sip newsletter

SOCIETY FOR INVERTEBRATE PATHOLOGY EDITOR: JOHN C. HARSHBARGER

VOL. II., NO. 6 JUNE 22, 1970

THIRD ANNUAL MEETING OF THE SOCIETY FOR INVERTEBRATE PATHOLOGY AND THE IVTH INTERNATIONAL COLLOQUIUM ON INSECT PATHOLOGY
ADULT EDUCATION BUILDING, UNIVERSITY OF MARYLAND, COLLEGE PARK, MARYLAND
AUGUST 25-28, 1970

Airport Transportation. The most convenient airport to the University of Maryland is Friendship International at Baltimore. Limousine service is available directly to the Adult Education Building for $3.50. Persons arriving at Dulles International can take a limousine to the Sheraton Hotel on Colesville Road in Maryland for $3.00. From there one can either take a taxi or call the transportation desk in the Adult Education Building, telephone number 454-2322, to have transportation arranged. From Washington National there are no limousines to College Park. One can either take a taxi all the way for $10-$12 or take a taxi to the Greyhound bus station and get a bus to College Park.

Registration. In the Adult Education Building from 2 p.m. to 9 p.m. on Monday, August 24 and from 8 a.m. to noon on Tuesday, August 25.

Final Program. A printed program with all pertinent information for both meetings will be distributed at the registration desk.

Housing. The best deal is University Housing in the Adult Education Building. Rooms are $9.50 per day for a single and $13.00 per day for a double. Some College Park motels within two miles of campus are: Interstate Inn International, Holiday Inn of America, Quality Court Motel, and Del Haven White House Motel. Write to Robert M. Faust, Housing Coordinator, Colloquium on Insect Pathology and Annual Meeting of the SIP, Center for Adult Education, University of Maryland, College Park, Maryland, 20742, USA.

Meals. Obtainable in the University cafeteria or local restaurants. Lunches will not be catered as formerly announced.

PROGRAM FOR COLLOQUIUM ON INSECT PATHOLOGY

Tuesday, August 25

8:30 a.m. - Opening of the Colloquium - Dr. Bickley, Chairman, Department of Entomology, University of Maryland

- Welcome - President of the University of Maryland or Representative

- Address - Dr. Knipling, Director, Entomology Research Division, U.S. Department of Agriculture

Tuesday, August 25 (cont'd)

10:00 a.m. - Business meeting of the Society for Invertebrate Pathology

1:30 p.m. - SESSION ON FUNGAL AND PROTOZOAN PATHOGENS OF INSECTS

- Chairman - Roy E. McLaughlin

- Invited speakers - Wayne Brooks, North Carolina State University; Donald W. Roberts, Boyce Thompson Institute for Plant Research, Yonkers, New York; William G. Yendal, Pennsylvania State University

- Submitted papers:

Augmentation de la Sensibilité des Larves de Melolontha melolontha L. (Coléoptère Scarabaeidae à la Mycose à Beauveria tenella (Delacr). P. Ferron, Station de Recherches de Lutte Biologique. La Minière, France).

A Coccidian Parasite of Galleria mellonella. Raimon L. Beard. The Connecticut Agricultural Experiment Station

Microsporidia Causing the Collapse of an Outbreak of the Green Tortrix (Tortrix viridana L.) in Germany. J. M. Franz and A. M. Huger. Institut für Biologische Schädlingsbekämpfung, Darmstadt, Germany

The Fungus Diseases of Adelges piceae (Ratz.) and Their Possible Use for the Control of This Species. W. A. Smirnoff. Laboratoire des Recherches Forestières, Ste. Foy, Canada

Adaptation of Herpetomonas swainie n. sp. on Ten Species of Tenthredinidae and Diprionidae. W. A. Smirnoff. Laboratoire des Recherches Forestières, Ste. Foy, Canada

The Use of Elevated Temperatures to Reduce Nosema apis Infections in the Honeybee. G. E. Cantwell and H. Shimanuki. U.S. Department of Agriculture, Beltsville, Maryland

Transmission of the Flagellate, Herpetomonas muscarum in Laboratory Cultures of the Eye Gnat, Hippelutes pusio (Diptera: Chlorapidae). C. H. Bailey and W. M. Brooks. North Carolina State University

The Effect of Temperature on the Infectivity and Incubation Period of the Fungi, E. aphidis and E. thaxteriana on the Pea Aphid Acyithorsiphon pisum. Neil Wilding. Rothamstad, Experiment Station, Harpenden Herts, England

Wednesday, August 26

8:30 a.m. - SESSION ON EXPERIMENTAL INSECT VIROLOGY

- Chairman - T. W. Tinsley

- Invited speaker - W. A. L. David. Glasshouse Crops Research Institute, Cambridge, England. "Current Problems in Insect Virology".

Wednesday, August 26 (cont'd)

- Submitted papers:

  Significance of Viroplasm in the Replication of Cytoplasmic-polyhedrosis Virus. Y. Hayashi, T. Kawarabata and F. T. Bird. Insect Pathology Research Institute, Sault Ste. Marie, Canada

  Development of an Insectpox Virus in the Nervous System of Estigmene acrea Larvae. Robert R. Granados. Boyce Thompson Institute for Plant Research, Yonkers, New York

  The Purification and Properties of the Inclusionbody Protein of the Granulosis Virus of Pieris brassicae. J. F. Longworth and J. S. Robertson. University of Oxford, England

  The Structure of P. dispar Nuclear Polyhedrosis Virus. K. A. Harrap. University of Oxford, England

  Relationship of Buffer pH and Ionic Strength to the Yield of Virions and Nucleocapsids Obtained by the Dissolution of Rachiplusia ou Nuclear Polyhedra. C. Y. Kawanishi and J. D. Paschke. Purdue University

  Serological Studies on the Nucleopolyhedrosis Virus of Heliothis. M. Shapiro and C. M. Ignoffo. International Minerals and Chemical Corporation, Libertyville, Illinois

  Interactions of Microsporidian, Plistophora and Nuclear Polyhedrosis Virus in Agratis segetum. J. Lipa. Instytut Ochrony Roslin, Poznan, Polska

  Toxic Factor Produced by a Granulosis Virus Infection in the Armyworm: Effect on Apanteles militaris. H. K. Kaya and Y. Tanada. University of California, Berkeley, California

  Comparison of the Mosquito Iridescent Viruses (MIV) with Other Insect Iridescent Viruses. Ronald E. Lowe. U.S. Department of Agriculture, Gainesville, Florida

  Effect of Gamma Radiation on Viral Infectivity in Hemerocampa leucostigma. H. W. Rossmoore, E. A. Hoffman and R. Rystedt. Wayne State University, Detroit, Michigan

1:30 p.m. - SESSION ON BACTERIAL PATHOGENS OF INSECTS

- Chairman - P. Grison

- Invited speaker - T. A. Angus, Insect Pathology Research Institute, Sault Ste. Marie, Canada

- Submitted papers:

  Microbial Sterility of the Intestinal Content of the Immature Honey Bee, Apis mellifera L. Martha Gilliam. U.S. Department of Agriculture, Tucson, Arizona

Wednesday, August 26 (cont'd)

The Relative Potency of Various Strains of *Bacillus thuringiensis* Against Second Instar Gypsy Moth Larvae (*Porthetria dispar* L). Normand R. Dubois. Forest Insect Laboratory, Hamden, Connecticut

Stability of *Bacillus thuringiensis* in Beeswax and Bee Comb. H. D. Burges. Pest Infestation Control Laboratory, Slough, England

Isolation of Endotoxin from Vegetative Cells of *Bacillus thuringiensis* var. sotto. P. Luthy. Insect Pathology Research Institute, Sault Ste. Marie, Canada

X-Irradiation and Acquired Immunity in Larvae of *Tenebrio molitor*. Betty W. Mortimore. University of Illinois

Glucose Catabolism of Healthy and Infected Japanese Beetle Larvae. L. A. Bulla, G. St. Julian, G. L. Adams, R. A. Rhodes. U.S. Department of Agriculture, Peoria, Illinois

Pathogenicity of Bicrystalliferous Bacillus Isolate for *Aedes aegypti* and Other Aedini Mosquito Larvae. Eldon L. Reeves and Clemente Garcia, Jr. University of California, Riverside

Action of *B. thuringiensis* on the Fruit Tree Leafroller (tentative). Leo van der Geest. University van Amsterdam, The Netherlands

Report on the Meetings of the Sub-Committee for Virus Nomenclature. C. Vago, Chairman. Station de Recherches Cytopathologiques, Ste. Christol-les-Ales, France

Thursday, August 27

8:30 a.m. - SESSION ON DISEASE IN NATURAL AND LABORATORY INSECT POPULATIONS

- Chairman - Keio Aizawa

- Invited speaker - Roy McLaughlin. Boll Weevil Research Laboratory, U.S. Department of Agriculture, State College, Mississippi

- Submitted papers:

Polyhedrosis Viruses Infecting the Eastern Hemlock Looper, *Lambdina fiscillaria fiscillaria*. J. C. Cunningham. Insect Pathology Research Institute, Sault Ste. Marie, Canada

Transovum Transmission of Nuclear Polyhedrosis Virus in Relation to Disease in Gypsy Moth Populations. Charles C. Doane. The Connecticut Agricultural Experiment Station

Cross Infectivity of a Nuclear Polyhedral Virus Isolated from the Alfalfa Looper *Autographa californica* Speyer. P. V. Vail. U.S. Department of Agriculture, Mesa, Arizona

Thursday, August 27 (cont'd)

Disease in Natural Gypsy Moth Populations. John D. Podgwaite and R. W. Campbell. Forest Insect and Disease Laboratory, Hamden, Connecticut

Mortality in Peridorma saucia Following Single and Combined Challenger with DDT and Nuclear Polyhedrosis Virus. James D. Harper. Auburn University, Alabama

Influence of Sunlight on Inactivation of the Virus of Neodiprion swainei Midd. (Preliminary Results). W. A. Smirnoff. Laboratoire des Recherches Forestieres, Ste. Foy, Canada

A Nosema Disease in Two Anopheles Mosquito Colonies. E. Hazard. U.S. Department of Agriculture, Gainesville, Florida

Studies on Nosema stegomyiae Infections in Anopheles guadrimaculatus. K. E. Savage and R. E. Lowe. U.S. Department of Agriculture, Gainesville, Florida

Studies on the Infectious Diseases in Insectary Reared Codling Moth Laspeyresia pomonella L. V. P. Pristavko, L. V. Yanishevskaia, and O. I. Rezvatova. Ukranian Research Institute for Plant Protection, Kiev, USSR

1:30 p.m. - SESSION ON METHODS FOR VIRUS PROPAGATION AND PURIFICATION

- Chairman - Jost M. Franz
- Invited speakers - Franklin B. Lewis, Forest Insect Laboratory, Hamden, Connecticut, and George B. Cline, University of Alabama
- Submitted papers:

Zonal Rotor Purification and Properties of a Nuclear Polyhedrosis Virus of the European Pine Sawfly (Neodiprion sertifer, Geoffroy). H. M. Mazzone, J. P. Breillatt and N. G. Anderson. Forest Insect and Disease Laboratory, Hamden, Connecticut and Oak Ridge National Laboratories, Tennessee

Development of Malacosoma disstria Cytoplasmic Polyhedrosis Virus in Bombyx mori Ovarian Tissue Cultures. S. S. Sohi, F. T. Bird and Y. Hayashi. Insect Pathology Research Institute, Sault Ste. Marie, Canada

Purification and Characterization of an Insectpox virus of Lepidoptera. Donald Roberts and Max Bergoin. Boyce Thompson Institute for Plant Research, Yonkers, New York and Station de Recherches Cytopathologiques, Ste. Christol-les-Ales, France

La Recherche de la Structure Fine des Virus des Insectes. Les Virus de Granulosis Chez Dendrolimus sibiricus Tschetw., Agrotis segetum Schiff et de Polyedrosis Nucleaire Chez Bombyx mori L. N. G. Shvedchikova and L. M. Tarasevich. Institut de Microbiologie de l'Académie des Sciences de l'USSR, Moscow

Thursday, August 27 (cont'd)

Sur l'ARN des Corps d'Inclusions Chez les Insectes Conlenants ADN-Virus. L. M. Tarasevich. Institut de Microbiologie de l'Académie des Sciences de l'USSR, Moscow

Defense Reactions in the Nuclear Polyhedrosis of the Silkworm. Keio Aizawa. Institute of Biological Control, Kyushu University, Japan

- Closing Remarks on the Colloquium. P. A. van der Laan. University van Amsterdam, The Netherlands

PROGRAM FOR THE THIRD ANNUAL MEETING OF THE
SOCIETY FOR INVERTEBRATE PATHOLOGY

Colloquium on Microsporida
Y. Tanada, Chairman
Conference Room C, Adult Education Center

[A microsporidian demonstration workshop will be held in conjunction with "The Protozoan Diseases and Pathology Section of the Molluscan and Crustacean Disease and Pathology Workshop," Thursday afternoon, August 27. See page 8 for further details.]

Wednesday, August 26

9:00-9:30 a.m. - Schizogony, Sporogony, and Spores of Thelohania in Mosquitoes: Characteristic States in the Male Larvae and the Stempellia-like Development in the Adult Female. E. I. Hazard. U.S. Department of Agriculture, Gainesville, Florida

9:30-10:00 a.m. - Comments on Sporoblast Development in Microsporidia. J. Lom. University of Illinois and Institute of Parasitology of the Czechoslovak Academy of Sciences

10:00-10:30 a.m. - Morphogenesis in the Genus Nosema. Ann Cali. Ohio State University

10:30-11:00 a.m. - Life Cycle of Nosema bombycis. J. Weiser. Simon Frazier University

LUNCH

1:00-1:30 p.m. - Summary of the Contributions of Cytochemical Reactions to Our Knowledge of Microsporidan Spores. B. Erickson and V. Sprague. University of Maryland

1:30-2:00 p.m. - Spore Morphology of Microsporidian Species Assigned to the Genus Octosporea. J. P. Kramer. Cornell University

2:00-2:30 p.m. - On the Autogamy of Nuclei and the Spore Formation of Nosema bombycis. K. Ohshima. Tokyo, Japan

2:30-3:00 p.m. - Unique Host Relations and Ultrastructure of a New Microsporidian of the Genus Coccospora Infecting Biomphalaria glabrata. C. S. Richards and H. G. Sheffield. National Institute of Allergy and Infectious Diseases

3:00-3:30 p.m. - Organizational Meeting of Microsporida Section

Consultants/Discussants for: (cont'd)

Tumors

Clyde J. Dawe, National Cancer Institute, Bethesda, Maryland

John C. Harshbarger, Smithsonian Institution, Washington, D.C.

Virus Diseases and Pathology

Frederik Bang, The Johns Hopkins School of Hygiene and Public Health, Baltimore, Maryland

Edward DeLamater, Florida Atlantic University, Boca Raton, Florida

Bacterial Diseases and Pathology

Rita Colwell, Georgetown University, Washington, D.C.

Marenes Tripp, University of Delaware, Newark, Delaware

Fungal Diseases and Pathology

John Mackin, Texas A & M University, College Station, Texas

Frank Perkins, Virginia Institute of Marine Science, Gloucester Point, Virginia

Metazoan Parasites, Diseases and Pathology

Thomas Cheng, Lehigh University, Bethlehem, Pennsylvania

Sung Feng, University of Connecticut Marine Research Laboratory, Noank, Connecticut

Protozoan Diseases and Pathology Including the Microsporidian Demonstration Workshop Described Below

Victor Sprague, Chesapeake Biological Laboratory, Solomons, Maryland

Leslie Stauber, Rutgers University, New Brunswick, New Jersey

MICROSPORIDIAN DEMONSTRATION WORKSHOP
BY ANN CALI, SECRETARY, DIVISION OF MICROSPORIDA
SOCIETY FOR INVERTEBRATE PATHOLOGY

All SIP members who have worked with microsporida are urged to bring demonstration material which may help in interpretations of life cycles. Type species are especially requested, but all species are of interest. Reprints, in addition to slides, photographs, and illustrations, would be of great value for exchange, as well as to stimulate discussion.

The microsporidan demonstration workshop will be held in conjunction with "The Protozoan Diseases and Pathology Section of the Molluscan and Crustacean Diseases and Pathology Workshop," Thursday afternoon, August 27.

Ultrastructural material should be sent as soon as possible for the assembly of The Microsporidan Atlas. This Atlas was proposed at the first meeting of those interested in microsporida at Burlington (August 1969). The Atlas will be a permanent, continuously growing, "file" of microsporidan ultrastructural research. The Atlas is not a publication, rather it will contain published, as well as unpublished material. It would be of great value in our demonstrations and discussions at the August meetings to have the Atlas already prepared. A special request is made for material from those who cannot attend the meeting so that their work may be represented. Due to the questionable quality of reproduction of electron micrographs in some journal publications, it would be greatly appreciated if original micrographs were to accompany reprints whenever possible. Material that is unpublished or in addition to specific publications should be clearly labeled as to host, parasite, experimental and technical processing, and magnification.

Material should be sent to:

Dr. Ann Cali
Department of Veterinary Pathology
The Ohio State University
1925 Coffey Road
Columbus, Ohio 43210

ABSTRACTS FOR THE SOCIETY FOR INVERTEBRATE PATHOLOGY MEETING

Schizogony, Sporogony, and Spores of Thelohania in Mosquitoes: The Characteristic Stages in the Male Larvae and the Stempellia-Like Development in the Adult Female. E. I. Hazard

The life cycle of several species of Thelohania in Anopheles and Culex mosquitoes is presented. The two types of development, one in the male and female larvae and the other in the adult female, is discussed. The development of the microsporidian in the male larvae is as described for the genus Thelohania and the sporonts produce eight oval spores in a pansporoblast; however, in the adult female the sporonts form large multinucleate plasmodia that divide, producing many (6-32) binucleate sporoblasts which form long cylindrical spores. The stages in the adult female are associated with the transovarial cycle of the parasite. Photographs of the stages found in Giemsa smears of infected host stages and electron micrographs of vegetative stages and spores of both sexes are presented and the generic placement of these microsporidians is discussed.

Comments on Sporoblast Development in Microsporidia. J. Lom

Sporoblasts arise either directly as transformed sporonts or, in most cases, as division products of sporonts. The sporont is a stage which gives rise to sporoblasts. This meager definition is the only one which applies to all microsporidian sporonts, because (a) there seems to be no general morphological characteristics common to the sporont cell in all species; (b) the type and behavior of nuclei vary in sporonts of different genera and species; and, (c) in some species the sporont is a product of a special diplokaryon stage, while in others it originates simply by division or transformation of a schizont.

As in sporonts, the sporoblasts display a variability in nuclear phenomena (absence or presence of division and/or fusion of sporoblast nuclei) but very soon become clearly differentiated at the ultrastructural level. A microsporidian whose cells up to the early sporoblast stage revealed no cytological structures other than flat cisternae of smooth and rough endoplasmic reticulum plus a few intranuclear and intracytoplasmic microtubuli, develops a set of very complicated organelles. The fragmentary state of knowledge of sporoblast

The microsporidan demonstration workshop will be held in conjunction with "The Protozoan Diseases and Pathology Section of the Molluscan and Crustacean Diseases and Pathology Workshop," Thursday afternoon, August 27.

Ultrastructural material should be sent as soon as possible for the assembly of The Microsporidan Atlas. This Atlas was proposed at the first meeting of those interested in microsporida at Burlington (August 1969). The Atlas will be a permanent, continuously growing, "file" of microsporidan ultrastructural research. The Atlas is not a publication, rather it will contain published, as well as unpublished material. It would be of great value in our demonstrations and discussions at the August meetings to have the Atlas already prepared. A special request is made for material from those who cannot attend the meeting so that their work may be represented. Due to the questionable quality of reproduction of electron micrographs in some journal publications, it would be greatly appreciated if original micrographs were to accompany reprints whenever possible. Material that is unpublished or in addition to specific publications should be clearly labeled as to host, parasite, experimental and technical processing, and magnification.

Material should be sent to:

Dr. Ann Cali
Department of Veterinary Pathology
The Ohio State University
1925 Coffey Road
Columbus, Ohio 43210

ABSTRACTS FOR THE SOCIETY FOR INVERTEBRATE PATHOLOGY MEETING

Schizogony, Sporogony, and Spores of *Thelohania* in Mosquitoes: The Characteristic Stages in the Male Larvae and the *Stempellia*-Like Development in the Adult Female. E. I. Hazard

The life cycle of several species of *Thelohania* in *Anopheles* and *Culex* mosquitoes is presented. The two types of development, one in the male and female larvae and the other in the adult female, is discussed. The development of the microsporidian in the male larvae is as described for the genus *Thelohania* and the sporonts produce eight oval spores in a pansporoblast; however, in the adult female the sporonts form large multinucleate plasmodia that divide, producing many (6-32) binucleate sporoblasts which form long cylindrical spores. The stages in the adult female are associated with the transovarial cycle of the parasite. Photographs of the stages found in Giemsa smears of infected host stages and electron micrographs of vegetative stages and spores of both sexes are presented and the generic placement of these microsporidians is discussed.

Comments on Sporoblast Development in Microsporidia. J. Lom

Sporoblasts arise either directly as transformed sporonts or, in most cases, as division products of sporonts. The sporont is a stage which gives rise to sporoblasts. This meager definition is the only one which applies to all microsporidian sporonts, because (a) there seems to be no general morphological characteristics common to the sporont cell in all species; (b) the type and behavior of nuclei vary in sporonts of different genera and species; and, (c) in some species the sporont is a product of a special diplokaryon stage, while in others it originates simply by division or transformation of a schizont.

As in sporonts, the sporoblasts display a variability in nuclear phenomena (absence or presence of division and/or fusion of sporoblast nuclei) but very soon become clearly differentiated at the ultrastructural level. A microsporidian whose cells up to the early sporoblast stage revealed no cytological structures other than flat cisternae of smooth and rough endoplasmic reticulum plus a few intranuclear and intracytoplasmic microtubuli, develops a set of very complicated organelles. The fragmentary state of knowledge of sporoblast structure and development, as well as existence of controversial opinions (such as on the absence of a true nucleus in the spore; or assumptions as to the origin of the polar filament) are due primarily to the difficulties in obtaining satisfactory preservation of cell structures but also to frequent and misleading spontaneous sporoblast malformations.

A sporoblast matures into a spore through a series of events approximately in this succession: (a) gradual thickening of the cell wall; (b) appearance, in addition to the elements of ER, of Golgi-like cisternae and clusters giving rise to both the core and outer layers of the polar filaments which are formed gradually, sometimes coil after coil; and (c) agglomeration of Golgi-like piles of membranes and their differentiation into the polar cap-polaroplast complex, together with increase in number of ribosomes, which may appear as ribbon- or sheet-like associations of polyribosomes. Finally, the cytoplasm becomes very dense, the polaroplast lamellae condensed, the spore wall attains its final shape with the appearance of a thick electron lucent layer, and an electron lucent space indicating the location of the posterior vacuole may appear. The process seems to be essentially the same in Nosema type spores (for which we suggest the term nosemospores) and Mrazekia type spores (equal manubriospores).

Morphogenesis in the Genus Nosema. A. Cali

An electron micrographic study of a Nosema life cycle has revealed many problems in correlating the observed structures with the present terminology. Paired very closely associated nuclei (diplokarya) were observed all during the proliferating long chain stages. The cell membrane thickening occurs before the last cell division.

In spore formation a vesicular complex was observed. This vesicular complex is closely associated with the filament as well as the polar cap and polaroplast and it is believed that this vesicular complex is responsible for their development. Comparative material suggests that this vesicular structure is a golgi complex. Morphogenesis of rough endoplasmic reticulum during spore formation will be illustrated and discussed.

Life Cycle of Nosema bombycis. J. Weiser

The taxonomy of Microsporidia was elaborated during the last 50 years. Many old species have never been found again. Type specimens are lost and characterization of the species uses many new aspects. Kudo in 1924 tried to base the taxonomy of Microsporidia on a rational basis, but could not include all characters discovered much later. The genus Nosema and the family Nosematidae are based on the type species Nosema bombycis. In Kudo's definition of Nosema each sporont develops into a single spore. In the life cycle of N. bombycis included in his monograph he indicates that each meront is a source of a spore. In my opinion and after my material, in Nosema bombycis there are two schizogonial cycles, the first with micronuclear, the second with macronuclear stages, not more than four nuclei in one schizont. The macronuclear merozoite grows into a ribbonlike stage with nuclei in one row, narrowing between the nuclei. Each nucleus divides into two coffee beanlike adjacent nuclei, the diplokaryon. This is the sexual phase. Paired nuclei produce chromosomes in their interior, fuse in single nuclei. The new uninuclear stage is the sporont. This sporont, oval or spherical, divides into two sporoblasts which separate and maturate to spores, without being connected by any wall or remains of cytoplasm. The same happens in N. apis and many other species; it is the question of good observation.

In the genus Perezia it is expected that spores remain together during spore formation, as in Perezia trichoptera. Another bisporal pansporoblast is Telomyxa glugeiformis, different in formation of a hard connecting layer. The genus Glugea does not produce bisporal pansporoblasts, but it belongs in qualities of sporogony close to Plistophora, with irregular number of sporoblasts in each pansporoblast, in addition to other important characters.

Summary of the Contributions of Cytochemical Reactions to Our Knowledge of Microsporidan Spores. B. Erickson and V. Sprague

For a century our knowledge of the development and structure of microsporidan spores progressed very slowly. Progress was hindered not only by the small size of the spores but also, very significantly, by a preconceived and false notion, generally held to this day, that these spores have more than a superficial resemblance to those of the Myxosporida. Our knowledge has increased most rapidly during the past decade, due largely to the use of electron microscopy. From time to time, however, cytochemical studies have contributed significant bits of information. Many years ago Jirovec (1932) made some observations that have profound implications not generally appreciated. Applying the Feulgen nucleal reaction to spores of five species, he found the nucleome was limited to one or two DNA granules in the sporoplasm. There were no "shell nuclei" nor "capsule nuclei" (A. Prostintenk. 77:379-90) as in the Myxosporida. Vavra (1959) first applied the PAS reaction to the study of the spore and discovered the unique McManus positive polar cap (Acta. Soc. Zool. Bohemoslov. 23:347-50). He found the PAS positivity can be prevented by previous acetylation and concluded the cap is a real polysaccharide containing 1, 2 glycol groups (Proc. 1st Intern. Congr. Protozool. P. 443-4). Sprague (J. Protozool. 13:196-9, 1966) pointed out that the polar filament also frequently gives a PAS-positive material of the cap and the filament as a component of the Golgi complex (J. Protozool. 16:264-71, 1969) and probably an unsaturated lipid (Proc. 3rd Intern. Congr. Protozool. P. 75, 1969). The later suggestion is consistent with Kudo's (J. Parasitol. 6:178-82, 1920) demonstration that the filament is argentophilic and by Lillie's statement (Histopathologic Technique and Practical Histochemistry, McGraw Hill, 1965) that the PAS reaction of certain Golgi substances is probably "due to unsaturated fatty acids and their oxidation products." The observation of several workers using electron microscopy, notably Vavra (C. R. Acad. Sci., Paris 261:3467-70, 1965) that the cytoplasm of the spore is rich in RNA was supported cytochemically by Davenport (manuscript, NRI Ref. No. 68-57, 1968). The latter found that cytoplasm of spores of Nosema sp. lost much of its affinity for iron hematoxylin after treatment with RNAse, indicating that RNA has been concentrated in that area. A siderophilic portion of the polaroplast, on the other hand, remained unaltered. Chitin in the spore wall has been demonstrated by a variety of methods by Kudo (Trans. Am. Miscrosp. Soc. 40:59-74, 1921), Koehler (Zool. Anz. 53:85-7, 1921), Dissanaike and Canning (Parasitology 47:92-9, 1957), Vavra (Proc. 1st Intern. Congr. Protozool. P. 443-4, 1966, and J. Protozool. 14 (Suppl.) 49, 1967) and Erickson and Blanquet (J. Invert. Pathol. 14: 358-64, 1969). Vavra (loc. cit.) found a number of amino acids in intact spores as well as several in hydrolysed spore walls.

Spore Morphology of Microsporidian Species Assigned to the Genus Octosporea. J. Kramer

Gross characteristics of spores of microsporidian species assigned to the genus Octosporea will be compared with particular reference to the shape and proportions of spores, both fresh and processed. The taxonomic significance of the variations encountered will be discussed.

On the Autogamy of Nuclei and the Spore Formation of Nosema bombycis. K. Ohshima

I have published that the spore of Nosema bombycis has two nuclei, and the sporoplasm has also two nuclei immediately after emergence (Ohshima, 1966, Jap. J. Zool. 15). This sporoplasm remains unchanged in the tiny form for about ten hours in the epithelial cell of mid-intestine after emergence. After about ten hours, it begins to enlarge, and its nuclei also begins to loosely spread making chromidial form. After about 15 hours, they begin to fuse, i.e., autogamy (automixis) takes place contrary to many other reports on Microsporidia. After 25 hours, multiplication of schizont begins by dividing into two to four daughter cells as Stempell already reported. I believe that the starting point of multiplication of Nosema bombycis is the autogamy of the nuclei after emergence of sporoplasm.

After two days, spore formation begins. The schizont enlarges at first taking a pyriform shape. There exists generally a single nucleus, but sometimes two. It is situated in the middle portion of the sporoblast. The nucleus (or nuclei) dispatches thread-like, chromatic substances to the bottom, and it gradually accumulates there. The thread elongates also to the fore end of the sporoblast a little later, and accumulates there a little. Soon after dispatch of the threads the chromatic substance accumulates forward more and more from the bottom till at last almost all the sporoblast is covered by the substance which is deeply stained with Giemsa. Therefore, nothing can be seen of what process is carried out during spore formation. It stains deeply with Giemsa for a long time even after the spore acquires apparently a matured form. However, when the spore is fully matured, its size shortens somewhat, and nothing can be seen except a sporoplasm with two nuclei in the center of the spore leaving clear spaces in the fore and the hind portion (somewhat larger) of the spore, when stained with Giemsa.

Unique Host Relations and Ultrastructure of a New Microsporidian of the Genus Coccospora Infecting Biomphalaria glabrata. C. S. Richards and H. G. Sheffield

A microsporidian with small, spherical spores and short polar filament with less than three coils, occurring in the intestinal epithelial cells of Biomphalaria glabrata is described as Coccospora brachynema, n.sp. Developmental stages are described from fresh preparations, stained sections, and electron microscopy. The filament has a tuberculate outer layer. Lamellar structures presumed to be Golgi apparatus are associated with both nucleus and developing filament.

Prevalence of infection is high in snails in laboratory populations. Extensive infected tissue masses occur in the hemocoele in some snails. In many heavily infected snails opaque areas of the shell are due to material deposited on the inner surface of the shell. This material consists of one to many thin, pliable, horn to straw colored sheets covered with infected host cells.

Serological Responses of an Opisthobranchiata (Aplysia californica Cooper). G. B. Pauley

The presence of an agglutinin for five marine bacteria was found in the serum of a mollusk, Aplysia californica. The presence of a hemagglutinin was also found in the same animal. Information on titers, specificity, and probable chemical nature of the molecules involved are presented. The possible role of these serological factors in the defense mechanism of the animal is discussed.

The Host Range and Possible Origin of the Crayfish Plague. T. Unestam

The crayfish plague is known only from Europe but does probably not belong there as indicated by the complete lack of resistance in all European crayfish species. Its sudden appearance 110 years ago may indicate that it was introduced at that time from some other biotope or continent. Physiological studies, however, indicate that the causal parasitic fungus, Aphanomyces astaci, belongs in freshwater and not in soil or sea-water. American crayfishes are very resistant to the disease while crayfish from other parts of the world show a remarkable lack of resistance. In Crustacea apart from Decapoda resistance is probably high. With these data as a background the possible origin and the possible present distribution of the crayfish plague fungus will be discussed.

Defense Reactions in the Crayfish Against a Severe Crayfish Parasite, Aphanomyces astaci. T. Unestam

The very low resistance against the crayfish plague in many crayfish species indicates that some crucial structure or mechanism of defense exists in American crayfishes, which may all be very resistant to the disease. The crucial "defense line" may be located in the surface layer of the exoskeleton. In vitro as well as in vivo studies have shown that in other (inner) parts of resistant and susceptible crayfish different reactions also occur which have a defensive character. Cellular reactions may be involved in exoskeleton, blood, as well as in other tissues. Polyphenol oxidation on the surface of and later around the fungus was mostly evident where hyphae were present in vivo and was found and followed also in vitro. Blood was in some cases inhibitory to growth and in some to chitinase activity of the fungus in vitro. Resistance in vivo against the development of the parasite was much more pronounced in the hemolymph of the animals than at the surface of their exoskeleton. Thus, even in susceptible animals blood is a very hostile environment for the fungus.

Seasonal Variation in Levels of Infestation of Different Anatomical Sites of Osmerus eperlanus mordax by Glugea hertwigi. C. Delisle

Twelve hundred autopsies were performed at a rate of one hundred per month on the adult stunted population of freshwater smelts Osmerus eperlanus mordax (Mitchell) of Heney Lake, Gatineau County, Quebec, Canada. It is shown that the digestive tract is really the primary site of infestation by Glugea hertwigi Weissenberg 1911 (Sporozoa; Microsporida).

Levels of infestation are given separately for the anterior, mid and posterior part of the intestine, for the pyloric caeca and for the oesophagus and stomach layers. Important infestation of the anal region was also found.

The adjacent organs of the digestive tract were also observed. Data on the infestation of the liver, the male and female gonads, the peritoneum, the air bladder, the adipose tissue and the heart and kidneys are discussed. When present, external cysts in the head, trunk and fin regions were counted.

The raise from 53% to 76% in the general rate of infestation during the spring, lets us postulate a seasonal variation in Glugea direct life cycle as well as a possible effect of this parasite on Lake Heney mass mortality of the stunted smelts. Since at least 1960, this mass mortality happened every spring, between May 17 to May 22.

Searches in view of finding invertebrates acting as spore reservoirs, were nonrevelant. Invertebrates, which were inspected, are Mysis relicta, Pontoporeia affinis, Daphnia sp., Cyclops sp., Gammarus sp. and Leptodora kindti, which all represent major food items for smelt.

It is proposed that all organs are susceptible to be invaded by Glugea spores and that warm water temperature had a positive effect on sporogony and schizogony leading to a general invasion of the host. Data on the bi-monthly progress in the number of Glugea cysts during the summer of 1967 on young-of-the-year smelt, helped us postulate this statement.

A Coralline Tumor of Acropora formosa from Guam. D. P. Cheney, A. J. Loerzel, R. H. Randall and M. R. Struck

Recently, specimens of tumorous staghorn coral, Acropora formosa, were collected from western Guam. The affected colonies were usually isolated and scattered. Grossly, the tumors were nodular, 1 to 10 cm in diameter and smooth. The polyps presented a normal morphology, but were more variable in size and fewer in number than normal coral. Whole sections through formalin-fixed specimens revealed a hard, calcified, sponge-like coenosteum which was sharply delimited from the normal laminated structure. No evidence of macroscopic invasive organisms was seen. The pathology does not exclude induction by microorganisms, chemicals or the disruption of the normal architecture by a regulatory defect of aragonite deposition. Evidence regarding the true nature of the tumor is as yet inconclusive. Results of histological and growth studies are forthcoming.

Effects of Diethylnitrosamine on the Crayfish, Procambarus clarkii. J. C. Harshbarger, G. E. Cantwell, and M. F. Stanton

The crayfish were exposed to 200 PPM of the liver carcinogen diethylnitrosamine for six months. Treated animals had a normal appearance except that their activities were more sluggish than the controls.

Histologically, differences were noted in the green gland and in the hepatopancreas of treated animals. In the green gland large amounts of hyaline material had accumulated intercellularly. In the hepatopancreas there was hyperplasia of the glandular epithelium. The nuclei of these hyperplastic cells were excentric.

THE WILDLIFE DISEASE ASSOCIATION
P.O. BOX 886
AMES, IOWA 50010

This is an international, non-profit organization of over 900 scientists interested in sharing the study and understanding of diseases of all wild vertebrate and invertebrate members of the animal kingdom.

Members of the Society for Invertebrate Pathology are invited to write for a free brochure of the Association, which explains the objectives, scope, historical perspective, publications, activities, and procedure for applying for membership.

REPRINTS AVAILABLE ON REQUEST

Kudo. 1918. Contributions to the study of parasitic protozoa. IV. Note on some Myxosporidia from certain fish in the vicinity of Woods Hole. J. Parasitol. 5, 11-16.

Kudo. 1920. Cnidosporidia in the vicinity of Urbana. Trans. Illinois State Acad. Sci. 13, 298-303.

Kudo. 1921. Microsporidia parasitic in copepods. J. Parasitol. 7, 137-143.

Kudo. 1921. On some protozoa parasitic in fresh-water fishes of New York. J. Parasitol. 7, 166-174.

Kudo. 1924. Studies on microsporidia parasitic in mosquitoes. III. On _Thelohania legeri_ Hesse (= _Th. illinoisensis_ Kudo). Arch. Protistenk. 49, 147-162.

Kudo. 1938. A microsporidian parasitic in _Reticulitermes flavipes_. J. Parasitol. 24, 377.

Kudo and DeCoursey. 1940. Experimental infection of _Hyphantria cunea_ with _Nosema bombycis_. J. Parasitol. 26, 123-125.

Send request to Dr. Victor Sprague, Chesapeake Biological Laboratory, Box 38, Solomons, Maryland, 20688, USA.

REPORT ON A MEETING CONVENED BY IUBS AT AMSTERDAM NOVEMBER 17-19, 1969, TO FINALIZE PLANS FOR THE PROPOSED NEW INTERNATIONAL ORGANIZATION FOR BIOLOGICAL CONTROL (IOBC)

Since the early 1960's there have been discussions and negotiations, principally between the International Advisory Committee for Biological Control and the OILB (International Organization for Biological Control of Pest Organisms), to expand the present, largely European, OILB into a truly world-wide organization. These efforts culminated in a conference sponsored by the International Union of Biological Sciences (IUBS) in Amsterdam, November 17-19, 1969 to attempt to finalize plans for a new global organization.

The meeting, held at the seat of the Royal Academy of Sciences of the Netherlands, was convened by Professor F. A. Stafleu, Secretary General of IUBS, and was attended by 34 specialists in biological control from all over the world.

Plans for the new organization, under the title given in the above heading, were consummated as far as could be done at this time. New statutes were proposed and approved by the delegates and other agreements reached. The statutes and agreements, along with a general report of the meeting, will soon be submitted to IUBS for approval. The IUBS will then formally request the OILB to act upon the new statutes and agreements. Approval by the current OILB presumably will occur at their next General Assembly in February 1971, at which time new members could be admitted forthwith and the formation of regional sections proposed and immediately approved.

A very brief outline of major aims and functions of the new organization, and of steps taken to consummate it, follow:

(1) It was agreed that it was desirable for OILB to develop into a world-wide organization; and

(2) It was agreed that the function and aims of this global body will be to:

(a) promote the development of biological control, its application in integrated control programs, and international cooperation to these ends. In this organization the term "biological control" means the use of living organisms to prevent or reduce the losses or harm caused by pests.

(b) collect, evaluate and disseminate information about biological control.

(c) promote national and international action concerning research, the training of personnel, the coordination of large-scale application and the encouragement of public awareness of the economic and social importance of biological control.

(d) arrange conferences, meetings and symposia, and take any other action to implement the general objectives of the Organization.

Under these broad functions, the following more specific aims, activities and services, among others, are contemplated:

(1) bring awareness of the importance of biological control to countries having little expertise in this field.

(2) sponsor working groups on major problems of international interest.

(3) distribute information on projects under way and on the natural enemies available from various sources, and facilitate discovery and international transfer of natural enemies.

(4) promote the training of biological control specialists.

(5) support basic bio-ecological research on problems fundamental to biological control.

(6) provide information on available facilities for the identification of natural enemies and support identification services.

(7) publish the Journal ENTOMOPHAGA as well monographs, and possible a newsletter.

(8) document the biological control literature and support the development of computerized information storage and retrieval.

(9) supply newsletter dealing with progress reports, personnel, new techniques, new projects, and such items.

(10) issue periodic lists of biological control workers and their research specialities.

(11) provide a consultation service.

(12) represent and promote the interests of biological control research in discussion with national or international organizations (FAO, WHO, IBP).

The new organization would provide for the voluntary formation of regional sections generally on a broad bio-geographical basis. For example, either a North American or the entire American region is contemplated as one. Membership will be open, both to individual scientists and to institutions. Fees for the global organization remain to be determined, but will approximate $10.00 for individual members, which will include a subscription to ENTOMOPHAGA, the current OILB journal which will be substantially expanded. Regions will be largely autonomous within the provisions of the statutes of the global organization, and will develop their own by-laws and fees. Members will have the choice of affiliating solely with the global organization, or with it through a regional section. The proposed statutes of the new global organization will be available for distribution early in 1970 and will provide more details of organizational structure, aims and functions.

During 1970, interested parties plan to proceed with the tentative formation of an American region and an Oriental region, and other regions doubtless will do the same. The current OILB will integrate into the new organization as a region. The following slate of candidates for the Executive Committee of the new Council of IOBC, proposed to be inaugurated in 1971 upon the ratification of the new statutes, was recommended by unanimous vote of the delegates in Amsterdam:

Paul DeBach, President - Professor of Biological Control, University of California, Division of Biological Control, Riverside, California, 92502, USA

E. Biliotti, Vice President - Chef du Department de Zoologie Agricole, Route de St. Cyr, F-78 Versailles, France

Frank Wilson, Vice President - Scientist-in-Charge, Sirex Biological Control Unit, Silwood Park, Sunninghill, Ascot, Berks., England

Vittorio Delucchi, Secretary General - Entomologisches Institut der Eindgenöss. Techn. Hochschule, Universitätstrasse 2, CH-8Q06, Zurich, Switzerland

Fred J. Simmonds, Treasurer - Director, Commonwealth Institute of Biological Control, Headquarters, Gordon Street, Curepe, Trinidad, West Indies

This group is formally appointed by the IUBS as an ad hoc committee to consummate details of the organization of the new IOBC and to serve until 1971.