

MCZ newsletter

MUSEUM OF COMPARATIVE ZOOLOGY

Harvard University
Cambridge, Massachusetts
Volume 2, Number 1
Fall 1972

Photo by Rick Stafford



PROFESSOR STØRMER LECTURES AT MCZ

A most distinguished paleontologist, Professor Leif Størmer, has been appointed as Visiting Alexander Agassiz Lecturer on Paleontology. Professor Størmer lectured in the same capacity at Harvard from 1965-66. During his term at the Museum, Dr. Størmer will continue his research on Ordovician fossil trilobites and eurypterids, often called sea scorpions, using the extensive collections of the Invertebrate Paleontology Department.

Professor Størmer teaches historical geology at the University of Oslo where he has also served as Curator of the Paleontological Museum. Dr. Størmer was Dean of Faculty from 1956-58. He is also a former President of the International Commission on Stratigraphy.

DR. LIEM NAMED HENRY BRYANT BIGELOW PROFESSOR OF ICHTHYOLOGY

Karel F. Liem has been appointed as Henry Bryant Bigelow Professor of Ichthyology and Curator of Ichthyology in the Museum. Professor Liem's chief research interest is the functional anatomy of fishes. Although his accomplishments are best known in this area, his work also has had an important influence on conceptual thinking in the systematics and evolutionary biology of fish. Furthermore, his scientific productivity has extended to other groups of lower vertebrates, notably amphibians and reptiles.

Professor Liem uses a variety of experimental, anatomical and physiological techniques reflecting the multi-disciplinary approach of his work. His work on fishes is directed toward determining and integrating the functional significance of anatomical arrangements on many levels, ranging from the analysis of a single character complex to broad scale studies of evolutionary adaptation and its relevance to systematics.

Early in his career, Liem investigated cardiovascular and respiratory mechanisms in various teleost fishes (Synbranchiformes) capable of respiration in both air and water. This complex biological problem is related to the entire question of water-to-land transition — an important phylogenetic as well as present-day ontogenetic phenomenon. He made similar investigations on anabantoid fishes and developed a comparative approach which emphasized the changes correlated with air-breathing adaptation.

However, Professor Liem's most significant contributions to ichthyology have been his comparative functional anatomy studies. His monograph on the leaf fishes (percoid family Nandidae) is a classic synthesis of diverse morphological and experimental techniques used to elucidate adaptive mechanisms, evolutionary trends and phylogenetic relationships. Leaf fishes are highly specialized fresh-water predators with living representatives in Asia, Africa and South America, but without a fossil record. Professor Liem recognized that certain behavioral peculiarities, particularly in regard to their voracious feeding habits, were central to understanding their evolution. Typically, they approach their prey without apparent swimming motion (the charac-

teristic floating leaf posture with little gill or fin movement is expressed in their common name), and with an extremely rapid cheek and pharyngeal movement swallow large prey intact. Through a series of surgical experiments coupled with cinematic analysis, Professor Liem was able to demonstrate the performance and interactions of bone and muscle units more precisely than had previously been done for any fish group. This approach revealed that the seemingly large number of morphological differences between leaf species was in fact an expression of the coadaptive dependency of adjacent structures.

Professor Liem has made a number of contributions to ichthyology other than his functional anatomical studies. His work on the reproductive cycle in the synbranchoid fish *Monopterus* demonstrated by histological and other methods a pattern of sex reversal related to age; individuals begin the reproductive cycle as functional females and switch to males at a later age, a mechanism which maintains reproductive potential of populations subjected to severe environmental conditions. Later, Professor Liem extended this study to the entire order Synbranchiformes, giving detailed consideration to geographical and taxonomic variation in natural sex reversal patterns. By demonstrating that rudimentary hermaphroditism is probably a derived evolutionary stage and that gonochorism in the Amphipnoidae is primitive, Liem made a fundamental contribution to the understanding of sex reversal among teleost fishes.

Professor Liem's current research efforts are directed to the fish family Cichlidae of Lake Tanganyika which is a remarkably diverse but closely related group. The feeding and respiratory systems offer an ideal test of how functional anatomy (including cineradiographic and electromyographic techniques) may contribute to understanding an adaptive radiation.

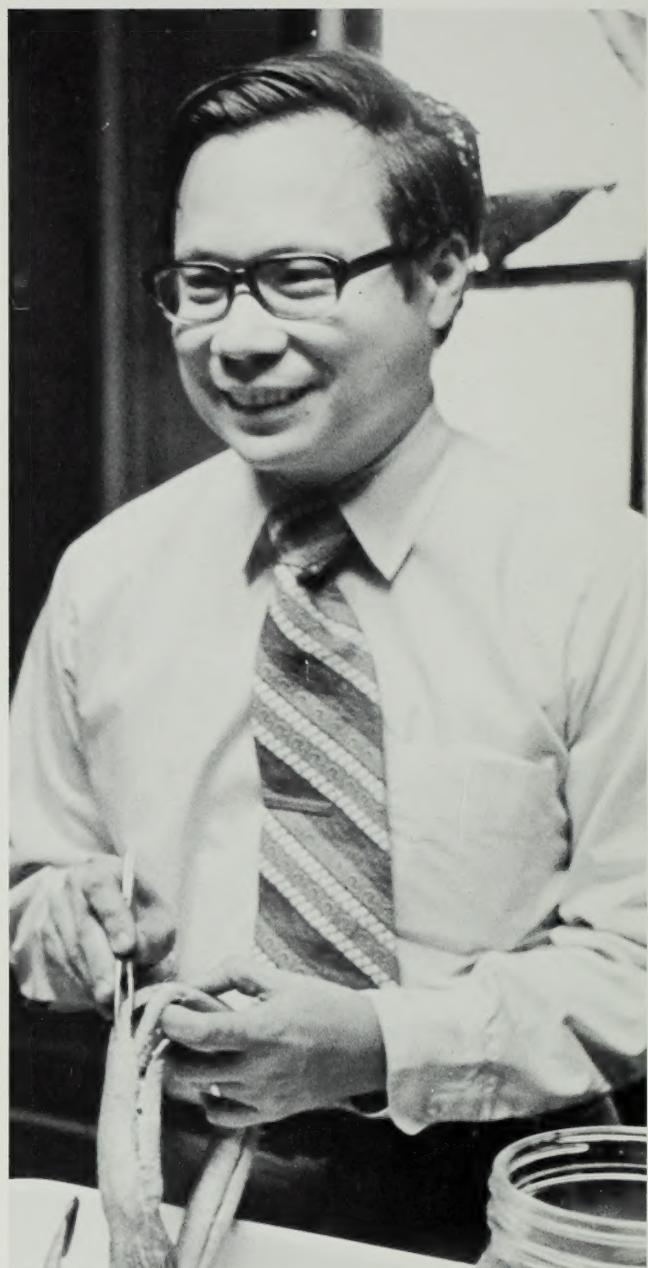
Professor Liem comes to the MCZ from the University of Illinois College of Medicine where he was Associate Professor of Anatomy. Concurrently, he served as Associate Curator of Vertebrate Anatomy at the Field Museum of Natural History and as Lecturer on Evolutionary Biology at the University of Chicago.

MCZ RECEIVES IMPORTANT COLLECTION

A major gift of 2500 reprints, separates and some books on spiders and other arachnids has been given to the Arachnology Department of the Museum. The collection was given by Dr. Arthur Merton Chickering and represents his entire reprint library.

Dr. Chickering was Professor of Biology at Albion College from 1918-1957. Following his retirement, he moved to Cambridge to continue his research. He was appointed as an Associate in Arachnology in the Museum where he helped to carry out highly specialized curatorial work on the MCZ's spider collections.

Dr. Chickering is now retired and lives in Gilsum, New Hampshire.



Professor Liem examines the air-breathing, land-dwelling fish, *Monopterus albus*, from Southeast Asia.

DR. BORESKE CURATES FOSSIL FISH COLLECTION

One of the MCZ's richest assets is its collection of fossil fishes which represents a complete spectrum from the earliest-known vertebrates to the late Tertiary teleosts. The collection was begun by Louis Agassiz, who brought with him considerable European material initially obtained for the natural history collections of Harvard College. Much of the European type material described by Agassiz in his *Poissons Fossiles*, 1843, was also deposited here at Harvard. Alexander Agassiz acquired a number of important addi-

tional fossil fish collections in the 1880's. Among these are the collection of exquisitely preserved fish and other vertebrates from the lithographic limestone at Solenhofen, Germany; the giant arthrodire collection from the Cleveland Shale; and the Stock collection of fish from the Scottish Coal Measures. During the 1890's and early 1900's Charles R. Eastman was the first well-known professional paleontologist to work actively on fossil vertebrates at the MCZ, and he added a quantity of important North American Paleozoic fishes.

This major collection of fossil fishes was last attended many years ago under the curatorship of Henry Stetson. There is thus a great need for this material to be updated and re-evaluated, and for this purpose Dr. John R. Boreske (Ph.D. Boston University, 1972) has recently been appointed Curatorial Associate in charge of the fossil fish collection. His first venture into field work was in the Cleveland Natural History Museum's fossil fish expedition, which produced the largest known collection of Late Devonian fishes. His current research has focused largely on an evolutionary and morphological study of the Recent *Amia calva* and its ancestral forms in North America and Europe. In addition to his work with the MCZ fossil collection, Dr. Boreske will be lecturing on fossil fishes in the Evolution of the Vertebrates course (Biology 139).

ASSOCIATE APPOINTED

Ronald Munson, an Associate Professor in the Department of Philosophy at the University of Missouri (St. Louis), has been appointed as an Associate in Biology in the Museum. Because Dr. Munson's chief interest is the philosophy of biology, he will study under Professor Ernst Mayr in an effort to broaden his understanding of biology.

CONCORD FIELD STATION TO HOLD OPEN HOUSE

Members of the Concord and Bedford communities, Friends of the MCZ and the Museum staff will have the opportunity to view the recent growth of the Concord Field Station at an open house which has been scheduled for Sunday, November 5th, at 3:00 P.M.

In addition to the vast improvements made within the Countway Laboratory, construction is underway on a new experimental facility for population, environmental, and behavioral studies. The construction, funded by the Ford Foundation, includes conversion of the underground Nike Missile bunkers at the Station into large controlled environmental study chambers (MCZ Newsletter, Vol. 1, no. 3).

The guests will be invited to tour the as yet uncompleted laboratories, and meet and talk with the research staff. Several members of the staff will demonstrate aspects of their work.

DR. BURNS RECEIVES APPOINTMENT

John McLaren Burns (Ph.D. University of California, Berkeley, 1961) has been appointed as Associate Professor of Biology. Professor Burns, who joined the MCZ scientific staff in July 1969 when he became Associate Curator of Lepidoptera, considers himself an "evolutionary biologist." Although most of his research deals with Lepidoptera, especially diurnal species, his work with them relates to genetics and ecology, as well as to systematics. His primary interest is in analyzing evolutionary processes, for which butterflies are an especially favorable group because they are already relatively well known taxonomically. Furthermore, butterflies differ so much from higher vertebrates (which are also well known and therefore much used in evolutionary studies) in their organization, development and behavior that working with them may provide different insights into evolutionary processes. For instance, Lepidoptera, being almost entirely phytophagous (feeding on plants), have many fascinating reciprocal evolutionary relations with plants.

In his research he is most concerned with problems of population differentiation and speciation, especially in

Professor Burns in his laboratory.

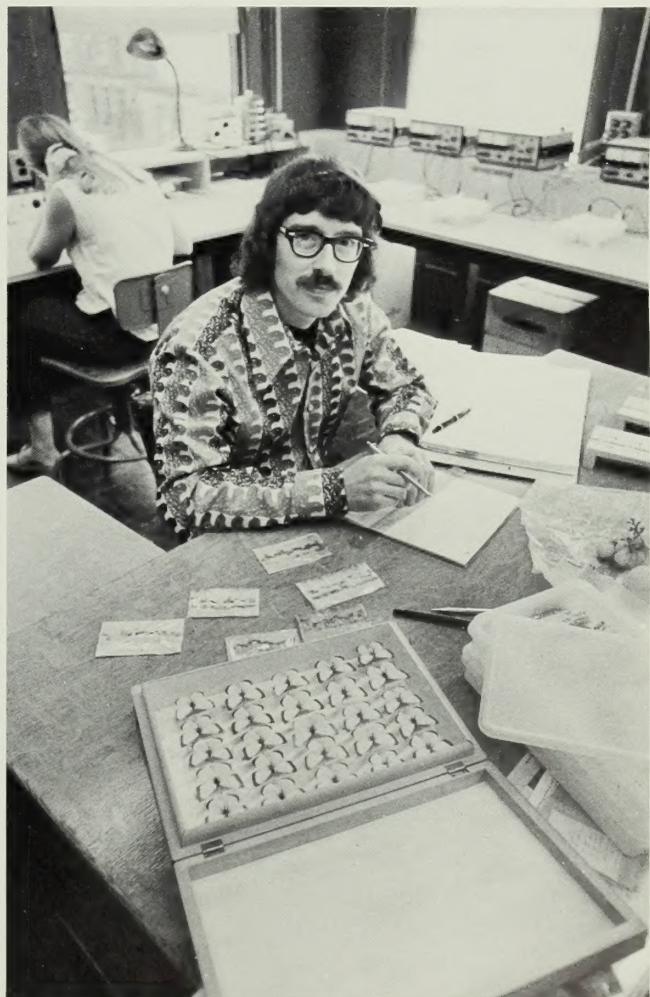


Photo by Rick Stafford

foodplant specialists; in interspecific hybridization; in the genetics and ecology of polymorphism, including mimetic polymorphism and especially electrophoretically-detectable protein polymorphism; and in mating biology. Most of his systematic work is with the skipper butterflies (Hesperiidae).

In recent years, he has used the technique of gel electrophoresis to study hereditary variation in natural populations. Electrophoresis is a fairly simple way of accurately separating differently charged molecules by placing them in an electric field under specified conditions for a period of time. Changes in hereditary factors (genes) lead to changes in details of a protein's structure which often alter the net surface charge of that protein molecule. By using electrophoresis to discriminate among variants of a single protein (some particular enzyme) in a sample of individuals from a population, it is possible to examine the result and estimate how much hereditary variation there is for that enzyme in that population. In other words, various alternative forms of one and the same gene — which are known as alleles — can be counted and their frequency compared in space and time. For this electrophoretic study, Professor Burns has often used the live butterfly, *Colias*. His comparison of North American species of *Colias* has now been extended to 12 species.

During Professor Burns' term as Associate Curator, more than half of the Lepidoptera collection has been extensively reorganized. The material is now systematized on a worldwide basis rather than on a continental basis. Several specialists in important moth groups have updated and rectified determinations of large numbers of specimens.

Professor Burns has taught in several courses at Harvard and this year will participate in the teaching of Principles of Evolutionary Biology (Biology 248) and Biology of Invertebrates (Biology 10a). He also coordinates the Natural History Seminars.

Recently Dr. Burns was a guest of the 17th International Congress of Zoology in Monaco, at which he presented a major paper, "Intra- and Interspecific Variation in Highly Polymorphic Esterases of Butterflies." In November, he will present another major paper at the joint annual meeting of the Entomological Society of America, the Entomological Society of Canada, and the Entomological Society of Quebec. He will speak on "Electrophoresis in Evolutionary and Systematic Biology."

Professor Burns previously served as Assistant Professor of Biology at Wesleyan University. He lives with his wife and three children in Lexington.

DR. PETERSON NAMED RESEARCH ASSOCIATE

Jane Audrey Peterson, a Research Associate in Herpetology and a Ph.D. from the University of Chicago, is interested in the comparative anatomy of limbs in various groups of reptiles. She is collaborating with E. E. Williams, Alexander Agassiz Professor of Zoology, on studies of locomotor diversity among Caribbean anoles.

Friends of the MCZ Notes

"THE ESSENCE OF BEING A DINOSAUR" IS SUBJECT OF FRIENDS' LECTURE

Bob Bakker, a graduate student in Vertebrate Paleontology who calls himself leader of the Dinosaur Anti-Defamation League, will speak to the Friends of the MCZ on November 28th on "The Essence of Being a Dinosaur." Bob feels that "dinosaurs have a bad press image" and really are "the great silent majority of the Mesozoic." Contrary to the impression that these immense animals were slow, thoughtful, "stuck in the mud", is Bob's conclusion that they were highly energetic. At the Friends' event Bob will show how he calculates the speed that a dinosaur was able to run, the amount the animal ate, and how much electricity would be needed to operate a tyrannosaurus.

In a recent paper (*Nature*, 238: 81-86) Bob cites endothermy as the reason for their successful radiation and eventual extinction. Bone histology, locomotor anatomy, pneumatopores, secondary palate and low predator/prey ratios are evidence that dinosaurs resembled advanced mammals or birds, not living reptiles. Because of their "mobility and capacity to unload high endogenous heat production" from vigorous activity in a warm climate dinosaurs had an advantage over mammal-like reptiles. The most primitive living mammals such as the tenrecs which are being studied in the Museum probably resemble advanced mammal-like reptiles. These mammals regulate



Bob Bakker

Photo by Rick Stafford

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their body temperature at relatively low levels and have poor mechanisms for coping with either endogenous or environmentally induced heat stress. Mesozoic mammals were restricted to small size because it was necessary for them to seek shelter in burrows and trees in order to escape dinosaurs. Unlike dinosaurs, the mammals also lacked effective evaporative cooling systems (*Evolution*, 25: 4, 636-658). Dinosaurs were actually adapted for high levels of sustained activity in fairly warm even temperatures where drastic diurnal or seasonal temperature changes were not present. Bob feels that they were annihilated when a sudden drop in world-wide temperature occurred at the Cretaceous-Tertiary boundary. Because of their large size and naked skin they could find no proper shelter and were subject to exposure. Unlike many ectotherms such as turtles and lizards, dinosaurs were unable to withstand prolonged drops in body temperature.

Before he came to the MCZ, Bob was Docent in Charge of Special Programs at Yale University. He originated the three dimensional approach to science teaching. Latex molds were made of important parts of fossil reptiles housed in the Peabody Museum. Children then made plaster casts of the fossils which they were able to keep for themselves or their schools. With this method the resources of the Peabody Museum were tapped in a unique way. He also developed projects and field trips for inner city children. He has served as consulting paleontologist at the National Museum of Canada (Ottawa) and the Rocky Hill Museum, Dinosaur Park, Connecticut. Bob is a student of Professor A. W. Crompton.

PROGRAMS INSTITUTED FOR CONCORD FRIENDS

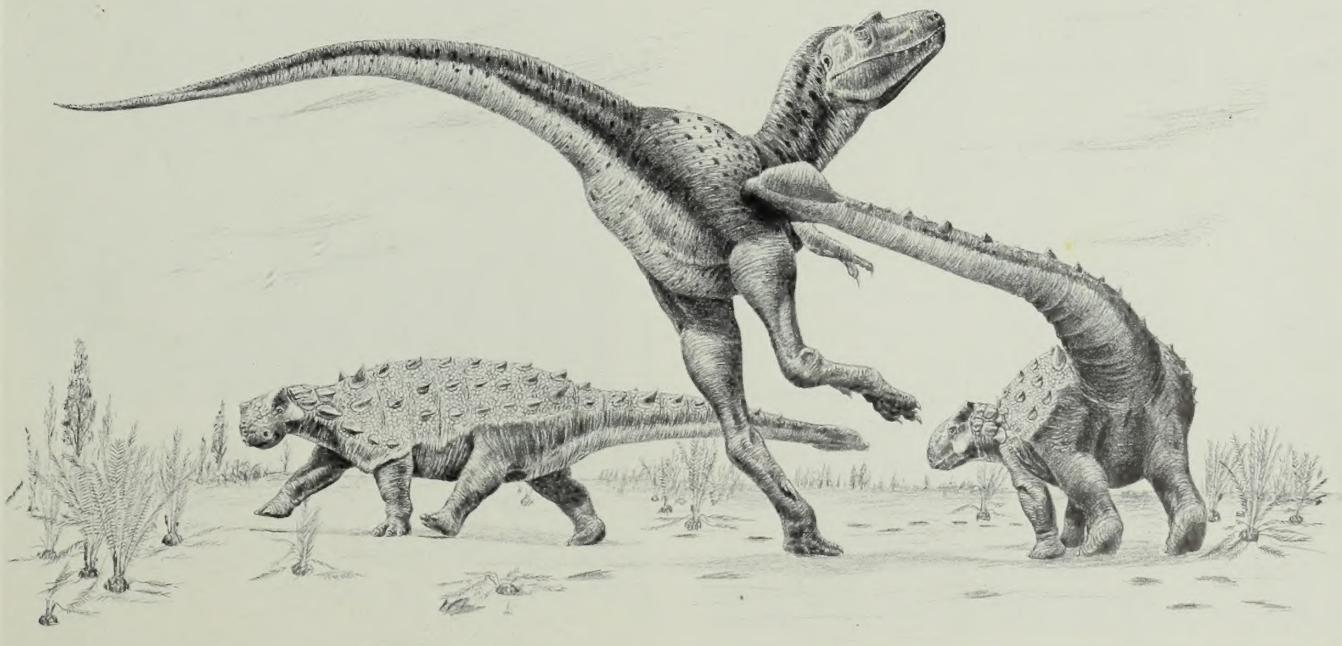
Special programs concerning the natural history of the Concord area have been scheduled for the Concord and Bedford Friends of the MCZ. The lectures and field trips will be oriented to family groups. Tim Moermond, a graduate student in herpetology, will speak on "The Ecology of Frogs." In the winter, John J. Littlejohn of the Invertebrate Paleontology Department will discuss "Geologic Evolution and Physiographic Development of New England and the Concord area." A graduate student in biology, Roger Swain, will acquaint the Friends with "Edible Plants of New England" in the spring.

All of the programs will be held at the Concord Field Station.

GIFTS AID MUSEUM PROJECTS

Since the time of Louis Agassiz, the MCZ has depended upon gifts of interested persons to support its research. The good will of so many people is represented by the tremendous number and diversity of scientific work projects as well as the continuing expansion of the Museum facilities. Once again, the MCZ has received very kind donations.

A Friend of the MCZ has most generously contributed funds which are being used to invite three outstanding biologists to speak to the Friends and the scientific staff.



TAIL-CLUB IN ACTION. The armored dinosaur, *Euoplocephalus*, repulses a tyrannosaur, *Albertosaurus*, on the Old Man Delta, 80 million year bp.

The Distinguished Speakers Series will form the basis of events for the year. The gift will also cover the costs of refurbishing the Museum lecture hall which is used extensively for teaching and will now also provide a good meeting place for the Friends.

Gifts from the Anne S. Richardson Fund and Mrs. Harry Drinker, a Friend of the MCZ, have made possible the preparation and future publication of a natural history survey of the Estabrook Woods and Pickman Area. The subsequent handbook will represent a culmination of research of many members of the Harvard community who have donated their time (*MCZ Newsletter*, Vol. 1, no. 2). It will serve as an excellent model for environmental and ecological study in this region of the country.

The Museum is most grateful for these particular contributions and all others which it receives.

DISTINGUISHED SPEAKERS SERIES ANNOUNCED

A Distinguished Speakers Series has been instituted for the Friends of the MCZ. The Series represents a major effort of the Museum to better inform an interested lay public in current research efforts in the field of natural history. The first event will feature Bob Bakker (see article: "The Essence of Being a Dinosaur"). At the January event the distinguished entomologist, Professor Carroll M. Williams of Harvard's Biological Laboratories, will discuss "Everything You Always Wanted to Know About Insect Hormones . . . But Were Afraid to Ask." Professor Williams' work will be featured in the winter *MCZ Newsletter*. The name of the third speaker will be announced shortly. The Series has been made possible by the generous donation of a Friend of the MCZ.

CHILDREN'S PROGRAMS SCHEDULED

Programs for children have once again been scheduled as a facet of the activities of the Friends of the MCZ. Last year's programs received an overwhelmingly enthusiastic response by the many families that participated in the events. The first program for this season will be a field trip to certain locations on the South Shore. Jack Sepkowski, a graduate student of Professor Bernhard Kummel, will conduct the tour. The children will have the opportunity to observe the biological life in the various littoral environments. They will also investigate the muddy intertidal region and the marshlands.

Another Ph.D. candidate, Carol Jones, will teach children how to decipher life styles of extinct animals. The younger children will work with microscopes while the older group will learn how to examine rocks to determine environmental conditions under which they were formed.

Stanley Awramik, an Invertebrate Paleontology graduate

student, will explore with the children life as it was one million years ago when blue-green algae "ruled the earth" and then will discuss the gradual development of organisms.

The dates for these first three programs will be scheduled immediately before the event so that they will not coincide with school functions. The mid-winter and spring events will be announced in the winter *MCZ Newsletter*.

OFFICERS OF FRIENDS NAMED

As the programs of the Friends of the MCZ take on new dimensions, there is an ever-increasing need for assistance from members in order to carry out the many areas of responsibility. The following persons have kindly consented to give additional time and help to the organization by serving as officers:

Paul Brooks — *President*

Herbert Pratt — *Vice President*

Mrs. Hedy Mattson — *Secretary*

Edward S. Gruson — *Treasurer*

Mrs. Barbara M. Marshall — *Membership*

Mrs. George Dick — *Entertainment*

Mrs. Alexandra O. Eliot — *Children's Programs*

Photo by Rick Stafford



In the photograph, Barbara E. Bee is holding a *Tenrec ecaudatus*. Barbara has assisted with preparation and animal care in the MCZ for several years. This fall, she entered Radcliffe's Class of 1976.



HENRY RUSSELL APPOINTED

Dr. Henry Russell (Ph.D. Boston University, 1940) will serve as Associate in Malacology in the Museum. For many years Dr. Russell has carried out extensive work projects in the MCZ. He has also been affiliated through teaching and research with many neighboring New England Institutions including the New England Museum of Natural History, the Marine Biological Laboratory at Woods Hole, the Massachusetts Institute of Technology, and the William F. Clapp Laboratories in Duxbury. He has worked for the states of Massachusetts and New Hampshire in the application of biological principles for improvement of the economic status of natural organisms such as pond and stream fish and coastal soft shell clams. Though Dr. Russell conducted research in many areas of biology, the major emphasis of his work is the study of the Nudibranchia. His research culminated in 1964 in the publication of *Index Nudibranchia*.

Dr. Russell is affiliated with many scientific societies including the Boston Malacological Club. He is also an active member of the Friends of the MCZ.

Presently he is collaborating with his daughter, Louise, an artist, on a nature guide of the Robert S. Hale Camping Reservation in Dover and Westwood.

Dr. Russell and his wife reside in Dover, Massachusetts.

LONDON UNIVERSITY RESEARCHER IS VISITING LECTURER

Dr. Pamela L. Robinson, Reader of Vertebrate Paleontology at London University (University College, Gower Street) has been appointed as a Visiting Lecturer during the Fall term of 1972. During her stay at the Museum, Dr. Robinson will present three lectures in Biology 139 (Evolution of the Vertebrates) and two or three seminars. She will spend much of her time working with the MCZ collections.

Dr. Robinson is a recognized authority on Mesozoic reptiles (especially lizards) and the paleoecology of this period. Her contributions are detailed studies on the earliest lizards, including a spectacular flying form, and nurturing vertebrate paleontology in India. In this latter connection she has played an important role in training Indians in this field both in India and at her laboratory in London.

DR. ROBERTS NAMED ASSISTANT PROFESSOR

Tyson Royal Roberts (Ph.D. Stanford, 1968), Assistant Curator of Fishes in the MCZ since June, 1969, has just been appointed as Assistant Professor of Biology. He is teaching the Biology of Fishes (Biology 130) this fall. The National Geographic Society recently awarded Professor Roberts a grant to survey the fish fauna of the rapids in the lower Congo River. This will be his fourth trip to the Congo; he has also done extensive fieldwork in tropical Asia (Ceylon and Thailand) and Latin America (Mexico, Brazil and Ecuador).

This summer Professor Roberts reviewed the higher classification of Ostariophysii for a Linnaean Society symposium on the higher classification of fishes. In addition, he is preparing a major contribution on the osteology and relationships of the characins, a predominant group of fresh-water fishes in Africa and South America.



Photo by John Lupo

Professor T. R. Roberts

DR. HIIEMÄE CONDUCTS RESEARCH WITH PROFESSOR CROMPTON

Karen M. Hiiemäe, Senior Lecturer in Anatomy with Special Relation to Dentistry at Guy's Hospital Medical School, University of London, has been named as Research Fellow in Paleontology for the coming academic year. Dr. Hiiemäe is collaborating with Professor A. W. ("Fuzz") Crompton on electromyographic (EMG) and cineradiographic (X-ray motion picture) studies of mastication in such primitive mammals as the American opossum. EMG recordings yield a record of muscle activity, and, consequently, of the functions of individual muscles in moving the jaw, tongue and throat. The researchers will also use cineradiography to study the oral behavior and mandibular movements in feeding in a wide variety of mammals but particularly in the primates and typical examples of carnivores, ungulates and insectivores. These studies will be undertaken in parallel with further studies on the morphology of the masticatory apparatus in critical fossil mammals. By combining experimental results with anatomical observations on living and extinct mammals as well as man, the researchers intend to understand more fully the structure and function of the masticatory system.

Dr. Hiiemäe and Professor Crompton previously worked together at Yale University where Professor Crompton was Director of the Peabody Museum. Dr. Hiiemäe holds both a Ph.D. and B.D.S. from the Royal Dental Hospital School of Dental Surgery, University of London.

Dr. Hiiemäe with cineradiographic equipment.

COMMUNITY COLLOQUIA ANNOUNCED

Once again this year the Concord community will have the opportunity to become better acquainted with current research efforts at the Concord Field Station through the Community Colloquia which are presented by members of the staff. Professor C. Richard Taylor, Director of the Field Station, will discuss "Animal Locomotion" on Thursday, February 8th. In the past several years he has carried out extensive study on energy use of animals in running.

On Thursday, April 26th, David S. Woodruff will discuss the "Ecology of the Estabrook Woods." Woodruff is heading a major study of the area which will be presented in a handbook to be published next year.

All talks will be held in the Middlesex School Assembly Hall, Main School Building, Concord, at 8:00 P.M.



Photo by Rick Stafford

Many thanks to Rick Stafford of the Harvard University Gazette who once again contributed nearly all of the photographs to the Newsletter and who has recently directed much attention to the MCZ in other University publications. Also, I wish to express appreciation to Professor Farish Jenkins for his help with the production of this issue.

(Ms) Hedy Mattson