan University, Middletown, Connecticut 06457, USA (SSE).

12:00 The genetics of speciation in the Mimulus guttatus complex. **M. R. MacNair,** Department of Biological Sciences, University of Exeter, Exeter EX4 4PS, United Kingdom (SSE, LSH).

PLENARY LECTURE

Thursday July 5, 1990, 12:30 PM - 1:30 PM, Tydings, Lecture Hall, Room 0130

Professor John Maynard Smith, FRS, School of Biological Sciences, University of Sussex, Falmer, Brighton BN1 9QG, England, United Kingdom

The evolution of prokaryotes: does sex matter?

Congress Symposium No. 5 (continued)

SYSTEMATICS, BIOGEOGRAPHY AND EVOLUTIONARY SIGNIFICANCE OF HYDROTHERMAL VENTS AND VENT-RELATED SEEPS: THE EMERGING GLOBAL PATTERN

Thursday July 5, 1990, 1:45 PM - 6:00 PM, LeFrak Hall, Room 2205

Organizer: **Dr. Meredeth Jones,** 2283 Mitchell Bay Road, Friday Harbor, Washington 98250.

Part III. Microbiology (continued)

1:45 Phylogenetic analysis of a hydrothermal vent endosymbiotic bacterium based on ribulose bisphosphate carboxylase/oxygenase gene sequences. **J. L. Stein, M. Haygood** and **H. Felbeck,** Marine Biology Research Division, Scripps Institution of Oceanography, University of California, La Jolla, California 92093, USA.

Part IV. Biochemistry, physiology, and endosymbiosis

2:15 Physiological ecology of vestimentiferan worms and vesicomyid clams: similarities in species from diverse habitats. **C. B. Fisher,** Marine Science Institute, University of California, Santa Barbara, California 93106, USA.

2:45 Break

3:00 Observations on the endosymbiosis in Bathymodiolus of the vent site at 13°N. **A. Fiala-Medioni,** Observatoire Oceanologique de Banyuls-sur-Mer, Universite P.M. Curie (Paris 6), 66650 Banyuls-sur-Mer, France.

3:30 Analysis of the phylogenetic origins of vent and non-vent symbioses. **Daniel L. Distel,** Marine Biology Research Division, Scripps Institution of Oceanography, University of California, La Jolla, California 92093, USA.

4:00 Detection of chemosymbiosis in the fossil record: the use of stable isotopy on the organic matrix of lucinid bivalves. **Emily CoBabe,** Department of invertebrate Paleontology, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

(Part II continued. Faunal components)

4:30 Systematic relationships of Polychaeta from hydrothermal vent ecosystems. **James A. Blake,** Science Applications International Corporation, Woods Hole, Massachusetts 02543, USA.

Congress Symposium No. 9 (continued)

THE EVOLUTION AND ECOLOGY OF SMALL POPULATIONS

Thursday July 5, 1990, 1:45 PM - 6:00 PM, A. Stamp Union, Tortuga Room

Organizer: **Dr. Fred W. Allendorf,** Division of Biological Sciences, University of Montana, Missoula, Montana 59812, and Population Biology and Physiological Ecology, National Science Foundation, 1800 G Street, Washington, D.C. 20550, USA.

1:45 Conservation of genetic diversity in rare plants: principles and prospects. **Kent E. Holsinger,** Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut 06269, USA.

2:15 Rare plants, unusual habitats, and disappearing disturbance regimes. **Donald M. Waller,** Department of Botany, University of Wisconsin, Madison, Wisconsin 53706, USA.

2:45 Genetic variation in populations of rare plants. **T. Mitchell-Olds,** Division of Biological Sciences, University of Montana, Missoula, Montana 59812, USA.

3:15 Evolutionary genetics and conservation of East African ungulate populations. **Nicholas Georgiadis,** Wildlife Conservation International, P.O. Box 62844, Nairobi, Kenya, and **Andrew Dobson,** Department of Biology, Princeton University, Princeton, New Jersey 08544, USA.

3:45 Break

4:00 Genetic analysis of the Channel Island fox as a model of genetic change in small populations. **R. K. Wayne,** Biology Department, University of California, Los Angeles, California; **S. A. George,** Los Angeles County Museum, Los Angeles, California 90024; **D. A. Gilbert,** Biological Carcinogenesis and Development Program, Program Resources Incorporated, NCI-FCRF, Frederick, Maryland 21207; and **P. W. Collins,** Santa Barbara Museum of Natural History, Santa Barbara, California 93105, USA.

4:30 Estimation of effective population size of grizzly bears by computer simulation. **F. W. Allendorf, R. B. Harris** and **L. H. Metzgar,** Division of Biological Sciences, University of Montana, Missoula, Montana 59812, USA.

5:00 Genetic diversity and the fitness consequences of population fragmentation. **Robert C. Vrijenhoek,** Center for Theoretical and Applied Genetics (CTAG), Rutgers University, New Brunswick, New Jersey 08903, USA.

Congress Symposium No. 17

MATERNAL EFFECTS IN EVOLUTIONARY BIOLOGY

Thursday July 5, 1990, 1:45 PM - 6:00 PM, LeFrak, Room 2205

Organizers: **Dr. Bruce Riska**, Department of Genetics, University of California, Davis, California 95616, and **Dr. Barry Sinervo**, Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

1:45 Introduction to maternal effects. **Bruce Riska**, Department of Genetics, University of California, Davis, California 95616, USA.

2:15 The evolution of maternal characters. **Mark Kirkpatrick**, Department of Zoology, University of Texas, Austin, Texas 78712, USA.

2:45 An experimental analysis of maternal effects and offspring fitness in lizards. **Barry Sinervo**, Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

3:15 Parental effects on life-history traits in plants. **Elizabeth P. Lacey**, Department of Biology, University of North Carolina, Greensboro, North Carolina 27412, USA.

3:45 Break

4:00 Maternal effects in insects: phenological considerations. **Timothy A. Mousseau and Hugh Dingle**, Department of Entomology, University of California, Davis, California 95616, USA.

4:30 Prenatal effects on mammalian growth: embryo transfer results. **David E. Cowley**, Department of Genetics, North Carolina State University, Raleigh, North Carolina 27695, USA.

5:00 Maternal effects in fish life histories. **David N. Reznick**, Department of Biology, University of California, Riverside, California 92521, USA.

5:30 Developmental plasticity and maternal effects in amphibian life histories. **Robert H. Kaplan**, Department of Biology, Reed College, Portland, Oregon 97202, USA.

Congress Symposium No. 23

PHYLOGENETIC ANALYSIS OF NUCLEOTIDE SEQUENCE DATA: METHODS, COMPARISONS, AND APPLICATIONS

Thursday July 5, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2203

Organizer: **Dr. David Hillis**, Department of Zoology, University of Texas, Austin, Texas 78712, USA.

Part I. Comparison of methods of analysis

1:45 Statistical inference in phylogenies from nucleotide sequence data. **J. Felsenstein**, Department of Genetics, University of Washington, Seattle, Washington 98195, USA.

2:15 Methods for testing molecular phylogenies. **Wen-Hsiung Li,** Center for Demographic and Population Genetics, University of Texas, Houston, Texas 77225, USA, and **Manolo Gouy,** Laboratoire de Biometrie, Universite Lyon I, 69622 Villeurbanne Cedex, France.

2:45 Tests to distinguish phylogenetic information and random noise in nucleotide sequence data. **J. W. Archie,** Department of Biology, California State University, Long Beach, California 90840, USA.

3:15 Direct tests of methods of phylogenetic inference using a laboratory-produced phylogeny of bacteriophage. **M. E. White, J. J. Bull, I. J. Molineaux** and **D. M. Hillis,** University of Texas, Austin, Texas 78712, USA.

3:45 Break

Part II. Phylogenetic applications of nucleotide sequence data

4:00 Using noncoding sequences to resolve phylogenetic relationships. **Morris Goodman,** Wayne State University School of Medicine, Detroit, Michigan 48201, USA.

4:30 Mitochondrial DNA phylogenies of artiodactyls and other eutherian mammals. **M. M. Miyamoto** and **F. Kraus,** Department of Zoology, University of Florida, Gainesville, Florida 32611, USA.

5:00 Compositional statistics: an improvement of evolutionary parsimony and its application. **Allan C. Wilson** and **Arend Sidow,** Division of Biochemistry and Molecular Biology, University of California, Berkeley, California 94720, USA.

5:30 Phylogenetic inference based on sequences of nuclear ribosomal DNA arrays. **D. M. Hillis,** Department of Zoology, University of Texas, Austin, Texas 78712, USA.

Congress Special Interest Symposium/Workshop No. 32 (continued)

THE LATEST TOOLS FOR CLADISTIC ANALYSIS

Thursday July 5, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 1116

Session III. Hands-on Workshop

Coordinators: **Dr. Estelle Russek-Cohen,** Department of Animal Sciences, University of Maryland, College Park, Maryland; **Dr. James Carpenter,** Department of Entomology, Museum of Comparative Zoology, Harvard University. Cambridge, Massachusetts, USA; **Dr. Walentina H. deWeerdt,** Institute of Taxonomic Zoology, Zoologische Museum, University of Amsterdam, Amsterdam, The Netherlands; and **Dr. Roderic Page,** Department of Zoology, University of Auckland, Private Bag, Auckland, New Zealand.

Discussion Group No. 2

THE ORIGIN OF THE METAZOA

Thursday July 5, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3207

Organizer: **Dr. Claus Nielsen**, Zoologisk Museum, Universietetsparken, DK 2100 Kobehavn, Denmark.

Morphological and physiological characteristics of Porifera, Placozoa and Cnidaria will be discussed in an attempt to create a firm basis for phylogenetic discussions about the early evolution of the Metazaoa. The discussion will make reference to choanoflagellates and "higher" animals where appropriate. Emphasis will be on cell contacts, cell communication, and extracellular matrices. The reliability of the published information will be evaluated, new information presented, and interesting areas for future research identified.

Contributed Paper Session No. 17

BEHAVIOR AND EVOLUTION

Thursday July 5, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3203

Co-chairs:
Dr. Lynne Parenti, Department of Vertebrate Zoology, Smithsonian Institution, Washington, D.C. 20560, USA.

Ms. Rosemary J. Smith, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA.

1:45 Differential choice of mimetic females by males in two tiger swallowtail populations. **Robert C. Lederhouse** and **J. Mark Scriber**, Department of Entomology, Michigan State University, East Lansing, Michigan, USA (SSE).

2:00 Male mating success and female fitness in the Mediterranean fruit fly, Ceratitis capitata. **T. S. Whittier** and **K. Y. Kaneshiro**, Hawaiian Evolutionary Biology Program, University of Hawaii at Manoa, Gilmore 310, Honolulu, Hawaii 96822, USA.

2:15 Function of bizarre, asymmetrical external genitalia of the sperm-limited cactophilic fruitfly, Drosophila pachea. **Scott Pitnick**, Department of Zoology, Arizona State University, Tempe, Arizona 85287 USA.

2:30 Bimodal distribution of copulation durations in the Malaysian stalk-eyed fly Cyrtodiopsis whitei (Diptera: Diopsidae). **P. D. Lorch** and **S. Kirby**, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA (SSE).

2:45 Evolution of sexual dimorphism in Malaysian stalk-eyed flies (Diopsidae). **G. S. Wilkinson** and **P. R. Reillo**, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

3:00 Sexual dimorphism in remating in Hawaiian Drosophila species. **C. R. B. Boake**, Department of Zoology, University of Tennessee, Knoxville, Tennessee 37996, and **J. M. Schwartz**, Hawaiian Evolutionary Biology Program, University of Hawaii, Honolulu, Hawaii 96822, USA (SSE).

3:15 DNA figerprinting analysis of Florida scrub jay parentage. Do helpers help themselves? **J. S. Quinn**, Department of Biology, Queen's University, Kingston, Ontario, Canada K7L 3N6; **G. E. Woolfenden**, Department of Biology, University of South Florida, Tampa, Florida 33620; **J. W. Fitzpatrick**, Archbold Biological Station, P. O. Box 2057, Lake Placid, Florida 33852, USA; and **B. N. White**, Department of Biology, Queen's University, Kingston, Ontario, Canada K7L 3N6 (SSE).

3:30 Break

3:45 Parentage analysis of red-winged blackbirds (Agelaius phoeniceus) using a hypervariable single locus DNA genetic marker. **H. L. Gibbs, L. M. Tabak, P. T. Boag** and **B. N. White**, Department of Biology, Queen's University, Kingston, Ontario K7L 3N6; and **P. W. Weatherhead**, Department of Biology, Carleton University, Ottawa, Ontario, Canada K1S 5B6 (SSE).

4:00 Phylogenetic analysis of the evolution of display behavior in the neotropical manakins (Aves: Pipridae). **Richard O. Prum**, Department of Ornithology, American Museum of Natural History, Central Park West at 79th, New York, New York, 10024, USA.

4:15 Why gregarious animals tend to be diurnal: phylogenetic analyses and the limitations of sensory modalities. **Rosemary J. Smith**, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA (ASN).

4:30 Phylogenetic relationships and the distribution of reproductive structures and behaviors in the Hepialidae (Lepidoptera: Exporia). **D. L. Wagner**, Department of Ecology and Evolutionary Biology, U-Box 43, Room 312, 75 North Eagleville Road, University of Connecticut, Storrs, Connecticut 06269, USA (SSZ, SSE, ASN).

4:45 Phylogeny of bees in the genus Perdita (Hymenoptera: Andrenidae) and the evolution of male mating behavior. **B. N. Danforth**, Department of Entomology, Smithsonian Institution, Washington, D. C. 20560, USA (ESA).

5:00 A phylogenetic analysis of the genus Apis (Hymenoptera: Apidae). **Byron Alexander**, Snow Entomological Museum, Snow Hall, University of Kansas, Lawrence, Kansas 66045, USA (ESA).

5:15 Mitochondrial DNA evolution in bees: single or multiple origins of highly social behavior? **S. A. Cameron**, Biology Department, Washington University, St. Louis, Missouri 63130, USA.

Contributed Paper Session No. 18

SPECIATION AND DIVERSIFICATION

Thursday, July 5, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3211

Co-chairs:
Dr. Warren Douglas Allmon, Department of Geology, University of South Florida, Tampa, Florida 33620, USA.

Ms. Jane Masterson, Committee on Evolutionary Biology, University of Chicago, 915 East 57th Street, Chicago, Illinois 60637, USA.

1:45 Testing the stochasticity of the evolution of diversity: a powerful new approach. **J. B. Slowinski,** Biology Department, University of Miami, P. O. Box 249118, Coral Gables, Florida 33124, and **C. Guyer,** Department of Zoology and Wildlife Science, Auburn University, Auburn, Alabama 36849, USA.

2:00 Role of formation and persistence of populations in speciation. **W. D. Allmon,** Department of Geology, University of South Florida, Tampa, Florida 33620, USA (SSE).

2:15 Relationships among reproductive mode, biogeographic distribution patterns and evolution in scleractinian reef-building corals. **R. H. Richmond,** Marine Laboratory, University of Guam, UOG Station, Mangilao, Guam 96923, USA.

2:30 Speciation and mosaic distributions of New Zealand litter arthropods. **P. M. Johns,** Department of Zoology, University of Canterbury, Private Bag, Christchurch, New Zealand.

2:45 Nonadaptive radiation in Albinaria. **E. Gittenberger,** Systematic Zoology Section, Population Biology Department, NL-2300 RA Leiden, The Netherlands.

3:00 Evolutionary feedback: a qualitative model to explain macroevolution and punctuational events in evolution. **David M. Seaborg,** Foundation for Biological Conservation and Research, 1154 Glen Road, Lafayette, California 94549, USA.

3:15 The evolution of ornithophily in the genus Keckiella (Scrophulariacea). **Ron Scogin,** Rancho Santa Ana Botanic Garden, Claremont, California 91711, USA.

3:30 Break

3:45 A simulation to examine the co-occurrence between a trait and its environment. **Victor N. Rush,** Department of Biological Sciences, University of California, Santa Barbara, California 93106, USA.

4:00 Patterns of speciation in the African antelope: bioclimatic analysis of species distributions reveals refugia and regions of vicissitude in a continental biota. **N. Caithness,** Department of Zoology, University of the Witwaterstrand, P.O. WITS 2050, South Africa.

4:15 Properties of foraminifera underlying their frequent evolutionary bursts into lines of giants. **J. J. Lee, W. W. Faber, Jr. and R. E. Lee,** Biology Department, City College of City University of New York, Convent Avenue at 138th Street, New York, New York 10031, and Department of Invertebrates, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024, USA.

4:30 The micro and macro in body size evolution. **James H. Brown,** Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, and Brian A. Maurer, Department of Zoology, Brigham Young University, Provo, Utah 84602, USA (ASN, SSE).

4:45 Supraspecific taxa: is their size distribution fractal? **A. Minelli, G. Fusco,** Biology Department, Padova University, Via Trieste 75, I 35121 Padova, and **S. Sartori,** Physics Department, Padova University, Via Marzolo 8, I 35131 Padova, Italy.

5:00 Polyploidy in animals: uncommon or unknown? **M. J. Collares-Pereira,** Departamento de Zoologia e Antropologia, Faculdade de Ciencias, Campo Grande, C2, 1700 Lisbon, Portugal.

5:15 Cytotaxonomy of Iberian loaches with some remarks on the karyological evolution of both families (Pisces; Cobitidae, Homalopteridae). **J. M. Madeira, M. J. Collares-Pereira,** Departamento de Zoologia e Antropologia, Faculdade de Ciencias, Campo Grande, C2, 1700 Lisbon, Portugal and **B. Elivra,** Departamento de Biologia Animal I, Facultad de Biologia, Universidade Complutense, 28040 Madrid, Espana.

5:30 The geological history of polyploidy for woody angiosperms: a feasibility test. **Jane Masterson,** Committee on Evolutionary Biology, University of Chicago, 915 E. 57th St., Chicago, Illinois 60637 USA.

SOCIETY OF SYSTEMATIC ZOOLOGY
Business Meeting

Thursday July 5, 1990, 6:30 PM, A. Stamp Student Union, Room 1139

PLENARY LECTURE

Thursday July 5, 1990, 8:00 PM - 9:00 PM, Tydings Lecture Hall, Room 0130

Dr. Peter H. A. Sneath, Department of Microbiology, University of Leciester, P. O. Box 138, Medical Sciences Building, University Road, Leicester LE1 9HN, England, United Kingdom.

Leeuwenhoek in Lilliput.

Graduate Student Discussion Group No. 17

CONCEPTUAL ISSUES IN SYSTEMATICS AND PHYLOGENETIC RECONSTRUCTION

Thursday, July 5, 1990, 9:00 PM, Tydings Lecture Hall, Room 0130

Organizer: **Bryan Dutton,** Department of Botany, University of Maryland, College Park, Maryland 20742, USA.

Questions

How are homologies determined and characters analyzed?

How are differences resolved between equally parsimonious trees, and can or should confidence limits on phylogenies be set?

How should cladograms as data be treated?

FRIDAY JULY 6, 1990

Congress Symposium No. 7

EVOLUTION IN ISLAND ARCHIPELAGOS: THE EMERGING PICTURE

Friday July 6, 1990, 8:00 AM - 12:15 PM, Architecture, Room 0204

Organizer: **Dr. Scott Miller,** Department of Entomology, Bishop Museum, Honolulu, Hawaii 96817, USA.

8:00 Introductory remarks. **Scott Miller,** Department of Entomology, Bishop Museum, P.O. Box 19000-A, Honolulu, Hawaii 96817, USA.

8:15 Evolution of waif floras: a comparison of the Hawaiian and Marquesas archipelagos. **W. L. Wagner,** Department of Botany, National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560, USA.

8:50 Hawaiian cave faunas: macroevolution on young islands. **F. G. Howarth,** Department of Entomology, Bishop Museum, P.O. Box 19000-A, Honolulu, Hawaii 96817, USA.

9:25 Mitochondrial DNA studies of the evolution of recently derived species complexes in the Hawaiian Islands. **Chris Simon,** Ecology, Evolution and Conservation Biology Program, University of Hawaii, Honolulu, Hawaii 96822, USA.

10:00 Break

10:15 Henderson Island: biogeography and evolution at the edge of the Pacific Plate. **Gustav Paulay,** Department of Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560, USA.

10:50 Evolution and biogeography of fossil birds of Hawaii and the Pacific. **Storrs Olson,** Division of Birds, Smithsonian Institution, Washington, D.C. 20560, USA.

11:25 Evolutionary and ecological biology of the Galapagos archipelago, Ecuador. **Stewart B. Peck,** Department of Biology, Carleton University, Ottawa, Canada K1S 5B6.

Congress Symposium No. 20

MULTIPLE LEVELS OF SELECTION IN RELATION TO EVOLUTIONARY THEORY

Friday July 6, 1990, 8:00 AM - 12:15 PM, Tydings Lecture Hall, Room 0130

Organizer: **Dr. Elisabeth S. Vrba,** Department of Geology and Geophysics, Yale University, New Haven, Connecticut 06511, USA.

8:00 Levels of selection in the genome. **W. Ford Doolittle,** Dalhousie University, Nova Scotia, Canada B3H 4H7.

8:45 The extended phenotype and its bearing on the "levels-of-selection" debate. **Richard Dawkins,** Oxford University, Oxford, United Kingdom.

9:30 Selection of genes, individuals and clades. **George C. Williams,** State University of New York, Stony Brook, New York, USA.

10:15 Break

10:30 The logic of group selection. **Elliott Sober,** University of Wisconsin, Madison, Wisconsin, and **David Sloane Wilson,** State University of New York, Binghamton, New York, USA.

11:15 Punctuated equilibria and species selection. **Niles Eldredge,** American Museum of Natural History, New York, New York 10024, and **Stephen Jay Gould,** Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

Congress Symposium No. 4

SYSTEMATICS AND THE RELEASE OF GENETICALLY ENGINEERED ORGANISMS

Friday July 6, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2203

Organizer: **Dr. Ramon J. Seidler,** U.S. Environmental Protection Agency, 200 Southwest 35th Street, Corvallis, Oregon 97333, USA.

8:00 Opening remarks. **Ramon J. Seidler,** U.S. Environmental Protection Agency, Environmental Research Laboratory, Corvallis, Oregon 97333, USA.

8:15 Why identification of genetically engineered microorganisms is important from a regulatory perspective. **E. L. Anderson,** Office of Toxic Substances, U.S. Environmental Protection Agency, Washington, D.C. 20460, USA.

8:45 Use of gene probe methodologies to detect gene exchange and recombination events in soil environments. **William E. Holben** and **James M. Tiedje**, Center for Microbial Ecology and Department of Crop and Soil Sciences, Michigan State University, East Lansing, Michigan 48864; **Janet K. Jansson**, Department of Crop and Soil Sciences, Michigan State University, East Lansing, Michigan 48864, USA.

9:15 Environmental significance of bacterial virus-mediated gene transfer. **Robert V. Miller**, Department of Biochemistry and Program in Molecular Biology, Stritch School of Medicine, Loyola University of Chicago, Maywood, Illinois 60153, USA.

9:45 Break

10:00 Conjugation as a means of gene transfer in wastewater. **M. A. Gealt**, Department of Bioscience and Biotechnology, Drexel University, Philadelphia, Pennsylvania 19104, USA.

10:30 Evidence for DNA transformation in environmental systems. **Gregory J. Stewart**, Department of Biology, University of South Florida, Tampa, Florida 33620, USA.

11:00 Will recombinant DNA impact the definition of species? **D. A. Stahl, R. Devereux, J. Urbance** and **C. Lin**, University of Illinois, Urbana, Illinois 61801, USA.

11:30 Closing remarks. **Ramon J. Seidler**, U.S. Environmental Protection Agency, Environmental Research Laboratory, Corvallis, Oregon 97333, USA.

Affiliated Society Symposium No. 2

THE PHYLOGENY OF BEHAVIOR (WILLI HENNIG SOCIETY)

Friday July 6, 1990, 8:00 AM - 12:15 PM, A. Stamp Student Union, Tortuga Room

Organizer: **Dr. John W. Wenzel**, Department of Entomology, University of Georgia, Athens, Georgia 30602, USA.

8:00 Phylogeny of behavior: historical overview and future prospects. **J. W. Wenzel**, Department of Entomology, University of Georgia, Athens, Georgia 30602, USA.

8:35 Exploring Trichoptera for evidence on the phylogeny of behavior. **G. B. Wiggins**, Department of Entomology, Royal Ontario Museum, Toronto, Ontario, Canada M5S 2C6 and Department of Zoology, University of Toronto, Toronto, Canada.

9:10 Cladistic analysis of orb weaving behavior in spiders. **J. A. Coddington**, Department of Entomology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA.

10:00 Break

10:20 Complementary contributions of morphology and behavior in the phylogenetic system of the social paper wasps (Hymenoptera: Vespidae: Polistinae). **J. M. Carpenter**, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

10:55 Mating call evolution in the frog genera Bufo and Pseudacris: a phylogenetic analysis. **R. B. Cocroft** and **M. J. Ryan,** Department of Zoology, University of Texas, Austin, Texas 78712, USA.

11:30 Integrating phylogeny and experimental ethology: from pattern to process. **D. A. McLennan,** Department of Zoology, University of Toronto, Toronto, Ontario, Canada M5S 1A1.

Affiliated Society Symposium No. 9

PATTERN VERSUS PROCESS: CAUSAL EXPLANATION IN EVOLUTIONARY BIOLOGY (THE SOCIETY OF SYSTEMATIC ZOOLOGY)

Friday July 6, 1990, 8:00 AM - 12:15 PM, H. J. Patterson, Room 0226

Organizer: **Dr. Joel Cracraft,** Department of Anatomy and Cell Biology, University of Illinois, Chicago, Illinois 60612, USA.

8:00 Introduction. **Joel Cracraft,** Department of Anatomy and Cell Biology, University of Illinois, Chicago, Illinois 60612, USA.

8:05 **Richard C. Lewontin,** Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

8:35 Bridging the gap between pattern and process. **D. R. Brooks,** Zoology Department, University of Toronto, Toronto, Ontario, Canada M5S 1A1; **E. O. Wiley,** Museum of Natural History and Department of Systematics and Ecology, University of Kansas, Lawrence, Kansas 66045, USA; and **J. D. Collier,** Philosophy Department, University of Calgary, Calgary, Alberta, Canada T2N 1N4.

9:05 Pattern, process, and causation within evolutionary biology: is there a distinction? **Joel Cracraft,** Department of Anatomy and Cell Biology, University of Illinois, Chicago, Illinois 60612, USA.

9:35 Natural selection and evolutionary patterns. **Richard M. Burian,** Department of Philosophy, Viriginia Polytechnic University and State University, Blacksburg, Virginia 24061, USA.

10:05 Break

10:15 Fitness and evolutionary explanation. **Richard E. Michod,** Department of Ecology and Evolutionary Biology, Unviersity of Arizona, Tucson, Arizona 85721, USA.

10:45 Causal/mechanical explanations of adaptations. **Robert N. Brandon,** Departments of Philosophy and Zoology, Duke University, Durham, North Carolina 27708, USA.

11:15 Causal explanation in ecology. **John A. Wiens,** Department of Biology, Colorado State University, Fort Collins, Colorado 80523, USA.

11:45 Adaptation to the edge of chaos. **Stuart A. Kauffman,** Department of Biochemistry and Biophysics, University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA.

UNESCO and IUBS/IABO Sponsored Discussion Group No. 8

HIGH DIVERSITY MARINE ECOSYSTEMS: ADVANCED RESEARCH ASPECTS

Friday, July 6, 1990, 8:30 AM - 12:15 PM, Art and Sociology, Room 3207

Organizer: **Dr. Pierre Lasserre,** Station Biologique de Roscoff, University of Paris, and C.N.R.S., Roscoff, France, **Dr. Frederick Grassle,** Institute of Marine and Coastal Sciences, Cook College, Rutgers University, New Brunswick, New Jersey, USA, and **Dr. G. Carleton Ray,** Department of Environmental Sciences, University of Virginia, Charlotteville, Virginia, USA.

Questions

What is biodiversity in the marine environment (genetic level, species level, habitat level)?

Can we speak of high diversity marine ecosystems, and what are the basic differences betwen terrestrial and marine systems?

It is possible to make biogeographic generalizations about marine biodiversity (latitudinal and depth gradients, surface area, nutrient levels, etc.)?

How can one assess bacterial diversity in marine ecosystems: community structure based on taxonomic or nutritional data, screening of active metabolic types, molecular approach through DNA/DNA analysis?

Are mesocosms (experimental ecosystems) useful for studying biodiversity?

What is the role of high diversity marine ecosystems in the global carbon cycle?

Discussants will include: **Alasdair McIntyre,** Marine Laboratory, Aberdeen, United Kingdom.; **Juan Carlos Castilla,** Faculdad de Ciencias Biologicas, Pontificia Universidad Catolica de Chile, Santiago de Chile, Chile; **W. Westheide,** Fachbereich Biologie/Chemie, Universitat Osnabruck, Sonabruck, Federal Republic of Germany; **Alain Guille,** Laboratoire Arago, University of Paris VI, Banyuls-sur-Mer, France; **Daniel Prieur,** Station Biologique de Roscoff University of Paris VI and CNRS, 29680 Roscoff, France; **Jeremy Jackson,** Smithsonian Tropical Research Institute, Republic of Panama; **C. Richard Robins,** Rosenstiel School of Marine and Atmospheric Science, University of Miami, Florida, USA; **Rita Colwell,** Maryland Biotechnology Institute and Department of Microbiology, University of Maryland, College Park, Maryland 20742, USA; **Marjorie Reaka-Kudla,** Department of Zoology, University of Maryland, College Park, Maryland 20742 USA; **T. R. Parsons,** Department of Oceanography, University of British Columbia, Vancouver, British Columbia, Canada Z6T IW5; **Ernest Naylor,** School of Ocean Sciences, University of Wales, Bangor, Menai Bridge, Gwynedd L59 5EY, United Kingdom; **John Ogden,** Florida Institute of Oceanography, St. Petersberg, Florida 33701, USA; and others.

Contributed Paper Session No. 19

EVOLUTION OF GENES AND GENOMES I

Friday, July 6, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203

Co-chairs:
Dr. Wolfgang Stephan, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

Dr. Marc Epstein, College of Agriculture and Maryland Institute of Biotechnology, University of Maryland, College Park, Maryland 20742, and Department of Entomology, Smithsonian Institution, Washington, D.C. 20560, USA.

8:00 Extensions of the universal primer concept for studies of DNA sequence evolution. **Thomas D. Kocher,** Department of Zoology, University of New Hampshire, Durham, New Hampshire 03824, USA (SSE).

8:15 Evolution of superoxide dismutases (Mn) from lamprey, hagfish, and sea cucumber: PCR amplification and sequence determination. **Michael W. Smith** and **Russell F. Doolittle,** Center for Molecular Genetics, University of California, San Diego, La Jolla, California 92093, USA.

8:30 Evolutionary relationships among class II MHC genes in mammals. **Austin L. Hughes,** Center for Demographic and Population Genetics, University of Texas, Houston, Texas 77225, USA.

8:45 Amplification of MHC class II gene polymorphism by intra-exonic recombination in rodents. **J. X. She, S. Boehme** and **E. K. Wakeland,** Department of Pathology, University of Florida, Gainesville, Florida 32611, USA.

9:00 In search of retrotransposons: testing the potential of the polymerase chain reaction. **R. A. Van Den Bussche** and **H. A. Wichman,** Department of Biological Sciences, University of Idaho, Moscow, Idaho 83843, USA (SSE).

9:15 Evolutionary consequences of mismatch inhibited DNA repair. **Wolfgang Stephan,** Department of Zoology, University of Maryland, College Park, Maryland 20742, and **Charles H. Langley,** Center for Population Biology, University of California, Davis, California 95616, USA.

9:30 Algorithm for reconstructing genomic rearrangements. **D. Sankoff,** Centre de Recherches Mathematiques, Universite de Montreal, C. P. 6128 Succursale A, Montreal, Quebec, Canada H3C 3J7.

9:45 Inheritance of mitochondrial DNA variants in Culaea inconstans. **M. H. Gach,** Museum of Zoology and Department of Biology, University of Michigan, Ann Arbor, Michigan 48109, USA (SSE).

10:00 Break

10:15 Recombination in animal mitochondrial DNA. **O. C. Stine, K. D. Smith, O. Hurko and D. Johns,** The Johns Hopkins Medical Institutes, Baltimore, Maryland 21205, USA (SSE).

10:30 Catching concerted evolution in the act: homogenization of a tandem array in cricket mtDNAs. **D. M. Rand,** Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA (SSE, SSZ).

10:45 Isolation, characterization and evolution of a tandem satellite array from the rock vole, Microtus chrotorrhinus (Rodentia). **W. S. Modi,** BCDP, Program Resources, Inc., NCI-FCRF, Frederick, Maryland 21701, USA (SSZ).

11:00 Nucleotide sequence evolution of intron 4 from three, closely-related, class 1 alcohol dehyrdogenase genes in humans. **C. J. Brown and H. J. Edenberg,** Department of Biochemistry, Indiana University School of Medicine, Indianapolis, Indiana 46202, USA (SSE).

11:15 Restriction-map variation associated with the fourth chromosome of Drosophila melanogaster. **J. W. Ajioka,** Department of Genetics, Washington University School of Medicine, St. Louis, Missouri 63110, and **Andrew Berry,** Department of Biology, Princeton University, Princeton, New Jersey 08544, USA (SSE).

11:30 DNA sequence variation at zeste in Drosophila melanogaster and D. simulans. **Jody Hey,** Rugters University, Nelson Labs, Piscataway, New Jersey 08855, USA (SSE).

Contributed Paper Session No. 20

PHENOTYPIC PLASTICITY AND QUANTITATIVE GENETICS

Friday, July 6, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2309

Co-chairs:
Dr. Martin D. Gebhardt, Department of Genetics, University of Georgia, Athens, Georgia 30602, USA.

Dr. Susan J. Mazer, Department of Biological Sciences, University of California, Santa Barbara, California 93106, USA.

8:00 Selection and phenotypic plasticity: the evolution of linear reaction norms in a quantitative genetic model. **Martin D. Gebhardt,** Department of Genetics, University of Georgia, Athens, Georgia 30602, USA.

8:15 Recombination and polygenic mutation as sources of genetic variation in reaction norms. **S. Via,** Department of Entomology and Section of Ecology and Systematics, Cornell University, Ithaca, New York 14853, USA (SSE).

8:30 Constraints on plasticity in spatially heterogeneous environments. **Peter H. Van Tienderen,** Department of Botany, Duke University, Durham, North Carolina 27706, USA.

8:45 Genetics, plasticity and canalization determine the variation of meristic characters in the composite flowering heads of Microseris (Asteraceae: Lactuceae). **E. C. Vlot and K. Bachmann,** Hugo de Vries-Laboratory, Kruislaan 318, NL-1098 SM Amsterdam, The Netherlands.

9:00 Phenotypic plasticity in response to soil moisture in Polygonum persicaria. **S. E. Sultan and F. A. Bazzaz,** Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, Massachusetts 02138, USA (SSE, ASN)

9:15 Diet-induced phenotypic plasticity in grasshoppers: ontogeny, quantitative genetics, and natural selection. **D. B. Thompson,** Department of Biological Sciences, University of Nevada, Las Vegas, Nevada 89154, USA (SSE)

9:30 An experimental study of food limitation and population differences in the growth of juvenile salamanders. **Joseph Bernardo,** Department of Zoology, Duke University, Durham, North Carolina 27706, USA (SSE).

9:45 Constancy of heritability estimates in Raphanus sativus (wild radish: Brassicaceae): effects of population density on life history and floral characters. **Susan J. Mazer,** Department of Biological Sciences, University of California, Santa Barbara, California 93106, USA (SSE).

10:00 The adaptive significance of phenotypic plasticity in western North American Aster. **G. A. Allen,** Department of Biology, University of Victoria, Victoria, British Columbia, Canada V8W 2Y2 (SSE).

Contributed Paper Session No. 21

HISTORICAL PROCESSES, BIOGEOGRAPHY, COMMUNITY STABILITY AND DIVERSITY

Friday, July 6, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3211

Co-chairs:
Dr. Robyn J. Burnham, New Mexico Museum of Natural History, Albuquerque, New Mexico 87194, USA.

Dr. Charles W. Thayer, Department of Geology, University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA.

8:00 Evolutionary refugia? Oligotrophic marine caves of Micronesia. **Charles W. Thayer and R. Allmon,** Department of Geology, University of Pennsylvania, Philadelphia, Pennsylvania 19104; **J. Deming,** School of Oceanography, University of Washington, Seattle, Washington, 98195; **H. Reiswig,** Redpath Museum, McGill University, Montreal, Quebec, Canada H3A 2K6; and **W. B. Saunders,** Department of Geology, Bryn Mawr College, Bryn Mawr, Pennsylvania 19010, USA.

8:15 A cladistic analysis of the shrimp family Palaemonidae (Crustacea, Decapoda) with comments on its origin and radiation. **Guido A. Pereira Suarez,** Universidad Central de Venezuela, Instituto de Zoologia Tropical, Apartado 47058, Caracas 1041-A, Venezuela.

8:30 Photosynthesis under high pCO_2: did the stromatolites starve? **L. J. Rothschild** and **R. L. Mancinelli**, Solar System Exploration, Mail Stop 239-12, NASA Ames Research Center, Moffett Field, California 94035, USA.

8:45 South American mammalian immigrants of the Great American Interchange. **D. J. Varricchio**, Museum of the Rockies, Montana State University, Bozeman, Montana 59717, USA.

9:00 The evolution of dispersal systems in Baobabs (Adansonia - Bombacaceae) and its bearing on phytogeography. **David A. Baum**, Department of Biology, Washington University, and The Missouri Botanical Garden, St. Louis, Missouri, USA (SSE).

9:15 The first Paleogene land placental mammal from Antarctica: its paleoclimatic and paleobiogeographical bearings. **A. A. Carlini, R. Pascual, M. A. Reguero, G. J. Scillato-Yane, E. P. Tonni*** and **S. F. Vizcaino** (alphabetical order). Div. Pal. Vert., Fac. Cs. Nat. y Museo, 1900 La Plata, CONICET and *CIC, Argentina.

9:30 Larval ecology of a relict Antarctic scallop. **P. A. Berkman**, Byrd Polar Research Center, The Ohio State University, Columbus, Ohio 43210; **T. R. Waller**, Department of Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560; and **S. P. Alexander**, Wadsworth Center for Laboratories and Research, Empire State Plaza, P. O. Box 509, Albany, New York 12201, USA.

9:45 Antarctic sponges: biogeographic and evolutionary aspects. **M. Sara', A. Balduzzi, M. Barbieri** and **G. Bavestrello**, Istituto di Zoologia dell'Universita, via Balbi 5, I-16126 Genova, Italy.

10:00 Break

10:15 Plant diversity and the fossil record: how reliable are the estimates? **Robyn J. Burnham**, New Mexico Museum of Natural History, Albuquerque, New Mexico 87194; **Scott L. Wing**, Department of Paleobiology, Smithsonian Institution, Washington, D. C. 20560; and **Geoffrey G. Parker**, Smithsonian Environmental Research Center, Edgewater, Maryland 21037, USA.

10:30 Glacial/interglacial climatic change and biodiversity. **A. C. Ashworth**, Geology Department, North Dakota State University, Fargo, North Dakota 58105, and **J. W. Hoganson**, North Dakota Geological Survey, Bismarck, North Dakota 58505, USA.

10:45 Patterns of extinction in the insects of a deteriorating riverine sand dune community during 60 years of human destruction. **J. A. Powell**, Department of Entomological Sciences, University of California, Berkeley, California 94720, USA (SSZ).

11:00 Biodiversity in a natural forest litter ecosystem with reference to inter and intraspecific dynamics of some associated species. **T. N. Ananthakrishnan** and **M. Noble Morrison**, Entomology Research Institute, Loyola College, Madras 600 034, India.

Contributed Paper Session No. 22

EVOLUTIONARY INTERACTIONS BETWEEN SPECIES I

Friday July 6, 1990, 8:00 AM - 12:15 PM, LeFrak, Room 2205

Co-chairs:
Mr. Evan D. Brodie III, Department of Ecology and Evolution, University of Chicago, Chicago, Illinois 60637, USA.

Dr. Douglas Gill, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

8:00 Effects of the hymenopteran parasitoid Leptopilina (Eucoilidae) on the genetic heterogeneity of its host population, Drosophila melanogaster. **M. Bouletreau,** University Lyon 1, 69622 Villeurbanne, France; **E. Wajnberg,** INRA 06602 Antibes, France; and **P. Fouillet,** University Lyon 1, 69622 Villeurbanne, France.

8:15 The Drosophila immune reaction and the parasitoid capacity to evade it: genetic and coevolutionary aspects. **Y. Carton,** Laboratoire de Biologie et Genetique Evolutives, CNRS, 91198, Gif, France, and **A. Nappi,** Department of Biology, Loyola University, Chicago, Illinois 60626, USA.

8:30 Haliotrema spp. (Monogenea: Dactylogyridae) and their boxfish hosts (Tetraodontiformes: Ostraciidae): a case study of effects of host specificity estimates on interpretations of coevolution. **G. J. Klassen,** Department of Zoology, University of Toronto, Toronto, Ontario, Canada M5S 1A1 (SSZ).

8:45 Development of physiological resistance to Bacillus thuringiensis in field populations of the diamondback moth (Plutella xylostella). **J. M. Schwartz** and **B. E. Tabashnik,** Department of Entomology, University of Hawaii, Honolulu, Hawaii 96822, USA (SSE).

9:00 Evolutionary response of predators to dangerous prey: tetrodotoxin toxicity of newts and resistance of garter snakes. **E. D. Brodie, III,** Department of Ecology and Evolution, University of Chicago, Chicago, Illinois 60637, and **E. D. Brodie, Jr.,** Department of Biology, University of Texas, Arlington, Texas 76019, USA (SSE, ASN).

9:15 Coevolution in a predator/prey system?: an experimental test using larval salamanders. **John E. Fauth,** Department of Zoology, Duke University, Durham, North Carolina 27706, USA (ASN).

9:30 Morphology and behavior of gastropods and crabs from Lake Tanganyika, Africa: implications for lacustrine predator-prey coevolution. **Kelly West** and **Andrew Cohen,** Department of Geosciences, University of Arizona, Tucson, Arizona 85716, USA.

9:45 Heteroaptive evolution as an alternative to coevolution: death-feigning in a butterfly switches housekeeping to toxin avoidance in a spider predator. **Alan R. Masters** and **K. L. Masters,** Department of Zoology, University of Florida, Gainesville, Florida 32611, USA.

10:00 Break

10:15 Evolutionary patterns in the spectral properties of silk proteins and their importance to prey capture at spider webs. **C. L. Craig,** Biology Department, Yale University, New Haven, Connecticut 02651, USA.

10:30 Tannins in acorns: a new look at seed predation and plant defenses. **M. A. Steele,** Department of Biology, Wilkes University, Wilkes-Barre, Pennsylvania 18766; **T. W. Knowles** and **K. Bridle,** Department of Biology, Wake Forest University, Winston-Salem, North Carolina 27104, USA.

10:45 Effects of plant chemical variation on a specialist herbivore: willow leaf beetles in the eastern Sierra Nevada. **N. E. Rank,** Department of Zoology, University of California, Davis, California 95616, USA (SSE).

11:00 Host plant influence on defensive regurgitation by conifer sawfly larvae. **S. G. Codella, Jr.** and **K. F. Raffa,** Department of Entomology, University of Wisconsin, Madison, Wisconsin 53706, USA (SSE).

11:15 Conservation of polyphagous abilities in oligophagous populations of Papilio canadensis. **Matthew P. Ayres** and **J. Mark Scriber,** Department of Entomology, Michigan State University, East Lansing, Michigan 48824, USA.

11:30 Effects of herbivore density on plant fitness. **D. J. Eitzman,** Zoology Department, Duke University, Durham, North Carolina 27706, USA (SSE).

PLENARY LECTURE

Friday July 6, 1990, 12:30 PM - 1:30 PM, A. Stamp Student Union, Grand Ballroom

Dr. Eugenie Clark, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

Sea monsters and deep sea sharks.

Congress Symposium No. 7 (continued)

EVOLUTION IN ISLAND ARCHIPELAGOS: THE EMERGING PICTURE

Friday July 6, 1990, 1:45 PM - 6:00 PM, Architecture, Room 0204

Organizer: **Dr. Scott Miller,** Department of Entomology, Bishop Museum, Honolulu, Hawaii 96817, USA.

1:45 Evolution of the vascular flora of the Juan Fernandez Islands, Chile. **T. F. Stuessy** and **D. J. Crawford,** Department of Botany, Ohio State University, Columbus, Ohio 43210, USA; and **M. Silva,** Departamento de Botanica, University of Concepcion, Concepcion, Chile.

2:20 Patterns of moth speciation in the Indo-Australian archipelago. **J. D. Holloway,** CAB International Institute of Entomology, Entomology Department, Natural History Museum, Cromwell Road, London SW7 5BD, United Kingdom.

2:55 Evolutionary patterns in the flora and vegetation of New Caledonia. **P. P. Lowry II,** Missouri Botanical Garden, St. Louis, Missouri 63166, USA, and Laboratoire de Phanerogamie, Museum National d'Histoire Naturelle, 16 rue Buffon, 75005 Paris, France.

3:30 Break

3:45 Krakatau - studies on the origin and development of a fauna. **I. W. B. Thornton,** Department of Zoology, La Trobe University, Bundoora, Victoria, Australia 3083.

4:20 Biogeographic patterns of Antillean insects: the emerging picture of Antillean geohistory and faunal diversification. **J. K. Liebherr,** Department of Entomology, Cornell University, Ithaca, New York 14853, USA.

4:55 The evolution of the hypogean fauna in the Canary Islands. **P. Oromi,** Department of Animal Biology, University de Laguna, Canary Islands, Spain.

5:30 Concluding remarks: **Scott Miller,** Department of Entomology, Bishop Museum, Honolulu, Hawaii 96817, USA.

Congress Symposium No. 20 (continued)

MULTIPLE LEVELS OF SELECTION IN RELATION TO EVOLUTIONARY THEORY

Friday July 6, 1990, 1:45 PM - 6:00 PM, Tydings Lecture Hall, Room 0130

Organizer: **Dr. Elisabeth S. Vrba,** Department of Geology and Geophysics, Yale University, New Haven, Connecticut 06511, USA.

1:45 A definition of species selection. **Steven M. Stanley,** Department of Earth and Planetary Sciences, The John Hopkins University, Baltimore, Maryland 21210, USA.

2:30 A contribution on the nature of species selection. **J. R. Vaisnys and E. S. Vrba,** Yale University, New Haven, Connecticut 06511, USA.

3:15 Break

3:30 The emergence of levels in thought, word, and deed. **H. H. Pattee,** Department of Systems Science, Thomas J. Watson School of Engineering, State University of New York, Binghamton, New York 13901, USA.

4:15 Are zooids, polyps and metameres interactors? **L. W. Buss,** Department of Biology and Geology and Geophysics, Yale University, New Haven, Connecticut 06511, USA.

5:00 Transitions between levels of organisation. **J. Maynard Smith,** University of Sussex, School of Biological Sciences, Brighton BN1 9QG, United Kingdom.

Affiliated Society Symposium No. 3

COMPARING TREES: MEASURES OF CONGRUENCE AND COEVOLUTION (WILLI HENNIG SOCIETY)

Friday July 6, 1990, 1:45 PM - 6:00 PM, A. Stamp Student Union, Tortuga Room

Organizer: **Dr. Susan J. Weller,** Department of Entomology, National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560, USA.

1:50 Choosing a tree from the forest: congruence measures in testing evolutionary scenarios. **S. J. Weller,** Department of Entomology, Smithsonian Institution, Washington, D.C. 20560, USA.

2:25 The use of congruence as a test of phylogenetic hypotheses. **A. H. Bledsoe** and **R. J. Raikow,** Department of Biological Sciences, University of Pittsburgh, Pittsburgh, PA. 15260, USA.

3:00 Evaluating alternative data sets, for the same set of taxa: molecular sequence data as an example. **D. Lipscomb,** Department of Biological Sciences, George Washington University, Washington, D.C. 20052, and **M. Mickevich,** Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

3:35 Break

4:00 The effect of ordered characters on phylogenetic reconstruction: an example from the Iguania. **David L. Hauser** and **William Presch,** San Diego State University, San Diego, California, and California State University, Fullerton, California, USA.

4:35 Assessing congruence between cladograms of parasites and their hosts. **R. T. O'Grady,** Department of Invertebrate Zoology, Smithsonian Institution, Washington, D.C. 20560, USA.

5:10 Historical zoogeography of the genus Halovelia (Heteroptera: Veliidae): a comparison of three methods. **D. A. Polhemus,** Department of Entomology, Smithsonian Institution, Washington, D.C. 20560, USA.

Affiliated Society Symposium No. 10

EVOLUTIONARY GENETICS OF AGING (THE SOCIETY FOR THE STUDY OF EVOLUTION)

Friday July 6, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2309

Organizer: **Dr. Michael R. Rose,** Department of Ecology and Evolutionary Biology, School of Biological Sciences, University of California, Irvine, California 92717, USA.

1:45 Introduction to the evolution of aging - the theories and their tests. **Michael R. Rose,** Department of Ecology and Evolutionary Biology, School of Biological Sciences, University of California, Irvine, California 92717, USA.

2:45 Mutation accumulation and the evolution of Drosophila ageing. **Laurence D. Mueller** and **Joseph L. Graves, Jr.,** Department of Ecology and Evolutionary Biology, School of Biological Sciences, University of California, Irvine, California 92717, USA.

3:45 Break

4:00 Antagonistic pleiotropy in the evolution of nematode aging: a genetic analysis. **Thomas E. Johnson, E. F. Hutchinson** and **P. T. Tedesco,** Institute for Behavioral Genetics, University of Colorado, Boulder, Colorado 80309, USA.

4:30 The evolution of soma in the green flagellates. **Vassiliki Koufopanou,** Department of Biology, McGill University, Montreal, Quebec, Canada J3A 1B1.

Discussion Group No. 7

NOMENCLATURE

Friday July 6, 1990, 1:45 PM - 6:15 PM, Art and Sociology, Room 3203

Organizer: **Dr. Christopher Thompson,** Department of Entomology, National Museum of History, Smithsonian Institution, Washington, D.C. 20560, USA.

Discussion Group No. 12

ENERGY AND COMMUNITY EVOLUTION

Friday July 6, 1990, 1:45 PM - 6:00 PM Art and Sociology, Room 3207

Organizers: **Dr. Leigh Van Valen** and **Dr. Virginia Maiorana,** Department of Ecology and Evolution, Whitman Laboratory, University of Chicago, 915 East 57th Street, Chicago, Illinois.

Questions

Is a mechanistic approach to evolution based on energy a useful complement to that based on information?

Can the biotic world be viewed as a system of energy flow?

How is this flow partitioned, what causes the flow and its partitions, and what regulates the various rates of flow?

How do the partitions and flows change over time, at both ecological and evolutionary time scales, and what processes cause these changes?

Discussants will include: **Richard K. Bambach, John Damuth, Richard K. Stucky and Richard G. Wiegert.**

Contributed Paper Session No. 23

EVOLUTIONARY INTERACTIONS BETWEEN SPECIES II, AND EVOLUTIONARY ECOLOGY

Friday July 6, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2309

Co-chairs:
Dr. G. A. Allen, Department of Biology, University of Victoria, Victoria, British Columbia, Canada V8W 2Y2.

Ms. Deborah J. Morrin, Department of Zoology and Program in Marine and Estuarine Environmental Sciences, University of Maryland, College Park, Maryland 20742, USA.

1:45 Floral and extrafloral nectars of neotropical Inga trees: a comparison of their constituents and composition. **Suzanne Koptur,** Department of Biological Sciences, Florida International University, Miami, Florida 33199, USA (SSE, ASN).

2:00 Selection for low floral height in Chiloglottis reflexa, a sexually deceptive orchid. **S. N. Handel,** Department of Biological Sciences, Rutgers University, Piscataway, New Jersey 08855, and **R. Peakall,** School of Biological Sciences, Macquarie University, Sydney, New South Wales, 2109, Australia.

2:15 The comparative pollination biology of Adansonia (Bombacaceae). **David A. Baum,** Department of Biology, Washington University and The Missouri Botanical Garden, St. Louis, Missouri, USA (SSE).

2:30 Models for the dynamics of pollen movement: plant presentation of pollen and pollen longevity, pollinator removal of pollen and delivery of pollen, and pollinator abundances. **J. D. Thomson and P. Wilson,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (SSE).

2:45 Leg length evolution among oil-collecting bees. **K. E. Steiner,** Compton Herbarium, National Botanic Gardens, Kirstenbosch, Private Bag X7, Claremont 7735, and **V. B. Whitehead,** South African Museum, P.O. Box 61, Cape Town 8000, Republic of South Africa (SSE).

3:00 A model for the dynamical coexistence of competing species. **J. T. Ihara,** Committee on Evolutionary Biology, University of Chicago, Chicago, Illinois 60637, USA (SSE).

3:15 Towards the range limit - occurrence, niche breadth and abundance of three Gyrinus species with similar habitat preferences. **B. W. Svensson,** Department of Zoology, Section of Entomology, Uppsala University, Box 561, S-751 22 Uppsala, Sweden (SSE).

3:30 Break

3:45 Do the germination mechanisms differ in plants originating in deserts receiving winter or summer rain? **Yitzchak Gutterman,** The Jacob Blaustein Institute for Desert Research, Sde Boker Campus and The Department of Biology, Ben-Gurion University of the Negev, Israel 84993 (SSE).

4:00 Conservation of Atlantic salmon populations. **K. Hindar,** Norwegian Institute for Nature Research, Tungasletta 2, N-7004 Trondheim, Norway.

4:15 Host shifts in the Drosophila quinaria species group. **Steven P. Courtney,** Department of Biology, University of Oregon, Eugene, Oregon 97403, USA (SSE).

Contributed Paper Session No. 24

EVOLUTION OF GENES AND GENOMES II

Friday July 6, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2203

Co-chairs:
Dr. Patricia Gentili, Department of Entomology, Smithsonian Institution, Washington, D.C. 20560, USA.

Dr. Brook G. Milligan, Department of Botany, University of Texas, Austin, Texas 78713, USA.

1:45 Chloroplast genome evolution in an achlorophyllous plant, Conopholis americana. **A. E. L. Colwell,** Department of Biology, Washington University, St. Louis, Missouri 63130, USA.

2:00 Origin and evolution of chromophycean plastid genomes. **K. V. Kowallik,** Botany Department, University of Dusseldorf, D 4000 Dusseldorf 1, Universitatsstr. 1, Federal Republic of Germany.

2:15 Gene transfer of tufA and the evolution of green chloroplasts. **M. G. Kuhsel, S. L. Baldauf** and **J. D. Palmer,** Department of Biology, Indiana University, Bloomington, Indiana 47405, USA (PSA).

2:30 Differentiation of chloroplast DNA within and among populations of Trifolium pratense. **Brook G. Milligan,** Department of Botany, University of Texas, Austin, Texas 78713, USA (SSE, ASN).

2:45 Ribosomal DNA and Chloroplast DNA variation in the genus Taraxacum (dandelions). **Lynn Mertens King,** Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA (SSE).

3:00 The evolution of the small heat shock genes in genus Brassica. **E. R. Waters,** Department of Biology, Washington University, St Louis, Missouri 63130, USA.

3:15 Nuclear DNA markers for the evolution of Microseris (Asteraceae). **K. Bachn Van Houten and L. Raijmann,** Hugo de Vries Laboratory, Kruislaan 318, NL-Amsterdam, The Netherlands.

3:30 Break

3:45 Positive Darwinian selection in the evolution of T-cell receptor genes. **J. W. H. Ferguson and Masatoshi Nei,** University of Texas Health Science Center, Houston, Texas, USA (SSE).

4:00 Evolution of $tRNA^{Lys}$, ATPase 8 and ATPase 6 in microtine rodent mitochondrial DNA. **D. E. Pumo, C. J. Phillips and C. A. Millan,** Department of Biology, Hofstra University, Hempstead, New York 11550, USA (SSE).

4:15 Coding versus non-coding DNA evolution in Drosophila. **A. Caccone,** Dipartimento di Biologie, II, Universita di Roma, "TOR VERGATA", Italy, and Department of Biology, Yale University, New Haven, CT 06511; and **J. R. Powell,** Department of Biology, Yale University, New Haven, CT 06511, USA (SSE).

4:30 Synonymous substitution patterns between mitochondrial protein coding regions are similar. **B. D. Kessing and S. R. Palumbi,** Department of Zoology, University of Hawaii, Honolulu, Hawaii 96822, USA.

4:45 Molecular genetic studies on the hyperthermophilic archaebacterium Pyrococcus furiosus. **Frank T. Robb,** Center of Marine Biotechnology and Department of Microbiology, University of Maryland, College Park, Maryland 20742; **Steven H. Brown and Robert M. Kelly,** The Johns Hopkins University, Baltimore, Maryland, USA.

5:00 Linear senescence plasmids in Neurospora: imperfect molecular parasites. **A. J. F. Griffiths,** Botany Department, University of British Columbia, Vancouver, B. C., Canada V6T 2B1.

Contributed Paper Session No. 25

CHARACTER ANALYSIS, PHYLOGENETIC INFERENCE AND METHODOLOGY I

Friday, July 6, 1990, 1:45 PM - 6:00 PM, LeFrak, Room 2205

Co-chairs:
Dr. Carey Krajewski, Laboratory of Molecular Systematics, Smithsonian Institution, Washington, D. C. 20560, USA.

Dr. Anthony H. Bledsoe, Department of Biological Sciences, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, USA.

1:45 Phenetics versus cladistics: the fight of the century or blind-man's buff? **Richard M. Bateman,** Paleobiology Department, Smithsonian Institution, Washington, D. C. 20560, USA

2:00 Relative efficiencies of various methods for phylogenetic tree reconstruction and their applications to molecular data. **Naruya Saitou,** Department of Anthropology, University of Tokyo, Tokyo, Japan.

2:15 Bootstrap analysis of phylogenetic trees derived from DNA hybridization distances. **Carey Krajewski,** Laboratory of Molecular Systematics, Smithsonian Institution, Washington, D. C. 20560, and **Allan W. Dickerman,** University of Wisconsin Zoological Museum, Madison, Wisconsin 53706, USA (SSZ).

2:30 Molecular homology and DNA hybridization. **A. H. Bledsoe,** Department of Biological Sciences, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, and **F. H. Sheldon,** The Academy of Natural Sciences, Philadelphia, Pennsylvania 19103, USA (SSE).

2:45 Computer programs for molecular systematics: restriction mapping management and analysis; molecular evolution simulations for testing phylogenetic reconstructions. **E. H. Harley,** Department of Chemical Pathology, University of Cape Town, Cape Town, South Africa.

3:00 Phylodat: a graphic universal front-end for data entry for phylogenetic analysis programs. **A. R. Lee,** Episcopal Church of the Holy Spirit, 601 Philippe Parkway, Safety Harbor, Florida 34695, USA.

3:15 The asymmetry of phylogenetic trees: stochastic simulations and cladistic results. **Sherman Suter,** Committee on Evolutionary Biology, Department of Geophysical Sciences, University of Chicago, 5734 S. Ellis Avenue, Chicago, Illinois 60637, USA (SSE).

3:30 Break

3:45 The influence of character number and sample size on the reliability of a cladistic hypothesis. **M. H. Kesner,** Biology Department, Indiana University of Pennsylvania, Indiana, Pennsylvania 15705, USA.

4:00 Assessment of phylogenetic content of a data-matrix. **W. J. Le Quesne,** Cicadella, Route de Noirmont, St. Brelade, Jersey, Channel Islands, United Kingdom (SSZ).

4:15 Homoplasy slope ratio and standardized homoplasy index: better measurements of observed homoplasy in cladistic analyses. **R. Meier, P. Kores** and **S. Darwin,** Department of Biology, Tulane University, New Orleans, Louisiana 70118, USA (SSZ).

4:30 Correlated evolution of continuous traits: a simulation study. **E. P. Martins** and **T. Garland, Jr.,** Department of Zoology, University of Wisconsin, Madison, Wisconsin 53706, USA (SSE).

4:45 Continuous characters and the general applicability of classifications. **G. D. E. Povel,** Leiden University, Department of Population Biology, Division of Systematic Zoology, P. O. Box 9516, 2300 RA Leiden, The Netherlands.

5:00 Phylogenetic inference from DNA sequences. **M. Hasegawa** and **H. Kishino,** The Institute of Statistical Mathematics, 4-6-7 Minami-Azabu, Minato-ku, Tokyo, Japan (ASN).

CONGRESS BANQUET
(Ticket required)

Thursday July 5, 1990, 6:30 PM, A. Stamp Student Union, Colony Ballroom

PLENARY LECTURE

Friday July 6, 1990, 8:00 PM - 9:00 PM, A. Stamp Student Union, Grand Ballroom

Dr. Stephen J. Gould, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

Darwin's unrecognized appeal to species selection.

SATURDAY JULY 7, 1990

Congress Symposium No. 3

UV-B RADIATION AS AN EVOLUTIONARY STRESS FACTOR

Saturday July 7, 1990, 8:00 AM - 12:15 PM, A. Stamp Student Union, Tortuga Room

Organizer: **Dr. George Bean**, Department of Botany, University of Maryland, College Park, Maryland 20742, USA.

8:00 Predicted and observed effects of stratospheric ozone depletion. **N. R. P. Harris**, Department of Chemistry, University of California, Irvine, California 92717, USA.

8:30 The role of biological action spectra in evaluating the solar UV-B radiation environment. **M. M. Caldwell**, Ecology Center, Utah State University, Logan, Utah 84322, USA.

9:00 Instruments and techniques for UV-B radiation. **Donald T. Krizek**, Climate Stress Laboratory, Natural Resources Institute, ARS, U.S. Department of Agriculture, Beltsville, Maryland 20705, USA.

9:30 Mechanisms of protection against natural and enhanced solar UV-B radiation: the role of pigments and leaf optical properties. **R. Robberecht**, Department of Range Resources, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow, Idaho 83843, USA.

10:00 Break

10:15 Interaction of UV-B and the photosynthetic process. **J. F. Bornman**, Department of Plant Physiology, University of Lund, S-220 07 Lund, Sweden.

10:30 Ecological consequences of UV-B radiation on terrestrial plants. **Alan Teramura**, Department of Botany, University of Maryland, College Park, Maryland 20742, USA.

Congress Symposium No. 10

CONSERVATION IN EVOLUTIONARY PERSPECTIVE: MADAGASCAR, A NEW ARENA

Saturday July 7, 1990, 8:00 AM - 12:15 PM, Architecture, Room 0204

Organizer: **Dr. Porter P. Lowry II**, Missouri Botanical Garden, St. Louis, Missouri 63166, USA and Laboratoire de Phanerogamie, Museum National d'Histoire Naturelle, 16, rue Buffon, Paris, France.

8:00 A history of the human transformation of Madagascar. **R. E. Dewar**, Department of Anthropology, University of Connecticut, Storrs, Connecticut 06269, USA, and **J. A. Rakotoarisoa**, Musee de L'Universite, Universite de Madagascar, 101 Antananarivo, Madagascar.

8:30 Processes of environmental change and causes of extinction in Madagascar. **David A. Burney**, Department of Biological Sciences, Fordham University, Bronx, New York 10458, USA; **J.-G. Rafamantanantsoa** and **T. Rahotondrazafy**, Service de Paleontologie, Universite d' Antananarivo, B.P. 906, Antananarivo 101, Madagascar.

9:00 Biogeography, evolution, and ecology of the Malagasy avifauna. **Olivier Langrand** and **Lucienne Wilme**, World Wildlife Fund, Aires Protegees, Antananarivo, Madagascar; **John W. Fitzpatrick** and **Thomas Schulenberg**, Field Museum of Natural History, Chicago, Illinois 60605, USA.

9:30 Mammalian radiations and recent habitat fragmentation in Madagascar. **M. E. Nicoll**, World Wildlife Fund Protected Areas Program, B.P. 738, Antananarivo 101, Madagascar; **P. J. Stephenson**, Department of Zoology, University of Aberdeen, Aberdeen, Scotland, United Kingdom; and **S. O'Connor**, World Wildlife Fund Protected Areas Program, B.P. 738, Antananarivo 101, Madagascar.

10:00 Break

10:15 The current status of the vegetation and flora of Madagascar. **G. E. Schatz** and **P. P. Lowry II**, Madagascar Research and Conservation Program, Missouri Botanical Garden, St. Louis, Missouri 63166, USA.

10:45 Conservation of biodiversity in Madagascar: prospects for the future. **V. A. Randrianasolo**, Parc Botanique et Zoologique de Tsimbazaza, Antananarivo 101, Madagascar.

Congress Symposium No. 29

MODE AND TEMPO OF VIRAL EVOLUTION

Saturday July 7, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2203

Organizer: **Dr. Wen Hsiung Li**, Center for Demographic and Population Genetics, University of Texas Health Science Center, Houston, Texas 77225, USA.

8:00 Introduction. **Wen Hsiung Li**, Center for Demographic and Population Genetics, University of Texas Health Science Center, Houston, Texas 77225, USA.

8:15 Influenza viruses: genetic relatedness, evolution in nature and mutation rate. **Peter Palese,** Department of Microbiology, Mount Sinai School of Medicine, New York, New York 10029, USA.

8:40 Discussion

8:45 Origin and evolution of tymoviruses. **Adrian Gibbs,** Research School of Biological Sciences, Australian National University, GPO Box 475, Canberra, ACT 2601, Australia.

9:10 Discussion

9:15 Lentiviruses: molecular biology and evolution history. **Michael J. Braun,** Laboratory of Molecular Systematics, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560; and **Matthew A. Gonda,** Program Resources Inc., Frederick Cancer Research Facility, Frederick, Maryland 21701, USA.

9:40 Discussion

9:45 Origins and evolution of the AIDS viruses. **Paul M. Sharp,** Department of Genetics, Trinity College, Dublin, Ireland, and **Wen-Hsiung Li,** Center for Demographic and Population Genetics, University of Texas, Houston, Texas 77225, USA.

10:10 Discussion

10:15 Fluctuation of HIV proviral population in vivo and in vitro over a four year period. **S. Wain-Hobson, Sylvie Delassus, Livia Pedroza-Martins, Andreas Meyerhans, Thierry Huet** and **Remi Cheynier,** Institut Pasteur, Paris, France.

10:40 Discussion

10:45 Break

11:10 Genetic diversity among simian immunodeficiency viruses and their relationship to human immunodeficiency viruses. **Y. Li, R. Steen, I.-W. Park** and **R. Desrosiers,** Department of Microbiology and Molecular Genetics, New England Regional Primate Center, Harvard Medical School, Southborough, Massachusetts 01772; **P. Fultz,** Yerkes Regional Primate Research Center, Emory University, Atlanta, Georgia 30322; and **P. Marx,** California Regional Primate Research Center, University of California, Davis, California 95616, USA.

11:35 Discussion

11:40 Retrovirus gene transfer between species and the evolution of viral genes in mammals. **Raoul Benveniste,** National Cancer Institute, Frederick, Maryland 21701, USA.

12:05 Discussion

Contributed Symposium No. 33

A THERMODYNAMIC PERSPECTIVE OF EVOLUTION

Saturday July 7, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2309

Organizer: **Dr. Eric D. Schneider,** National Oceanic and Atmospheric Administration, Washington, D. C., and the Hawkwood Institute for Evolutionary Studies, McLeod, Montana, USA.

8:00 The thermodynamics of self-organizing (evolving) systems. **Eric D. Schneider,** National Oceanic and Atmospheric Administration, Washington, D. C., and the Hawkwood Institute for Evolutionary Studies, McLeod, Montana, USA, and **James J. Kay,** Environment and Resource Studies, University of Waterloo, Ontario, Canada N2L 3G1.

8:30 Thermodynamics of ecosystem development. **James J. Kay,** Environment and Resource Studies, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1, and **Eric D. Schneider,** National Oceanic and Atmospheric Administration and Hawkwood Institute for Evolutionary Studies, McLeod, Montana, USA.

9:00 Formal causality in evolution. **Robert E. Ulanowicz,** Chesapeake Biological Laboratory, University of Maryland, Solomons, Maryland 20688, USA.

9:30 Consideration of thermodynamics and information in the Submarine Hot Springs Model for the origin of life. **John B. Corliss,** Goddard Space Flight Center, NASA, Greenbelt, Maryland, USA.

10:00 Break

10:15 Evolution, self-organization and ecological structure. **Peter M. Allen,** International Ecotechnology Research Centre, Cranfield Institute of Technology, Cranfield, United Kingdom.

10:45 The physics of emergence and evolution: a causal account. **Rod Swenson,** Center for the Study of Complex Systems, New York, New York 10013, USA.

(Contributed Papers)

11:15 The development of complex systems: a paradigm for the new evolutionary synthesis. **John S. Fellows,** M.E.E.S. Department, University of Maryland, College Park, Maryland 20742, USA.

11:30 Evolutionary self-organization in model ecosystems. **Thomas P. Maxwell** and **Robert Costanza,** Chesapeake Biological Laboratory, Box 38, Solomons, Maryland 20688, USA.

11:45 Discussion

Discussion Group No. 14

THE INFLUENCE OF MOLECULAR BIOLOGY ON EVOLUTIONARY THEORY

Saturday July 7, 1990, 8:00 AM - 12:15 PM, Tydings Lecture Hall, Room 0130

Organizer: **Dr. Gabriel A. Dover,** Department of Genetics, University of Cambridge, Cambridge CB2 3EH England, United Kingdom.

The molecular biology of genomes and development has uncovered a range of phenomena which could not have been incorporated into the 'Modern Synthesis'. These include, amongst others, mobile genetic elements, split genes, multigene families, internally-repetitive genes, 'junk' DNA, genes within genes, overlapping transcripts, a range of non-Mendelian DNA 'turnover' mechanisms (gene conversion, unequal crossing over, amplification, slippage, transposition and retrotransposition) and combinatorial genetic operations controlling ontogeny.

Questions

To what extent can the above processes be incorporated into the 'Modern Synthesis' without reconsideration of its major premises.

Do the 'new' processes simply add to the range of mutational and recombinational mechanisms that supply the requisite variation for selection and drift, or do they also provide alternative means for spreading mutations through populations?

What are the range, speed, and biological effects of such processes? In what ways are they expected to interact with natural selection?

Can the evolution of development be modelled only as a process of selection on Mendelian polygenic systems? Or do the combinatorial genetic operations affecting development require a different theoretical treatment?

How do the 'new' processes affect current theories of the origins of new species?

How do the 'new' processes help in the understanding of the genetic systems responsible for the origins, stasis, extinction, and trends of taxa?
Is the Darwinian process of adaptation the only means for the establishment of complex biological functions, in tune with their environment?

To what extent do the 'new' processes affect the theory of neutral drift and the concept of the 'molecular clock'?

If chance and contingency are major components in the historical process of evolution, from DNA to extraterrestrial events, can a theory of evolution provide a realistic model of the past, present and future of biological change? Do we have a null hypothesis?

UNESCO and IUBS/IABO Sponsored Discussion Group No. 19

HIGH DIVERSITY MARINE ECOSYSTEMS: ADVANCED RESEARCH ASPECTS

Saturday July 7, 8:30 AM - 12:15 PM, Art and Sociology, Room 3207

Organizer: **Dr. Pierre Lasserre,** Station Biologique de Roscoff, University of Paris, and C.N.R.S., Roscoff, France, **Dr. Frederick Grassle,** Institute of Marine and Coastal Sciences, Cook College, Rutgers University, New Brunswick, New Jersey, USA, and **Dr. G. Carleton Ray,** Department of Environmental Sciences, University of Virginia, Charlotteville, Virginia, USA.

Questions

Are there particular habitats, regions or geographic areas that require special consideration in global comparative biogeography?

Are there practical aspects of maintaining marine biodiversity from an economic perspective?

What should an international scientific programme on high diversity marine ecosystems be? For example, should it provide a base for long-term observational and experimental studies of marine ecosytems as indicators of global change?

Discussants will include: **Alasdair McIntyre,** Marine Laboratory, Aberdeen, United Kingdom.; **Juan Carlos Castilla,** Faculdad de Ciencias Biologicas, Pontificia Universidad Catolica de Chile, Santiago de Chile, Chile; **W. Westheide,** Fachbereich Biologie/Chemie, Universitat Osnabruck, Sonabruck, Federal Republic of Germany; **Alain Guille,** Laboratoire Arago, University of Paris VI, Banyuls-sur-Mer, France; **Daniel Prieur,** Station Biologique de Roscoff University of Paris VI and CNRS, 29680 Roscoff, France; **Jeremy Jackson,** Smithsonian Tropical Research Institute, Republic of Panama; **C. Richard Robins,** Rosenstiel School of Marine and Atmospheric Science, University of Miami, Florida, USA; **Rita Colwell,** Maryland Biotechnology Institute and Department of Microbiology, University of Maryland, College Park, Maryland 20742, USA; **Marjorie Reaka-Kudla,** Department of Zoology, University of Maryland, College Park, Maryland 20742 USA; **T. R. Parsons,** Department of Ocenaography, University of British Columbia, Vancouver, British Columbia, Canada Z6T IW5; **Ernest Naylor,** School of Ocean Sciences, University of Wales, Bangor, Menai Bridge, Gwynedd L59 5EY, United Kingdom; **John Ogden,** Florida Institute of Oceanography, St. Petersberg, Florida 33701; USA; and others.

Contributed Paper Session No. 26

EVOLUTION OF THE PROKARYOTES AND MULTICELLULAR EUKARYOTES: MOLECULAR APPROACHES

Saturday July 7, 1990, 8:00 AM - 12:15 PM, LeFrak, Room 2205

Co-chairs:
Mr. James Sniezek, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

Dr. Katherine G. Field, Department of Microbiology, Oregon State University, Corvallis, Oregon 97331, USA.

8:00 On species in bacteria. **Daniel E. Dykhuizen,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (SSE).

8:15 Phylogenetic relationships of prokaryotes analyzed by comparative sequencing of genes encoding 23S rRNA, elongation factor Tu and beta subunit of ATP-synthase. **W. Ludwig, M. Weizenegger, G. Kirchhof, G. Kohler, N. Klugbauer, S. Dorn** and **K. H. Schleifer,** Lehrstuhl fur Mikrobiologie, Technisches Universitat Munchen, Arcisstr. 21, D-8000 Munchen 2, Federal Republic of Germany.

8:30 Higher order phylogenetic reconstruction using protein sequence comparisons. **S. L. Baldauf** and **J. D. Palmer,** Indiana University, Bloomington, Indiana 47405, USA (SSE).

8:45 The evolution of eukaryotes as deduced from small subunit ribosomal RNA sequences. **L. Hendriks, A. Goris, R. De Baere, Y. Van De Peer, J. M. Neefs** and **R. De Wachter,** Department of Biochemistry, University of Antwerp (UIA), B-2610 Antwerp, Belgium.

9:00 The genetic identification of symbiotic dinoflagellates by gene amplification. **Rob Rowan** and **Dennis A. Powers,** Department of Biological Sciences, Stanford University, Hopkins Marine Station, Pacific Grove, California 93950, USA.

9:15 Concordance of molecular and ultrastructural phylogenies of the unicellular green algae Neochloris and Characium. **Louise A. Lewis, Lee W. Wilcox, Paul A. Fuerst*** and **Gary L. Floyd,** Departments of Plant Biology and *Molecular Genetics, The Ohio State University, Columbus, Ohio 43210, USA (PSA, SSE).

9:30 Molecular evolution of Polytoma, a non-green chlorophyte. **D. Vernon-Kipp** and **C. W. Birky, Jr.,** Department of Molecular Genetics, The Ohio State University, Columbus, Ohio 43210, USA (SSE).

9:45 18S rDNA sequence analysis of Asteromonas gracilis and Dunaliella salina, two enigmatic green algal flagellates. **Lee W. Wilcox, Louise A. Lewis, *Paul A. Fuerst,** and **Gary L. Floyd,** Departments of Plant Biology and *Molecular Genetics, The Ohio State University, Columbus, Ohio 43210, USA (PSA).

10:00 Break

10:15 Comparisons of small subunit nuclear ribosomal RNA gene sequences in two colonial green algae, Eudorina elegans and Volvox aureus (Volvocaceae, Chlorophyceae). **Brian A. Berry, Gary L. Floyd** and ***Paul A. Fuerst,** Departments of Plant Biology and *Molecular Genetics, The Ohio State University, Columbus, Ohio 43210, USA (PSA).

10:30 A Phylogenetic analysis of the Ulvophyceae (Chlorophyta) based on cytoplasmic rRNA sequences. **F. W. Zechman, R. L. Chapman,** Department of Botany, and **E. A. Zimmer,** Department of Biochemistry, Louisiana State University, Baton Rouge, Louisiana 70803, USA (PSA).

10:45 Molecular classification of the rumen fungus Neocallimastix. **B. Bowman, T. White and S.-D. Lu,** Hoffman-La Roche, Inc., 5301 Horton Street, Emeryville, California 94608; **J. Lee,** Cetus Corporation, 1400 53rd Street, Emeryville, California 94608; **J. Taylor,** Department of Plant Biology, University of California, Berkeley, California 94720, USA; and **A. Brownlee,** CSIRO, Division of Animal Production, P. O. Box 239, Blacktown, NSW 2148 Australia.

11:00 Evolutionary relationships of the Phylum Cnidaria inferred from 18S rRNA sequence data. **K. G. Field,** Department of Microbiology, Oregon State University, Corvallis, Oregon 97331; **J. M. Turbeville** and **R. A. Raff,** Department of Biology, Indiana University, Bloomington, Indiana 47405; and **B. Best,** National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560, USA.

11:15 Phylogenetic relationships of nemertines inferred from ribosomal RNA sequence analysis: molecular data as a test of morphological character homology. **J. McClintock Turbeville** and **Rudolf A. Raff,** Department of Biology, Indiana University, Bloomington, Indiana 47405; and **Katharine G. Field,** Department of Microbiology, Oregon State University, Corvallis, Oregon 97331, USA.

Contributed Paper Session No. 27

EVOLUTIONARY GENETICS OF POPULATIONS

Saturday July 7, 1990, 8:00 AM - 12:15 PM, H. J. Patterson, Room 0226

Co-chairs:
Dr. Stephen R. Palumbi, Department of Zoology, University of Hawaii at Manoa, Honolulu, Hawaii 96822, USA.

Paul Jivoff, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

8:00 Constraints on multiple resource use and the evolution of positive assortative mating. **D. B. Goldstein, K. E. Holsinger** and **S. W. Pacala,** Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut 06269, USA (SSE)

8:15 Electrophoretically detectable genetic evidence in aquatic macrophytes. **Ludwig Triest,** Algemene Plantkunde en Natuurbeheer, Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussels, Belgium.

8:30 Mutational order: a major stochastic factor in molecular evolution. **B. C. Clarke,** Department of Genetics, University of Nottingham, Queens Medical Centre, Clifton Boulevard, Nottingham NG7 2UH, England, and **G. S. Mani,** Department of Physics, Shuster Building, the University of Manchester, Manchester M13 9PL, England (SSE).

8:45 Rapid evolution and founder effects in the masked shrew. **D. T. Stewart** and **A. J. Baker,** Department of Zoology, University of Toronto, Toronto, Ontario, Canada M5S 1A1, and Department of Ornithology, Royal Ontario Museum, Toronto, Ontario, Canada M5S 2C6.

9:00 Natural selection of protein and DNA polymorphisms in nature: patterns and theory. **E. Nevo,** Institute of Evolution, University of Haifa, Mt. Carmel, Haifa 31999, Israel.

9:15 Global patterns in genetic richness: mitochondrial DNA variation of tropical and temperate seas urchins. **Stephen R. Palumbi,** Department of Zoology, University of Hawaii, Honolulu, Hawaii 96822, USA (SSE).

9:30 Inter-locus heterozygosity correlations: implications for neutral theory. **M. Woodwark and D. O. F. Skibinski,** School of Biological Sciences, University College of Swansea, Singleton Park, Swansea, SA2 8PP, United Kingdom, and **R. D. Ward,** C.I.S.R.O., Division of Fisheries, G.P.O. Box 1538, Hobart, Tasmania 7001, Australia.

9:45 Genetic variation within and between species in the genus Penaeus. **S. L. F. Sunden and S. K. Davis,** Department of Animal science, Texas A & M University, College Station, Texas 77843, USA (SSE).

10:00 Break

10:15 Molecular variation in the genus Zea. **S. I. Fuerstenberg,** Department of Plant Biology, University of Minnesota, St. Paul, Minnesota 55108 USA (SSE).

10:30 The maintenance of MHC genetic diversity: mating preferences, disease resistance, and inbreeding depression. **W. K. Potts, C. J. Manning and E. K. Wakeland,** Department of Pathology, University of Florida, Gainesville, Florida 32610, USA (SSE, ASN).

Contributed Paper Session No. 28

CHARACTER ANALYSIS AND METHODOLOGY II; EDUCATION AND POLICY

Saturday, July 7, 1990, 8 AM - 12:15 PM, Tydings, Room 1101

Co-chairs:
Dr. Peter Houde, Department of Biology, Princeton University, Princeton, New Jersey 08544, USA.

Dr. Susan Weller, Department of Entomology, Smithsonian Institution, Washington, D.C. 20560, USA.

8:00 Use of universal PCR primers to amplify 28S ribosomal DNA from taxonomically diverse organisms. **P. K. Rogan,** National Cancer Institute, Frederick Cancer Research Facility, Frederick, Maryland 21701; **J. J. Salvo,** Biological Sciences Division, General Electric Corporation, Research and Development, Schenectady, New York 12301; and **P. W. Tooley,** U. S. Department of Agriculture, Ft. Detrick, Building 1301, Frederick, Maryland 21701, USA.

8:15 A new method for hybridization of repetitive DNA in systematic studies. **Peter Houde and Martin Kreitman,** Department of Biology, Princeton University, Princeton, New Jersey 08544, USA (SSE).

8:30 Relative efficiencies of the maximum parsimony and distance-matrix methods of phylogeny construction for restriction data. **L. Jin** and **M. Nei**, Center for Demographic and Population Genetics, The University of Texas Health Science Center, Houston, Texas, USA.

8:45 Plasticity of conservative characters: a systematic problem for a new genus of hydrozoan. **K. L. Mangin**, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA.

Uncertainty of the relation taxa/characters. **C. Dupuis**, Museum National d'Histoire Naturelle, Entomologie, 45 rue Buffon, 75005 Paris, France (WHS).

9:00 A multivariate study of size and shape variation in three common species of frogs found in Virginia. **R. E. Shea**, Biology Department, Randolph-Macon College, Ashland, Virginia 23005; **J. A. Mitchell**, Biology Department, University of Richmond, Richmond, Virginia 23173; and **C. A. Pague**, Natural Heritage Program, 203 Governor Street, Suite 402, Richmond, Virginia 23219, USA (SSE).

9:15 Individual variation in avian limb muscles as a potential source of error in phylogeny reconstruction. **R. J. Raikow** and **A. H. Bledsoe**, Department of Biological Sciences, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, USA (WHS, SSZ).

9:30 Morphometry of two diatoms: removing subjectivity from identification and determining relatedness. **Robin L. Rice**, University of Rhode Island Graduate School of Oceanography, Kingston, Rhode Island, USA (PSA).

9:45 Fractal geometry in systematics. **M. Molvray, S. P. Darwin** and **P. Kores**, Biology Department, Tulane University, New Orleans, Louisiana 70118, USA.

10:00 Break

10:15 Automated classificatory analyses from a DELTA database: a case study using the sedge genera of the world. **J. J. Bruhl**, Missouri Botanical Garden, St. Louis, Missouri 63110, USA (WHS).

10:30 Stable worldwide taxonomic reference systems, using the ILDIS Leguminosae prototype to illustrate the issues. **Frank A. Bisby**, Biology Department, University of Southampton, S09 5NH, United Kingdom; **Roger M. Polhill**, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, United Kingdom; and **James L. Zarucchi**, Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166, USA.

10:45 Classification methods - new vistas from a unifying theory. **A. V. Hall**, Bolus Herbarium, University of Cape Town, Rondebosch, South Africa (LSL).

11:00 Teaching evolution as science or as dogma. **Barbara J. Moon**, Department of Natural Sciences, Fraser Valley College, Abbotsford, British Columbia, Canada V2S 4N2.

11:15 Anti-evolutionism is alive and well. **Eugenie C. Scott**, Executive Director, National Center for Science Education, 2107 Dwight Way #105, Berkeley, California 94704, USA.

Contributed Paper Session No. 29

LIFE HISTORY EVOLUTION II: GROWTH, GENERATION TIME AND NATURAL SELECTION

Saturday July 7, 1990, 8:00 AM - 12:15 PM, Tydings, Room 1102

Co-chairs:
Dr. William J. Etges, Department of Zoology, University of Arkansas, Fayetteville, Arkansas 72701, USA.

Dr. George Roderick, Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

8:00 The inheritance of physiological, allocational and growth related characters in Abutilon theophrasti Medic. **K. Garbutt,** Department of Biology, West Virginia University, Morgantown, West Virginia 26506, USA (SSE).

8:15 The life history of a cricket in a variable environment: bet-hedging and phenotypic plasticity. **Michael J. Bradford** and **Derek A. Roff,** Department of Biology, McGill University, 1205 Dr. Penfield Avenue, Montreal, Quebec, Canada H3A-1B1.

8:30 Life history differences between chromosomal races in a hybrid zone of the grasshopper Caledia captiva. **F. R. Groeters** and **D. D. Shaw,** Research School of Biological Sciences, The Australian National University, Canberra, ACT 2601, Australia (SSE).

8:45 Quantitative genetic analysis of life histories in Drosophila mojavensis. **W. J. Etges,** Department of Zoology, University of Arkansas, Fayetteville, Arkansas 72701, USA.

9:00 Evolution of alternative strategies of development in spadefood toad tadpoles. **D. W. Pfenning,** Department of Zoology, Arizona State University, Tempe, Arizona 85287, USA (SSE).

9:15 Maximum lift production during takeoff in the flesh fly, Sarcophaga bullata. **David A. Berrigan,** Department of Biology, University of Utah, Salt Lake City, Utah 84112, USA (SSE).

9:30 Variation in biochemical and life history correlates of longevity with developmental perturbations in Drosophila melanogaster. **V. F. Riha** and **L. S. Luckinbill,** Department of Biological Sciences, Wayne State University, Detroit, Michigan 48202, USA (SSE).

9:45 The origin of the kelp life cycle. **L. D. Druehl** and **G. W. Saunders,** Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, Canada V5A 1S6.

10:00 Break

10:15 Significance of a complex life cycle: experimental evidence for the evolutionary transition from predation to parasitism, via phoresy, in the mite Hemisarcoptes (Acari: Hemisarcoptidae). **M. A. Houck,** Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA.

10:30 Fitness differences between macropterous and micropterous crickets; antagonistic pleiotropy or selective neutrality? **D. A. Roff,** Department of Biology, McGill University, 1205 Dr. Penfield Avenue, Montreal, Quebec, Canada H3A 1B1, and **D. J. Fairbairn,** Department of Biology, Concordia University, 1455 de Maisonneuve Boulevard West, Montreal, Quebec, Canada H3G 1M8.

10:45 Phenotype fixation and interclonal variation in the life cycle of Pemphigus aphids. **Nancy A. Moran,** Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA (SSE).

11:00 Selective advantage of flight tactics of migrating Danaus plexippus. **D. L. Gibo,** Zoology Department, Erindale Campus, University of Toronto, Mississauga, Ontario, Canada L5L 1C6.

11:15 Do any insects in the north temperate region exhibit latitudinal two-way migrations? **G. K. Roderick and R. F. Denno,** Department of Entomology, University of Maryland, College Park, Maryland 20742, USA (SSE).

CONGRESS CLOSING

Saturday July 7, 1990, 12:30 PM - 1:30 PM, Tydings, Lecture Hall, Room 0130

Presiding: **Dr. C. Barry Cox,** Co-President, Assistant Principal, King's College and Department of Zoology, University of London, Campden Hill Road, London W8 7AH, United Kingdom.

Presentation of the Engler Medal

AMERICAN SOCIETY OF NATURALISTS
Executive Committee Meeting

Saturday July 7, 1990, 1:30 PM - 3:30 PM, A. Stamp Student Union, Room 1139

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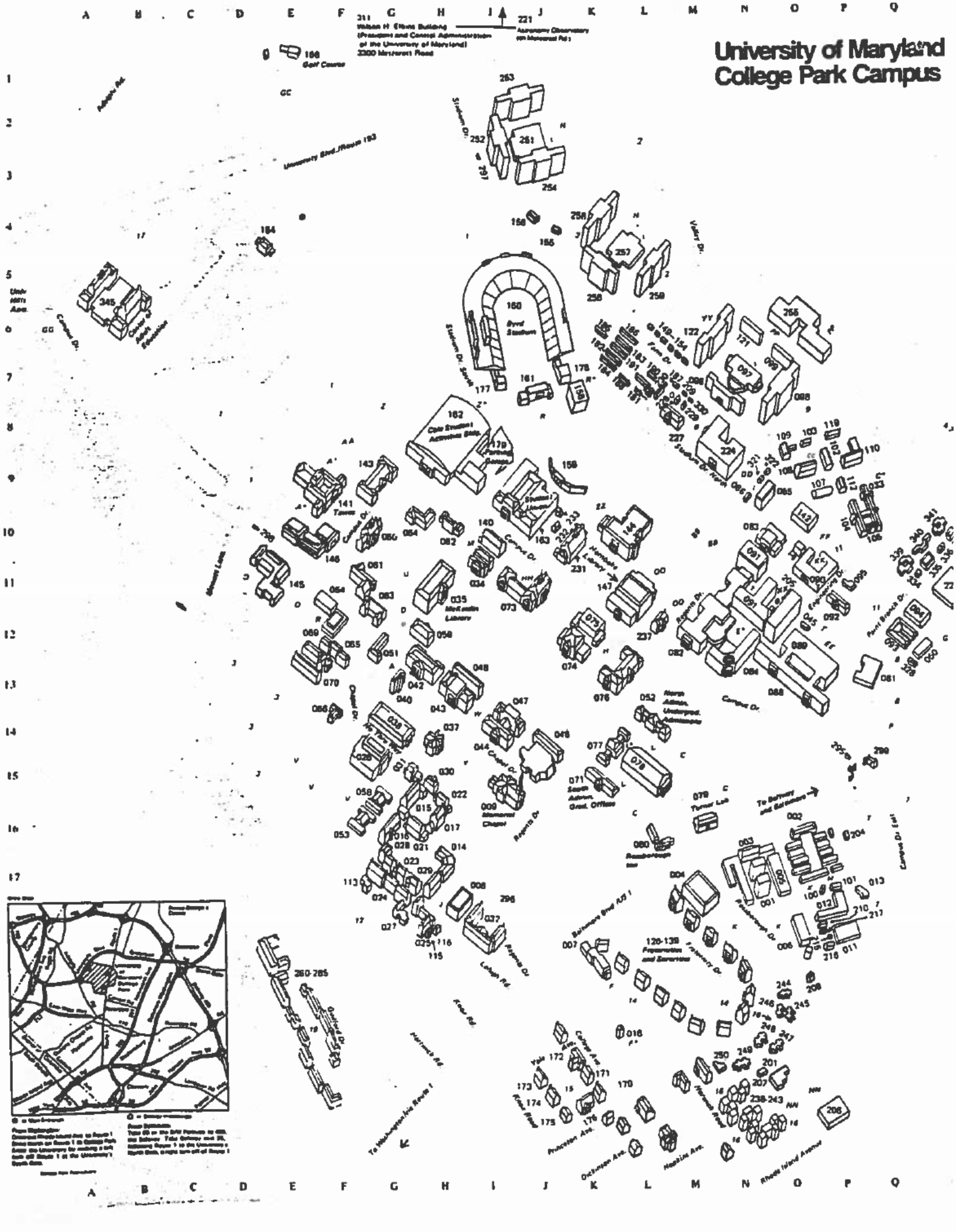
ADDENDUM TO THE PROGRAM

University of Maryland College Park Campus



LONG DAY?

* * * THE PUB * * *

Sunday through Friday 7:30 pm-12:00
except
Wednesday, 4 July
9:00-12:00

Maryland Ballroom -- No. 7 on Map
Next to Dining Hall

BEAT THE HEAT

SETTLE THAT ARGUMENT!

RELAX

PROGRAM ASSISTANCE:

Schedule Summary

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8:00 Genetic Constraints
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8:00 Databases
Union Tortuga (p. 4)
8:00 Co-evolution/Symbiosis
ArtSoc 3207 (p. 4)
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1:45 Linnaean Typification
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1:45 Contributed Papers 4
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Smithsonian Institution
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8:00 Ultraselfish Genes
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M.B. Davis, Ice Age
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Page numbers were inadvertently not included in the Abstract Volume for which we apologize.

CORRECTIONS IN THE PROGRAM

CORRECTIONS TO PRINTED PROGRAM

Correction for paragraph 8, **page xiii:**
During the Congress, the 24th Annual Festival of American Folklife sponsored by the Smithsonian Institution will be taking place near the museums in the area known as the Mall on June 27 - July 1 and July 4 - 8, 1990. Traditional music, crafts, ethnic foods, folk heritage and occupational folklife are on demonstration. This annual event will feature performances and demonstrations on the U.S. Virgin Islands, the West African Nation of Senegal, and the "Musics of Struggle" around the world.

Room change on **page xix** and **page 18:**
Contributed Paper Session No. 6, MOLECULAR AND MORPHOLOGICAL RELATIONSHIPS AMONG POPULATIONS II, Art and Sociology, **Room 3217** instead of Room 3203.

Room change on **page xxv** and **page 66:**
SOCIETY FOR THE STUDY OF EVOLUTION BUSINESS MEETING, Tuesday July 3, 1990, 7:00 PM, **Room 1139, A. Stamp Student Union,** instead of Atrium.

Room change on **page 49:**
THE AMERICAN SOCIETY OF NATURALISTS RECEPTION is in the **Atrium,** A. Stamp Student Union, instead of in the Hoff Theatre.

Date Change at top of **page 103:**
CONGRESS BANQUET (ticket required). Date should read: **Friday July 6, 1990, 6:30 PM, A. Stamp Student Union, Colony Ballroom**

REVISED SESSIONS: CURRENT SCHEDULE OF SPEAKERS

Sequenced by day and time, as in the program

Contributed Paper Session No. 1

SEX AND SEX RATIOS

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203

Co-chairs:
Dr. Lin Chao, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

Dr. Curtis M. Lively, Department of Biology, Indiana University, Bloomington, Indiana 47405, USA.

8:00 An experimental test of the tangled bank/frozen niche-variation models. **Stephen C. Weeks**, Center of Theoretical and Applied Genetics, P. O. Box 231, Rutgers University, New Brunswick, New Jersey 08903, USA (SSE).

8:15 Maintenance of sex in a heterogeneous environment. **O. E. Gaggiotti**, Center for Theoretical and Applied Genetics (CTAB), Cook College/Rutgers University, New Brunswick, New Jersey 08903 USA (SSE).

8:30 Clonal diversity and environmental heterogeneity in the population frequency of a parthenogenetic fish (Dace: Phoxinus). **C. Anna Toline** and **Mart R. Gross**, Department of Zoology, University of Toronto, Toronto, Ontario, Canada M5S 1A1 (SSE).

8:45 Helminths and the genetic diversity of North American fish and mammals. **J. Da Silva**, Department of Biology, McGill University, Montreal, P.Q., Canada H3A 1B1.

9:00 Genetic variation in thelytokous nothroid mites. **S. C. Palmer**, Cazenovia College, Cazenovia, New York 13305, and **R. A. Norton**, State University of New York, College of Environmental Science and Forestry, Syracuse, New York 13210, USA.

9:15 Digenean parasitism and the origin and consequences of apomictic parthenogenesis in a North American freshwater snail, Campeloma decisum. **Steven G. Johnson**, Museum of Natural History and Department of Systematics and Ecology, The University of Kansas, Lawrence, Kansas 66045, USA (SSE).

9:30 Cancellation

9:45 A social spider perspective on the evolution of sex ratio in structured populations. **L. Aviles**, Museum of Comparative Zoology, Harvard University,

Cambridge, Massachusetts 02138, USA and Department of Integrative Biology, University of California, Berkeley, California 94720, USA (SSE).

10:00 Break

10:15 Female-predominant sex ratios in Rumex acetosa and R. acetosella. **H. Korpelainen,** Department of Genetics, University of Helsinki, Arkadiankatu 7, SF-00100 Helsinki, Finland.

10:30 A test of the evolutionary significance of environmental sex determination in reptiles. **Fredric J. Janzen,** Department of Ecology and Evolution, University of Chicago, Chicago, Illinois 60637, USA (SSE).

10:45 Influences of incubation temperature on sex and growth of the diamondback terrapin, Malaclemys terrapin. **W. M. Roosenburg,** Department of Biology, University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA (SSE).

11:00 Evolution of sex determining mechanisms: the transition from environmental to genetic sex determination across a latitudinal gradient in Menidia menidia. **I. V. Lagomarsino and D. O. Conover,** Marine Sciences Research Center, State University of New York, Stony Brook, New York 11794, USA.

11:15 Levels of selection and the evolution of sex in RNA viruses. **Lin Chao,** Department of Zoology, University of Maryland, College Park, Maryland 20742, USA (SSE).

11:30 Parasitism in sexual and clonal fish supports assumptions of the Red Queen hypothesis. **C. M. Lively,** Biology Department, Indiana University, Bloomington, Indiana 47405; and **C. Craddock** and **R. C. Vrijenhoek,** Center for Theoretical and Applied Genetics (CTAG), Cook College, Rutgers University, New Brunswick, New Jersey 08903, USA.

Contributed Paper Session No. 2

MOLECULAR AND MORPHOLOGICAL RELATIONSHIPS AMONG POPULATIONS I

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3211

Co-chairs:
Mr. F. X. Villablanca, Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA.

Dr. Richard Highton, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

8:00 Mitochondrial DNA variation: genes, species and phylogenies. **F. X. Villablanca,** Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA (SSE, SSZ).

8:15 Cancellation

8:30 Comparison of the 5' exon and intron region of the hsp70A gene in the nematode Bursaphelenchus spp. using PCR. **K. A. Beckenbach** and **J. M. Webster,** Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia Canada V5A 1S6.

8:45 Historical zoogeography and the evolution of spawning mode in capelin, Mallotus villosus, in the North Atlantic based on mtDNA polymorphisms. **J. J. Dodson, C. Ouellet, L. Bernatchez,** Departement de biologie, Universite Laval, Quebec, Canada, and **J. E. Carscadden,** Department of Fisheries and Oceans, Northwest Atlantic Fisheries Centre, St. John's, Newfoundland, Canada (SSE).

9:00 Mitochondrial DNA differentiation of stickleback (Gasterosteus aculeatus) from the Queen Charlotte Islands, Canada. **P. O'Reilly** and **T. E. Reimchen,** Zoology Department, University of Alberta, Edmonton, Alberta, Canada T6G 2E9.

9:15 Mitochondrial DNA phlyogeographic structure of the lake whitefish, Coregonus clupeaformis complex (L.). **L. Bernatchez** and **J. J. Dodson,** Department de Biologie, Universite Laval, Quebec, Canada (SSE).

9:30 Mitochondrial DNA analyses and the origins and relative ages of unisexual lineages of the genus Poeciliopsis. **J. M. Quattro** and **R. C. Vrijenhoek,** Center for Theoretical and Applied Genetics, Rutgers University, New Brunswick, New Jersey

08903, USA and **J. C. Avise,** Department of Genetics, University of Georgia, Athens, Georgia 30602, USA (SSE).

9:45 Geographic variation in Fundulus heteroclitus: allozymes, mtDNA, and morphological shape. **M. E. Douglas,** Department of Zoology, Arizona State University, Tempe, Arizona, USA, and **M. W. Smith,** Department of Biological Sciences, University of California, San Diego, California, USA (SSE).

10:00 Break

10:15 The use of molecular biology to study the structural basis of genetic variation of the Ldh-B locus in the fish Fundulus heteroclitus. **T. Lauerman, D. Crawford** and **D. Powers,** Biological Sciences Department, Hopkins Marine Station of Stanford University, Pacific Grove, California 93950, USA.

10:30 Environmental adaptation by transcriptional regulation of the Ldh-B locus in the teleost fish Fundulus heteroclitus. **Douglas L. Crawford** and **Dennis A. Powers,** Hopkins Marine Station, Stanford University, Pacific Grove, California 93950, USA.

10:45 Genetic and environmental effects on the expression of Ldh-ß locus in the teleost fish Fundulus heteroclitus. **Douglas L. Crawford** and **Dennis A. Powers.** Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950

11:00 High mitochondrial DNA sequence divergence between geographic regions of Macaca mulatta despite few differences in allozyme polymorphisms. **G. A. Hoelzer, R. Absher** and **D. J. Melnick,** Department of Anthropology, Columbia University, New York, New York 10027, USA (SSE).

11:15 Population differentiation decreases with depth in deep-sea gastropods. **R. J. Etter,** Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543, and **M. A. Rex,** Biology Department, University of Massachusetts, Boston, Massachusetts 02125, USA.

Congress Symposium No. 28

EARLY LIFE

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Tydings Lecture Hall, Room 0130

Organizer: **Dr. J. William Schopf**, Center for the Study of Evolution and the Origin of Life, Institute of Geophysics and Planetary Physics, Geology Building, University of California, Los Angeles, California 90024, USA.

1:45 Origin of life. **Mitchell K. Hobish**, Vectrix Corporation, 5606 Rockspring Road, Baltimore, Maryland 21209, USA.

2:15 Discussion

2:25 Evolution of the Precambrian environment. **Heinrich D. Holland**, Department of Earth and Planetary Sciences, Harvard University, Cambridge, Massachusetts 02138, USA.

2:55 Discussion

3:05 Evolution of early life: molecular biology. **W. Ford Doolittle**, Department of Biochemistry, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4H7, and Canadian Institute for Advanced Research Program in Evolutionary Biology.

3:35 Discussion

3:45 Break

4:00 Evolution of early life: microfossils and stromatolites. **J. William Schopf**, Department of Earth and Space Sciences and IGPP Center for the Study of Evolution and the Origin of Life, University of California, Los Angeles, California 90024, USA.

4:30 Discussion

4:40 The Precambrian carbon cycle. **David J. Des Marais**, Ames Research Center, NASA, Moffett Field, California, USA.

5:10 Discussion

5:20 The rise of the multicellular eukaryotes. **Bruce Runnegar**, Department of Earth and Planetary Sciences, University of California, Los Angeles, California 90024, USA.

5:50 Discussion

Affiliated Society Symposium No. 8

HOST-PARASITE INTERACTIONS AND THE EVOLUTION OF REPRODUCTIVE CHARACTERISTICS

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2203

Organizers: **Dr. Samuel W. Skinner** and **Dr. Keith Clay**, Biology Department, Indiana University, Bloomington, Indiana 47405, USA.

Moderator: **S. Skinner**

1:45 Parasitic castration and selection for sexual reproduction in a freshwater snail. **Curtis Lively**, Indiana University.

2:15 Pathogens and plant mating systems. **Matthew Parker**, State University of New York.

2:45 The Red Queen dethroned: plant parasites that suppress sex in their hosts. **Keith Clay**, Indiana University.

3:15 Microorganism-mediated reproductive incompatibility in Tribolium flour beetles. **Lori Stevens**, University of Vermont.

3:45 Break

Moderator: **K. Clay**

4:00 Sex ratio dynamics: cause and consequence in an insect-pathogen interaction. **Sam Skinner**, Indiana University.

4:30 Reproductive behavior of a malarial parasite and its transmission success to the invertebrate host. **Joseph Schall**, University of Vermont.

5:00 Implications of a floral fungal disease for the reproductive biology of Silene alba. **Helen Alexander**, University of Kansas.

5:30 Cultural vectors and the evolution of disease virulence. **Paul Ewald**, Amherst College.

Contributed Paper Session No. 4

PLANT MATING SYSTEMS

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3219

Co-chairs:
Dr. Paul R. Neal, Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA.

Dr. Linda F. Delph, Department of Biology, Indiana University, Bloomington, Indiana 47405, USA.

1:45 Evidence for a genetic basis to gender in a subdioecious shrub. **L. F. Delph,** Department of Biology, Indiana University, Bloomington, Indiana 47405, USA (SSE).

2:00 Phenotypic and genetic correlations among floral traits for males and females of Silene alba. **T. R. Meagher,** Department of Biological Sciences, Rutgers University, Piscataway, New Jersey, USA (SSE, ASN).

2:15 The reproductive biology of the dioecious shrub, Lindera benzoin, in shade and sun habitats. **R. A. Niesenbaum,** Department of Biology, University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA.

2:30 Multiple paternity and selfing throughout the lifespan of individual flowers in Mimulus. **Michele R. Dudash,** Department of Botany, University of Maryland, College Park, Maryland 20742, USA, and **Kermit Ritland,** Department of Botany, University of Toronto, Toronto, Ontario, Canada M5S 3B2 (SSE).

2:45 The influence of variation in herkogamy on outcrossing rates in Turnera ulmifolia var. angustifolia. **S. Belaoussoff** and **J. S. Shore,** Department of Biology, York University, North York, Ontario, Canada M3J 1P3 (SSE).

3:00 The evolution of selfing and the phylogeny of the mustard genus Leavenworthia. **E. E. Lyons,** Biology Department, Amherst College, Amherst, Massachusetts 01002, USA (SSE).

3:15 Genetics of sex allocation in an andromonoecious plant. **Paul R. Neal,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (ASN).

3:30 Genetic evidence for multiple origin of selfing within Eichhornia paniculata (Pontederiaceae). **C.**

B. Fenster, Department of Botany, The University of Maryland, College Park, Maryland 20742, USA and **S. C. H. Barrett**, Department of Botany, The University of Toronto, Toronto, Ontario, Canada M5S 1A1 (SSE).

3:45 Asymmetric pollen flow and morph specific pollen limitation in the tristylous plant Lythrum salicaria. **P. O'Neil**, Department of Biology and Medicine, Brown University, Providence, Rhode Island 02912, USA (SSE).

4:00 An experimental evaluation of the functional significance of heterostyly in Eichhornia paniculata (Pontederiaceae). **J. R. Kohn** and **S. C. H. Barrett**, Department of Botany, University of Toronto, Toronto, Ontario, Canada M5S 3B2 (SSE).

4:15 The contribution of post-pollination mechanisms to disassortative mating in tristylous Eichhornia paniculata. **M. B. Cruzan and S. C. H. Barrett**, Department of Botany, University of Toronto, Toronto, Ontario M5S 3B2, CANADA.

4:30 Self-incompatibility and effective population size in rare plant species. **D. L. Byers** and **T. R. Meagher**, Department of Biological Sciences, Rutgers University, Piscataway, New Jersey, USA.

4:45 Intrapopulation variation in fitness consequences of mating types in Phacelia dubia. **R. F. Del Castillo**, Department of Botany, Duke University, Durham, North Carolina 27706, USA.

5:00 Pollen limitation in the facultatively autogamous annual, Lupinus nanus. **K. Karoly**, Committee on Evolutionary Biology, The University of Chicago, Chicago, Illinois 60637, USA (SSE).

5:15 The influence of self versus outcrossed mating on progeny success in natural and greenhouse populations of Aquilegia caerulea James (Ranunculaceae). **Arlee M. Montalvo**, Department of Biology, University of California, Riverside, California 92521, USA (SSE).

5:30 The effects of inbreeding depression and maternal sex on offspring fitness components in Sidalcea oregana ssp. spicata. **Tia-Lynn Ashman** and **Maureen Stanton**, Department of Botany, University of California, Davis, California 95616, USA (SSE).

5:45 Breeding system evolution in Mimulus (Scrophulariaceae). **C. B. Fenster**, Department of Botany, The University of Maryland, College Park,

Maryland 20742, USA, and **K. Ritland**, Department of Botany, The University of Toronto, Toronto, Ontario, Canada M5S 1A1, (SSE).

Contributed Paper Session No. 9

GENETIC STRUCTURE OF POPULATIONS I

Monday July 2, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203

Co-chairs:
Ms. Sabine S. Loew, Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA.

Dr. Joseph E. Neigel, Biology Department, University of Southwestern Louisiana, Lafayette, Louisiana 70504, USA.

8:00 Heterogeneity in pollen allele frequencies among cones and trees of Pinus pungens Lam. **J. P. Gibson** and **J. L. Hamrick,** Department of Botany, The University of Georgia, Athens, Georgia 30602, USA (SSE).

8:15 Population structure and linkage disequilibrium in Palaemonetes kadiakensis from Texas. **D. K. Garcia** and **S. K. Davis,** Texas A & M University, College Station, Texas 77843, USA (SSE).

8:30 Genetic population structure of Gerris remigis. **R. F. Preziosi** and **D. J. Fairbairn,** Department of Biology, Concordia University, 1455 de Maisonneuve West, Montreal, Quebec, Canada H3G 1M8 (SSE, ASN).

8:45 Analysis of dispersal from geographic variation in animal mitochondrial DNA. **J. E. Neigel,** Biology Department, University of Southwestern Louisiana, Lafayette, Louisiana 70504, USA (SSE).

9:00 Association of an allozyme polymorphism with nonmigratory behavior in the blackcap (Sylvia atricapilla). **F. Pulido,** Department of Zoology, University of Frankfurt, Siesmayerstrasse 70, D-6000 Frankfurt/M. 11, West Germany, and **P. Berthold,** Max-Planck-Institut fur Verhaltensphysiologie, Schloss Moggingen, D-7760 Radolfzell, West Germany.

9:15 Cancellation

9:30 Sex-biased dispersal, mating behavior and inbreeding avoidance in the eastern chipmunk. **S. S. Loew,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (SSE).

9:45 Searching for inbreeding depression in captive stocks of Poeciliopsis. **R. J. Schultz** and **E. Fielding,** Department of Ecology and Evolutionary

Biology, The University of Connecticut, Storrs, Connecticut, 06269, USA (SSE).

10:00 Break

10:15 Interpretation of breeding structure by fixation indices. **R. K. Chesser,** University of Georgia, Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29801, USA (SSE).

10:30 Molecular genetic determination of kinship in African lions. **C. Packer** and **A. E. Pusey,** Department of Ecology, Evolution and Behavior, University of Minnesota, Minneapolis, Minnesota 55455; **D. Gilbert,** Program Resources Inc., BCDP/NCI-FCRF, Frederick, Maryland 21701; and **S. J. O'Brien,** National Cancer Institute, Frederick, Maryland 21701, USA.

10:45 The interdependence of migration patterns and mating structures in subdivided populations. **R. B. Campbell,** Department of Mathematics and Computer Science, University of Northern Iowa, Cedar Falls, Iowa 50614, USA (SSE, ASN).

11:00 Microgeographic genetic structure of morphological and life history traits in a natural population of Impatiens capensis. **A. Argyres** and **J. Schmitt,** Graduate Program in Ecology and Evolutionary Biology, Brown University, Providence, Rhode Island 02912, USA.

11:15 Patterns of spatial and temporal variation in carrying capacities and the evolution of dispersal. **M. A. McPeek,** Archbold Biological Station, Lake Placid, Florida 33852, and **R. D. Holt,** Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA (SSE).

11:30 Predictions for structuring: temporal vs. microgeographic. **G. E. Svendsen** and **M. M. White,** Department of Zoological and Biomedical Sciences, Ohio University, Athens, Ohio 45701, USA (SSE, ASN).

11:45 Spatial and temporal genetic variation in a white-tailed deer herd. **M. H. Smith, K. B. Willis** and **P. E. Johns,** Savannah River Ecology Laboratory, University of Georgia, Aiken, South Carolina 29802, USA (SSE, ASN).

Contributed Paper Session No. 10

RATES OF EVOLUTION, AND ANALYSIS OF PHYLOGENETIC PATTERNS I

Monday July 2, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3211

Co-chairs:
Dr. Harilaos A. Lessios, Smithsonian Tropical Research Institute, Apartado 2072, Balboa, Republic of Panama.

Dr. Margaret F. Smith, Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA.

8:00 Rates of MtDNA evolution in transisthmian geminate species. **T. M. Collins, E. Bermingham** and **H. A. Lessios,** Smithsonian Tropical Research Institute, Apartado 2072, Balboa, Republic of Panama (SSE, SSZ).

8:15 A test of the mitochondrial and protein molecular clocks using organisms separated by the Isthmus of Panama. **H. A. Lessios** and **E. Bermingham,** Smithsonian Tropical Research Institute, APO Miami 34002, USA (SSE).

8:30 Molecular evidence for a shared history between Hydractinia and its hermit crab hosts. **C. W. Cunningham, L. W. Buss** and **C. Anderson,** Department of Biology, Yale University, New Haven, Connecticut 06511, USA (SSE, SSZ).

8:45 The fossil record, divergence times and extremely rapid rates of single copy DNA evolution in sand dollars. **Charles R. Marshall,** Department of Biology, Indiana University, Bloomington, Indiana 47405, USA (SSZ, SSE).

9:00 Rate of mitochondrial DNA sequence evolution in sharks. **A. P. Martin,** Department of Zoology, University of Hawaii, Honolulu, Hawaii 96822, and Pacific Biomedical Research Center, Kewalo Marine Lab, 41 Ahui Street, Honolulu, Hawaii 96813, USA (SSE).

9:15 Cancellation

9:30 Phylogenetic and taxonomic implications of variation in mitochondrial DNA, morphology, behavior, and ecology of francolins (Galliformes: Phasianidae). **Timothy M. Crowe** and **Anna A. Crow,** Fitzpatrick Institute, University of Cape Town, Rondesbosch 7700, South Africa; **Eric H. Harley** and **Mariola Jakutowicz,** Department of Chemical Pathology,

University of Cape Town, South Africa; and **Joris Komen**, Department of Birds, National Museum of Namibia, Box 1203, Windhoek 9000, Namibia (WHS).

9:45 Cercopithecine divergence estimates as determined from mitochondrial DNA sequence. **T. R. Disotell**, Department of Anthropology, Harvard University, Cambridge, Massachusetts 02138; **R. L. Honeycutt**, Department of Wildlife and Fisheries Science, Texas A & M University, College Station, Texas 77843; and **W. M. Brown** and **L. Szura**, Department of Biological Sciences, University of Michigan, Ann Arbor, Michigan 48109, USA.

10:00 Break

10:15 Resolution of the African hominoid trichotomy using a mitochondrial gene sequence. **M. Ruvolo** and **T. Disotell**, Department of Anthropology, Harvard University, 11 Divinity Avenue, Cambridge, Massachusetts 02138; **M. W. Allard**, Department of Organismal and Evolutionary Biology, Harvard University, Cambridge, Massachusetts 02138; **W. M. Brown**, Division of Biological Sciences, Natural Science Building, University of Michigan, Ann Arbor, Michigan 48109; and **R. L. Honeycutt**, Department of Wildlife and Fisheries Science and Genetics, Texas A & M University, College Station, Texas 77843, USA.

10:30 Ribosomal RNA gene sequences and hominoid phylogeny. **I. L. Gonzalez** and **J. E. Sylvester**, Hahnemann University, Pathology Department MS 435, Broad & Vine, Philadelphia, Pennsylvania 19102, USA (SSE).

10:45 Investigation of the phylogenetic relationship of humans and the great apes by analysis of restriction fragment length variations in nuclear DNA. **K. I. Zeller** and **M. J. Braun**, Laboratory of Molecular Systematics, Smithsonian Institution, Washington, D. C. 20560; and Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221, USA.

11:00 DNA sequence cladograms of the Bovidae and the evolution of African antelopes. **J. Gatesy** and **E. Vrba**, Department of Geology and Geophysics, Yale University, New Haven, Connecticut 06511; and **D. Yellon** and **R. DeSalle**, Department of Biology, Yale University, New Haven, Connecticut 06511, USA.

11:15 Molecular phylogeny of some Bovidae using restriction endonuclease mapping. **E. H. Harley, M. F. Essop** and **I. Baumgarten**, Department of Chemical Pathology, University of Cape Town, Cape Town, South

Africa.

11:30 Variation in mitochondrial cytochrome b sequence in South American akodontine rodents [Muridae: Sigmodontinae]. **M. F. Smith** and **J. L. Patton,** Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA.

11:45 Systematics and evolution of the Bathyergidae. **M. W. Allred,** Museum of Comparative Zoology and Department of Organismic and Evolutionary Biology, Harvard University, 26 Oxford Street, Cambridge, Massachusetts 02138, and **R. L. Honeycutt,** Department of Wildlife and Fisheries Sciences, 210 Nagle Hall, Texas A & M University, College Station, Texas 77843, USA (WHS, SSZ, SSE).

Poster Session No. 5

MOLECULAR AND CHROMOSOMAL EVOLUTION

Monday, July 2, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

39. Markovian aspects of molecular evolution and the Dayhoff Mutation Data Matrix. **G. Y. Srinivasarao, D. G. George** and **W. C. Barker,** National Biomedical Research Foundation, Washington, D.C., USA.

40. Restriction site variation in Hyla and Pseudacris. **D. L. Jameson,** Molecular Systematics, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118, and **Nese Muderrisoglu,** Room 2C-109, Orea(151), 1400 VFW Parkway, W. Roxbury, Massachusetts 02132, USA (SSE).

41. Is mitochondrial genome conformation uniform at the family, genus or species level in the Volvocales? **A. W. Coleman,** Department of Biology and Medicine, Brown University, Providence, Rhode Island 02912; and **L. J. Moore** and **L. J. Goff,** Department of Biology, University of California, Santa Cruz, California 95064, USA.

42. Phylogeny, rates and type of DNA change of the Adh gene and the origin of the Hawaiian Drosophila. **John A. Hunt** and **Richard H. Thomas,** Department of Genetics, University of Hawaii, Honolulu, Hawaii 96822, USA.

43. Isolation and characterization of chorion cDNAs from gypsy moth, and their comparison with sequences from two bombycoids. **R. F. LeClerc** and **J. C. Regier,** Center for Agricultural Biotechnology and Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

44. Organisation and evolution of ribosomal RNA genes in Lathyrus. **S. D. Ahmad** and **R. K. J. Narayan,** Department of Agricultural Sciences, University College of Wales, Aberystwyth, Wales SY23 3DD, United Kingdom.

45. Evolution of Ribosomal DNA in Salmonid Fishes. **R. B. Phillips, K. A. Pleyte** and **M. R. Brown,** Department of Biological Sciences, University of Wisconsin, Milwaukee, Wisconsin 53201, USA (SSE).

46. Evolutionary rates of group II introns in the inverted repeat and single copy regions of chloroplast genomes. **G.H. Learn** and **M.T. Clegg,** Department of Botany and Plant Sciences, University of California, Riverside, California 92521, USA (SSE).

47. Genomic distribution of rapidly evolving heterochromatic

sequences in the equids. **H. A. Wichman,** Department of Biological Sciences, University of Idaho, Moscow, Idaho 83843; **O. A. Ryder,** Research Department, San Diego Zoo, San Diego, California 92112; and **M. J. Hamilton, M. Maltbie** and **R. J. Baker,** Department of Biology, Texas Tech. University, Lubbock, Texas 79409, USA.

48. Host-independent evolution of the hepadnavirus family. **Y. Ina,** National Institute of Genetics*, Mishima 411, Japan, **M. Mizokami, E. Orito, N. Kameshima** and **M. Yamamoto,** Nagoya City University Medical School, Nagoya 467, Japan; and **E. N. Moriyama*** and **T. Gojobori***.

49. Hybrid zone dynamics between two chromosome races of the Sceloporus grammicus complex: the nature and behavior of chromosome 2. **K.M. Reed,** Department of Biology, Texas A & M University, College Station, Texas 77843; **J. W. Sites, Jr.,** Department of Zoology, Brigham Young University, Provo, Utah 84602; and **I.F. Greenbaum,** Department of Biology, Texas A & M University, College Station, Texas 77843, USA.

50. In situ hydridization analysis of chromosomal homologies in Drosophila and related genera. **D. E. Jeffery, Y. Su, J. L. Farmer, J. H. Whiting, Jr., K. Hatch** and **S. Stallings,** Zoology Department, Brigham Young University, Provo, Utah 84602, USA (SSE).

51. Meiotic and evolutionary consequences of chromosomal polymorphisms in deer mice (Peromyscus). **I. F. Greenbaum, D. W. Hale** and **P. D. Sudman,** Department of Biology, Texas A & M University, College Station, Texas 77843, USA (SSE).

52. Modification of meiotic pairing behavior by addition of homologous heterochromatic segments to the X and Y chromosomes in Peromyscus. **D. W. Hale, P. D. Sudman, M. C. Hedin, S. A. Smith,** and **I. F. Greenbaum,** Department of Biology, Texas A & M University, College Station, Texas 77843, USA (SSE).

52A. Relationships between retroposons and retroviruses - more on the evolution of the retroid family. **M. McClure,** Department of Ecology and Evolutionary Biology, University of California, Irvine, California 92717, USA.

52B. Hypervariable and conserved regions in NADH dehydrogenase genes in mammalian mitochondrial DNA. **C. A. MILLAN, D. E. PUMO, C. J. PHILLIPS,** and **A. K. WILLIAMS,** Department of Biology, Hofstra University, Hempstead, NY 11550, USA.

Poster Session No. 6

PHYLOGENETIC RELATIONSHIPS AND DIVERSITY

Monday, July 2, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM

53. A revision of the taxonomists community in Spain. **E. Bello** and **A. Garcia-Valdecasas,** Museo Nacional de Ciencias Naturales, Jose Gutierrez Abascal, 2 Madrid-28006, Spain.

54. Using taxonomical numerical systems for biological data bases. **J. M. Becerra** and **A. Garcia-Valdecasas,** Museo Nacional de Ciencias Naturales, Jose Gutierrez Abascal, 2 Madrid-28006, Spain.

55. Consistency indices and random data sets, or, how low can you get? **G. Klassen, R. D. Mooi** and **A. Locke.** Department of Zoology, University of Toronto, Toronto, Ontario, Canada M5S 1A1 (SSE).

56. A name-checker and data source for the world's Leguminosae: a demonstration of the ILDIS Phase 1 Database. **Frank A. Bisby** and **Susan Hollis,** ILDIS Co-ordinating Centre, Biology Department, The University, Southampton S09 5NH, United Kingdom; **James L. Zarucchi,** Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166, USA; **Roger M. Polhill** and **Bob Allkin,** Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, United Kingdom; and **Peter J. Winfield,** Department for Agriculture and Fisheries for Scotland, East Craigs, Edinburgh EH12 8NJ, Scotland, United Kingdom.

56A. The influence of character number and sample size on the reliability of a cladistic hypothesis. **M. H. Kesner,** Biology Department, Indiana University of Pennsylvania, Indiana, Pennsylvania 15705, USA.

57. Examples supporting a polyphasic approach to microbial systematics: a study of the Vibrionaceae. **Sue E. Steven,** Naval Medical Research Institute, Bethesda, Maryland 20814; **Rita R. Colwell,** Microbiology Department, University of Maryland, College Park, Maryland 20742; and **Rose Coty** and **Robert Gherna,** American Type Culture Collection, Rockville, Maryland 20852, USA.

58. Phylogeny of marine bacteria based on 16S rRNA partial sequence. **K. Kita-Tsukamoto,** Ocean Research Institute, University of Tokyo, Minamidai, Nakano, Tokyo 164; **H. Oyaizu,** Department of Biology, College of Liberal Arts, Toyama University, Toyama 930; **K. Nanba** and **U. Simidu,** Ocean Research Institute, University of Tokyo, Minamidai, Nakano, Tokyo 164, Japan.

59. Taxonomical study in culture of Oscillatoriaceae strains (Cyanophyceae, Cyanobacteria): joint use of morphological, autoecological and molecular characterizations. **A. Wilmotte,** Department of Biochemistry, University of Antwerp (UIA), Universiteitsplein, 1, B-2610 Antwerp, Belgium.

60. Codium systematics as delineated by restriction fragment analysis. **L. B. Liddle,** Long Island University, Southampton, New York 11968, and **L. J. Goff,** Department of Biology, University of California, Santa Cruz, California 95064, USA.

61. Phylogenetic analysis of the Micromonadophyceae and Pleurastrophyceae based on cytoplasmic rRNA sequence analysis. **T. S. Kantz, R. L. Chapman,** Department of Botany, and **E. A. Zimmer,** Department of Biochemistry, Louisiana State University, Baton Rouge, Louisiana 70803, USA.

62. Are ancient divergences clearly recorded in nuclear-encoded ribosomal RNA gene sequences in the green algae (Chlorophyta)? **R. L. Chapman, M. A. Buchheim, T. S. Kantz, F. W. Zechman,** Department of Botany, and **E. A. Zimmer,** Department of Biochemistry, Louisiana State University, Baton Rouge, Louisiana 70803, USA.

63. Further development of a ribosomal RNA phylogeny for the grasses. **L. E. Issel, R. K. Hamby,** Department of Biochemistry, and **E. A. Zimmer,** Department of Botany and Biochemistry, Louisiana State University, Baton Rouge, Louisiana, 70803.

64. Genetic divergence in the Marshallia graminifolia complex (Asteraceae): a previously hypothesized progenitor-derivative species-pair. **Linda W. Watson, Wayne J. Elisens** and **James R. Estes,** Oklahoma Biological Survey and Department of Botany and Microbiology, University of Oklahoma, Oklahoma 73019, USA (SSE).

65. Phylogenetic analyses of the Polemoniaceae using cpDNA sequence data. **K. P. Steele,** Department of Biology, Appalachian State University, Boone, North Carolina 28608; and **R. Vilgalys, S. Rehner** and **P. Thrall,** Department of Botany, Duke University, Durham, North Carolina 27706, USA (SSZ).

66. Evolutionary relationships in Hormogaster (Oligochaeta, Hormogastridae): biochemical variation and palaeogeography. **M. Cobolli Sbordoni** and **E. De Matthaeis,** Dipartimento di Biologia Animale e dell'Uomo, Universita di Roma "La Sapienza", 00185 Roma, Italy; and **M. Mattoccia, P. Omodeo** and **E. Rota,** Dipartimento di Biologia, Universita di Roma "Tor Vergata", 00173 Roma, Italy.

67. Allozyme studies on the evolution of "glacial relict" crustaceans. **R. Vainola,** Department of Genetics, University of Helsinki, Finland.

68. Biomass of the coral rubble cryptofaunal community of St. Croix. **D. J. Morrin,** Department of Zoology, Program in Marine-Estuarine Environmental Sciences, University of Maryland, College Park, Maryland 20742, USA.

69. Biochemical systematics of the Pteronarcyidae (Plecoptera). **M. M. White,** Department of Zoological and Biomedical Sciences, Ohio University, Athens, Ohio 45701, USA.

70. Phylogenetic analysis of Great Lakes ictalurids based on mitochondrial DNA and allozyme differentiation. **M. H. Murdoch, R. G. Danzmann, L. J. Weider** and **P. D. N. Hebert,** Department of Biological Sciences, Great Lakes Institute, University of Windsor, Windsor, Ontario, and Department of Zoology, University of Guelph, Guelph, Ontario, Canada (SSE).

71. A molecular perspective on the evolutionary relationships of the salamander families. **Allan Larson,** Department of Biology, Washington University, St. Louis, Missouri 63130, USA (SSE).

72. Patterns in the evolution of tiger snakes. **Terry D. Schwaner,** Virginia Museum of Natural History, 1001 Douglas Avenue, Martinsville, Virginia 24112, USA.

73. Phylogenetic and geographic relations of North American colubroid snakes. **Herndon G. Dowling,** Department of Biology, New York University, New York, New York 10003, USA (SSE).

74. "Relic" colubroid snakes of North America. **Theodora Pinou,** Department of Biology, New York University, New York, New York 10003, USA.

75. A phylogenetic analysis of the Alligatoridae based on mitochondrial DNA nucleotide sequence data. **G. D. Amato,** New York Zoological Society, Bronx Zoo, Bronx, New York 10460; **J. Gatesy,** Department of Geology and Geophysics, Yale University, New Haven, Connecticut 06511; and **M. A. Norell,** Department of Vertebrate Paleontology, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024, USA (SSE).

76. Evolution and systematics of cetaceans: a serum albumin immunological, and biochemical perspective. **Don Lint,** Department of Zoology, University of Manitoba, Winnipeg, Manitoba, Canada, and **Jim Clayton, Margaret Friesen, Ross Lillie** and **Lianne Postma,** Canada Department of Fisheries and Oceans, Winnipeg, Manitoba, Canada (SSE).

77. Phylogenetic relationships among neotropical primates. **T. Fanning** and **A. Reid,** Department of Cellular Pathology, AFIP/WRAMC, Washington, D.C. 20306 (SSE); and **H. Seuanez,** Laboratory of Viral Carcinogenesis, NCI/NIH, Frederick, Maryland 21701, USA (SSE).

Contributed Paper Session No. 11

ANALYSIS OF PHYLOGENETIC PATTERNS II

Monday July 2, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2309

Co-chairs:
Dr. C. Riley Nelson, Department of Zoology, University of Texas, Austin, Texas 78712, USA.

Dr. Daphne G. Fautin, Department of Systematics and Ecology, University of Kansas, Lawrence, Kansas 66045; and Kansas Geological Survey, University of Kansas, Lawrence, Kansas 66046, USA.

1:45 Phylogeny of the species within the Drosophila melanogaster subgroup and their relationships with the oriental subgroup. **L. Nigro**, Dipartimento di Biologia, Universita' di Padova, 35121 Padova, Italy, and **M. Solignac**, Laboratoire de Biologie et Genetique Evolutives, 92298 Gif-sur-Yvette, France.

2:00 Vitellogenin gene evolution in Hawaiian Drosophila. **E. M. Craddock**, Division of Natural Sciences, State University of New York, Purchase, New York 10577; and **K.-W. Dong, M. Parisi, K. F. Ho, V. C. Bromleigh** and **M. P. Kambysellis**, Department of Biology, New York University, New York, New York 10003, USA (SSE).

2:15 Phylogenetics of North American winter stoneflies (Insecta: Plecoptera: Capniidae). **C. R. Nelson**, Department of Zoology, University of Texas, Austin, Texas 78712, USA.

2:30 Cladistic analysis of the Ochrotrichia shawnee group (Trichoptera: Hydroptilidae) including a new member from the Interior Highland region of northwestern Arkansas. **Kenneth S. Frazer** and **Steven C. Harris**, Aquatic Biology Program, University of Alabama, Tuscaloosa, Alabama 35487, USA (SSZ).

2:45 On the monophyly and the sister group of polygyrid land snails. **K. C. Emberton**, Department of Malacology, Academy of Natural Sciences, 19th and the Parkway, Philadelphia, Pennsylvania 19103, USA (SSZ, SSE).

3:00 Phylogenetic relationships among scleractinians, actinians, and corallimorpharians. **D. G. Fautin**, Department of Systematics and Ecology, University of Kansas, Lawrence, Kansas 66045; Kansas Geological Survey, University of Kansas, Lawrence, Kansas 66046, and Department of Invertebrate Zoology,

California Academy of Sciences, Golden Gate Park, San Francisco, California 94118; and **J. M. Lowenstein**, University of California, San Francisco, California 94143, and California Academy of Sciences, Golden Gate Park, San Francisco, California 94118, USA (SSZ).

3:15 Fossil planktonic foraminiferal amino acid compositions as a chemotaxonomic character. **L. Stathoplos**, Graduate School of Oceanography, University of Rhode Island, Narragansett, Rhode Island 02882, USA.

3:30 Break

3:45 Origin of tetrapods inferred from their mitochondrial DNA affiliation to lungfish. **Axel Meyer** and **Allan C. Wilson**, Division of Biochemistry and Molecular Biology, University of California, Berkeley, California 94720, USA (SSE).

4:00 Genetic biogeography of anchovies in the genus Engraulis. **W. Stewart Grant**, Department of Genetics, University of the Witwatersrand, 2050 Johannesburg, South Africa, and **Robin W. Leslie**, Sea Fisheries Research Institute, 8012 Cape Town, South Africa.

4:15 Smelt phylogeny and the pattern of reductive evolution. **D. P. Begle**, Division of Fishes, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109, USA (SSZ).

4:30 Convergent evolution of nasal structure in sedentary Elasmobranchs. **Michael A. Bell**, Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (SSE).

4:45 Evolution of length polymorphisms and heteroplasmy in the D-loop region of sturgeon mitochondrial DNA. **J. R. Brown, A. T. Beckenbach** and **M. J. Smith**, Institute of Molecular Biology and Biochemistry, Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, Canada V5A 1S6 (SSE).

5:00 Character evolution and phylogenetic relationships among populations of the yellow warbler (Dendroica petechia). **Nedra K. Klein**, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109, USA (SSE).

Congress Symposium No. 14

DIVERSIFICATION: PATTERNS, RATES, CAUSES, AND CONSEQUENCES

Tuesday July 3, 1990, 9:00 AM - 12:15 PM, Architecture, Room 0204

Organizers: **Dr. Alan Kohn**, Department of Zoology, University of Washington, Seattle, Washington 98195; **Dr. Charles Mitter** and **Brian Farrell**, Department of Entomology, University of Maryland, College Park, Maryland 20742, USA.

9:00 Introductory comments by Moderator. **Alan J. Kohn**, Department of Zoology, University of Washington, Seattle, Washington 98195, USA.

9:05 Overview of Phanerozoic diversity patterns. **J. John Sepkoski, Jr.**, Department of Geophysical Sciences, University of Chicago, Chicago, Illinois 60637, USA.

9:40 Estimating probabilities of origination and extinction. **N. L. Gilinsky**, Department of Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA.

10:10 Break

10:30 Gastropod morphology and durophagous predation through geologic time: the Mesozoic marine revolution reconsidered. **P. W. Signor**, Department of Geology, University of California, Davis, California 95616, USA.

11:05 Diversification patterns in the most diverse marine snail genus. **Alan J. Kohn**, Department of Zoology, University of Washington, Seattle, Washington 98195, USA.

Affiliated Society Symposium No. 1

RATES AND WEIGHTS: RATES OF EVOLUTION AND CHARACTER WEIGHTING (WILLI HENNIG SOCIETY)

Tuesday July 3, 1990, 1:45 PM - 6:00 PM, A. Stamp Student Union, Tortuga Room

Organizer: **Dr. Christopher J. Humphries,** Botany Department, British Museum, Cromwell Road London SW7 5BD, United Kingdom.

1:45 Introduction. **C. J. Humphries**, Department of Botany, The Natural History Museum, London.

2:00 Weighting: successive, spectral, paradoxical, and phantasmal. **J. S. Farris**, Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA.

2:45 Weighted parsimony. **W. Fitch**, Department of Ecology and Evolutionary Biology, University of California, Irvine, California 92717, USA.

3:30 Break

4:00 Tempo and mode of evolution of the cytochrome b gene. **D. Irwin,** Department of Molecular and Cell Biology, University of California, Berkeley, California 94720, USA.

4:45 General Discussion

Affiliated Society Workshop No. 12

MOLECULAR EVOLUTION OF ARCHAEBACTERIA (UNIVERSITY OF MARYLAND CENTER FOR MARINE BIOTECHNOLOGY; CO-SPONSORED BY THE ASSOCIATION OF SYSTEMATIC COLLECTIONS)

Wednesday July 4, 1990, 9:30 AM - 6:30 PM, Center of Marine Biotechnology, Baltimore, Maryland
(By invitation. Limited space available, see Registration Desk. Buses leave College Park at 8:00 AM for transportation to COMB.)

Organizer: **Dr. Frank Robb,** Center of Marine Biotechnology, University of Maryland, Baltimore, Maryland.

9:00	Introduction and review of workshop format. **Frank Robb,** Center for Marine Biotechnology, University of Maryland, Baltimore, Maryland.
9:10	The natural history of archaebacteria. **J. Baross.**
9:45	The phylogeny of archaebacteria. **J. Lake**
10:30	Break
10:45	Molecular genetics of archaebacteria: An overview. **W. F. Doolittle.**
11:30	Cancellation
12:15	Discussion
12:30	Lunch at COMB
1:45	The RNA database and physical mapping of archaebacterial genomes. **L. Achenbach**
2:45	Molecular methods for assessing microbial diversity. **D. Stahl**
3:45	Biotechnology: Using archaebacterial systems. **R. Kelly, M. Adams, & E. Chang**
5:00	Buses leave for College Park Seafood Feast

Sponsors: International Congress of Systematic and Evolutionary Biology, Center of Marine Biotechnology, Bechman Instruments, Office of Naval Research, Sun Microsystems.

Congress Symposium No. 13

THE ROLE OF SYSTEMATICS AND EVOLUTION IN BIOTECHNOLOGY

Thursday July 5, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2203

Organizer: **Dr. Rita Colwell,** Director, Maryland Biotechnology Institute, University of Maryland, College Park, Maryland 20742, USA.

8:00 Molecular phylogenetic studies of the rumen microbial ecosystem. **D. A. Stahl, R. Key** and **B. Flesher,** University of Illinois, Urbana, Illinois 61801; **L. Montgomery,** University of Michigan, Ann Arbor, Michigan 48109, USA; and **R. I. Amann,** Technische Universitat Munchen, 8000 Munchen Z, Federal Republic of Germany.

8:30 Molecular evolution of 15s ribosomal RNA. **Hiroshi Hori,** Department of Genetics, Hiroshima University, Hiroshima, Japan.

9:00 Molecular genetics and systematics of the Enterobacteriaceae. **Patrick Grimont,** Institut Pasteur, Paris, France.

9:30 Nucleic acid probes in microbial systematics. **Gary Olson,** Department of Microbiology, University of Illinois, Urbana, Illinois, USA.

10:00 Break

10:15 Cancellation

10:45 Phylogenetic analysis of marine picoplankton diversity by ribosomal RNA gene cloning and sequencing. **T. B. Britschgi, C. L. Moyer, K. G. Field** and **Steve Giovannoni,** Department of Microbiology, Oregon State University, Corvallis, Oregon 97331, USA.

(Contributed Paper)

11:15 The role of systematics in drug discovery: predicting trends in bioactivity of marine natural products. **S. A. Pomponi,** Harbor Branch Oceanographic Institution, Inc., Division of Biomedical Marine Research (HBOI/DBMR), Fort Pierce, Florida 34946, USA; **R. D. McCauley, P. T. Murphy** and **R. H. Willis,** Australian Institute of Marine Science, Townsville, Australia; **J. K. Reed,** HBOI/DBMR and **K. M. Snader,** National Cancer Institute, Division of Cancer Treatment, Natural Products Branch, Frederick, Maryland 21701, USA.

Discussion Group No. 6

CO-EVOLUTION: SYMBIOSIS IN EVOLUTION

Thursday July 5, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3207

Organizer: **Dr. Mary Beth Saffo**, Institute of Marine Sciences, University of California, Santa Cruz, California 95064, USA.

Questions

Is symbiosis a source of evolutionary innovation?

Co-evolution theory, mutualism theory, and endosymbiotic interactions: do mutualistic endosymbioses listen to evolutionary theorists?

Discussants will include: **Lynda J. Goff**, University of California, Santa Cruz, California 95064; **Robert M. May**, FRS, Department of Pure and Applied Biology, Imperial College, Prince Consort Road, London SW7 2BB, England, United Kingdom; **John Maynard Smith**, FRS, School of Biological Sciences, University of Sussex, Falmer, Brighton BN1 9QG, England, United Kingdom; and **John Thompson**, Washington State University, Pullman, Washington, USA.

Contributed Paper Session No. 16

MECHANISMS OF ISOLATION, SPECIATION AND HYBRIDIZATION

Thursday, July 5, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203

Co-chairs:
Ms. Nancy L. Reagan, Department of Ecology and Evolution, University of Chicago, 940 East 57th Street, Chicago, Illinois 60637, USA.

Dr. Judy Rhymer, Laboratory of Molecular Systematics, Museum Support Center, Smithsonian Institution, Washington, D.C. 20560, USA.

8:00 The role of natural selection in the acquisition of isolating mechanisms. **Rosaura Ruiz G.,** Departamento de Biologia, Facultad de Ciencias, Universidad National Autonoma de Mexico, Ciudad Universitaria, 04510, Mexico, D. F. Mexico.

8:15 The evolution of sexual isolation within the Desmognathus ochrophaeus complex. **P. A. Verrell,** Department of Ecology and Evolution, University of Chicago, Chicago, Illinois 60637, USA.

8:30 Evolution of sexual isolation in salamanders: Plethodon jordani, P. tevahalee and their hybrids. **Nancy L. Reagan,** Department of Ecology and Evolution, University of Chicago, 940 East 57th Street, Chicago, Illinois 60637, USA (SSE).

8:45 Cricket calling song displacement in a zone of overlap and hybridization. **J. H. Benedix, Jr.,** Division of Biology, Kansas State University, Manhattan, Kansas 66506, and **D. J. Howard,** Department of Biology, New Mexico State University, Las Cruces, New Mexico 88003, USA (SSE).

9:00 Courtship songs, reproductive isolation, and hybridization in green lacewings (Neuroptera: Chrysopidae: Chrysoperla). **Marta M. Wells** and **Charles S. Henry.** Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut 06268, USA (SSE).

9:15 Sympatric fireflies (Col.: Lampyridae) in a temperate Guatemalan site: fenological and behavioral differences. **Jack C. Schuster,** Biology Department, Universidad del Valle de Guatemala, Apartado Postal No. 82, Guatemala.

9:30 Reproductive isolating mechanisms in two host-

associated strains of a noctuid moth, Spodoptera frugiperda. **D. P. Pashley,** Entomology Department, Louisiana State University, Baton Rouge, Louisiana 70803, USA (SSE).

9:45 Host plant-induced assortative mating in Encenopa treehoppers. **T. K. Wood,** Department of Entomology and Applied Ecology, University of Delaware, Newark, Delaware 19717, and **M. C. Keese,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (SSE).

10:00 Break

10:15 The ecology and genetics of Rhagoletis pomonella host races. **Jeffrey L. Feder,** Biology Department, Princeton University, Princeton, New Jersey 08544, and **Guy L. Bush,** Zoology Department, Michigan State University, East Lansing, Michigan 48824, USA (SSE).

10:30 Families vs. phenology: the conversion of Orgyia vetusta from a generalist to a specialist. **Barbara L. Bentley** and **Nelson D. Johnson,** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794, USA (ASN).

10:45 Botanical ecotones and butterfly hybrid zones. **J. M. Scriber, R. C. Lederhouse** and **R. H. Hagen,** Department of Entomology, Michigan State University, East Lansing, Michigan 48824, USA (SSE, ESA).

11:00 Sex chromosomes and speciation in tiger swallowtails (Papilio glaucus group [Lepidoptera: Papilionidae]). **Robert H. Hagen** and **J. Mark Scriber,** Department of Entomology, Michigan State University, East Lansing, Michigan 48824, USA.

11:15 Gamete incompatibility between closely related Hawaiian sea urchins, genus Echinometra. **E. C. Metz** and **S. R. Palumbi,** Department of Zoology, University of Hawaii, Honolulu, Hawaii 96822, USA (SSE).

11:30 Molecular evidence for the origin of Gossypium bickii via homoploid reticulate speciation. **J. F. Wendel,** Department of Botany, Iowa State University, Ames, Iowa 50011; **J. McD. Stewart,** Department of Agronomy, University of Arkansas, Fayetteville, Arkansas 72701; and **J. H. Rettig,** Department of Biology, Texas A & M University, College Station, Texas 77843, USA (SSE).

11:45 The potential for genetic exchange by transformation within a natural population of Bacillus subtilis. **F. M. Cohan, M. S. Roberts** and **E. C. King,**

Department of Biology, Wesleyan University, Middletown, Connecticut 06457, USA (SSE).

12:00 Cancellation

Affiliated Society Symposium No. 10

EVOLUTIONARY GENETICS OF AGING
(THE SOCIETY FOR THE STUDY OF EVOLUTION)

Friday July 6, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2309

Organizer: **Dr. Michael R. Rose**, Department of Ecology and Evolutionary Biology, School of Biological Sciences, University of California, Irvine, California 92717, USA.

1:45 Introduction to the evolution of aging - the theories and their tests. **Michael R. Rose**, Department of Ecology and Evolutionary Biology, School of Biological Sciences, University of California, Irvine, California 92717, USA.

2:45 Physiology of the evolution of aging in Drosophila. **Joseph L. Graves**, Department of Ecology and Evolutionary Biology, School of Biological Sciences, University of California, Irvine, California 92717, USA.

3:15 Mutation accumulation and the evolution of Drosophila ageing. **Laurence D. Mueller**, Department of Ecology and Evolutionary Biology, School of Biological Sciences, University of California, Irvine, California 92717, USA.

3:45 Break

4:00 Antagonistic pleiotropy in the evolution of nematode aging: a genetic analysis. **Thomas E. Johnson, E. F. Hutchinson** and **P. T. Tedesco**, Institute for Behavioral Genetics, University of Colorado, Boulder, Colorado 80309, USA.

4:30 The evolution of the soma in the green flagellates. **Vassiliki Koufopanou**, Department of Biology, McGill University, Montreal, Quebec, Canada J3A 1B1.

Contributed Paper Session No. 25

CHARACTER ANALYSIS, PHYLOGENETIC INFERENCE AND METHODOLOGY I

Friday, July 6, 1990, 1:45 PM - 6:00 PM, LeFrak, Room 2205

Co-chairs:
Dr. Carey Krajewski, Laboratory of Molecular Systematics, Smithsonian Institution, Washington, D. C. 20560, USA.

Dr. Anthony H. Bledsoe, Department of Biological Sciences, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, USA.

1:45 Phenetics versus cladistics: the fight of the century or blind-man's buff? **Richard M. Bateman,** Paleobiology Department, Smithsonian Institution, Washington, D. C. 20560, USA

2:00 Relative efficiencies of various methods for phylogenetic tree reconstruction and their applications to molecular data. **Naruya Saitou,** Department of Anthropology, University of Tokyo, Tokyo, Japan.

2:15 Bootstrap analysis of phylogenetic trees derived from DNA hybridization distances. **Carey Krajewski,** Laboratory of Molecular Systematics, Smithsonian Institution, Washington, D. C. 20560, and **Allan W. Dickerman,** University of Wisconsin Zoological Museum, Madison, Wisconsin 53706, USA (SSZ).

2:30 Molecular homology and DNA hybridization. **A. H. Bledsoe,** Department of Biological Sciences, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, and **F. H. Sheldon,** The Academy of Natural Sciences, Philadelphia, Pennsylvania 19103, USA (SSE).

2:45 Computer programs for molecular systematics: restriction mapping management and analysis; molecular evolution simulations for testing phylogenetic reconstructions. **E. H. Harley,** Department of Chemical Pathology, University of Cape Town, Cape Town, South Africa.

3:00 Phylodat: a graphic universal front-end for data entry for phylogenetic analysis programs. **A. R. Lee,** Episcopal Church of the Holy Spirit, 601 Philippe Parkway, Safety Harbor, Florida 34695, USA.

3:15 The asymmetry of phylogenetic trees: stochastic simulations and cladistic results. **Sherman Suter,** Committee on Evolutionary Biology, Department of Geophysical Sciences, University of Chicago, 5734

S. Ellis Avenue, Chicago, Illinois 60637, USA (SSE).

3:30 Break

3:45 Cancellation

4:00 Assessment of phylogenetic content of a data-matrix. **W. J. Le Quesne,** Cicadella, Route de Noirmont, St. Brelade, Jersey, Channel Islands, United Kingdom (SSZ).

4:15 Homoplasy slope ratio and standardized homoplasy index: better measurements of observed homoplasy in cladistic analyses. **R. Meier, P. Kores** and **S. Darwin,** Department of Biology, Tulane University, New Orleans, Louisiana 70118, USA (SSZ).

4:30 Correlated evolution of continuous traits: a simulation study. **E. P. Martins** and **T. Garland, Jr.,** Department of Zoology, University of Wisconsin, Madison, Wisconsin 53706, USA (SSE).

4:45 Continuous characters and the general applicability of classifications. **G. D. E. Povel,** Leiden University, Department of Population Biology, Division of Systematic Zoology, P. O. Box 9516, 2300 RA Leiden, The Netherlands.

5:00 Cancellation

Contributed Paper Session No. 28

CHARACTER ANALYSIS AND METHODOLOGY II; EDUCATION AND POLICY

Saturday, July 7, 1990, 8 AM - 12:15 PM, Tydings, Room 1101

Co-chairs:
Dr. Peter Houde, Department of Biology, Princeton University, Princeton, New Jersey 08544, USA.

Dr. Susan Weller, Department of Entomology, Smithsonian Institution, Washington, D.C. 20560, USA.

8:00 Use of universal PCR primers to amplify 28S ribosomal DNA from taxonomically diverse organisms. **P. K. Rogan,** National Cancer Institute, Frederick Cancer Research Facility, Frederick, Maryland 21701; **J. J. Salvo,** Biological Sciences Division, General Electric Corporation, Research and Development, Schenectady, New York 12301; and **P. W. Tooley,** U. S. Department of Agriculture, Ft. Detrick, Building 1301, Frederick, Maryland 21701, USA.

8:15 A new method for hybridization of repetitive DNA in systematic studies. **Peter Houde** and **Martin Kreitman,** Department of Biology, Princeton University, Princeton, New Jersey 08544, USA (SSE).

8:30 Relative efficiencies of the maximum parsimony and distance-matrix methods of phylogeny construction for restriction data. **L. Jin** and **M. Nei,** Center for Demographic and Population Genetics, The University of Texas Health Science Center, Houston, Texas, USA.

8:45 Cancellation

9:00 A multivariate study of size and shape variation in three common species of frogs found in Virginia. **R. E. Shea,** Biology Department, Randolph-Macon College, Ashland, Virginia 23005; **J. A. Mitchell,** Biology Department, University of Richmond, Richmond, Virginia 23173; and **C. A. Pague,** Natural Heritage Program, 203 Governor Street, Suite 402, Richmond, Virginia 23219, USA (SSE).

9:15 Individual variation in avian limb muscles as a potential source of error in phylogeny reconstruction. **R. J. Raikow** and **A. H. Bledsoe,** Department of Biological Sciences, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, USA (WHS, SSZ).

9:30 Morphometry of two diatoms: removing subjectivity from identification and determining relatedness.

Robin L. Rice, University of Rhode Island Graduate School of Oceanography, Kingston, Rhode Island, USA (PSA).

9:45 Fractal geometry in systematics. **M. Molvray, S. P. Darwin** and **P. Kores,** Biology Department, Tulane University, New Orleans, Louisiana 70118, USA.

10:00 Break

10:15 Automated classificatory analyses from a DELTA database: a case study using the sedge genera of the world. **J. J. Bruhl,** Missouri Botanical Garden, St. Louis, Missouri 63110, USA (WHS).

10:30 Stable worldwide taxonomic reference systems, using the ILDIS Leguminosae prototype to illustrate the issues. **Frank A. Bisby,** Biology Department, University of Southampton, S09 5NH, United Kingdom; **Roger M. Polhill,** Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, United Kingdom; and **James L. Zarucchi,** Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166, USA.

10:45 Classification methods - new vistas from a unifying theory. **A. V. Hall,** Bolus Herbarium, University of Cape Town, Rondebosch, South Africa (LSL).

11:00 Teaching evolution as science or as dogma. **Barbara J. Moon,** Department of Natural Sciences, Fraser Valley College, Abbotsford, British Columbia, Canada V2S 4N2.

11:15 Anti-evolutionism is alive and well. **Eugenie C. Scott,** Executive Director, National Center for Science Education, 2107 Dwight Way #105, Berkeley, California 94704, USA.

SUMMARY OF CANCELLATIONS

Sequenced by day and time, as in the program

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203
Contributed Paper Session No. 1
SEX AND SEX RATIOS

9:30 Identifying the functional domains on the "selfish" psr chromosome causing paternal genome loss. **Leo W. Beukeboom,** Department of Biology, University of Rochester, Rochester, New York 14627, USA (SSE).

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3211
Contributed Paper Session No. 2
MOLECULAR AND MORPHOLOGICAL RELATIONSHIPS AMONG POPULATIONS I

8:15 Relationships between retroposons and retroviruses - more on the evolution of the retroid family. **M. McClure,** Department of Ecology & Evolutionary Biology, University of California, Irvine, California 92717, USA.

10:45 Character evolution and phylogenetic relationships among populations of the yellow warbler (Dendroica petechia). **Nedra K. Klein,** Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109, USA (SSE).

Sunday July 1, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM
Poster Session No. 2
SEX, BREEDING SYSTEMS, SEXUAL AND NATURAL SELECTION

11. Breeding system evolution in Mimulus (Scrophulariaceae). **C. B. Fenster,** Department of Botany, The University of Maryland, College Park, Maryland 20742, USA, and **K. Ritland,** Department of Botany, The University of Toronto, Toronto, Ontario, Canada M5S 1A1, (SSE).

12. Genetic evidence for multiple origin of selfing within Eichhornia paniculata (Pontederiaceae). **C. B. Fenster,** Department of Botany, The University of Maryland, College Park, Maryland 20742, USA and **S. C. H. Barrett,** Department of Botany, The University of Toronto, Toronto, Ontario, Canada M5S 1A1 (SSE).

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2203
Affiliated Society Symposium No. 8
HOST-PARASITE INTERACTIONS AND THE EVOLUTION OF REPRODUCTIVE CHARACTERS (THE SOCIETY FOR THE STUDY OF EVOLUTION)

5:30 Parasitism in sexual and clonal fish supports assumptions of the Red Queen hypothesis. **C. M. Lively**, Biology Department, Indiana University, Bloomington, Indiana 47405; and **C. Craddock** and **R. C. Vrijenhoek**, Center for Theoretical and Applied Genetics (CTAG), Cook College, Rutgers University, New Brunswick, New Jersey 08903, USA.

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3219
Contributed Paper Session No. 4
PLANT MATING SYSTEMS

4:15 Molecular phylogenetics and mating system evolution in the Pontederiaceae. **J. R. Kohn, B. R. Morton** and **S. C. H. Barrett**, Botany Department, University of Toronto, Toronto, Ontario, Canada M5S 3B2 (SSE).

Monday July 2, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203
Contributed Paper Session No. 9
GENETIC STRUCTURE OF POPULATIONS I

9:15 Clonal diversity in a unisexual fish related to Fundulus heteroclitus, as estimated by allozyme variability and DNA fingerprinting. **Robert M. Dawley**, Ursinus College, Collegeville, Pennsylvania 19426; **John F. Elder** and **Bruce J. Turner**, Virginia Polytechnic and State University, Blacksburg, Virginia 24061, USA.

Monday July 2, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3211
Contributed Paper Session No. 10
RATES OF EVOLUTION, AND ANALYSIS OF PHYLOGENETIC PATTERNS I

9:15 A comparison of bird nuclear and mitochondrial DNA rates of evolution by solution DNA hybridization. **F. H. Sheldon, E. Slikas** and **F. B. Gill**, Academy of Natural Sciences, Logan Square, Philadelphia, Pennsylvania 19103, USA (SSZ, WHS, SSE).

Wednesday July 4, 1990, 9:30 AM - 6:30 PM, Center of Marine Biotechnology, Baltimore, Maryland
Affiliated Society Workshop No. 12
MOLECULAR EVOLUTION OF ARCHAEBACTERIA (UNIVERSITY OF MARYLAND CENTER FOR MARINE BIOTECHNOLOGY; CO-SPONSORED BY THE ASSOCIATION OF SYSTEMATIC COLLECTIONS)

11:30 Evolution of archaebacterial translational machinery. **V. Erdman**

Thursday July 5, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 2203
Congress Symposium No. 13
THE ROLE OF SYSTEMATICS AND EVOLUTION IN BIOTECHNOLOGY

10:15 5s rRNA sequences and the structure of ribosomal RNA in systematics. **Volker A. Erdmann,** Freie Universitat Berlin, Berlin, West Germany.

Thursday July 5, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203
Contributed Paper Session No. 16
MECHANISMS OF ISOLATION, SPECIATION AND HYBRIDIZATION

12:00 The genetics of speciation in the Mimulus guttatus complex. **M. R. MacNair,** Department of Biological Sciences, University of Exeter, Exeter EX4 4PS, United Kingdom (SSE, LSH).

Friday July 6, 1990, 1:45 PM - 6:00 PM, LeFrak, Room 2205
Contributed Paper Session No. 25
CHARACTER ANALYSIS, PHYLOGENETIC INFERENCE AND METHODOLOGY I

3:45 The influence of character number and sample size on the reliability of a cladistic hypothesis. **M. H. Kesner,** Biology Department, Indiana University of Pennsylvania, Indiana, Pennsylvania 15705, USA.

5:00 Phylogenetic inference from DNA sequences. **M. Hasegawa** and **H. Kishino,** The Institute of Statistical Mathematics, 4-6-7 Minami-Azabu, Minato-ku, Tokyo, Japan (ASN).

Saturday July 7, 1990, 8:00 AM - 12:15 PM, Tydings, Room 1101
Contributed Paper Session No. 28
CHARACTER ANALYSIS AND METHODOLOGY II; EDUCATION AND POLICY

8:45 Plasticity of conservative characters: a systematic problem for a new genus of hydrozoan. **K. L. Mangin,** Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA.

Uncertainty of the relation taxa/characters. **C. Dupuis,** Museum National d'Histoire Naturelle, Entomologie, 45 rue Buffon, 75005 Paris, France (WHS).

SUMMARY OF ADDITIONS

Sequenced by day and time, as in the program

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3203
Contributed Paper Session No. 1
SEX AND SEX RATIOS

11:30 Parasitism in sexual and clonal fish supports assumptions of the Red Queen hypothesis. **C. M. Lively**, Biology Department, Indiana University, Bloomington, Indiana 47405; and **C. Craddock** and **R. C. Vrijenhoek**, Center for Theoretical and Applied Genetics (CTAG), Cook College, Rutgers University, New Brunswick, New Jersey 08903, USA.

Sunday July 1, 1990, 8:00 AM - 12:15 PM, Art and Sociology, Room 3211
Contributed Paper Session No. 2
MOLECULAR AND MORPHOLOGICAL RELATIONSHIPS AMONG POPULATIONS I

10:45 Genetic and environmental effects on the expression of Ldh-ß locus in the teleost fish Fundulus heteroclitus. **Douglas L. Crawford** and **Dennis A. Powers.** Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950

Sunday July 1, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 3219
Contributed Paper Session No. 4
PLANT MATING SYSTEMS

3:30 Genetic evidence for multiple origin of selfing within Eichhornia paniculata (Pontederiaceae). **C. B. Fenster,** Department of Botany, The University of Maryland, College Park, Maryland 20742, USA and **S. C. H. Barrett,** Department of Botany, The University of Toronto, Toronto, Ontario, Canada M5S 1A1 (SSE).

4:15 The contribution of post-pollination mechanisms to disassortative mating in tristylous Eichhornia paniculata. **M. B. Cruzan** and **S. C. H. Barrett,** Department of Botany, University of Toronto, Toronto, Ontario M5S 3B2, CANADA.

5:45 Breeding system evolution in Mimulus (Scrophulariaceae). **C. B. Fenster,** Department of Botany, The University of Maryland, College Park, Maryland 20742, USA, and **K. Ritland,** Department of Botany, The University of Toronto, Toronto, Ontario, Canada M5S 1A1, (SSE).

Monday July 2, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom; Authors present 3:30 PM - 5:00 PM
Poster Session No. 5
MOLECULAR AND CHROMOSOMAL EVOLUTION

52A. Relationships between retroposons and retroviruses - more on the evolution of the retroid family. **M. McClure**, Department of Ecology & Evolutionary Biology, University of California, Irvine, California 92717, USA.

52B. Hypervariable and conserved regions in NADH dehydrogenase genes in mammalian mitochondrial DNA. **C. A. MILLAN, D. E. PUMO, C. J. PHILLIPS, and A. K. WILLIAMS**, Department of Biology, Hofstra University, Hempstead, NY 11550, USA.

Monday July 2, 1990, 9:00 AM - 5:00 PM, A. Stamp Student Union Grand Ballroom, Authors present 3:30 PM - 5:00 PM
Poster Session No. 6
PHYLOGENETIC RELATIONSHIPS AND DIVERSITY

56A. The influence of character number and sample size on the reliability of a cladistic hypothesis. **M. H. Kesner**, Biology Department, Indiana University of Pennsylvania, Indiana, Pennsylvania 15705, USA.

Monday July 2, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2309
Contributed Paper Session No. 11
ANALYSIS OF PHYLOGENETIC PATTERNS II

5:00 Character evolution and phylogenetic relationships among populations of the yellow warbler (Dendroica petechia). **Nedra K. Klein**, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109, USA (SSE).

Friday July 6, 1990, 1:45 PM - 6:00 PM, Art and Sociology, Room 2309
Affiliated Society Symposium No. 10
EVOLUTIONARY GENETICS OF AGING (THE SOCIETY FOR THE STUDY OF EVOLUTION)

2:45 Physiology of the evolution of aging in Drosophila. **Joseph L. Graves**, Department of Ecology and Evolutionary Biology, School of Biological Sciences, University of California, Irvine, California 92717, USA.

ABSTRACTS FOR PRESENTATIONS ADDED INTO THE PROGRAM

Arranged alphabetically

A molecular phylogenetic reconstruction of unicellular eukaryotes. A. BAROIN and R. PERASSO, Laboratoire de Biologie Cellulaire 4 (URA 1134, CNRS), Universite Paris-Sud, 91405 Orsay-Cedex, France.

Quantitative genetics of shell form in a marine snail population grown at different densities: potential for response to sudden changes in selection pressures. E. G. Boulding Department of Zoology NJ-15, University of Washington, Seattle, WA 98195, USA.

Comparative allometry of sexual dimorphism in blennies of the genus Paraclinus, Labrisomidae. M. J. BROOKS, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ 85721, USA.

Detection of chemosymbiosis in the fossil record: the use of stable isotopes on the organic matrix of lucinid bivalves. E. A. COBABE, Museum of Comparative Zoology, Harvard University, Cambridge, MA 02138, USA.

Genetic variation in monoecious and dioecious Ecballium elaterium (L.) A. Rich. in relation to breeding system and geographic distribution in Spain. D. E. COSTICH and T. R. MEAGHER, Department of Biological Sciences, Rutgers University, Piscataway, NJ 08855, USA.

Genetic and environmental effects on the expression of Ldh-β locus in the teleost fish Fundulus heteroclitus. DOUGLAS L. CRAWFORD AND DENNIS A. POWERS. Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950, USA.

The contribution of post-pollination mechanisms to disassortative mating in tristylous Eichhornia paniculata. M. B. CRUZAN and S. C. H. BARRETT, Department of Botany, University of Toronto, Toronto, Ontario, Canada.

Evolution, morphology, and rapid environmental change. D. P. FAITH and L. BELBIN, Division of Wildlife and Ecology, Commonwealth Scientific and Industrial Research Organisation, P.O. Box 84, Lyneham, A.C.T., 2602 Australia and M. GILL, Division of Plant Industry, Commonwealth Scientific and Industrial Research Organisation, P.O. Box 1600, Canberra, A.C.T., 2601 Australia.

Genetic evidence for multiple origin of selfing within Eichhornia paniculata (Pontederiaceae). C. B. FENSTER, Department of Botany, University of Maryland, College Park, Maryland, 20742, USA and S. C. H. BARRETT, Department of Botany, University of Toronto, Toronto, Ontario, Canada.

Implications of morphological frequency distributions to evolution and management. S. HALLOY, MAF Technology, Invermay Agricultural Centre, Private Bag, Mosgiel, New Zealand.

Tempo and mode of evolution of the cytochrome b gene. DAVID M. IRWIN.

A "Genera Compositarum" as a database project. C. JEFFREY, Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AE, England, United Kingdom.

Comparative anatomy of the Azorian Enidae (Gastropoda: Pulmonata). A. M. F. MARTINS, Departamento de Biologia, Universidade dos Acores, P-9502 Ponta Delgada, Sao Miguel, Acores, Portugal.

Phylogenetic relationships among representative species of Laminaria and Cymathere triplicata (Laminariaceae, Phaeophyta). C. MAYES and L.D. DRUEHL, Biological Sciences, Simon Fraser University, British Columbia, Canada, V5A 1S6.

Hypervariable and conserved regions in NADH dehydrogenase genes in mammalian mitochondrial DNA. C. A. MILLAN, D. E. PUMO, C. J. PHILLIPS, and A. K. WILLIAMS, Department of Biology, Hofstra University, Hempstead, NY 11550, USA.

On the reality and structure of biodiversity. I. JA. PAVLINOV, Zoological Museum, Moscow State University, Moscow, 103009 USSR, and R. S. HOFFMANN, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA.

Variation in plant growth strategies within a single lawn population of Agrostis capillaris L. (Poaceae). G. L. RAPSON, Department of Botany and Zoology, Massey University, Private Bag, Palmerston North, New Zealand.

Social organization and sound use by Hamadryas butterflies. R. H. ROSENBERG, School of Biological Science, University of New South Wales, Kensington 2033, Australia.

Restriction-map variation at the rp49 region of Drosophila and subobscura as a tracer of a colonization process. J. ROZAS and M. AGUADE. Department de Genetica, Facultat de Biologia, Universitat de Barcelona, Barcelona 08071, Spain.

Phylogenetic relationships within Laminariales (Phaeophyta): new perspectives in kelp evolution from DNA sequence comparisons. G. W. SAUNDERS and L. D. DRUEHL. Department of Biological Sciences, Simon Fraser University, Burnaby, B.C., Canada.

Correlation of allozyme heterozygosity and genetic distance. D. O. F. SKIBINSKI and M. WOODWARK, School of Biological Sciences, University College of Swansea, Singleton Park, Swansea, SA2 8PP, U. K., and R. D. WARD, C.S.I.R.O., Division of Fisheries, G.P.O. Box 1538, Hobart, Tasmania 7001, Australia.

Contrasting neutral and selective expectations of genetic structure under diversity models. D. G. STIRLING, Department of Zoology, University of Maryland, College Park, Maryland 20742, USA.

Systematic and ecological implications of the mutualism between polydnaviruses and ichmeumonoid wasps. J. B. WHITEFIELD, Biology Department, University of Missouri, St. Louis Missouri 63121, USA.

Cost of reproduction in a population of Mexican-Americans from Laredo, Texas (1950-1977). M. E. ZALDIVAR and A. BUCHANAN, Department of Anthropology, Pennsylvania State University, University Park, Pennsylvania 16802, USA.

A molecular phylogenetic reconstruction of unicellular eukaryotes.
A BAROIN, R. PERASSO, Laboratoire de Biologie Cellulaire 4 (URA 1134, CNRS), Université Paris-Sud, 91405 Orsay-Cedex, France.

In order to construct a phylogeny of protists, we have undertaken a comparative analysis of partial sequences of the nuclear encoded 28S rRNA molecule. We have sequenced the 5' 450 terminal nucleotides from 50 representatives of several photosynthetic or non-photosynthetic protistan phyla (chlorophytes, chromophytes, rhodophytes, cryptophytes, ciliates, rhizopods, polymastigotes, actinopods, ...). The most highly conserved portions of the sequence were aligned, combined with a broad database of metazoa, metaphytes and fungi and used to construct dendrograms by different tree construction methods.

In agreement with classical systematics, we observe a number of clusters separated by large evolutionary distances (those of the ciliates, chromophytes, chlorophytes, ...). Within each group, comparative analysis of this molecular index, opens the possibility of an independent confrontation with classical systematics. This will be particularly illustrated with the rich group of the ciliates : a detailed analysis of 21 species representing the major classes will be presented.

Many groups (including the three major groups of algae) emerge in a bush close to the metazoa-metaphyte radiation, far antedated by the divergence of some flagellated groups such as the Euglenozoa. This suggest an ancient origin of the flagellar apparatus (1) and a relatively late occurrence of eukaryotic photosynthetic symbiosis (2). The major biological inferences deduced from this phylogenetic tree will be discussed in the light of other available molecular data.

1. Proc. Natl. Acad. Sci. USA 85:3474-3478 (1988)
2. Nature 339:142-144 (1989)
This study was supported by grants from the ATP and ASP "Evolution" of the C.N.R.S.

Quantitative genetics of shell form in a marine snail population grown at different densities: potential for response to sudden changes in selection pressures. E. G. Boulding[1] Department of Zoology NJ-15, University of Washington, Seattle, WA 98195, USA.

The heritability and genetic covariation of some shell form traits were estimated for a population of *Littorina tatooshensis* (Prosobranchia: Gastropoda); this new species from the Northeastern Pacific is described on the basis of morphological and behavioral differences, hybridization studies, and allozyme electrophoresis. Quantitative genetic parameters were estimated using a half-sibling breeding design, with each brood of full siblings split between two "environment" treatments which differed in snail density. Significant heritability estimates were obtained for shell size and shape and for aperture shape even though field and laboratory studies suggest that the directional selection on these traits can be strong. Heritable genetic variance for shell traits may be maintained in this population because the direction of the selection pressures changes with the degree of wave exposure. *L. tatooshensis* cultured at low density had faster growth rates, higher spires, and narrower apertures than their siblings cultured at high density. Significant genetic correlations were estimated among shell shape parameters and between environments. Genetic correlations among traits could constrain the response of a trait to small perturbations in selection pressures if the correlated response in other traits would be in an unfavorable direction. Large perturbations in selection pressures, such as would result from the invasion of a crab predator, could overwhelm slightly deleterious correlated responses and could lead to dramatic changes over a few generations if the snail population did not go extinct first.

present address: Department of Biological Sciences, Simon Fraser University, Burnaby, B.C. V5A 1S6, Canada.

Comparative allometry of sexual dimorphism in blennies of the genus *Paraclinus*, Labrisomidae. M. J. BROOKS, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ 85721 USA.

Sexual dimorphism is a property of both sexes; one sex cannot be dimorphic except in relation to the other. Why then do most studies of sexual dimorphism describe and explain shape in terms of male differences, neglecting the fact that females are as "different" as males? This emphasis probably results from the generality that in sexually dimorphic species, females resemble juveniles, implying that for a given character or set of characters male growth rates diverge from juvenile growth rates while females continue along the pattern established by juveniles. To examine actual allometric patterns of males and females in relation to juvenile growth, sexual dimorphism was quantified in several *Paraclinus* species. For each species, allometries of distance measures were evaluated for fit to each of three growth models; (1) Model A, where neither sex diverges from the juvenile trajectory, (2) Model B, either males or females diverge, (3) Model C, both sexes diverge. Male characters did not show a general trend of divergence during growth. Rather, divergence from juvenile allometry occurred as often in females as males; less often, both sexes diverge. Further, multivariate analysis shows females as more divergent from juvenile shape than males, and females of different species as more different from each other than either males or juveniles of different species. These results indicate that current explanations of dimorphism, most often formulated in terms of male interactions with males, females, or the environment, may be biased and draw attention from equally important changes in female and juvenile form.

Detection of Chemosymbiosis in the Fossil Record: The Use of Stable Isotopes on the Organic Matrix of Lucinid Bivalves. E.A. COBABE, Museum of Comparative Zoology, Harvard University, Cambridge, MA 02138

All members of the bivalve family Lucinidae appear to house chemolithoautotrophic bacterial symbionts in their gill structure. The symbionts may provide these bivalves with a considerable portion of their nutrition. This additional, independent food source may prove evolutionarily advantageous to these bivalves. While the evolutionary history and the question of chemosymbiosis as an advantage can be evaluated by more traditional methods of paleontology (e.g., variations in biogeographic ranges and survivorship across extinction boundaries), this requires the assumption that taxa possessing symbionts today have possessed them in the past. Isotopic geochemistry may allow the detection of chemosymbiosis in both modern and fossil shells, providing an independent means for confirming chemosymbiosis in the fossil record.

It has been well documented that the carbon and nitrogen stable isotopic signals from the tissues of chemosymbiotic organisms are significantly more negative than the signal from non-symbiotic organisms. Carbon isotopic signals from the organic matrix of modern bivalves indicate that the organic matrix material also reflects this isotopic difference between symbiotic and non-symbiotic bivalves. This will allow exceptionally well-preserved fossil shell material to be evaluated for chemosymbiosis. From this work, questions about the evolutionary history of chemosymbiosis as a trophis strategy in bivalves can be assessed.

Genetic variation in monoecious and dioecious Ecballium elaterium (L.) A. Rich. in relation to breeding system and geographic distribution in Spain. D. E. COSTICH and T. R. MEAGHER, Department of Biological Sciences, Rutgers University, Piscataway, NJ 08855 USA.

Knowlege of the effects of different breeding systems on genetic variation is fundamental to an understanding of their evolution. One approach is to study species showing intraspecific variation in breeding system. To this end, Ecballium elaterium (Cucurbitaceae) provides a model system. It comprises two subspecies: elaterium, which is monoecious, and dioicum (Batt.) Costich, which is dioecious. Genetically based theory on the evolution of dioecy states that the selective advantage of unisexuality lies primarily in its enforcement of outcrossing: a unisexual mutant's outcrossed offspring would have an immediate advantage over the inbred offspring of the self-compatible cosexes, given a high level of inbreeding depression. We hypothesize that dioecy promotes outcrossing in Ecballium, so that 1) genetic variation within populations (and hence heterozygosity) should be higher in the dioecious subspecies than in the monoecious subspecies and 2) genetic variation among populations should be lower in the dioecious subspecies than in the monoecious subspecies. To quantify allelic diversity within and among dioecious and monoecious populations of Ecballium, we calculated F statistics based on data from an electrophoretic survey of 10 populations of each subspecies. The study populations were all located in Spain, where the two subspecies occur allopatrically.

Perez Chiscano (1) proposed that the monoecious subspecies colonized the Iberian Peninsula from the north, via southern Europe, while the dioecious subspecies invaded from the south via North Africa. To test this hypothesis we compared genetic distances with geographic distances among the 20 study populations.

1. Studia Botanica 4:57-77 (1985)
This study was supported in part by a National Geographic Society research grant to DEC.

Genetic and environmental effects on the expression of *Ldh-B* locus in the teleost fish *Fundulus heteroclitus*. DOUGLAS L. CRAWFORD AND DENNIS A. POWERS. Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950

In populations of the fish *Fundulus heteroclitus* there is clinal variation in the concentration of LDH-B_4 enzyme and the mRNA that it encodes (1, 2). Although acclimation is not responsible for this clinal variation, it is possible that acclimation can modify the expression of the *Ldh-B* locus. To invesitgate the effect of acclimation and genotype on *Ldh-B* expression, we acclimated fish from a single geographically intermediate location to three temperatures (10^{o}C, 20^{o}C and 30 ^{o}C). These fish were scored for there *Ldh-B* genotype and the amount of both LDH-B_4 enzyme and the LDH-B mRNA were determined. Thermal acclimations does effect the level of *Ldh-B* expression. Acclimation has a significant effect on both the enzyme activity and the concentration of LDH-B mRNA. Additionally, these measures of LDH-B are correlated, indicating that the variation in enzymatic activity at different acclimation temperatures is a function of the steady state levels of mRNA. Importantly, the *Ldh-B* genotype does not effect the concentration of either the mRNA or the amount of protein, suggesting that the differences between populations are not due to structural differences between the alleles but due to differential regulation.

(1) **Proc. Natl. Acad. Sci.** 86:9365-9369 (1989)
(2) **J. Exp. Zool.** *In Press.*

The contribution of post-pollination mechanisms to disassortative mating in tristylous Eichhornia paniculata.

M.B. CRUZAN AND S.C.H BARRETT, Department of Botany, University of Toronto, Toronto, Ontario M5S 3B2, CANADA.

High levels of disassortative mating and low selfing rates have been reported in several natural and experimental populations of tristylous E. paniculata. This is unexpected since plants are fully self- and intramorph compatible, exhibit large floral displays, and capture significant amounts of illegitimate pollen. We investigated the contribution of differential pollen germination, pollen tube growth rate, and pollen-style compatibility (pollen tube attrition), to patterns of non-random mating. Crosses were made among the three floral morphs using pollen from both anther levels of each morph to compare legitimate (pollen from the same anther height as the stigma) with illegitimate (pollen from a different anther height) intermorph crosses, and intramorph with self crosses for the three style morphs. On the stigmas of all style morphs pollen germination rate was fastest for pollen from the short anther level, followed by pollen from the mid and long anther levels, respectively. Overall germination was fastest for pollen placed on stigmas of the long morph, followed by the mid and short morphs, respectively. There were no differences in pollen germination rate between legitimate vs. illegitimate or self vs. outcross pollinations. Pollen tube growth rate differed for the three anther levels, but depended on the length of the recipient style; for all three morphs legitimate pollen grew faster than illegitimate pollen. There was no difference in pollen tube growth rate when illegitimate and self crosses were compared. For pollen tube attrition (the proportion of tubes failing to reach the base of the style) there were differences due to plant genotype, but pollen from different anther levels of the same plant tended to have similar attrition values for a particular cross. The results suggest that faster pollen tube growth for legitimate pollen contributes to the observed levels of disassortative mating and high outcrossing rates, but also indicate that disassortative pollen transfer may be important.

Evolution, morphology, and rapid environmental change. D.P. FAITH, L. BELBIN, Division of Wildlife and Ecology, Commonwealth Scientific and Industrial Research Organisation, P.O. Box 84, Lyneham, A.C.T., 2602 Australia and M. GILL, Division of Plant Industry, Commonwealth Scientific and Industrial Research Organisation, P.O. Box 1600, Canberra, A.C.T., 2601 Australia.

Concepts and models from evolutionary biology can help in understanding organisms' ecological responses to rapid environmental change. We explore such a framework in developing models of the distribution of species of Eucalyptus in continental Australia, with the ultimate goal of predicting changes in distribution resulting from rapid environmental change. Because similarities among eucalypt species in their responses to environment may be poorly indicated by phylogenetic similarity, we attempt instead to identify the sets of key traits that help determine success or failure of species under a variety of environmental conditions. This approach requires an exploratory model in which patterns of morphometric variation among species are revealed and then interpreted in relation to possible underlying environmental factors. An important property of these models is that they are multivariate in using a pattern based on many morphological characters, thus avoiding the limitations of assuming that a single character represents an "adaptation" with a consistent relation to environment. Thus, the multivariate approach means that a suite of different morphological characters, taken together, may reveal a consistent relationship with one or more environmental factors that would not be apparent using any one character alone.

As a pattern inference method, our approach is analogous to that of phylogenetic systematics (cladistics), where the sharing by species of evolutionary derived character states is assumed to indicate pattern similarity. An important difference is that shared derived characters in our models necessarily include shared morphological convergences. Additionally, the pattern itself is not a tree diagram but a multidimensional Euclidean space in which the species are represented by points. This exploratory model is implemented using a form of Multidimensional Scaling (1) that has advantages over similar morphometric approaches (2) based on correspondence analysis. Following the inference of such a space from the morphological data, the space is linked with possible underlying environmental or habitat factors whose values vary among species. Vectors in the multidimensional space may be found to correlate with different underlying dimensions of habitat/environmental variation. An advantage of the resulting model is that statistical methods can be used to partial out environmental covariates and to focus on key variables of interest, such as those related to climate change.

We discuss applications of these models to species of Eucalyptus in continental Australia, using a large existing data base on morphological and environmental variables. Practical difficulties are discussed, including those of data availability, lack of phylogenetic information, and problems of scale.

1. Cladistics 5:235-258 (1989)
2. Nature 343:153-156 (1990)

Genetic evidence for multiple origin of selfing within Eichhornia paniculata (Pontederiaceae). C. B. FENSTER, Department of Botany, The University of Maryland, College Park, Maryland, 20742-5815, USA And S. C. H. BARRETT, Department of Botany, The Universtiy of Toronto, Toronto Ontario, Canada, M5S 1A1.

Populations of the emergent aquatic E. paniculata are commonly tristylous and highly outcrossing in N.E. Brazil. However, occasionaly some populations contain a modified morph where one or more anthers are elevated to the level of the mid-stigma resulting in a breakdown of the spatial separation of the female and male reproductive structures. These modified mids may have increased levels of selfing. Additionaly, some populations in N.E. Brazil and Jamaica contain a high proportion of modified highly selfing mids. In N.E. Brazil there is a large area of inhospitable xeric habitat which causes the range of E. paniculata to be disjunct by several hundered kilometers. Previous work has shown the modification to be recessive to the wild-type outcrossing morph. Crosses between modified mids within a region resulted in progeny that were also modified. However, crosses between modified mids across the region of disjunct gave full recovery of the unmodified wild type outcrossing morph. Apparantly crosses between recessive modified mids from the two regions resulted in genetic complementarity. These results suggest that there has been convergent evolution for selfing in different regions of the species range and the mechanisms involve different genetic pathways.

This study was supported by a grant from NSERC, Canada.

Implications of morphological frequency distributions to evolution and management. S HALLOY, MAF Technology, Invermay Agricultural Centre, Private Bag, Mosgiel, New Zealand.

The frequency distribution of morphological character (FDMC) states in plants has long been hypothesized to be the result of environmental (mainly climatic) factors[1]. The FDMCs (or life form spectra as in Raunkiaer) of a flora should then predict the environment under which it evolved. If FDMC curves converged to the same form, it could be hypothesized that if a species which belongs to x character state disappears, a new species will appear with the same character state. Conversely, if a new species is introduced, the species in that environment with the highest probability to go extinct should be in the same morphological category. This hypothesis would expand an equilibrium theory of island biogeography by predicting what form species are liable to have.

To test the first hypothesis, one needs to filter out the variation due to biogeographic (historical-philogenetic) factors[2]. To do this, 21 sites were selected within similar environments, different environments and over three continents. The morphological characters used were leaf length, width, area, margin, pubescence, section and consistence. Practically all plant species were measured at each site. Meristic parameters were log transformed, averages were t-tested and frequency distributions were X^2 tested. The resulting FDMCs showed variable forms, from normal-like (eg, area) to three-modal (eg, length/width ratio).

FDMCs for all alpine sites were essentially similar, as they were for all high alpine sites; contiguous alpine and high alpine sites were all significantly different; regardless of floristic affinities.

The FDMC in full florulas (one macro-environment) seemed to reflect quite precisely the environment in which they grew, regardless of floristic affinities and provided they have lived there for long enough. The implications may be: 1-in a given environment, the introduction or elimination of a species may have a predictable long term consequence on the FDMCs of resulting floras 2-in a changing environment, new frequency curves could be predicted; 3-there may be potential to use FDMCs as an additional tool in determining which species to manage for sustaining diversity.

1. J. Veg. Sci. 3 (1990)
2. Evol. Theory 6 : 233-255 (1983)

This study was supported by the Miss E L Hellaby Indigenous Grasslands Research Trust, Department of Scientific and Industrial Research, Ministry of Agriculture and Fisheries (New Zealand) and Universidad Nacional de Tucuman (Argentina).

Tempo and Mode of Evolution of the Cytochrome *b* Gene

David M. Irwin

With the polymerase chain reaction (PCR) and versatile primers that amplify the whole mitochondrial cytochrome *b* gene, we obtained 17 complete gene sequences representing three orders of hoofed mammals (ungulates) and dolphins (cetaceans). The fossil record of some ungulate lineages allowed estimation of the evolutionary rates for various components of the cytochrome *b* DNA and amino acid sequences. The relative rates at first, second, and third positions within codons are in the ratio 10 to one to at least 33. For deep divergences (>5 million years) it appears that both replacement positions and silent transversions can be used for phylogenetic inference, if specific conditions are maintained. Comparison of these cytochrome *b* sequences support current structure-function models for this protein. The outer membrane loops of the molecule, which include the Q_o reaction center are more constrained than the remainder of the molecule (transmembrane segments and inner membrane loops). Many of the amino acid substitutions within the transmembrane segments are exchanges between the different hydrophobic residues (especially leucine, isoleucine, and valine). Replacement nucleotide substitutions at first and second positions of codons approximate a negative binomial distribution, similar to other protein coding sequences. At four-fold degenerate positions of codons the nucleotide substitutions approximate a poisson distribution, implying that the underlying mutational spectrum is random with respect to position.

A "Genera Compositarum" as a database project. C. JEFFREY, Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AE, England, U.K.

The symposium "Dealing with Data" at the Kew International Compositae Conference 1994 plans to include the setting-up of an organization to produce a systematic account of the Compositae, at generic level, as an international database project. This informal round-table discussion with the above title is open to anyone interested in contributing to, or just finding out more about, the project. An introductory paper to serve as a basis for discussion is available from me in advance. Please see ICSEB IV publicity for details of venue, date and time.

Comparative anatomy of the Azorian Enidae (Gastropoda: Pulmonata). A. M. F. MARTINS, Departamento de Biologia, Universidade dos Açores, P-9502 Ponta Delgada, São Miguel, Açores, PORTUGAL.

The Azorian Enidae show different degrees of shell and anatomical variability from species to species and from island to island. A comparative survey of the taxon is conducted and an assessment of the reliability of the reproductive system as key taxonomic character for specific separation is made. The seven known species represent an endemic taxon, to be proposed properly elsewhere.

Phylogenetic relationships among representative species of Laminaria and Cymathere triplicata (Laminariaceae, Phaeophyta). C. MAYES and L.D. DRUEHL, Biological Sciences, Simon Fraser University, British Columbia, Canada, V5A 1S6.

Evolutionary relationships and taxonomy of kelp genera have been commonly determined on the basis of gross morphological features. A particular problem presented by the current taxonomy is the delineation of two kelp genera, Cymathere and Laminaria. No consistent morphological feature separates these genera. Both have species with longitudinal folds in their blades and representatives of both have hapteral or discoid holdfasts. Cymathere triplicata has three longitudinal folds within the blade and a discoid holdfast. Laminaria is divided into three subgenera. The subgenus Laminaria has three Sections: Fasciatate, Digitatae and Simplicies. Species within the Sections can be easily distinguished on the basis of blade type; Fasciate blades have longitudinal folds, Digitate blades are deeply dissected and Simplicies blades are plain. All species within the Sections have hapteral holdfasts. We suggest that morphologically, C. triplicata most closely resembles the Fasciate Laminaria species. These species differ with regard to holdfast type; however, specimens of C. triplicata have been reported with rudimentary haptera (1). Molecular techniques were used to study representative species from both genera. In particular, all three Sections of Laminaria are represented including a species with a discoid holdfast from the subgenus Solearia. DNA from blade tissue of Laminaria species were isolated. Evolutionary relatedness among these species is determined using direct dideoxy sequencing of Polymerase Chain Reaction amplified small subunit ribosomal DNA. Difficulty encountered extracting DNA from C. triplicata blade tissue was overcome by a novel method for DNA extraction from meiospores. C. triplicata DNA was isolated and its small subunit rDNA sequenced in a similar fashion. Our results are presented and a phylogenetic scheme devised for the genus Laminaria and the alga, Cymathere triplicata.

1. J. Facul. Agr. Hokkaido Imp. Univ., Sapporo. 46: 1-50 (1940)
This study was supported by NSERC grant 2918 to L.D. Druehl.

Hypervariable and conserved regions in NADH dehydrogenase genes in mammalian mitochondrial DNA. C.A. MILLAN, D.E. PUMO, C.J. PHILLIPS and A.K. WILLIAMS, Department of Biology, Hofstra University, Hempstead, NY 11550.

Sixteen mitochondrial DNA (mtDNA) genotypes have been isolated from two species of Neotropical fruit bats, Artibeus jamaicensis and A. lituratus. Restriction site maps suggested that some regions of the mtDNA might be more conserved than other regions, at least in these animals. Southern blot hybridizations also indicated that at least one protein coding region of bat mtDNA might have little sequence similarity to mouse mtDNA. Bat mtDNA was digested with Hind III, fragments were cloned, and the double stranded mtDNA inserts were sequenced. For the present analysis we compared and contrasted the conserved 5' end of ND1 with a hypervariable 631 bp region of ND5. Both of these genes code for protein subunits of the respiratory chain enzyme, NADH dehydrogenase. In addition to comparing the two genes within bat mtDNA, we also compared the sequences to homologous mtDNA sequences from humans, mice, cows, and frogs. Transition:transversion ratios, and nucleotide and amino acid sequence similarity were determined. The amino acid sequence encoded in the 5' end of the ND1 gene is highly conserved across mammals. By way of contrast, the 3' end of the ND5 gene could be regarded as hypervariable. A 631 bp Hind III fragment from this gene hybridizes only weakly to mouse mtDNA. Not surprisingly, only 66% of the nucleotides match those in the homologous mouse mtDNA. More importantly, up to 40% of the 210 amino acids coded within this region differ between bat and mouse mtDNA. The same set of amino acids encoded in bat mtDNA differ from those encoded in homologous frog mtDNA by 49%. This means that rapid diversification has occurred within mammals. What has promoted this extraordinary amount of amino acid substitution? What impact has it had on the protein? Is this variability the result of "relaxed constraints," selection, or both? This extensive amino acid substitution has affected features of 2° protein structure (turns, α-helices and β- pleated sheets). It also has affected the presence, absence, and locations of possibly hydrophilic surface features. Supported by NIH GM42563 and NSF BBS-8609231.

On the reality and structure of biodiversity. I. JA. PAVLINOV, Zoological Museum, Moscow State University, Moscow, 103009 USSR, and R.S. HOFFMANN, National Museum of Natural History, Smithsonian, Washington, D.C. 20560 USA.

For conservation of biodiversity, appropriate theoretical models are necessary. Such models should, among other things, embody concepts concerning the structural nature of biological diversity. To formulate such concepts, and the models that include them, the following problems must be addressed.

1. The existence of a large, but indeterminant, number of different species is universally accepted. However, do natural assemblages of different species lead to a distinct natural phenomenon -- biodiversity -- or is the term a descriptive catchall for an arbitrary assemblage of independent taxa?

2. It is reasonable to expect that there should be a relationship between biodiversity and the structure of biotic communities. Is there a one-to-one correspondence between elements of these two concepts?

3. Most, perhaps all, current classifications of biodiversity are static, and based on some form of enumeration of biological entities (genotypes, populations, species, phyletic, habitat, community) without questioning the nature, or existence of, biodiversity as a distinct phenomenon. Supposing that it is a natural phenomenon, is it possible to develop dynamic, as opposed to static models for biodiversity?

4. Hierarchically related components of biodiversity are often recognized, including genetic/phenetic, population, species, ecosystemic, biogeographic, and phylogenetic. Should such components be recognized only if they result from independent processes and gradients?

5. If at least some independent hierarchies exist, can they be integrated into a total hierarchy of biodiversity?

6. Can metrics be devised for various components of biodiversity? If so, could those components be treated as multidimensional axes in order to describe fundamental properties of the structure of biodiversity?

These problems are directly related to biological conservation. If biodiversity as a whole is a natural phenomenon, then an integrated strategy based on its total hierarchy is an urgent need for conservation. If, however, the various components of biodiversity are independent and do not form a distinct natural phenomenon, then each separate component can best be conserved by its own protective measures specific to that component.

Variation in plant growth strategies within a single lawn population of *Agrostis capillaris* L. (Poaceae).

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Within-population variation has been shown in previous studies to be variable and often extremely high. This investigation looks at such variation in *Agrostis capillaris* (Poaceae) from New Zealand, and uses it to construct a physical map of the occurrence of various ecological strategies within the population.

A lawn population, the most uniform habitat available, was sampled. 400 genotypes were collected as individual tillers, by restricted random sampling of a 10x10 m area, and cloned. All plants were grown in a randomised, blocked experiment with three replicates and measured for a number of morphological and growth analysis variates.

Within-population variation was high, though variable between variates. Ranges were 3 (eg. lamina length/width ratio) to 100 (Unit Leaf Rate) times the smallest genotype mean values. Most variates were normally distributed (eg. Leaf Area Ratio, Specific Leaf Area, lamina length/width ratio). Some variates (eg. tiller number, length of longest stem, tiller size) showed skewed distributions, with a number of genotypes having very large values.

An ordination of the data demonstrated that some genotypes are outliers, having, for example, large values for a suite of size related variates. The strategies of the genotypes formed a complex mosaic when depicted on a map of the physical space from which they were sampled.

Different genotypes operate equivalent ecological strategies, indicating that evolution operates on a "package deal", rather than on individual characters.

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Social organization and sound use by Hamadryas butterflies. RISA H. ROSENBERG, School of Biological Science, University of New South Wales, Kensington 2033, Australia.

I studied the social organization of populations of two species of Hamadryas butterflies (H. feronia and H. februa) in Panama, by using behavioral observations and experimental manipulations. I found that males of both species are territorial. Recapture rates of individually marked males of both species were extremely high (H. feronia resighted in more than 94% of days, and H. februa resighted 84% of days), with males observed perching on the same trees. Transplantation and removal experiments support this observation of site tenacity. Interactions between and within species were common and over 70% of interactions were won by the resident.

Males of one species (H. feronia) make audible sounds. Results of playback experiments were unambiguous, with H. feronia males flying towards and around the speaker. A lifelike cardboard model butterfly also elicited responses from both species. I conclude that both sound and movement are important in the territorial system of Hamadryas butterflies. In addition, in another set of experiments it was found that territoriality breaks down when abundant high quality food is available.

Restriction-map variation at the rp49 region of Drosophila subobscura as a tracer of a colonization process. J. ROZAS, M. AGUADÉ. Departament de Genètica, Facultat de Biologia, Universitat de Barcelona, Barcelona 08071, Spain.

Drosophila subobscura, a paleartic species, has recently colonized the American continent. Some aspects of this colonization have already been studied by analysing variation at the chromosomal, allozyme and mtDNA levels.

In the present study we have analysed both chromosomal inversion polymorphism and restriction-map variation at the rp49 region in natural populations of the recently colonized area by using seven four-cutter restriction enzymes. Due to the location of the rp49 gene, in segment I of the O chromosome, three gene arrangements can be considered. The distribution of both restriction-site and length polymorphisms as well as the number of haplotypes within each of these three gene arrangements have been studied. These results have been compared to those previously obtained for the same genomic region in natural populations of the paleartic area. This comparison enables to estimate the number of actual colonizers as well as to further characterize the colonization process.

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Phylogenetic relationships within Laminariales (Phaeophyta): new perspectives in kelp evolution from DNA sequence comparisons. G.W. SAUNDERS and L.D. DRUEHL. Department of Biological Sciences, Simon Fraser University, Burnaby, B.C. V5A 1S6 Canada.

Traditionally, the Alariaceae, Lessoniaceae and Laminariaceae of Laminariales (kelp) have been delineated by morphological features. These features include sporophyll production, regular and persistent branching and simple undivided thalli for the three families respectively. However, these morphological traits are not exclusively partitioned to the three families. Additionally, recent investigations utilizing kelp chloroplast genomes has brought doubt as to the phylogenetic validity of the current system of classification (1). Particularly, these studies have suggested that the representatives of the Lessoniaceae should be allocated to the remaining two families. It was noted (2) that chloroplast phylogenies are not necessarily organismal phylogenies owing to chloroplast introgression and this process may explain the phylogenetic inconsistency between the morphological and chloroplast based molecular data. We have concluded a restriction fragment length polymorphism analysis of the cytoplasmic ribosomal cistron and presently are conducting direct dideoxy sequencing of Polymerase Chain Reaction amplified small subunit ribosomal DNA for a variety of kelp genera [Alaria, Egregia, Eisenia, Pterygophora. (Alariaceae); Lessoniopsis, Macrocystis, Nereocystis, Postelsia. (Lessoniaceae) and as an outgroup Sargassum muticum (Fucales)] in an attempt to clarify Laminariales phylogeny. Our data suggest Egregia represents an early lineage within the Laminariales and does not belong with the remainder of the Alariaceae. Macrocystis represents the next lineage being discrete from the remainder of the Lessoniaceae which are closely aligned with the Laminariaceae. We meld our results with earlier morphological and chloroplast DNA sequence data to present a revised evolutionary hypothesis for the kelp.

1. J. phycol. 24: 292-302 (1988)
2. Am. Nat. 130 (Suppl.): 56-529 (1987)

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Correlation of allozyme heterozygosity and genetic distance. D. O. F. SKIBINSKI. M. WOODWARK. School of Biological Sciences. University College of Swansea. Singleton Park, Swansea, SA2 8PP. U.K. and R. D. WARD. C.S.I.R.O.. Division of Fisheries. G.P.O. Box 1538. Hobart. Tasmania 7001. Australia.

Analysis of an allozyme database provides evidence of a high positive correlation between heterozygosity and genetic distance across a wide range of animal and plant groups. This relationship can be accounted for by variation in effective neutral mutation rate arising from differences in evolutionary constraint between proteins. It is observed that some proteins consistently exhibit unusually high or low genetic distance given their heterozygosity values. This can be explained by balancing selection or positive directional selection for advantageous mutations.

Contrasting neutral and selective expectations of genetic structure under diversity models

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The effect of selection on allelic variation within sexual populations is difficult to document convincingly. It has been argued that selection may act more effectively on linked groups of genes, yet there is the problem of recombination at each generation. Cyclically sexual populations provide an opportunity to test the efficiency of selection on composite genotypes frozen in 'linkage groups' between sexual episodes.

Diversity criteria may be used to indicate differences in frequency distributions of discrete taxa. Ameiotic parthenogens may be grouped on the basis of composite genotypes. This study uses a graphical test and a statistical index based on ecological diversity models, to contrast neutral and selective expectations of genotype diversity in pelagic Daphnia populations. Generally, most individuals belong to a relatively small proportion of the genotypes present in a population, even though a large number of genotypes may be detected. The populations with the lowest diversities have significant deviations from expected composite genotype frequencies. While a range of diversities is observed, frequency distributions of composite genotypes do not conform to those expected under neutral models. These results appear to be independent of sample size, and similar to some cyclically sexual pond populations.

These results indicate that in part, selection structures genotype frequency in these populations. At the same time, diversity and the implied importance of selection appears to vary among lakes. This suggests that pelagic Daphnia populations may be model systems for testing the conditions under which selection structures the evolution of genetic diversity.

Systematic and ecological implications of the mutualism between polydnaviruses and ichneumonoid wasps. J.B.WHITFIELD. Biology Department, University of Missouri- St. Louis. St. Louis, Missouri 63121 USA.

Polydnaviruses are endosymbionts within species of many groups of endo-parasitoid ichneumonoid wasps (1). As they strongly influence the survival of wasp progeny within host insects, by suppressing the immune response of host insects, and appear to exhibit some specificity to particular hosts or sets of host insects, the viruses could be expected to have played a major role in the evolution of host ranges of, and perhaps in the speciation of, their wasp carriers. Some theoretical aspects of symbiont-induced speciation have been investigated (2) but only recently have been applied to parasitoid wasps and their polydnaviruses (3). Further investigation of the impact of polydnaviruses on the evolution of ichneumonoid wasps depends upon molecular systematic investigations of the wasps and their viruses (3). These co-phylogenetic systematic studies in turn depend on the assumption that the viruses are inherited maternally rather than passed horizontally between unrelatedwasps attacking the same hosts. Molecular genetic studies suggest that this assumption is met in ichneumonoid wasp/ polydnavirus interactions (4). Ramifications of these coevolutionary studies may include insights into the origins and potential manipulations of biological host races of natural enemies attacking pest insects.

1. Adv. Virus Res. 24: 125-171 (1979)
2. Biol. J. Linn. Soc. 32: 385-393 (1987)
3. Evol. Theor. In press. (1990)
4. J. Virol. 57: 552-562 (1986)

Cost of reproduction in a population of Mexican-Americans from Laredo, Texas (1950-1977). M.E. ZALDIVAR, A. BUCHANAN, Department of Anthropology, The Pennsylvania State University, University Park, Pennsylvania 16802 USA.

We examine the costs of reproduction in a population of Mexican-Americans living in Laredo, Texas, from 1850 to 1977. These costs are measured as reduced parental survival or lower survivorship of the offspring. We compare the fertility of women who died between 15 and 50 years of age with women who survived. On average, women who live to age fifty, have less children for any 5 year interval between ages 15-35 than women who die before age 35. We also compare the length of interbirth intervals preceding or following the birth of children who died during their first year of life. We repeat the analyses looking at child survivorship during the first five years of life. Interbirth intervals are shorter if the first child of the pair dies, and this is true even if we restrict the sample to cases where the older child survives to conception of the next. In the same way, interbirth intervals are also shorter if the second child of the pair dies, and once again, this is true even after controlling for survivorship of the first child to conception of the second one. This suggests that, among humans, there might be a trade off between risky intense offspring production or a moderately paced safer reproductive pattern.