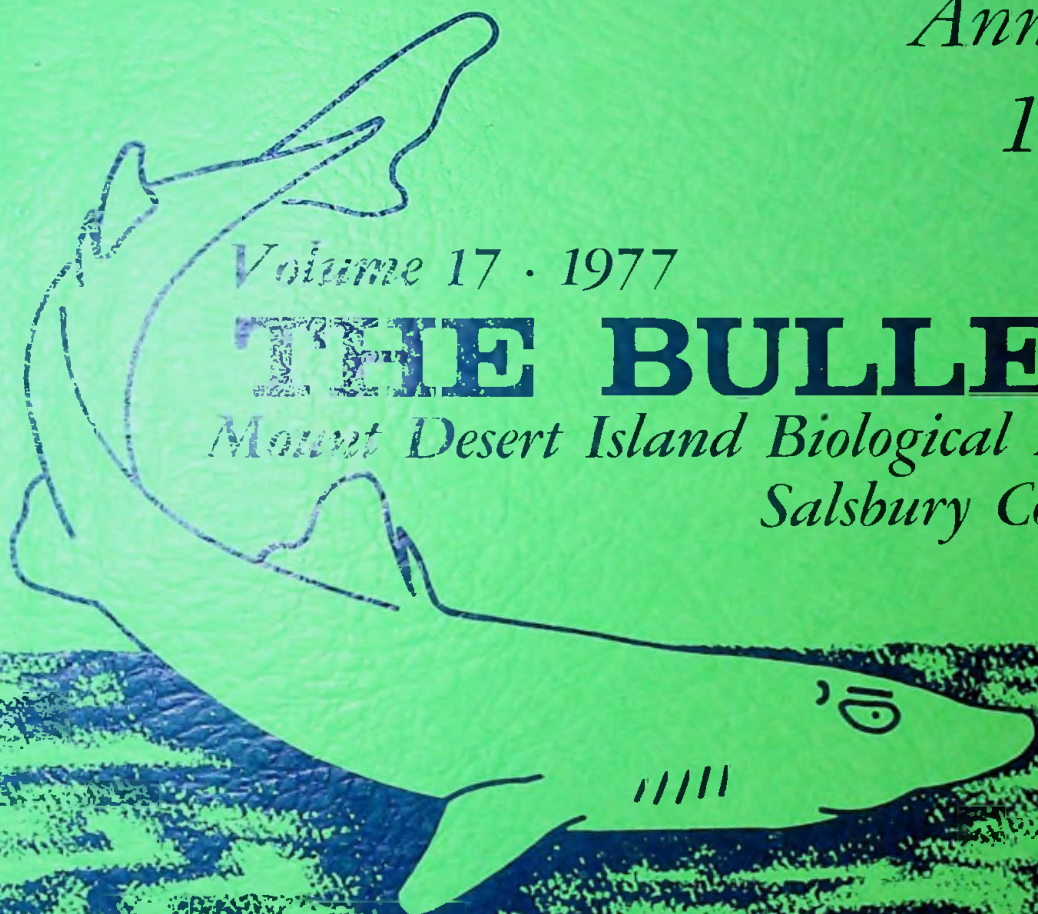


80th  
Anniversary  
1898-1978

*Volume 17 · 1977*

# **THE BULLETIN**

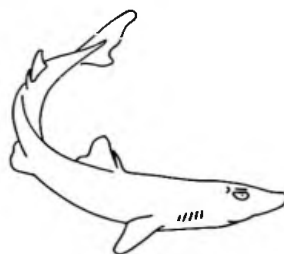
*Mount Desert Island Biological Laboratory  
Salsbury Cove, Maine*



*80th*  
*Anniversary*

**THE BULLETIN OF**  
*The Mount Desert Island*  
*Biological Laboratory*  
*Salsbury Cove, Maine*  
1977

**Volume 17**



**Issued 1978**

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HENRY O. HEINEMANN  
1920-1977

Dr. Henry O. Heinemann, a member of the Mount Desert Island Biological Laboratory since 1952, died in New York on November 23, 1977.

Born in Petoemboekran, Indonesia, the son of a Dutch physician, Dr. Heinemann received his medical education at the University of Amsterdam. He was a member of the Dutch Resistance during World War II. In 1951, Dr. Heinemann came to the United States as a Fulbright Scholar, and worked in the laboratory of Dr. Stanley Bradley at Columbia-Presbyterian Hospital. In his first summer at the Mount Desert Island Biological Laboratory, he was joined by his wife Frederika and his young son Murk-Hein, and began, with his family, a long association with the Laboratory as an investigator and member of the Corporation. His early studies, with Hodler, Walbach and Fishman, centered on problems of renal function and acid-base balance in marine and freshwater fish. His interest in renal function remained throughout his career, in his work with Dr. Homer Smith at New York University and during his tenure as Professor of Medicine at the New York Hospital-Cornell Medical Center. His later studies included papers of major importance on the metabolism of the lung.

There was another theme, however, that ran through his entire life as a physician: his untiring concern with the welfare of the patient. In later years, he became deeply involved in the problems of caring for the dying patient, and his concern was conveyed to his residents and colleagues.

During the winter months, he often spoke of his "beloved Maine," and the time that he would return with his family to his home near Salsbury Cove. A colleague recalled the pleasure of sailing with him on Frenchman Bay, and said "he was the most gentle and caring of men, and the most generous of friends."

## DESCRIPTION OF FACILITIES

The Mount Desert Island Biological Laboratory is an independent marine biological station on the coast of Maine near the mouth of the Bay of Fundy which provides a research facility for investigations on local flora and fauna. There is basic laboratory space for 36 research programs. Certain specialized equipment is available. During 1977 there were 113 scientific personnel in 33 research groups representing 46 institutions both here and abroad. There were 62 professional scientists and 51 students, technicians and staff in the 1977 programs. The work of the laboratory covers a broad area of biology, comparative physiology, and biochemistry.

No formal courses are offered, but some advanced undergraduate, graduate, medical, and post doctoral students spend the summer as assistants to senior investigators, thereby gaining research training. Most of these students are selected by the investigators from their home institutions. Effective September 1971, the laboratory established year-round programs with two investigator groups.

History and Organization

The Laboratory was founded in 1898 by J. S. Kingsley of Tufts College, and its original location was at South Harpswell, Maine. The site at Salsbury Cove was donated to the Laboratory by the Wild Gardens of Acadia, a group instrumental in the establishment of Acadia National Park, and removal to this location was completed in 1921. The first laboratory buildings, the original salt water system, and some of the residential cottages were constructed or obtained by the gifts of local summer residents.

The Mount Desert Island Biological Laboratory was incorporated in 1914 under the laws of the State of Maine as a nonprofit scientific and educational institution, and it is owned and operated by the Trustees and members of the Corporation. At present there are 360 members of the Corporation. It functions with minimal full-time professional administrative personnel and in most ways it is a cooperative enterprise. Income is derived from membership dues, laboratory fees, cottage rentals, investments, private and corporate donations, and grants. The business and scientific management of the Laboratory is in the hands of the Director and the Board of Trustees.

The Directors have been: Ulrich Dahlgren, Princeton University (1920-26); H. V. Neal, Tufts College (1926-31); William H. Cole, Rutgers University (1931-40); Roy P. Forster, Dartmouth College (1940-47); J. Wendell Burger, Trinity College (1947-50); Warner F. Sheldon, University of Pennsylvania (1950-56); Raymond Rappaport, Jr., Union College (1956-59); Alvin F. Rieck, Marquette University (1959-64); William L. Doyle, University of Chicago (1964-67); Charles E. Wilde, Jr., University of Pennsylvania (1967-70); H. V. Murdaugh, Jr., University of Pittsburgh (1970-75), Richard M. Hays, Albert Einstein College of Medicine (1976- ).

Location

Mount Desert Island lies in the Gulf of Maine about 150 miles northeast of Portland, Maine, and is connected to the mainland by a short bridge. Year-round air service on major airlines is available to Bangor, Maine with connecting flights on Bar Harbor Airlines, as well as direct flights from Boston to

Bar Harbor Airport. The island has an area of more than 100 square miles and is traversed east to west by a range of glaciated mountains and north to south by a narrow fjord six miles long that partially divides the east and west halves. Among the mountains lie several deep fresh water lakes and shallow ponds. Much of the mountainous area is a part of Acadia National Park. The island is separated from the mainland and adjacent island by narrow deep bays. Spring tides average 13.2 feet and neap tides 8.7 feet.

The many varied biological resources of the Acadian area are readily available. In summer, the cold waters of the Gulf of Maine are rich in marine life. The rocky shores, mud flats and strong tidal currents provide a variety of habitats. Fresh water lakes and ponds and the mixed terrain give further diversity to the forms available. Certain of these are abundant, others are scarce. The research abstracts in past Bulletins will give a good indication of the common forms. The director will be glad to furnish an estimate of the availability of any special forms. Special arrangements may be made for collections in Acadia National Park.

### Physical Plant

The Laboratory is situated on a tract of about 150 acres fronting on Frenchman Bay at Salsbury Cove in the Township of Bar Harbor. In addition to shore frontage, the Laboratory owns part of a fresh water pond and brook, and its land varies from meadow and forest to sphagnum bog. Investigation is carried on in single story buildings of frame construction located along the shore. These buildings are as follows:

- (1) *Neal Laboratory*. This, the oldest and largest of the laboratory buildings, was remodeled in 1955 and now contains eight laboratories: four large rooms that will each accommodate 3 to 4 persons, and four small rooms suitable for single investigators. All rooms are provided with gas, and fresh and salt water. Water troughs, aquaria, and larger tanks are located along the north wall outside.
- (2) *Halsey Laboratory* was remodeled in 1961 and consists of four rooms, each capable of accommodating 3 to 4 persons. The rooms all have gas, fresh and salt water. Refrigerators, ovens and aquaria are located on a common terrace at the entrance to the building.
- (3) *Marshall Laboratory*, a new year-round facility containing four laboratories and a common instrument room, and a full basement.
- (4) *The Kidney Shed* is a single large laboratory. It accommodates two research groups.
- (5) *Hegner Laboratory* contains 9 laboratory rooms provided with salt and fresh water each accommodating 1 to 3 persons.
- (6) *Karnofsky Laboratory*, constructed in 1970, contains 4 large laboratories, one large enough to accommodate 2 research groups. This lab has been winterized and is a year-round facility.
- (7) *Union Station* erected in 1962 contains two laboratories, each suitable for 2 to 3 persons and is equipped with salt and fresh water.
- (8) *The Instrument Room* was renovated in 1955 for the purpose of housing equipment used in common by members of the Laboratory. In 1969 one-half of this space was equipped as a research laboratory.
- (9) *Biophysics Building*. This air-conditioned building was erected in 1965. It houses isotope counting systems, ultracentrifuges, spectrophotometers, and a chemical hood.
- (10) *Shop and Stockroom*. The shop contains power and hand tools for woodworking; the stockroom has a few chemicals and analytical balances.

(11) *Business Office*. In the same building as shop and stockroom, an office staff serves both the seasonal and year-round needs of the Laboratory.

(12) *Director's Office and Library*. A separate building was constructed in 1955 to contain the Director's Office and library. The library is small, comprising reference texts for biology and medicine, a few complete journals (Biological Abstracts, Biological Bulletin, and the Journal of the Marine Biological Association), as well as monographs.

(13) *Dahlgren Hall*, the former village schoolhouse, was purchased and converted to use as a meeting hall; it houses a reprint collection. The single large room can seat about 120 persons. It is equipped with projectors for regular lantern slides, 35 mm slides, and 16 mm silent motion pictures.

(14) *The Dining Hall*. This dining hall and living room for about 20 junior investigators and students was built in 1963. It is operated by a cook-manager. A small general library of books and records and a record player have been furnished by private donation.

(15) *Bowen Hall* is one of the finest remaining examples of early 19th century Island architecture. It now serves as one of three dormitories and has a common room for young women.

(16) *Dock*. The dock consists of two floats with livewells and attached live cars for storage of specimens. It is attached to the shore by an inclined ramp and a bridge and abutment.

(17) *Collecting Boats*. A 32' gasoline powered collecting boat, the *Squalus*, was built in 1958. It is provided with a circulating water tank for the transportation of specimens. Arrangements can be made with local fishermen for offshore specimens. A Nova Scotia skiff with an outboard motor is also used for collecting and skiffs are available to investigators.

### Housing

Sixteen cottages suitable for families with children stand on land owned by the Laboratory and are within easy walking distance of it. The cottages are rented by the season, or occasionally for shorter periods. Occupants must supply their own blankets and linen, as well as pay the Laboratory for the use of the cottage (which includes utilities and garbage disposal). Rent is \$570 to \$980 per season, depending upon the size of the cottage. A few privately owned cottages are also available for rental near the Laboratory, and in other communities on the Island. An automobile is essential for family mobility in the area.

Single investigators, student assistants, and couples without children rent rooms in the village or in laboratory dormitories and take their meals in the Laboratory Dining Hall. The weekly charge for meals is based on self-sustaining nonprofit operation.

In order to encourage private construction and ownership of cottages by workers, the Laboratory has a policy of issuing leases on certain plots of laboratory land. Provision is made for sale or rental of the cottages to other workers in case their owner finds it impossible to continue to work at the Laboratory. In this way, the Laboratory is able to encourage capital investment by individuals and at the same time ensure that the land will remain under its own jurisdiction. At present seven cottages are privately owned in this way.

### Recreational Activities

Mount Desert Island has long been known to have one of America's most desirable summer climates. The ocean, rocky shores, and mountains provide scenery of unexcelled beauty. The distance from large

metropolitan areas has so far helped to keep it relatively unspoiled. Swimming, hiking, mountain climbing, picnicking, boating and sailing, tennis, golf, and other sports are readily available. Acadia National Park with its excellent naturalists' program contributes to the general interest. There are small museums of Indian and local lore, public gardens, a good public library and cultural exhibits. Proximity to the Jackson Laboratory adds scientific interest and resources. Salsbury Cove is an old fishing and farming community on the northern shore of the Island near the main road from Bar Harbor to Ellsworth. It has one general store and Post Office. The Laboratory colony comprises about 100 adults and 60 children of assorted ages, and forms a considerable portion of the summer population of the village. Bar Harbor, the largest town on Mount Desert Island, is about six miles from the Laboratory and provides many of the services of a city including excellent shopping facilities and a good hospital.

#### Acknowledgments

The Mount Desert Island Biological Laboratory is indebted to the National Science Foundation for substantial support during the past decade. Funds for renovations of buildings and new construction have permitted the laboratory to expand and upgrade its facilities. Contributions to operating costs and for specialized research equipment have greatly improved the efficiency of research activities. The individual research projects which have been served by this laboratory are variously funded by private and government agencies and by individuals and all of these projects have benefited from the National Science Foundation grants to the Laboratory. Current support under grant BMS75-03098 is gratefully acknowledged.

#### Applications

Fees for research space vary according to the demand made on the facilities. They range from \$220 to \$1045 depending on the space assigned and the number of workers. Special arrangements may be made for facilities beyond the summer season (June 15 - September 15). All investigators have the use of the general facilities, but special arrangements are necessary if unusual demands are anticipated. Investigators are urged to bring their own specialized equipment and chemicals. On occasion, the Laboratory may be able to provide apparatus which would have long-term usefulness for other workers. Isotope counting systems and ultracentrifuges are available on a fee basis. Persons planning to use isotopes must make prior arrangements in conformity with our Radiation Safety Committee requirements.

In an effort to make our specimen collecting facilities as self-supporting as possible, fees change almost annually. This year's fees ranged from \$3 for dogfish, skates, and flounder, to \$50 per trip for unusual specimens. Some of the commonly used organisms include:

Pisces: *Myxine glutinosa*, hagfish; *Squalus acanthias*, spiny dogfish; *Raja erinacea*, little skate; *Anguilla rostrata*, eel; *Fundulus heteroclitus*, killifish; *Lophius americanus*, goosefish; *Myxocephalus* sp, sculpins; *Pholis gunnellus*, rock eel; *Pseudopleuronectes americanus*, winter flounder.

Invertebrates: *Echinarachnius parma*, sand dollar; *Pagurus* sp, hermit crabs; *Homarus americanus*, lobster; *Boltenia ovifera*, sea potato.

Other native fauna under investigation include:

echinoderms, gastropods, frogs and salamanders, and marine birds.

Limited fellowships are supported by funds from the Ulrich Dahlgren Memorial fund (a gift from the American Philosophical Society) and other memorial funds.

Application and inquiries should be addressed to the Laboratory Director:

July 1 - August 31            Dr. Richard M. Hays  
Mount Desert Island Biological Laboratory  
Salsbury Cove, ME 04672

September 1 - June 30       Dr. Richard M. Hays  
Albert Einstein College of Medicine  
1300 Morris Park Avenue  
Bronx, NY 10461

Inquiries regarding specific matters such as laboratory charges and facilities can also be directed to:

Mr. Jonathan S. Gormley  
Business Manager  
Mount Desert Island Biological Laboratory  
Salsbury Cove, ME 04672



OFFICERS: 1977-78

President	Jack D. Myers*
Vice-President	Charles E. Wilde, Jr.*
Treasurer	Dwight L. Eaton
Secretary	Stanley E. Bradley
Clerk	Roger Chagnon
Director	Richard M. Hays*

Elected Members of the Executive Committee: Thomas H. Maren  
Patricia Silva

*\*Ex Officio member of the Executive Committee*

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# THE MOUNT DESERT ISLAND BIOLOGICAL LABORATORY

## PERSONNEL 1977

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Director	Richard M. Hays	Albert Einstein College

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Assistant Director	Richard Crawford	Trinity College
Plant Manager	Robert Dolliver	MDIBL
Business Manager	Jonathan Gormley	MDIBL
Grounds Crew	Jeffrey Dolliver	MDIBL
Collecting Crew	William Sylvia	MDIBL
	Gary Buzzell	MDIBL
Co-op Manager	Sharon Peterson	MDIBL
Co-op Assistant	Kevin Crawford	MDIBL
Isotope Technician	Ann Gryboski	Trinity College
Flame Spectrometer Tech.	Bill Shaw	MDIBL
Secretaries	Peg Bailey	MDIBL
	Peggy Buckley	MDIBL
	Chris Crawford	MDIBL
Office Assistant	Sue Goldstein	MDIBL

# THE MOUNT DESERT ISLAND BIOLOGICAL LABORATORY

1977

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Hans Doerstling	MDIBL
Jill Eveloff	MDIBL
Ellen Hatch	MDIBL
William Kinter	MDIBL
Eric Lacy	MDIBL
Jan Meryweather	MDIBL
David Miller	MDIBL
Bodil Schmidt-Nielsen	MDIBL
Karel Walls	MDIBL

## SEASONAL SCIENTIFIC PERSONNEL

NAME	INSTITUTION
William Armstrong	Indiana University
Maria Baranano	Beth Israel Hospital
John R. Bend	NIEHS
William Bixenman	Indiana School of Medicine
James T. Blankemeyer	Oklahoma State University
William Bobier	University of Waterloo
Anne Bogar	University of Rhode Island
Jennifer Bolton	Beth Israel Hospital
George Booz	University of Pennsylvania
James L. Boyer	University of Chicago
Stanley Bradley	Columbia University
Monique Churchill	Wayne St. University
Paul Churchill	Wayne St. University
Charles A. Clark	University of South Carolina
Dennis Clayton	University of Pittsburgh
Gary Conrad	Kansas State University
Calvin U. Cotton	
Richard Crawford	Trinity College
Susan Davis	Kansas State University
Kevin Degnan	N.Y. University Medical Center
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Franklin H. Epstein	Beth Israel Hospital
Jonathan Epstein	Brookline High School
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Roy P. Forster	Dartmouth College
Gary Foureman	NIEHS
James R. Fouts	NIEHS
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Leon T. Garretson	N.Y. University Medical Center
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Dayle Geroski	Medical College of Wisconsin
Denise Giguere	
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Howard Haines	University of Oklahoma
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David Hays	California Inst. of the Arts
Richard M. Hays	Albert Einstein College of Medicine
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Adrian Hogben	University of Iowa
Randall Holcombe	Duke University
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Jacob H. Kahn	University of Virginia
Karl J. Karnaky	Temple University
Barbara Kent	Bronx Veteran's Hospital
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Eva Kinne	
Rolf Kinne	Max Planck Institute
Arnost Kleinzeller	University of Pennsylvania
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Michael Levy	Paseack Valley Regional H.S.
Richard Malvin	University of Michigan
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Jussi Melarton	Wesleyan Station
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Victor Murdaugh	University of South Carolina
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Stephanie Orellana	Beth Israel Hospital
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Richard Solomon	Roger Williams General Hospital
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John L. Stephenson	NIH
Arthur Stevens	Hampshire College
Jeffrey Stoff	Beth Israel Hospital
Erik R. Swenson	University of California
Karl Ullrich	Max Planck Institute
Evan Vosburgh	
Charles E. Wilde	University of Rhode Island
Dixon Wilde	Earlham College
José A. Zadunaisky	N.Y. University Medical Center



Bend, John R.

1. Epoxide metabolism by marine species
2. Pharmacokinetics of single, radiolabeled constituents of crude oil and polychlorinated biphenyl (PEB) isomers in marine species
3. Reconstitution of the microsomal mixed-function oxidase system from selected marine species
4. Induction of mixed-function oxidase and epoxide-metabolizing enzyme systems in marine vertebrates (skate, flounder, dogfish shark)
5. Non-nutritive carboxylic acid metabolism in flounder and dogfish shark

Boyer, James L.

Bile secretory function in elasmobranchs

Bradley, Stanley E.

Effect of bioelectric potentials upon relative clearances of charged and uncharged solute by the rectal gland of the dogfish *S. acanthias*

Churchill, Paul C.

Renal effects of angiotensin II in fish

Conrad, Gary W.

Role of calcium ions in regulating changes of cell shape

Crawford, Richard B.

Effects of xenobiotic compounds on embryogenesis

Dinsmore, Charles E.

Continued investigation of epimorphic regeneration mechanisms in the plethodontid salamanders

Doyle, William L.

Morphological correlates of saline secretory processes

Edelhauser, Henry F.

Comparative corneal ultrastructure and metabolism in marine teleosts and elasmobranchs

Epstein, Franklin H.

Chloride transport by teleost gills and elasmobranch rectal gland

Erlij, David

Role of  $\text{Ca}^{++}$  in transepithelial Na transport

Field, Michael

Chloride transport in teleost intestine and dogfish rectal gland

Foster, Roy P.

Cell volume and regulation in skate myocardium

Goldstein, Leon

Nitrogen metabolism in elasmobranch fishes

Hays, Richard M.

1. Urea transport across the rectal gland
2. Isolation of vesicles from amphibian bladder plasma membrane

Hogben, C. Adrian M.

Action of furosemide on chloride transport of gastric mucosa

Huwer, Charles

1. A chemical technique for preserving fertility of teleost gametes
2. Effects of acid rain on the development of teleost eggs

Kent, Barbara

Cardiovascular studies in *S. acanthias* using total body perfusion techniques

Kidder, George W.

Studies on the electrophysiology of dogfish gastric mucosa with sufficient oxygen

Kinter, William B.

1. Physiology and morphology of cell transport
2. Membrane toxicity theory and environmental pollutants

Kleinzeller, Arnost

The renal handling of sugars in the winter flounder (*Pseudopleuronectes americanus*)

Maren, Thomas H.

A comparative study of the Bohr effect

Myers, Jack D.

Continued study of electrolytes, other solutes, and water excretion in *S. acanthias*, the adaptation of that species to varying aqueous environments, and the endocrine control of renal function under the above circumstances.

Opdyke, David F.

Development of vertebrate vascular control systems

Peakall, David B.

Effect of oil on transport mechanisms in seabirds

Pritchard, John B.

1. Excretion of DDA and 2,4-D by flounder kidney
2. In vivo transport of sugars by the winter flounder kidney
3. Molluscan CaATPase and its pesticide sensitivity

Rappaport, Raymond

Tensiometric studies on dividing sand dollar eggs

Schultz, Stanley G.

Relation between transepithelial sodium chloride transport by the gallbladder of  
*Squalus acanthias* and intracellular sodium and chloride ionic activities

Schmidt-Nielsen, Bodil

The functional anatomy of the skate nephron  
Micropuncture of the hamster papilla

Silva, Patricio

Mechanism of electrolyte transport by the rectal gland of the spiny dogfish  
*Squalus acanthias*

Sivak, Jacob G.

1. Visual optics of the elasmobranch eye
2. Anatomy, physiology and optics of the eyes of flatfish

Wilde, Charles E.

Further studies on the molecular, developmental and behavioral biology of  
*Fundulus heteroclitus*

Zadunaisky, José A.

Transport phenomena in ocular and other tissues of marine animals

Formal Evening Seminars - Dahlgren Hall

- TUESDAY, July 5 Dr. Steven Ernst, Department of Anatomy, Temple University, Philadelphia, PA.  
"Localization of sodium pumps in transporting epithelia"
- TUESDAY, July 12 Dr. Raymond Rappaport, Union College, Schenectady, N.Y.  
"Mechanisms of cell division"
- TUESDAY, July 19 Dr. Kevin J. Degnan, Department of Physiology, New York University, N.Y.  
"Chloride and sodium movements across the isolated opercular epithelium of *Fundulus heteroclitus*"
- TUESDAY, July 26 Dr. Andrew Kandutsch, Jackson Laboratories, Bar Harbor, Maine  
"Synthesis and function of membrane cholesterol"
- MONDAY, August 1 Dr. Keith Thompson, Department of Biology, Yale University, New Haven, CT.  
"Shark locomotion"
- WEDNESDAY, August 10 Dr. Karl J. Ullrich, Max Planck Institut für Biophysik, Frankfurt, Germany  
(Visiting Investigator)  
"Factors affecting phosphate transport in the proximal tubule of the rat kidney"
- TUESDAY, August 16 Dr. Quais Al-Awqati, Department of Medicine, Columbia University, N.Y.  
"Energy cost of ion transport"
- TUESDAY, August 23 Dr. Rolf Kinne, Max Planck Institut für Biophysik, Frankfurt, Germany  
(Second Annual William Doyle Lecture)  
"Hormonal regulation of sodium transport processes in kidney and intestine: studies with isolated brush border vesicles"

Informal Seminars - 1977

Lunch Hour Seminars

- July 7 and 14 4-5 minute description of summer research projects by investigators  
(presented in alphabetical order)
- July 21 Winter Flounder: A model to study the mechanisms of xenobiotic excretion by John Pritchard
- July 28 Secretory function of the isolated, perfused rectal gland by Richard Solomon
- August 4 The circulatory system of the dogfish by Barbara Kent and David Opdyke
- August 12 Vertebrate strategies for vision in air and water by J. G. Sivak
- August 18 Membrane potentials and intracellular chloride activities in epithelial systems by William Armstrong
- August 25 Effects of ingested crude oil on marine birds by David Miller

Special Seminars

- August 5 Nuclear metabolism of polycyclic aromatic hydrocarbons by Dr. Edward Bresnick of the University of Vermont Medical School
- August 17 Status of and prospects for the N.I.H. intramural program by Dr. DeWitt Stetten, Jr., Scientific Director, NIH

Epithelial Membranes Transport Colloquia

- August 5 Intestinal absorption and secretion of chloride. Discussion leader Michael Field of the University of Chicago

### Epithelial Membranes Transport Colloquia

- August 5                      Intestinal absorption and secretion of chloride. Discussion leader  
                                 Michael Fields of the University of Chicago
- August 10                     Model for cotransport of Na and Cl. Discussion leader  
                                 Stanley Schultz, University of Pittsburgh
- August 17                     The chloride transport and O<sub>2</sub> consumption in the rectal gland of the  
                                 shark. Discussion leader Franklin Epstein, Harvard University
- August 24                     The situation of chloride secretion by the stomach. Discussion leader  
                                 George Kidder, University of Maryland



Editorial Committee - Vol. 17

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William B. Kinter  
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Printed at Chicago 1978