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Report of Diagnoses of Diseased Insects

1962-1972

Gerard M. Thomas and
George O. Poinar, Jr.

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During the 10-year period January 1, 1962–December 31, 1971, our diagnostic laboratory received a total of 1,208 accessions for disease diagnosis. Of these, 1,194 were in the phylum Arthropoda with most (1,173) in the class Insecta. Other arthropod classes represented were Arachnida (16), Crustacea (3), and Symphyla (2). Ten accessions were from the phylum Annelida, one from the phylum Chordata, and three were microbial cultures submitted for identification.

The following report is an abstract listing of the accessions received during this 10-year period, including brief statements as to the source of the material and the identity of the etiology involved. Each accession is cited under the submitted species. Orders, families, genera and species are in alphabetical order under their respective phyla. Indices to the submitted insects and other hosts (page 351) as well as to the pathogens (page 355), will assist in locating specific organisms.

The microbial pathogens isolated from the 1,208 accessions summarized in this report, including repeats and multiple diagnoses from individual accessions, totaled 88 viruses (52 nuclear polyhedrosis viruses, 7 cytoplasmic polyhedrosis viruses, 24 granulosis viruses, 5 noninclusion viruses), 1 rickettsia, 224 bacteria, 1 algae, 285 fungi, 122 protozoans (100 microsporidians, 18 schizogregarines, 4 coccidians), 5 nematodes, and 1 nematomorph. Entomophagous parasites and predators were found in 11 accessions, while other causes of death, such as starvation, mechanical injury, and toxic chemicals accounted for 7. In 315 accessions, no microbial pathogens were involved, and it was not possible to determine the etiologies in 29 accessions. New records of pathogens, hosts, and distribution are noted in the text.

THE AUTHORS:

Gerard M. Thomas is Staff Research Associate III, Department of Entomological Sciences, University of California, Berkeley.

George O. Poinar, Jr. is Lecturer and Associate Insect Pathologist, Department of Entomological Sciences, University of California, Berkeley.

Report of Diagnoses of Diseased Insects¹ 1962–1972

INTRODUCTION

THE LABORATORY FOR THE DIAGNOSIS of diseased insects was initiated in 1944 by the late Professor Edward A. Steinhaus and continued by him and Gordon A. Marsh to March, 1964. With the increased interest in the field of insect pathology and with diagnosis serving as its basis, the Berkeley diagnostic laboratory was continued along similar lines. This decision was also strengthened when it was learned that no other laboratory in the United States was performing a similar service for all insects (including agricultural, medical, and beneficial forms).

It must be emphasized that this work is a service, since there are no costs involved to the submitter and specimens are accepted from anywhere in the world. Aside from establishing new host and pathogen records, and helping graduate students to become better acquainted with a variety of disease-producing organisms, little use is made of most pathogens. This is unfortunate since some of these organisms undoubtedly have potential use in basic and practical studies. However, many of the microorganisms are kept in a culture collection and are available upon request. Unfortunately, the in-

creasing costs involved in maintaining these cultures have forced us to ask a small fee for each culture.

During the first six years of the diagnostic service (from 1944 to 1950), a total of 575 accessions were received (Steinhaus, 1951). The second period, from 1951 to 1961, covered 1,257 accessions (Steinhaus and Marsh, 1962). The present report covers 1,208 accessions received from 1962 to 1972. During this period, the diagnostic service changed hands and some accessions were misplaced when previous diagnosticians moved to Irvine, California. Subsequent searches for these accessions failed and therefore it was impossible to include them in the present report. The missing accessions were: 1837, 1838, 1840, 1842, 1848, 1867, 1869, 1872, 1879, 1880, 1897, 1899, 1913, through 1922, 1947, 1948, 1950, 1965 through 1971, 1989, 1999, 2004, 2011, 2013, through 2015, 2018, 2019, 2030, 2033, 2034, 2044, 2048, 2050 through 2056, 2059, 2062, 2065 through 2067, 2072 through 2074, 2084, 2090 through 2093, 2099 through 2132, 2135 through 2148, 2150 through 2152, 2156 through 2161, 2167 through 2175, 2182, 2184, 2189, 2200, 2201, 2203, 2205, 2206, 2214, 2215, 2219, and 2228.

HOW TO SUBMIT SPECIMENS

For quick and complete identification of pathogens, submitted specimens should contain relatively pure and viable pathogenic organisms. Thus, tim-

ing is of extreme importance: it is preferable to submit living diseased insects or specimens freshly dead because the organism originally responsible for the

¹ Submitted for publication July 16, 1973.

condition may break down and the action of secondary agents may mask the original etiology. This is one of the biggest problems confronting the diagnostician receiving specimens from long distances, and especially from warm climates. It is important, therefore, to submit specimens before general deterioration occurs. If this can't be done, some additional specimens should also be submitted in a preservative (70 per cent alcohol or 5 per cent formalin). Under ordinary circumstances, it is better not to use preservatives as the identification of bacteria and fungi (the two most common types of disease organisms encountered) depends on tests requiring their growth on various nutrient media.

When sending specimens, enclose them in a clean vial or pill box and include the following information.

1. Common and scientific name (including the family and author of the species) of the insect.
2. Date and locality of the collection.
3. Conditions under which the diseased material was found.
4. Any external signs or symptoms of the diseased specimens.
5. Occurrence of other agents or factors, such as insecticides, extreme temperatures, crowding, etc. that might account for the condition.

Shipments made from outside the United States should be labelled "Dead biological specimens; no commercial value."

DIAGNOSTIC PROCEDURE

Every submitted shipment is assigned an accession number for our records and the sender is notified of this number when receipt of his shipment is acknowledged. A permanent accession card is made with information received from the submitter. This card and other special data sheets for specific groups of pathogens are shown in the previous published diagnostic report (Steinhaus and Marsh, 1962).

The specimens are thoroughly examined and sometimes, as in the case of a microsporidian infection or a bacteriosis caused by *Bacillus thuriensis*, a diagnosis can almost be made by simply examining the affected tissues under the compound microscope, but,

usually more time consuming tests have to be conducted before a diagnosis can be completed.

Eventually, the sender will receive a diagnostic report giving him the name of any pathogen found and other pertinent information. The sender is free to submit additional material or make any other inquiry regarding the diagnosis. The sender is entitled to use the information in publications and on the same token, our Department reserves the right to include the results of the examination in any of its publications. The Department also is entitled to use the diseased insects or isolated pathogens in any way it may desire.

ARTHROPODA

Insecta

BLATTARIA

Blattidae

Blattella germanica (L.)

2921—Two dead adult cockroaches

which had been reared on dry food were submitted on October 13, 1969, by R. Guttentag, Brooklyn, New York. Diagnosis: Mycosis caused by *Aspergillus flavus*.

Leucophaea maderae (Fabricius)

2554—Several specimens of this roach were submitted by M. Martignoni, Corvallis, Oregon on January 13, 1965. All contained nematodes in their intestines and one contained bacteria in its hemocoel. Diagnosis: Nematodes belonging to *Leidynema* sp. and bacteria belonging to the following groups; A, *Citrobacter* group; B, *Haffnia* group, or possibly an *Erwinia*-like bacterium; C, *Streptococcus faecalis*.

Periplaneta sp.

2252—Several specimens were received from D. R. A. Wharton, Natik, Massachusetts, on April 15, 1964. Some specimens were healthy; others were infected or dead. Dr. Wharton complained of a highly virulent infection in his laboratory colony. Extensive investigations were conducted, but no microbial pathogen was found. In one test, a strain of *Serratia marcescens* was found, but was not significant. Diagnosis: Undetermined.

COLEOPTERA

Brentidae

Arrhenodes minutus (Drury)

1900—One oak timberworm adult was submitted by R. D. Frye, Fargo, North Dakota, on July 20, 1962. The specimen was nearly hollow internally, with tissues shrunk against the inner surface of the exoskeleton and supporting a few miscellaneous gram negative bacterial rods. Diagnosis: Non-microbial.

1951—Several specimens were collected and submitted by R. D. Frye, Fargo, North Dakota, on September 25, 1962. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Carabidae

Calosoma sp.

1957—One specimen was submitted by R. D. Frye, Fargo, North Dakota on

September 25, 1962. Diagnosis: Undetermined. *Bacillus megaterium* was isolated but was probably a secondary invader.

Nechryopus savagei (Hope)

2089—One adult of this predaceous ground beetle from Eastern Nigeria was submitted by A. Catley on July 30, 1969. The specimen showed a white matted mycelium along most of the sutures of the legs, coxal cavities, mandibles, antennal insertions, and around the ventral surface of the head at the insertion into the prosternum. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*.

Unidentified

2987—One adult ground beetle, found while collecting ground beetles in Red Wood Park, Russian River, California, was submitted by S. Davidson on April 27, 1971. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*.

Cerambycidae

Megacyllene robiniae (Forst.)

2394—Several specimens were submitted by C. J. Hay, Delaware, Ohio, on April 22, 1965. The larvae had been field-collected and reared in the laboratory on artificial media. All larvae on different types of media were affected. Symptoms of submitted larvae indicated a bacteriosis. Diagnosis: Bacterioses caused by *Bacillus thuringiensis* var. *thuringiensis* as the primary pathogen, and a secondary infection of *Pseudomonas aeruginosa*.

Moneilema laevigata (Bland)

2191—One specimen was submitted by A. Raske, Berkeley, California, on October 28, 1963. The submitted specimen was the only death in a colony of laboratory-reared *M. laevigata*. Diagnosis: Possible bacteriosis induced by sub-optimal environmental conditions affecting this particular specimen. The

cadaver was badly deteriorated and contained a number of gram negative enteric bacteria.

Monilema sp.

2224—Three pinned museum specimens were submitted by A. Raske, Berkeley, California, on February 3, 1964. Two specimens were *M. laevigata*, and the third was *M. appressa* LeConte. The specimens showed signs of fungus infection. Diagnosis: *M. laevigata*: both specimens were infected with *Beauveria bassiana*. The specimens of *M. appressa* harbored a secondary saprophytic fungus, *Verticillium terrestre*.

Monochamus sp. prob. *notatus* (Drury)

2642—One specimen in the larval stage was received from R. G. Dearborn, Orono, Maine, on June 28, 1966. This specimen was covered with white, cottony mycelium. Diagnosis: Mycosis *Beauveria bassiana*.

Phymatodes nitidus (LeConte)

1875—These specimens collected in Portola State Park, San Mateo County, California, were submitted by J. Powell and J. Chemsak on May 9, 1962. Diagnosis: Non-microbial; a *Fusarium* sp. was present on the surface of the specimens, but little or no penetration of tissues was evident.

Tragidion sp.

2087—These specimens were collected in Los Angeles County, California, and submitted by J. Chemsak on July 26, 1963. They had been starved for 4½ months. Diagnosis: General secondary bacteriosis, probably induced by the starved conditions.

Unidentified specimen

2338—An unidentified larva was submitted by D. Wood, Berkeley, California, on November 10, 1964. The single field-collected specimen had completely

deteriorated into a fluid residue which was filled with a gram positive spore-forming bacterium. The bacterium was isolated in pure culture directly from the specimen. Diagnosis: Bacteriosis caused by *Bacillus cereus*.

Cleridae

Cymatodera ovipennis (LeConte)

2081—Several specimens were collected in Linden, California, and submitted by L. Falcon on July 11, 1963. It was possible that the area had been treated with an insecticide. Diagnosis: Non-microbial; no pathogens were found.

Thanasimus dubius (Fab.)

2416—Four diseased eggs of this Clerid were submitted by L. S. Pickard, Pineville, Louisiana, on June 14, 1965. Examination revealed the eggs were infected with a fungus. Diagnosis: Mycosis caused by *Aspergillus flavus*.

Chrysomelidae

Diabrotica undecimpunctata howardi (Barber)

2721—Several adult specimens were received from J. C. Smith, Holland, Virginia, on January 19, 1967. All specimens showed signs of fungi, but examination revealed no pathogens. Diagnosis: probably non-microbial or, if microbial, the primary agent had been obscured by saprophytic fungi such as *Rhizopus nigricans*, *Aspergillus ochraceous* and a *Penicillium* sp.

2773—Several larvae of the southern corn rootworm were received from R. B. Chalfant, Tifton, Georgia, on September 19, 1967. The specimens were soft and white in appearance. Diagnosis: Microsporidiosis caused by a *Nosema* sp.

2860—Smears made from larval and adult stages of this beetle were fixed in methyl alcohol for 2 minutes and submitted on September 20, 1968, by R. B.

Chalfant, Tifton, Georgia, with the request for confirmation of a possible *Nosema* infection. Thorough examination of the smears by staff members failed to confirm a *Nosema* infection. Diagnosis: Not possible from the submitted material.

Oulema melanopa (L.)

2175—Several laboratory reared specimens of the cereal leaf beetle were submitted by T. Castro, East Lansing, Michigan, on October 2, 1963. The specimens were dessicated. Diagnosis: General bacterioses, consisting of gram negative and gram positive strains, with a *Proteus* sp. being dominant. No groups containing entomogenous pathogens were found.

2216—Several laboratory reared specimens were submitted by T. R. Castro, East Lansing, Michigan, on December 31, 1963. Diagnosis: Bacterioses. Mixed strains of gram negative rods and gram positive cocci present. One strain, *Aerobacter aerogenes*, predominated.

2349—Several adults were collected in the field and submitted by C. F. Koval, Madison, Wisconsin, on January 18, 1965. Diagnosis: Mycosis: *Beauveria bassiana*.

2413—Three larvae were submitted by M. S. Gomulinski, East Lansing, Michigan, on June 2, 1965. Of the four specimens, one suffered a bacteriosis and the rest showed no microbial etiology. Diagnosis: Bacteriosis caused by *Pseudomonas aeruginosa*.

2485—Several specimens were submitted by M. Gomulinski, East Lansing, Michigan, on September 30, 1965. They had been removed from field over-wintering cages and subsequently died in the lab. Diagnosis: General bacterial deterioration, primary etiology obscured.

2489—One specimen "obtained from a graduate experiment" was submitted

by M. Gomulinski, East Lansing, Michigan, on October 7, 1965. Diagnosis: General bacterial deterioration; no primary pathogens.

2809—Several diseased cereal leaf beetle larvae from a laboratory culture were submitted by S. G. Wellso, East Lansing, Michigan, on February 26, 1968. The larvae were dying in the last larval instar, and exhibited symptoms of a bacteriosis. Diagnosis: Bacteriosis caused by *Streptococcus faecalis* var. *liquefaciens* and a non-chromogenic strain of *Serratia marcescens*.

2997—Three larvae of the cereal leaf beetle which died in the laboratory culture of S. G. Wellso, East Lansing, Michigan, were submitted to the Diagnostic Service on June 21, 1971. Diagnosis: Non-microbial.

3014—Fecal debris from old adults of the cereal leaf beetle was submitted by S. G. Wellso, East Lansing, Michigan, on September 15, 1971, to check for the presence of pathogens. Diagnosis: No pathogens found.

Pagria signata (Mots)

2357—Several adult specimens were submitted by S. Rao, Kuala Lumpur, Malaya, on February 15, 1965. Diagnosis: Mycosis caused by *Beauveria tenella*.

Coccinellidae

Hyperaspis lateralis Muls.

2938—Several adult coccinellids preserved in 70 per cent ethyl alcohol, some dry fungus material in a vial scraped from the beetles, and a microscope slide of fungus material were submitted by K. Hagen, Berkeley, on February 16, 1970. The preserved specimens showed no signs of a primary microbial etiology. The dry fungus material was a saprophytic *Aspergillus* sp. nr. *ochraceus* and the microscope slide contained another saprophyte, *Rhizopus nigricans*. Diagnosis: Non-microbial.

Curculionidae*Aramminchus (Otiorynchus) cribicollis* Gyll.

2752—Several diseased larvae were submitted by C. T. Buchelos, Patras, Greece, on May 20, 1967. These specimens were brown and shriveled. Diagnosis: Bacteriosis caused by a non-chromogenic strain of *Serratia marcescens*. A secondary bacterium, *Aerobacter* grp. C, was also present.

Cecyropa sp.

1993—Two adult weevils, showing external signs of a possible fungus infection were submitted by G. A. H. Helson, Wellington, New Zealand, on December 13, 1962. Diagnosis: Probably non-microbial. The fungus present was a *Fusarium* sp. which had not penetrated the tissues. A check of the internal tissues for the presence of major groups of entomogenous pathogens was negative.

Cosmopolites sordidus (Germar)

2377—One larva of the banana root weevil was submitted by F. Lara, Limon, Costa Rica, on March 31, 1965. The specimen was collected in La Estrella Valley, Costa Rica. Diagnosis: Bacterioses, *Pseudomonas aeruginosa* and *Septococcus* sp. Probably invaded the insect through wounds.

Cossonus piniphilus Boheman

2006—Many specimens of this weevil apparently infected with a *Hirsutella* sp. were discovered by C. W. O'Brien in a Bishop pine tree near Inverness, California. Additional specimens were collected from the same tree; some showed synnemata, others did not. Diagnosis: Mycoses caused by *Synnematium jonesii* and *Beauveria bassiana*.

Cylas formicalius (Fab.)

2728—A few adult weevils were received from H. Katayama, Sasayama,

Hyogo-ken, Japan, on February 21, 1967. Diagnosis: Mycosis: *Beauveria bassiana*.

2734—Several adult specimens of the sweet potato weevil were received from H. Katayama, Sasayama, Hyogo, Japan, on March 24, 1967. They were collected on the Ryuku Islands, Okinawa. Diagnosis: Mycosis: *Metarrhizium anisopliae*.

Cylindrocopturus eatoni Buchanan

2190—Fifteen larvae of this weevil were collected in Groveland, Tuolumne County, California, on Ponderosa pine by R. E. Stevens on October 5, 1963. Examination and microbial analysis produced no pathogenic microorganisms. Diagnosis: Non-microbial.

Graphognathus sp.

3007—Four grubs found dead in the field were received on August 25, 1971 from R. Ahmad, Bariloche, Argentina. The grubs were brown and deteriorating. Diagnosis: Non-microbial.

3021—A few brown and deteriorating grubs of this weevil were submitted by R. Ahmad, Bariloche, Argentina, on October 12, 1971. Diagnosis: Non-microbial.

Hypera brunneipennis (Boheman)

2943—Several larval specimens of this weevil were collected from alfalfa fields near Woodland, California, by C. S. Koehler on March 23, 1970. The affected specimens were sluggish, and exhibited abnormal pink coloration. Diagnosis: Mycoses caused mainly by *Beauveria bassiana*. One specimen showed infection by an *Entomophthora* sp.

Hypera postica (Gyll.)

2068—A single specimen, field-collected and reared in the laboratory was one of twelve that died from an original

collection of 600. Submitted by W. R. Cothran, Ithaca, New York, on June 12, 1963. Diagnosis: Mycosis caused by *Beauveria bassiana*.

2095—Several specimens were submitted by W. H. Ziener; Amherst, Massachusetts, on August 5, 1963. The weevils were from laboratory cultures and the field. Diagnosis: The laboratory culture suffered a mycosis caused by *Beauveria bassiana*. The field-collected specimens' cause of death was not determined.

2266—Several field-collected larvae were submitted by C. F. Lagace, Albany, California, on June 2, 1964. The specimens were filled with bacteria which proved to be secondary saprophytic invaders. Diagnosis: Undetermined, possibly non-microbial.

2374, 2376, 2381, 2382, 2383, 2390—These specimens were collected by R. van den Bosch in Lebanon, and submitted by G. Finney on March 29, 1965. Diagnosis: Non-microbial in some, and mycosis caused by *Beauveria bassiana* in others.

2286—Several larvae were collected in the field in Siskiyou County, California, by C. S. Koehler; on July 3, 1964. Diagnosis: Probably non-microbial with secondary bacterioses — *Streptococcus* sp. and *Aerobacter* grp. C.

2388, 2397—Several specimens collected in Chtaura, Lebanon, by R. van den Bosch, on March 31 and April 15, 1965, were submitted by G. Finney on April 12 and April 27, 1965. Diagnosis: Mycosis caused by *Beauveria bassiana*, parasitism and bacteriosis.

2448—On August 3, 1965, R. Hedlund, Lexington, Kentucky, submitted several specimens suffering from a fungus infection. Diagnosis: Mycosis caused by *Beauveria bassiana*.

2611—Several dry specimens and a fungus culture isolated from them were submitted by R. B. Subba Rao, New

Delhi, India, on May 10, 1966. Diagnosis: The fungus was a *Chalaropsis* sp. The specimens suffered a bacteriosis caused by *Bacillus cereus* and *Streptococcus faecalis*.

2748—Several diseased larvae were submitted by C. Koehler from Porterville, California, on April 28, 1967. Diagnosis: Mycosis: a species of *Spicaria*, or *Paecilomyces*.

2858—Three alfalfa weevil larvae which had been stored in the refrigerator were submitted by G. Finney, Berkeley, California, August 13, 1968. A routine pathogen check was requested. Examination revealed no frank microbial infection, and microbial analysis yielded one isolate of a saprophytic bacterium, *Aerobacter* sp. Diagnosis: Cause of death was probably non-microbial.

2900—Many dead larvae were submitted by R. van den Bosch from Clampino (Rome), Italy, on July 1, 1969. Examination of specimens indicated a general secondary bacteriosis. Diagnosis: Secondary bacteriosis caused by *Streptococcus* sp. and *Aerobacter* grp. C., which indicates that some other predisposing factors were probably operating in the environment.

2985—R. K. Smith, Urbana, Illinois, submitted six adult weevils on April 23, 1971. The weevils had been reared in the laboratory in plexiglass tubes, where the humidity was high. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Lissorhopturus oryzoophilus (Kuschel)

2847—Several adult rice water weevils were submitted by J. E. Lauck, Davis, California, on July 16, 1968. These specimens had been field-collected and then held in the laboratory at 43°F. Examination showed them to be hollow internally, with all tissues dried and shrunken against the body walls. Tissues showed evidence of some septate

Fig 1. Acc. No. 2458: Adult banana weevil (*Metamasius hemipterus*) infected with *Beauveria bassiana*. Note fungal mycelium emerging from inter-segmental areas (arrows). Magnification = 5X.

mycelium, but microbial analysis produced only a few saprophytic fungi. Diagnosis: Non-microbial.

2853—On August 8, 1968, one adult weevil was received from J. Lauck, Davis California. This specimen was found in the field and exhibited a possible mycosis. Upon examination, however, the fungus was found to be a Dematiaceae in the saprophytic genus *Bactrodesmiella*. Diagnosis: Probably non-microbial.

2909—One dead adult was submitted by J. Knabke, Davis, California. This specimen was from a laboratory culture and contained mycelium on its surface. Examination showed the fungus to be one of the aquatic Phycomycetes in the Peronosporales. Diagnosis: Non-microbial.

Metamasius hemipterus (L.)

2458—One weevil found on a banana

in a grocery store was submitted by J. Powell, Berkeley, California, on August 16, 1965. Diagnosis: Mycosis caused by *Beauveria bassiana*. New record. (Fig. 1.)

Microlarinus lareynii (Jaqueline du Val)

2505—Several dead specimens of the puncture vine weevil, collected in Modesto, California, on September 16, 1965, were submitted by J. Hamai, Berkeley, California. The specimens were beginning to deteriorate, and showed signs of a bacterial infection. Diagnosis: Bacterioses caused by *Streptococcus faecalis*, and a secondary *Aerobacter* sp.

Nemocestes incomptus (Horn)

3031—A few adults of this root weevil, covered with mycelium, were submitted by W. T. Cram, Vancouver, Brit-

ish Columbia, Canada, on November 19, 1971. The weevils were from a laboratory culture where the disease had become epizootic in proportions. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Pantomorus godmani (Haw.)

2384—Two adults of the Fuller rose beetle were submitted by Y. Tanada, Berkeley, California, on April 9, 1965. They were collected at the Kahua Ranch, Waimea-Kohala, Hawaii, on March 24, 1965. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Pantomorus sp.

3012—A few adults of the white-fringed beetle, submitted on September 8, 1971 by R. Ahmad, Bariloche, Argentina, were infected with a fungus. Diagnosis: Mycosis caused by *Beauveria bassiana*.

3020—A few specimens of the white-fringed weevil were received from R. Ahmad, Bariloche, Argentina, October 12, 1971. The specimens were infected with nematodes. Diagnosis: Probably a *Neoplectana* sp.

Pissodes terminalis (Hopk.)

2009—One larva of the lodgepole terminal weevil collected in Truckee, California, was submitted by R. W. Stark and D. L. Wood of Berkeley, California, on February 7, 1963. Diagnosis: Non-microbial, death due to mechanical injury.

2760—Several larvae were submitted by A. Cameron, Berkeley, California, on July 21, 1967, with a request for examination for possible pathogens. Diagnosis: Non-microbial.

2861—Three larvae were brought in for a routine pathogen check by A. Cameron, Berkeley, California, on September 27, 1968. Thorough examination revealed no primary pathogens present. Diagnosis: Non-microbial.

2894—Three dead larvae were dissected out of lodgepole pine terminals by A. Cameron, Berkeley, California, and submitted for a routine pathogen check on June 2, 1969. Thorough examination showed no microbial etiology in two specimens, but the third was filled with monorefringent protein crystals similar to virus polyhedra. Electron microscope studies revealed a configuration similar to that of a cytoplasmic polyhedrosis virus inclusion body, but dissolution in hydroxide was so rapid that confirmation was not possible. Diagnosis: Non-microbial in two specimens. A possible virus etiology in one specimen, but sufficient material was not available for confirmation. Additional material was requested.

2898—As requested above, additional specimens of this weevil were submitted by A. Cameron on June 27, 1969. Of the four larvae brought in, one showed the protienaceous crystals, but electron microscope study failed to show virus particles. Diagnosis: Probably non-microbial.

2905—On July 21, 1969, five more specimens of this weevil were received from A. Cameron. Of the five dead larvae, four were negative for a microbial etiology, and one cadaver was filled with the monorefringent protein crystals. However, again electron microscopy failed to confirm a virus nature for these crystals. Diagnosis: Probably non-microbial.

2906—Three dead weevil larvae and one dead adult were submitted by A. Cameron on August 7, 1969. All were thoroughly examined, but no microbial etiology was found. Diagnosis: Non-microbial.

2947—On April 20, 1970, A. Cameron submitted four dead larvae which had been dissected out of lodgepole pine tips. These tips were field-collected and held in laboratory refrigeration for overwintering. A routine check for

pathogens was negative; however, two specimens contained the protein crystals found previously. Electron microscope study again failed to show a virus nature for these crystals. Diagnosis: Probably non-microbial.

2948 — Five additional specimens from the same overwintering material mentioned above were submitted by A. Cameron on April 22, 1970, for a routine pathogen check. No pathogens were found, but two specimens contained the protein crystals found previously. However, electron microscope study failed to show a virus nature for these crystals. Diagnosis: Probably non-microbial.

2950—Seven more specimens were submitted by A. Cameron from his laboratory overwintering stock. Routine pathological examination and microbial analysis revealed no primary microbial etiology. Diagnosis: Non-microbial.

Pissodes yosemite (Hopkins)

2005B—Four larvae of the Yosemite bark weevil were collected in Groveland, California, and submitted by R. E. Stevens, Berkeley, California, on January 28, 1963. Diagnosis: Undetermined.

2204—Four larval specimens were collected in Groveland, California, and submitted by R. E. Stevens, Berkeley, California, on December 6, 1963. The specimens had been collected in September and stored at 40°F before submittal. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Rhabdoscelus asperipennis (Fairmaire)

2199—Several diseased larvae of this weevil were submitted by F. A. Bianchi, Pacific Trust Territory, Koror, Caroline Islands, on November 20, 1963. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*.

Smicronyx sp. nr. *albovariegatus* Faust

2245—Several diseased larvae were

submitted by V. P. Rao, Bangalore, India, on March 26, 1964. The submitted specimens were collected in Ranebenur, Dharwar District, Mysore State, India, extracted from witch weed galls, and placed in soil in the laboratory for pupation. About 50 per cent of the population became infected with a fungus. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Stenopelmus refinasus Gyllenhal

2430—Several adult weevils were submitted by A. A. Grigarick, Davis, California, on July 8, 1965. These weevils are semi-aquatic and the submitted specimens had been reared in the laboratory. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Unidentified weevil

3003—One dead weevil larva was submitted by R. Ahmad, Bariloche, Argentina, on August 6, 1971. Examination and microbial analysis revealed no microbial pathogens. Diagnosis: Non-microbial.

Dermestidae

Trogoderma glabrum (Herbst)

2036—Four laboratory reared specimens were submitted by W. A. Burkholder, Madison, Wisconsin, on March 27, 1963. Diagnosis: Protozoan infection caused by *Mattesia dispersa*.

Trogoderma inclusum LeConte

2035—Four laboratory reared larval specimens were submitted by W. E. Burkholder, Madison, Wisconsin, on March 27, 1963. Diagnosis: Protozoan infection caused by *Mattesia dispersa*.

2779—Several diseased carpet beetle larvae were submitted by Y. Carmi, Jaffa, Israel, with the request for identification of the protozoan. Diagnosis: Coccidiosis: *Adelina* sp. (Fig. 2.)

Fig. 2. Acc. No. 2779: Fat-body tissue smears from *Trogoderma inclusum* infected with an *Adelina* sp. **A:** Intact oöcyst (arrow) containing developing sporoblasts (S). Magnification = 800X. **B:** Phase-contrast micrograph of a ruptured oöcyst showing sporoblasts containing developing sporozoites (Sz.) Magnification = 800X.

Elateridae

Unidentified wireworms

3005—Several dead click beetle larvae were submitted by E. Omi, Berkeley, California, on August 8, 1971. The specimens were from a laboratory culture. Examination revealed a mixture of secondary saprophytic bacteria. Diagnosis: Probably non-microbial.

Eumolpidae*Colaspis hypochlora* Lefebvre

2817—One adult beetle, covered with a fungus, was submitted by C. S. Stephens, Changuinola, Panama, on April 2, 1968. The specimen had been collected from banana on the Caribbean Coast near the Costa Rican border. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Halticidae*Haltica carduorum* Guer.-Men.

2927—Many larvae stuck to thistle leaves by a fungus were submitted by L. Anderson, Palisade, Colorado, on November 26, 1969. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Melandryidae

Unidentified (Melandryid beetle)

1904—One dead larva found under the bark of a fallen oak tree was submitted by R. D. Frye, Fargo, North Dakota, on July 20, 1962. The submitted specimen was dry and hollow except for some thin mycelium. No evidence of a primary pathogen was found. The fungus was isolated in culture and identified as a common wood inhabiting saprophyte, *Trichoderma koningi*. Diagnosis: Probably non-microbial

Meloidae*Epicauta cinerea* Forst.

2727—A preserved mid-gut and two histological slides from a supposedly

diseased blister beetle were submitted by P. H. Thompson, Brunswick, New Jersey, on February 16, 1967, along with a description of an apparent disease condition. Diagnosis: No microbial disease present. The condition described by the submitter was obviously a misinterpretation of artifacts produced in fixing and sectioning the submitted material.

Melolonthidae*Psilopholis vestita* (Sharp)

2510 — One somewhat deteriorated specimen of this grub was submitted by B. Sripathi Rao, Kuala Lumpur, Malaysia, on October 28, 1965. This grub is a serious pest of rubber trees and appeared to be suffering from a fungus infection. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*.

Ostomidae*Temnochila virescens* ssp. *chlorodia* (Mann.)

2696 — Several larval specimens which had been reared in the laboratory on boiled *Galleria melonella* (Linnaeus) larvae were submitted by T. O'Connell, Albany, California, on October 6, 1966. Examination indicated a bacterial infection. Diagnosis: Bacteriosis caused by *Bacillus cereus*.

Scarabaeidae*Anomala expansa* (Bates)

1941—A fungus culture isolated from *A. expansa* was submitted on September 7, 1962 by Wen-Yi-Cheng, Tainan, Taiwan, for identification. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*. This was the first record of this fungus from this host in Taiwan.

Bothynus gibbosus (DeGeer)

2920—Seven dead adults of the carrot beetle were submitted by D. G. Bottrell, Lubbock, Texas on October 2,

1969. These were collected from sunflower and pigweed and appeared to be infected with a fungus. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*.

Copris incertus Say

2574—Two specimens in 70 per cent ETOH and one dry specimen were submitted by G. F. Bornemissza, Kamuela, Hawaii; they were collected in January and February 1966 in Waikii, Hilo and Puako, Hawaii. Diagnosis: Two specimens collected at Waikii: non-microbial. They had a surface growth of what appeared to be some algae. Dissection and examination showed no internal mycosis, nor any other microbial etiology. Preservation in 70 per cent ETOH prevented cultivation of microorganisms. One specimen collected at Puako: mycosis caused by *Beauveria bassiana*.

Costelytra zealandica (White)

1908—Several specimens of this grass grub were submitted by G. A. H. Helson, Wellington, New Zealand, on July 24, 1962. Insecticide treatments had been carried out 1 year previously. At that time, full-strength DDT had been used. Diagnosis: Non-microbial.

1935—Two specimens of this grass grub collected in Outram Otago, New Zealand, were submitted on August 28, 1962, by G. A. H. Helson. The specimens were part of a lot collected in the field and reared in the laboratory at Wellington. After 5 weeks, all specimens developed a fungus. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*. Probably a new record for this host.

Cyclocephala signaticollis Burmeister

2655—Two specimens collected in the field and reared in the laboratory were submitted by L. E. San Martin, Balcarce, Argentina, on July 26, 1966. Diagnosis: Undetermined. The submitted specimens had been completely

destroyed by saprophytic mites, making a diagnosis impossible.

Eremobothynus cornutus (Stnhl.)

3004—Two black and shriveled dead grubs were submitted by Rafiq Ahmad, Bariloche, Argentina, on August 6, 1971. Examination showed an abundance of bacterial spores. Diagnosis: Bacteriosis by the potential pathogen *Bacillus cereus*.

Heterogomphus pauson (Perty)

2654—Two larvae were received from L. E. San Martin, Balcarce, Argentina, on July 26, 1966. The cadavers were yellow, tinged with violet, and mummified. Diagnosis: Mycosis caused by a *Cordyceps* sp.

Holotrichia sp.

2230—A fungus culture isolated from cockchafer grubs was submitted by P. Somasekhar, Mysore State, India, on February 11, 1964. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*.

Pericoptes truncatus Fab.

1994—Some specimens of this sand scarab were submitted by G. A. H. Helson, Wellington, New Zealand, on December 13, 1962. Mr. Helson suggested infection by *Serratia marcescens*. Diagnosis: Undetermined. The presence of *S. marcescens* was not confirmed. The predominant bacterium isolated from the specimens was a strain of *Escherichia freundii*.

1995—One additional specimen of this sand scarab was submitted by G. A. H. Helson, Wellington, New Zealand, on December 5, 1962. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*.

Polyphylla sp.

2829—A few larvae of this scarab were received from J. Onsager, Yakima, Washington, on May 20, 1968. The

Fig. 3. Acc. No. 1976: Electron micrograph of virus particles of SIV (Sericesthis Iridescent Virus) from *Sericesthis pruinosa*. Magnification = 35,000X.

specimens were infected by a *Cordyceps* sp., and specific identification of this fungus was requested. Diagnosis: Mycosis, caused by a *Cordyceps* sp. The stroma on the submitted specimens was immature, and attempts to culture the fungus and force maturity were unsuccessful; thus, specific identification was not possible.

Sericesthis pruinosa (Dalman)

1976—One larva of the pruinose scarab was received from R. J. Roberts, New South Wales, Australia, on October 29, 1962. Studies on this specimen, transmission of hemolymph to *Galleria melonella* larvae, and studies of the resulting material showed the presence of an icosahedral virus of the TIV type. This was the first record of this virus, which eventually became known as the Sericesthis Iridescent Virus (SIV). Diagnosis: Virosis caused by SIV. (Fig. 3.)

Strategus antaeus (Drury)

2917—Two deteriorated and putred grubs were received from W. G. Genung, Belle Glade, Florida, on September 23, 1969. Diagnosis: Bacterioses caused by the potential pathogens *Bacillus cereus* and *Serratia marcescens*.

Unidentified specimen

1958—One field-collected specimen which died in a vial, was submitted by R. D. Frye, Fargo, North Dakota. When received, the specimen was shriveled and dessicated with no external signs of a frank microbial infection. Diagnosis: Undetermined. Microbial analysis produced only a few gram negative small rods, which were present in very low numbers. No known pathogenic microorganisms were found.

1964—One specimen submitted by G. A. H. Helson, Wellington, New Zealand, on October 9, 1962. Diagnosis: Undetermined. No known insect patho-

gens were noted or isolated from this single specimen.

Unidentified scarab larva

2038—This specimen was collected and submitted by E. H. Wollerman, Delaware, Ohio, on April 3, 1963. Diagnosis: Mycosis caused by *Cordyceps* sp. The stroma on the submitted specimen was immature, and attempts to force maturity were unsuccessful. The species was either *C. melolonthae* or *C. ravenelli*.

Xylopyctes sp.

2310—Several specimens were submitted by M. J. MacQuillan, Honiara, British Solomon Islands, on August 31, 1964. They had been preserved in alcohol, and a diagnosis was not possible. Diagnosis: Undetermined.

Scolytidae

Dendroctonus brevicomis (LeConte)

2606—Several larvae were received from W. Bedard, Berkeley, California, on May 2, 1966. Diagnosis: Probably non-microbial.

2653—Ten adults were received from D. Wood, Berkeley, California, on July 25, 1966. Diagnosis: *Isaria* species which were non-pathogenic in tests against *Galleria melonella*; therefore, the fungus may be a saprophyte and have obscured the primary cause of death.

2683—A yeast culture was received from J. Ball, Berkeley, California, on September 16, 1966. Diagnosis: The yeast was tested against *Galleria* larvae for pathogenicity by intra-hemocoelic and per-os injections. The results of both tests were negative. We concluded that the yeast in question is not a pathogen, at least not under the conditions of these tests.

Dendroctonus frontalis (Zimm.)

2021—Some 21 adults of the southern pine beetle were received from J. C.

Moser, Alexandria, Louisiana, on March 1, 1963. These beetles died about 5 days after emerging from a bolt of shortleaf pine. Diagnosis: Mycosis, caused by *Aspergillus flavus*. Probably a new host record for this fungus.

2365—Several larvae were submitted by L. S. Pickard, Pineville, Louisiana, on March 11, 1965. They had been kept at 40°F for 14 days prior to this. Two strains of yeast were isolated. Infectivity tests with these yeasts against *Galleria melonella* gave negative results. Diagnosis: Probably non-microbial.

2711—Eight bacterial cultures isolated from the southern pine beetle were received from G. E. Moore, Research Triangle Park, North Carolina, on December 14, 1966. Diagnosis: The cultures were identified as follows: one culture of *Bacillus thuringiensis* var. *thuringiensis*, two cultures of *Aerobacter* grp. C, two cultures of an *Alcaligenes* sp., two cultures of *Pseudomonas aeruginosa*, and one culture of a gram negative, pleomorphic, non-spore forming, non-flagellate, non-fermentative rod, which was not identified.

2735—On March 28, 1967, eight additional bacterial cultures isolated from the southern pine beetle were received from G. A. Moore, Research Triangle Park, North Carolina. Diagnosis: All eight culture tubes contained *Pseudomonas aeruginosa*, and one also contained *Alcaligenes faecalis*.

Ips calligraphus Germ.

2313—Twelve larvae were submitted by J. C. Moser, Alexandria, Louisiana. The larvae were collected August 21, 1964, and stored at 40°F until September 1, 1964. Only some secondary bacteria were found. Diagnosis: Probably non-microbial.

Scolytus ventralis LeConte

2305—Several larvae of the fir engraver were submitted by R. Stark,

Berkeley, California. These were collected at Blodgett Forest, Eldorado County, California, on July 29, 1964. The larvae were in pupal cells which were completely filled with a dense mycelial growth of an *Oedocephalum* sp. This fungus belongs to a group normally considered saprophytic and was probably a saprophytic secondary invader, rather than a primary pathogen. Diagnosis: Probably non-microbial, or if microbial, then the primary etiology has been masked by the invasion of the secondary saprophytic fungus.

2682—Several larvae were received from M. Ashraf, Pullman, Washington, on September 9, 1966. Microbial analysis produced a pathogenic fungus. Diagnosis: Mycosis: *Aspergillus flavus*.

Tenebrionidae

Coelocnemis punctata LeConte

2862—Three preserved adults were submitted by J. Doyen, Berkeley, California, on October 1, 1968. These specimens were from a stock culture in which dead adults exhibited black nodules in the tissues. Examination of the fixed tissues showed a microsporidian infection. Diagnosis: Microsporidiosis, probably *Nosema* sp.

Coelocnemis sp.

2799—Five larvae were submitted from a laboratory culture by J. Doyen on January 15, 1968. Diagnosis: Non-microbial. A thorough examination revealed no pathogens. Microbial analysis yielded only *Rhizopus nigricans* and an *Aerobacter* sp.

Tenebrio molitor Linnaeus

2952—One adult and several pupae were submitted from a laboratory culture by B. Hammoca, Berkeley, California, on June 3, 1970. Examination and microbial analysis showed no pathogens present. The cadavers had been invaded by saprophytic bacteria, suggesting that the primary cause of death

was other than microbial. Diagnosis: Non-microbial.

Tribolium anaphae Hint.

2589—A sample of dead larvae from a laboratory culture of this flour beetle was submitted by M. Hoy, Berkeley, California, on March 31, 1966. Mortality in the laboratory culture was significant. Diagnosis: Microsporidiosis caused by *Nosema whitei*.

Tribolium castaneum (Herbst)

2022—A large number of laboratory reared larvae were submitted by P. S. Tyler, Slough, Bucks, England, on March 1, 1963. Two protozoans were isolated. Diagnosis: *Triboliocystis garnhami* and *Nosema whitei*.

2043 *et al.*—From April 15, 1963, to March 12, 1969, numerous specimens of the red flour beetle were submitted for routine pathogen checks. These included some 99 accessions (see numbers below) from the Department of Genetics, University of California, Berkeley, California. The source material was from stock and experimental cultures of various genetic strains. Diagnoses: Protozoan infections were found in 59 accessions and consisted of the following organisms: *Farinocystis tribolii* (8); and *Nosema whitei* (51). Bacteriosis caused by *Streptococcus faecalis* was found in eight accessions. Thirty-seven accessions were non-microbial. Accession numbers: 2043, 2192, 2196, 2208, 2226, 2232, 2236, 2238, 2239, 2263, 2264, 2283, 2333, 2362, 2373, 2409, 2410, 2412, 2439, 2449, 2453, 2470, 2471, 2472, 2477, 2482, 2491, 2492, 2496, 2498, 2503, 2506, 2513, 2518, 2519, 2522, 2524, 2525, 2530, 2535, 2536, 2538, 2539, 2541, 2543, 2548, 2550, 2552, 2558, 2561, 2569, 2573, 2575, 2583, 2588, 2591, 2599, 2601, 2604, 2607, 2618, 2619, 2621, 2629, 2634, 2643, 2644, 2646, 2661, 2670, 2673, 2679, 2703, 2709, 2718, 2722, 2726, 2730, 2739, 2743, 2757, 2764, 2769, 2775, 2778, 2781, 2784, 2788, 2804, 2813, 2821, 2828, 2839, 2851, 2868, 2874, 2880, 2882, 2886. (Fig. 4.)

Fig. 4. Acc. No. 2524: Giemsa-stained fat-body smear from *Tribolium castaneum* infected with the schizogregarine, *Farinocystis tribolii*. Arrow shows mature spores. Magnification = 1200X.

Tribolium confusum Jacqueline duVal

2042 *et al.*—A total of 59 accessions of specimens of the confused flour beetle were submitted by the Department of Genetics, University of California, Berkeley, California, during the period April 15, 1963, to November 28, 1967. These specimens were either from stock or experimental cultures and were submitted for routine pathogenic examination. Diagnoses: Of the 59 accessions, 42 were non-microbial; 14 showed a microsporidiosis caused by *Nosema whitei*; one showed a coccidiosis caused by *Adelina tribolii* and two showed a bacteriosis caused by *Streptococcus faecalis*. Accession numbers included: 2042, 2193, 2202, 2209, 2220, 2247, 2263, 2280B, 2333, 2356, 2393, 2483, 2490, 2495, 2499, 2507, 2508, 2511, 2517, 2520, 2523, 2529, 2537, 2542, 2544, 2549, 2551, 2559, 2570, 2572, 2576, 2581, 2584, 2587, 2602, 2608, 2617, 2622, 2630, 2633, 2645,

2647, 2662, 2669, 2672, 2674, 2678, 2698, 2701, 2702, 2705, 2707, 2710, 2712, 2725, 2731, 2742, 2747, 2789. (Fig. 5.)

Tribolium destructor Uyttenboogaart

2372, 2472, 2484, 2797, 2553, 2562, 2663—Seven accessions of this flour beetle were submitted by the Department of Genetics, University of California, Berkeley, California, from March 24, 1965, to August 2, 1966, and were from the department's stock or experimental cultures. Routine examination for pathogens was requested. Diagnoses: Four showed a bacteriosis caused by *Streptococcus faecalis*; one showed a microsporidiosis by *Nosema whitei* and two were non-microbial.

Tribolium madens Charp

2428, 2431, 2464, 2481, 2502, 2509, 2512, 2521, 2531—These nine accessions were received from the Department of

Fig. 5. Acc. No. 2280B: Phase-contrast micrograph of a giemsa-stained fat-body smear from *Tribolium confusum* infected with the coccidian *Adelinea tribolii*. Arrow shows immature oöcyst. Magnification = 800X.

Genetics, University of California, Berkeley, California, from July 6, 1965, to December 5, 1965, with the request for routine pathogenic examinations. The submitted material came either from stock or experimental cultures. Diagnoses: Five accessions showed a bacteriosis caused by *Streptococcus faecalis*; one showed a microsporidiosis caused by *Nosema whitei*; and three were non-microbial.

Tribolium sp.

2069—Live larvae and pupae were submitted from a laboratory stock culture by J. V. Slater, Berkeley, California, on June 12, 1963. Submitted larvae appeared to be healthy. Some of the pupae exhibited local discoloration, but otherwise appeared normal. A thorough examination of the submitted specimens showed no microbial etiology. Diagnosis: Nonmicrobial.

Unidentified

3002—One dead adult beetle preserved in alcohol was submitted by L. Magaw, Quincy, California, on July 26, 1971. Diagnosis: Nematomorphosis caused by a *Gordius* sp.

COLLEMBOLA

Entomobryidae

Entomobrya unostrigata

2822—Several dead nymphs from a laboratory culture were submitted by J. E. Lauck, Davis, California, on April 25, 1968. The cultures were contaminated with various fungi, and their identification was requested to determine if any were known insect pathogens. Diagnosis: Saprophytic fungi present included *Tritirachium* sp., *Aspergillus niger*, and an unidentified Dematiaceae.

2826—Three cultures were submitted by J. Lauck on May 8, 1968 for the

identification of fungal contaminants. Four fungi were isolated, one of which was an insect pathogen. Diagnosis: Saprophytic fungi included a yeast, an unidentified Dematiaceae, and *Rhizopus nigricans*. The pathogenic fungus was *Paecilomyces farinosus* (= *Spicaria farinosa*). This isolate was tested for pathogenicity against *Galleria melonella* L. with positive results.

DERMAPTERA

Carcinophoridae

Euborellia cincticollis (Gerstaecker)

2729—Two adult specimens were received from J. Knabke, Davis, California, on February 21, 1967. Diagnosis: Probably non-microbial, or if microbial, primary etiology had been obscured by secondary fungi and bacteria.

2897—A few adult earwigs from a laboratory culture were submitted by J. Knabke, Davis, California, on June 25, 1969. Diagnosis: Mycosis caused by an *Entomophthora* sp.

Forficulidae

Forficula auricularia (L.)

2082—These specimens were collected in Linden, California, by L. Falcon, on July 11, 1963. Diagnosis: No pathogens found.

2086—Several specimens of this earwig were submitted by R. Schoeppner, Berkeley, California, on July 19, 1963. Diagnosis: Mycosis caused by *Entomophthora* sp. near *E. forficulae*.

2560—One dead specimen was submitted by J. Powell, Berkeley, California, on January 21, 1966. Diagnosis: Mycosis: *Beauveria bassiana*.

2008—Several laboratory reared specimens were submitted by R. Schoeppner, Berkeley, California, on February 5, 1963. Diagnosis: Secondary mycoses caused by *Fusarium* sp. and *Mucor* sp., and a slime mold near *Stemonitis*.

DIPTERA

Agromyzidae

Ophiomyia sp.

2155—One adult agromyzid was submitted by C. E. Stegmaier, Hialeah, Florida, on September 9, 1963. Diagnosis: Mycosis caused by a member of the *Aspergillus ochraceus* group.

Unidentified specimen

2187—One specimen was submitted by S. Prasertphon, Berkeley, California, on October 17, 1963. Diagnosis: Mycosis caused by *Entomophthora sphaerosperma*.

Anthomyiidae

Hylemya spp. *platura* (Meig.) & *florilega* Zett.

2791—Three, dry, pinned, adults were received from A. G. Wheeler, Ithaca, New York, on December 18, 1967. Diagnosis: Mycosis caused by *Entomophthora muscae*.

Ophyra leucostoma Wied.

2279—One adult from Sonoma County, California, was submitted by J. Poorbaugh, Berkeley, California, on June 18, 1963. Diagnosis: Mycosis caused by *Entomophthora* sp., probably *E. muscae*.

Blepharoceridae

Neocurupira campbelli Dumbleton

2063—Several specimens were submitted by G. A. H. Helson, Wellington, New Zealand, on June 5, 1963. Diagnosis: Mycosis caused by an aquatic Phycomycete.

2235—Four vials of preserved specimens submitted by G. A. H. Helson, Wellington, New Zealand, had been collected from January 1963 to February 1964. Diagnosis: Vial 1. Mucoraceous fungus, probably *Mucor*, or possibly a new species and genus. Vials 2 and 3. Mites belonging to the Trombidioidea:

Fig. 6. Acc. No. 2306: Immature oöcysts (arrows) of an *Adelina* sp. in an alcohol-fixed giemsa-stained smear from *Chaoborus astictopus*. Magnification = 1000X.

Johnstonianidae, apparently an undescribed genus intermediate between the subfamilies Johnstonianinae and Lasensiinae. Vial 4. *Saprolegnia* sp.—saprophytic.

Cecidomyiidae

Haplodiplosis equestris (B. Wagner)

2896—Several adults of the saddle gall midge from barley were submitted on June 24, 1969 by Th. Thygesen, Lyngby, Denmark. Diagnosis: Non-microbial.

Chaoboridae

Chaoborus astictopus Dyar and Shannon

2306—Several specimens and histological sections were submitted by P. Sikorowski, Lakeport, California, July 31, 1964. The larvae were collected at Pinto Lake, Santa Cruz County, California, and appeared granular and grayish in color, whereas normal larvae

are colorless. In Pinto Lake, about 1 per cent of the 4th instar larvae were infected. Diagnosis: Protozoan disease caused by a Coccidian, *Adelina* sp. New Record. (Fig. 6.)

2330—Cultures of a bacterium isolated from the Clear Lake gnat were submitted by P. P. Sikorowski, Lakeport, California, on October 16, 1964. These cultures were thought to be a gram positive spore former, but examination showed them to be gram negative, non-spore forming. Requests for additional cultures were not fulfilled. Diagnosis: *Aerobacter* sp.

2700—One bacterial culture isolated from the Clear Lake gnat was received from P. P. Sikorowski, Lakeport California, on October 15, 1966. Diagnosis: *Pseudomonas aeruginosa*.

2774—Several larvae of the Clear Lake gnat were received from P. Sikorowski, Lakeport, California, on Sep-

tember 20, 1967. Confirmation of a possible coccidian infection was requested. Diagnosis: Coccidiosis caused by an *Adelina* sp. (Fig. 7.)

Chironomidae

Chironomus plumosus (L.)

2210—Two slides of a microsporidian isolated from this chironomid were submitted by O. L. Lovett, Madison, Wisconsin, on December 12, 1963. Diagnosis: *Thelohania* n. sp. related to *T. pin-guis*. New record—new pathogen.

Chloropidae

Thaumatomyia glabra (Meigen)

2859—On September 24, 1968, one adult from an alfalfa field was received from A. G. Wheeler, Ithaca, New York. Diagnosis: Mycosis caused by *Entomophthora muscae*.

Cordyluridae

Scopeuma stercorarium (L.)

2254—One adult was submitted by J. Poorbaugh, Berkeley, California, on April 17, 1964. Diagnosis: Non-microbial.

Culicidae

Aedes aegypti (Linn.)

2973—On November 16, 1970, C. L. Judson, Davis, California, sent several dead mosquito larvae from his laboratory culture. Two strains of gram negative bacteria were isolated and tested against mosquitoes in our laboratory, with negative results. Diagnosis: Probably non-microbial, or if a primary microbial etiology was present, it has been masked by the action of secondary bacteria.

Fig. 7. Acc. No. 2774: *Chaoborus astictopus* larva infected with *Adelina* sp. The larval cuticle ruptured, releasing oöcysts which had completely filled the host's body cavity. Oöcysts appear empty at this low magnification due to the high refractivity of their thick walls. Magnification = 40X.

Fig. 8. Acc. No. 2720: A sporulating culture of *Paecilomyces fumoso roseus* isolated from *Aedes sollicitans*. Phialides (Ph) ; Conidia (C). Magnification = 800X.

Aedes sollicitans (Walker)

2720—A fungus culture from this mosquito was submitted by T. Clark, Fresno, California, on January 12, 1967. Diagnosis: Mycosis: *Paecilomyces fumoso-roseus*. (Fig. 8.)

Aedes togoi (Theobald)

2025—Ten laboratory-reared larvae were submitted by B. R. Laurence, London, on March 12, 1963. Diagnosis: Undetermined.

Aedes vexans (Mg.)

2463—A bacterium isolated from larvae was submitted by W. R. Kellen, Fresno, California, on August 24, 1965. It was not possible to culture the bacterium, so identification was not made.

Culex pipiens fatigans Wied.

2966—Several laboratory-reared larvae preserved in alcohol were submitted on August 29, 1970 by H. N. Espinola,

Belo Horizonte, Brazil. The specimens had a black plug near the trachea in the thorax. Dissection revealed the plug to be fungal in nature. However, preservation and the absence of reproductive structures prevented identification. Diagnosis: Possible mycosis.

2980—Several additional larvae were received from Dr. H. N. Espinola on January 28, 1971. These were shipped in water and were rather deteriorated upon arrival. Thus, the fungus causing the tracheal plugs mentioned above was not viable, and no identification could be made. Diagnosis: Possible mycosis.

Culex quinquefasciatus (Say)

2418—Several larvae were submitted by P. Y. Nakagawa, Honolulu, Hawaii, on June 14, 1965. They had been collected in an area which had been exposed to insecticidal treatment with EC, DDT and Baytex (Fenthion) granules

as larvacides. Diagnosis: Bacterioses caused by *Bacillus cereus* var. *mycoides*, and *Pseudomonas aeruginosa*.

Culex tarsalis Coquillett

2965—One frozen adult was submitted by G. Grodhaus, Berkeley, California, on September 11, 1970. The specimen had been collected by K. H. Hansgen; Lincoln, Placer County, California, on August 31, 1970, and showed a yellow sphere on one eye. It was a pollen grain which had become stuck to the eye with a bit of nectar. Diagnosis: Non-microbial.

Culicida sp.

2841—Several laboratory reared larvae were submitted on June 24, 1968 by L. Ehler, Berkeley, California. Diagnosis: Non-microbial.

Unidentified mosquito larva

2396—One larva was found in a roadside ditch by B. T. Whitworth, Willows, California, on April 27, 1965. Diagnosis: Bacterioses caused by *Clostridium* sp. and *Pseudomonas aeruginosa*.

Drosophilidae

Drosophila melanogaster Meigen

2697—Several adult flies were submitted by F. K. Ho, Berkeley, California, on October 6, 1966. Diagnosis: Non-microbial.

2929—Eggs, larvae, pupae and adults were submitted, on December 9, 1969, by F. H. Sobels, Leiden, the Netherlands. The material was from laboratory cultures in which egg hatch was slightly sub-normal, but larval mortality was high. Pupae were misshapen, and adults from these seldom lived more than 24 hours. Microbial analysis produced no known pathogenic micro-organisms, and electron micrographs showed no virus. However, the electron microscope examinations did show the salivary glands to be filled with yeast cells. Two yeasts

were isolated and identified as *Pichia membranaefaciens*, and *Candida sorbosa*. It was not determined whether or not these might be pathogenic. Diagnosis: Inconclusive.

3032—Adult fruit flies, which were being used in investigations on quantitative intake of food under the influence of carbon dioxide, were submitted by S. S. Chawla, Quebec, Canada, on November 22, 1972. Diagnosis: Possible infection with sigma virus (from description of submitter), or non-microbial.

3037—Additional fruit fly adults from the above laboratory were received from S. S. Chawla, Quebec, Canada, on December 14, 1971. Diagnosis: Possible infection by sigma virus, or non-microbial.

Glossinidae

Glossina morsitans Westw.

2941—Adults and pupae of this tsetse fly were submitted by J. Fraga de Azevedo, Lisbon, Portugal, on March 19, 1970. The specimens were from laboratory colonies exhibiting a great number of abortions, reduction of longevity, reduction in size of pupae, and general weakness. However, thorough examination and microbial analysis showed no microbial etiology. Diagnosis: Non-microbial.

Muscidae

Fannia canicularis (L.)

1886—One adult was submitted by R. D. Frye, Fargo, North Dakota, on June 1, 1962. Diagnosis: Mycosis caused by *Entomophthora muscae*.

1980—One adult specimen was submitted by J. H. Poorbaugh, Berkeley, California, on November 15, 1962. Diagnosis: non-microbial.

Haematobia irritans (L.)

2843—Larvae from laboratory cultures were submitted by H. G. Kinzer,

University Park, New Mexico, on June 26, 1968. Diagnosis: Bacterioses caused by *Bacillus cereus* and *B. cereus* var. *mycoides*.

Hylemyia antiqua (Meigan)

1925—Several adults and pupae were submitted by J. Ellington, Ithaca, New York, on August 9, 1962. They had been laboratory reared. Diagnosis: Undetermined.

Hylemyia seneciella (Meade)

2079—Three adults collected in Paris, France, were submitted by L. A. Andres, on July 5, 1963. Diagnosis: Mycosis caused by *Entomophthora muscae*.

Musca domestica (L.)

1836—A single adult was submitted by H. Scott, Jr., Berkeley, California, on January 22, 1962. Diagnosis: Mycosis caused by *Entomophthora muscae*.

1979—Eight adults were submitted by J. H. Poorbaugh, Berkeley, California, on November 15, 1962. Diagnosis: Mycosis caused by *Entomophthora muscae*.

2457—Several laboratory-reared larvae were submitted by J. Poorbaugh, Berkeley, California, on August 16, 1965. Diagnosis: Mycosis caused by *Aspergillus flavus* and bacteriosis caused by *Bacillus cereus*.

Stomoxys calcitrans (L.)

1981—A single adult was submitted by J. H. Poorbaugh, Berkeley, California, on November 15, 1962. Diagnosis: Non-microbial.

Unidentified (anthomyiid—*Hylemyia* and *Pegomyia* group)

1903—Three adults were submitted by R. D. Frye, Fargo, North Dakota, on July 20, 1962. Diagnosis: Mycosis caused by *Entomophthora muscae*.

Unidentified Anthomyiid

2016—One adult was submitted by J. Linsley Gressitt, Honolulu, Hawaii, on February 19, 1963. Diagnosis: Non-microbial.

2032—Nine dead adults were submitted by D. M. Peterson, San Pedro, California, on March 25, 1963. Diagnosis: Mycosis caused by *Entomophthora muscae*.

Unidentified Muscoid fly

2267—Eight adults collected in Bowman, California, were submitted by R. W. Gaetjen, Berkeley, California, on June 4, 1964. Diagnosis: Mycosis caused by *Entomophthora* sp.

Oritidae

Tetanops myopaeformis (Roder)

2527—Eight dead dry specimens were submitted by K. Shea, Twin Falls, Idaho, on November 29, 1965. Collected in Rupert, Idaho. Diagnosis: Mycosis: *Metarrhizium anisopliae*.

Sciaridae

Unidentified

2165—Many larval specimens were submitted by W. Steffan, Berkeley, California, on September 16, 1963. They had been reared on artificial media. Diagnosis: Non-microbial.

2188—A single adult female was submitted by W. Steffan, Berkeley, California, on October 18, 1963. Diagnosis: Mycosis caused by *Entomophthora* sp. near *E. dipterigena*.

2462—One laboratory-reared adult was submitted by W. Brooks, Berkeley, California, on August 24, 1965. Diagnosis: Mycosis caused by *Entomophthora* sp.

2660—Several adults were received from G. O. Poinar, Jr., Berkeley, California, on August 2, 1966. Diagnosis: Mycosis: *Entomophthora* sp.

Simuliidae**Unidentified**

2058—Fourteen larvae collected near Danville, California, were submitted by J. R. Anderson, Berkeley, California, on May 27, 1963. Diagnosis: Microsporidiosis caused by *Thelohania* sp., probably *T. fibrata*.

Syrphidae***Melanostoma* sp.**

2650—One larva was submitted by M. A. Mattar, La Cruz, Chile, on July 13, 1966. Diagnosis: Bacterioses, secondary: *Proteus* sp. and *Alcaligenes* sp.

***Syrphus americana* (Wiedeman)**

1876—Seventeen adults were submitted by G. M. Buxton, Sacramento, California, on May 17, 1962. Diagnosis: Mycosis caused by *Entomophthora muscae*.

***Syrphus octomaculatus* Walker**

2675—Two larvae were received from M. A. Mattar, La Cruz, Chile, on August 18, 1966. Diagnosis: Bacteriosis: Non-chromogenic strain of *Serratia marcescens*.

***Syrphus torvus* O. Sacken**

2281—These larvae were submitted on June 26, 1964 by G. D. Amman, Asheville, North Carolina. They were part of a laboratory colony and were completely deteriorated. A bacterium that has been known to cause epizootics in the laboratory was isolated. Diagnosis: Possible bacteriosis: *Pseudomonas aeruginosa*.

***Syrphus* sp.**

2649—Two shriveled larvae were submitted by M. A. Mattar, La Cruz, Chile, on July 13, 1966. Examination showed an abundance of bacteria. Analysis provided cultures of *Proteus* sp. and *Alcaligenes* sp., both secondary invaders. Diagnosis: Either non-micro-

bial, or the primary etiology has been obscured by the action of a secondary bacterial infection.

Unidentified

2759—Several adults were submitted by T. Gordon, Oakland, California, on July 10, 1967. Diagnosis: Mycosis: *Entomophthora muscae*.

2793—One pinned adult specimen was submitted by A. G. Wheeler, Ithaca, New York, on December 18, 1967. Diagnosis: Mycosis caused by *Entomophthora sphaerosperma*.

Psychodidae***Phlebotomus sanguinarius* (Fairchild and Hertig)**

1874—A single adult was submitted from a laboratory culture by P. T. Johnson, Balboa Heights, Canal Zone, on May 15, 1962. Diagnosis: Undetermined.

***Phlebotomus vexator occidentis* (Mau-gabeicot and Galiudo)**

2336—Some specimens were submitted from a laboratory culture by B. Chaniotis, Berkeley, California, on November 2, 1964. A bacteriosis was discovered which was probably secondary. Diagnosis: Bacteriosis caused by *Pseudomonas* sp.

Tabanidae***Chrysops vittatus* Wied.**

2765—One pupa was received from P. H. Thompson, New Brunswick, New Jersey, on July 31, 1967. Diagnosis: Probable bacteriosis, caused by *Bacillus cereus*, with secondary invasion by an *Aerobacter* sp.

***Tabanus* sp.**

2766—One larva was submitted by P. H. Thompson, New Brunswick, New Jersey, on July 31, 1967. Diagnosis: *Proteus morganii* and *Alcaligenes* sp. isolated as secondary saprophytic bac-

teria. Primary cause of death may not have been microbial, or may have been obscured by the action of secondary saprophytes.

2771—Three larvae were submitted by P. H. Thompson, New Brunswick, New Jersey, on August 22, 1967. Diagnosis: Bacteriosis: *Pseudomonas aeruginosa*.

Tachinidae

Lespesia sp.

2442—Two endoparasites of the banana bagworm were collected and submitted by F. Lara, Limon, Costa Rica, on July 28, 1965. The cadavers were filled with mites and the primary etiology was obscured. Diagnosis: Undetermined.

Lixophaga diatraeae (Townsend)

1939 — Several laboratory-reared adults were submitted by L. W. van Whervin, Barbados, West Indies, on September 6, 1962. Diagnosis: Mycosis caused by *Entomophthora* sp.

1998—Several laboratory-reared specimens were submitted by L. W. van Whervin, Barbados, West Indies, on December 27, 1962. Diagnosis: Mycosis caused by *Entomophthora* sp. near *apiculata*.

Tephritidae

Ceratitus capitata (Wiedeman)

2736—Many adults were submitted by E. Naton, Munich, West Germany. The specimens were collected on March 25, 1967 and submitted on April 3, 1967. Diagnosis: Probably non-microbial.

Dacus dorsalis (Hendel)

2406—Several adults were submitted by R. T. Cunningham, Hilo, Hawaii, on May 13, 1965. Examination showed only secondary saprophytic fungi and bacteria. Diagnosis: Probably non-microbial.

Dacus oleae (Gmelin)

1854—Many pupae were submitted by T. C. Buchelos, Patras, Greece, on March 15, 1962. Diagnosis: No pathogen observed.

Rhagoletis completa (Cresson)

2179—Seven dead larvae were submitted by L. A. Falcon, Berkeley, California, on October 7, 1963. They had been collected in Linden, California, in an area which had been treated with *Bacillus thuringiensis*. Diagnosis: Non-microbial.

2515—Several dead pupae submitted by J. Shimizu, Albany, California, were collected in Manteca, California, from April to July, 1965. Diagnosis: Probable Aspergillosis: *Aspergillus flavus*. In addition, a *Fusarium* was also isolated and a bacterium, *Aerobacter*, sp. It would appear that *Aspergillus* was the microbial etiological agent.

2922—An agar plate containing bacteria isolated from the walnut husk fly was submitted on October 17, 1969 by K. Hagen, Albany, California, with a request for identification. Diagnosis: The bacteria were identified as *Aerobacter* sp., and *Aerobacter cloacae*.

Tipulidae

Tipula graminivora (Alexander)

1855—Several specimens were collected near Petaluma, California, and submitted by W. H. Lange, Davis, California, on March 15, 1962. Specimens showed signs of a mycosis. Diagnosis: Possible mycoses caused by *Fusarium* sp., *Mucor* sp. and *Fumago* sp.

Tipula quaylii (Doane)

2233—Three specimens were collected at Herald, California, by H. Lange, Davis, California, on February 19, 1964. Diagnosis: Undetermined.

Tipula sp.

2218—Nine larvae were submitted by W. H. Lange, Davis, California, on January 3, 1964. The disease appeared to be an epizootic. Diagnosis: Undetermined.

2590—A few dead specimens collected in Petaluma, California, on March 26, 1966, were submitted by W. H. Lange, Davis, California. Diagnosis: General bacterioses: *Bacillus cereus*, *Streptococcus faecalis* and *Pseudomonas aeruginosa*.

Trypetidae*Anastrepha suspensa* (Loew)

2780—Several adults of the Caribbean fruit fly were received from R. B. Marlatt, Homestead, Florida, on October 11, 1967. Diagnosis: Mycosis caused by *Entomophthora echinospora*.

2794—Several brown and shriveled larvae were submitted by R. B. Marlatt, Homestead, Florida, on December 26, 1967. Diagnosis: Non-microbial.

Xylophagidae

Inopus rubiceps Macquart (= *Altermetoponia rubiceps* [Macquart] Stratiomyida)

2500—Some specimens were collected in Colma, California, by L. Campbell, Berkeley, California, on October 22, 1965. Diagnosis: External saprophytic fungi and general bacterial deterioration.

Unidentified

2028—One pupa was submitted by G. A. H. Helson, Wellington, New Zealand, on March 18, 1963. Diagnosis: Mycosis caused by *Beauveria bassiana*.

2547—Many dead specimens preserved in alcohol were submitted by S. Shima, Jr., Palmira, Valle, Colombia, South America, on December 9, 1965. They were collected in La Torre, Palmira, Valle. Diagnosis: Non-microbial;

examination of whole and dissected specimens revealed no microbial etiology.

2556—Many dead specimens submitted by S. Shima, Jr., Palmira, Valle, Colombia, South America, on January 10, 1966. They were collected in December, 1965, in La Torre, Palmira, Valle. Diagnosis: Mycosis: *Spicaria rileyi*.

2815—Fungus cultures isolated from a cane fly were submitted by B. M. Hogg, Mandeville, Jamaica, West Indies, on March 28, 1968. Diagnosis: The fungus, *Metarrhizium anisopliae*, was present.

HEMIPTERA (HETEROPTERA)**Anthocoridae***Anthocoris* sp.

2375—One dead adult was submitted by J. Shimizu, Berkeley, California, on March 29, 1965. Diagnosis: Non-microbial. A secondary fungus, *Penicillium* sp., which was external only, had not colonized the insect.

Cimicidae*Paracimex* n. sp.

1887—N. Ueshima, Berkeley, California submitted eight bedbugs on June 7, 1962. The bedbugs had been sent to him from Kuala Lumpur, Malaya, where they had been collected from the nests of Swifts. Diagnosis: Mycosis, caused by *Aspergillus flavus*. A new host record for this fungus. (Fig. 9.)

Lygaeidae*Ligyocoris* n. sp. (nr. *L. sobrius* (Uhler))

1984—Two adults were submitted by J. A. Chemsak, Berkeley, California, on November 30, 1962. The specimens had been collected by P. D. Ashlock; Carson Ridge near Woodacre, Marin County, California, from under the bark of a dead Sargent's Cypress. Di-

Fig. 9. Acc. No. 1887: *Paracimex* sp. infected with *Aspergillus flavus*. Note sporophores of fungus protruding from intersegmental folds (arrows). Magnification = 12X.

agnosis: Mycosis caused by *Beauveria bassiana*. A new host record for this fungus.

Miridae

Adelphocoris lineolatus (Goeze)

2855—One adult and three nymphs collected from alfalfa at Ithaca, New York, were submitted by A. G. Wheeler, Jr., on August 20, 1968. Diagnosis: Mycosis caused by *Entomophthora erupta*.

Helopeltis clavifer Walker

1931—One specimen was submitted by A. Catley, Papua, New Guinea, on August 17, 1962. This mirid is the most important pest of cacao in the territory. Diagnosis: Mycosis caused by *Beauveria bassiana*. Probably a new host record for this fungus.

Lygus lineolaris (Palisot de Beauvois)

2672—One preserved specimen was submitted by R. F. Ruppel, East Lan-

sing, Michigan, on November 9, 1970. Diagnosis: Mycosis caused by an unidentified Hyphomycete.

Unidentified Miridae

2651—Several adults were received from J. Hamai, Albany, California, on July 14, 1966. Diagnosis: Bacteriosis: *Bacillus cereus*.

Nabidae

Nabis sp.

2593—Two dead specimens were submitted by J. Shimizu, Albany, California, April 6, 1966. Diagnosis: Bacteriosis: *Bacillus cereus* and *Serratia marcescens*.

Zelus sp.

2699—Several nymphs of this predator were submitted by J. Shimizu, Berkeley, California, on October 23, 1966. The specimens had been reared in

the laboratory on an artificial diet. Diagnosis: Non-microbial.

Pentatomidae

Bathycoelia thalissima

2341—J. T. Legg, Tafo, Ghana, submitted a fungus culture isolated from *B. thalissima* on November 18, 1964. Diagnosis: A non-entomogenous fungus, *Cephalosporium* sp.

Dinocoris melanoleuca Westwood

2908—Adults and nymphs of this pentatomid were submitted by L. A. Stange, San Miguel de Tucuman, Argentina, on August 21, 1969. Diagnosis: Mycosis caused by *Metarrhizium brunneum*.

Podisus maculiventris (Say)

2632—One nymph was received from J. Shimizu, Albany, California, on June 13, 1966. Diagnosis: Possible bacteriosis caused by a gram negative rod in either the *Haffnia* grp. or an *Erwinia* sp.

Podisus serieventris Uhl.

2597—One dead nymph was submitted by D. H. Dahlston, Berkeley, California, in August, 1965. The specimen was collected at Knox Mt., 30 miles southwest of Alturas, Modoc Co., California. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* var. *thuringiensis*.

Pyrrhocoridae

Dysdercus cardinalis Gerst.

3027—Eggs, nymphs, and adults of the cotton stainer collected in Nairobi, Kenya, and reared in Amsterdam, the Netherlands, were submitted by L. van der Geest on November 19, 1971. Diagnosis: Non-microbial.

Dysdercus intermedius Distant

2796—Five adult cotton stainers preserved in Bouin's fixative were received from J. L. Vincent, Devon, England, on

December 26, 1967. Diagnosis: Non-microbial.

Reduviidae

Triatoma rubida (Uhler)

2334—Two specimens were submitted on October 23, 1964, by R. Watkins, San Francisco, California. The hemocoel was filled with small gram negative rods which failed to grow on various artificial media. On October 29, 1964, Mrs. Watkins brought in a culture of the bacterium on blood agar. This bacterium was identified as a *Pseudomonas* sp. Diagnosis: Bacteriosis, possibly caused by a *Pseudomonas* sp., but not confirmed by infectivity tests.

Ricaniidae

Scolypopa australis (Walker)

2273 — Some specimens were submitted from Tambourine Mountain, Queensland, Australia, by J. H. D. Barnett, Brisbane, Australia, on June 12, 1964. Diagnosis: Mycosis caused by *Hirsutella citriformis*.

HEMIPTERA (HOMOPTERA)

Adelgidae

Adelges piceae (Ratz)

2783—Adults and eggs of the balsam wooly aphid on bark discs of *Abies fraseri* were submitted by G. F. Fedde, Asheville, North Carolina, on November 3, 1967. The specimens were collected on October 25, 1967 in Mt. Mitchell State Park, North Carolina. Diagnosis: Mycosis caused by a *Fusarium* sp.

2790—Additional specimens of the balsam wooly aphid were received from G. F. Fedde, Asheville, North Carolina, on December 12, 1967. These specimens were again submitted on *Abies fraseri* bark sections. Diagnosis: Mycosis caused by a *Fusarium* sp.

Aleyrodidae*Aleurodes barodensis* Maskal

2229—Many nymphs of the sugar cane whitefly were submitted by H. David, Madras State, India, on February 11, 1964. Diagnosis: Mycosis, caused by *Aschersonia* sp., in the *Aleyrodiplocenta* group.

Bremesia tabaci (Gennadius)

2971—Slides, and agar slant cultures of a fungus isolated from white flies in Chiangmai, Thailand, were received on November 10, 1970, from U. Sonpirode. Examination of the mounted specimens confirmed a mycosis and the fungus was identified as a *Fusarium* sp. Diagnosis: Mycosis caused by a *Fusarium* sp.

Dialeurodes citrifolii (Morg.)

2805—On February 8, 1968, several specimens of the cloudy winged whitefly were received from Q. L. Holdeman, La Ceiba, Honduras. Diagnosis: Mycosis caused by *Aschersonia goldiana*.

Trialeurodes sp.

1906—These specimens were submitted by J. L. Nickel from Cambodia on July 20, 1962. The insects were kept in a cyanide jar for several days. Diagnosis: The fungus, *Cladosporium* sp., was isolated from the dead specimens.

Aphidae*Acrothosiphon pisum* (Harris)

2977—Many specimens were submitted by E. Zuniga-Salinas, La Cruz, Chile, on December 23, 1970. The material was field collected from alfalfa in Rancagua, Chile, where the disease had reached epizootic proportions in natural aphid populations. Diagnosis: Mycosis caused by *Entomophthora aphidis*.

Aphis craccivora (Koch)

2369—Several specimens were submitted by J. A. K. Farrell, Kilongwe, Malawi, Africa, on March 19, 1965. The

disease is widespread in the field, and epizootic in the laboratory. Diagnosis: Mycosis caused by *Entomophthora* sp.

Aphis gossypii (Glover)

2302 — Several specimens of the melon aphid were submitted by D. A. Wolfenbarger, Welasco, Texas, on July 22, 1964. They had been reared in a greenhouse. Diagnosis: Mycosis caused by *Aspergillus* sp. in the *flavus-oryzae* group.

Aphis helichrysi (Kaltenbach)

2265—Several specimens collected in Colma, California, were submitted by W. Allen, Berkeley, California, on June 1, 1964. Diagnosis: Mycosis caused by *Entomophthora* sp.

Aphis sp. (possibly *gossypii*)

1858—Several specimens were submitted by M. A. Janjua, Rawalpindi, Pakistan, on March 26, 1962. Diagnosis: No primary pathogen observed.

Brevicoryne brassicae (L.)

2741—Several adults were submitted by D. White, Sydney, Australia, on April 14, 1967. Diagnosis: Bacteriosis: *Pseudomonas aeruginosa*.

Macrosiphum pechumani Mac Gillivray

2867—On October 18, 1968, four aphids collected from *Convalaria majalis* were submitted by A. G. Wheeler, Ithaca, New York. Diagnosis: Mycosis caused by *Entomophthora aphidis*.

Macrosiphum pisi (Harris)

1956—Several specimens were submitted by R. D. Frye, Fargo, North Dakota, on September 25, 1962. Diagnosis: Non-microbial.

Metopolophium dirhodum (Wlk.)

2873—Several rose-grass aphids were received on December 6, 1968 from E. Zuniga-Salinas, La Cruz, Chile, with

reports of from 50 per cent to 75 per cent mortality in field populations. Diagnosis: Mycosis, caused by *Entomophthora aphidis*.

2877—On January 21, 1969, additional rose-grass aphids were received from E. Zuniga-Salinas, La Cruz, Chile. These specimens had been collected from barley and wheat near La Cruz. Diagnosis: Mycosis, caused by *Entomophthora aphidis*.

Myzus persicae (Sulzer)

1857—Several specimens were submitted by D. Purcifull, Davis, California, on March 23, 1962. Diagnosis: Mycosis caused by *Entomophthora aphidis*.

1862—Some specimens were collected along the lower California coast and submitted by R. J. Shepard, Davis, California, on April 16, 1962. Diagnosis: Mycosis caused by *Entomophthora aphidis*.

1871—Some nymphs of the green peach aphid were collected from spinach near Painter, Virginia, by R. N. Hofmaster, and submitted by S. R. Dutky, Beltsville, Maryland, on May 5, 1962. Diagnosis: Mycosis caused by *Entomophthora aphidis*.

2274—Some specimens were collected at Redland Bay, Queensland, Australia, by J. H. D. Barnett, Brisbane, on June 12, 1964. Diagnosis: Mycosis caused by *Entomophthora aphidis*.

Rhopalosiphum maidia (Fitch)

2613—A slide of a fungus isolated from this insect was submitted by R. B. Subba Rao, New Delhi, India, on May 10, 1966. Identification: *Entomophthora* sp.

1945—Some specimens were submitted by E. A. Wood, Stillwater, Oklahoma, on September 17, 1962. Diagnosis: Some were parasitized while the cause of death in others was unknown.

Therioaphis trifolii (Monell)

2475—Several slides of a fungus

collected from this insect were submitted for identification by R. B. Subba Rao, New Delhi, India, on September 20, 1965. Identification: *Entomophthora* sp. probably *E. aphidis*.

Unidentified root aphid

1843—Several specimens were submitted by T. C. Lawrence, Berkeley, California, on February 23, 1962. Diagnosis: No pathogen found. Slight growth of *Mucor* sp.

Unidentified

1850—A single nymph was submitted by D. Gerling, Berkeley, California, on March 13, 1962. Diagnosis: Mycosis caused by *Entomophthora* sp.

Cercopidae

Aeneolamia postica Ulrich & *Prosapia bicincta* Say

3033—A mixture of adults and nymphs of these two spittlebugs collected in Aldama, Tamaulipas, Mexico, was submitted by J. Carrillo, Chapingo, Mexico, on November 23, 1971. Diagnosis: Mycosis caused by an *Entomophthora* sp.

Philaenus leucophthalmus (L.)

2468—A bacterium isolated from this spittlebug was submitted by R. Whitcomb, Berkeley, California, on July 23, 1965. Identification: *Aerobacter* sp., group C.

Philaenus spumarius L.

2792—One, dry mounted adult was submitted by A. G. Wheeler, Ithaca, New York, on December 18, 1967. Diagnosis: Mycosis caused by *Entomophthora thaxteriana*.

Chermidae

Chermes picea (Ratz.)

2178—Several specimens, collected at Mt. Mitchell, North Carolina, were submitted by A. T. Drooz, Asheville, North

Carolina, on October 4, 1963. Diagnosis: Mycosis caused by an unidentified fungus. The fungus which had colonized the insect was no longer viable, and had not produced fruiting structures on the host.

Cicadellidae

Ballana sp.

2465—A bacterium isolated from this leafhopper was submitted by R. Whitcomb, Berkeley, California, on July 23, 1965. Identification: an *Erwinia*-like bacterium.

Chlorina furcifera (Horvath) (or *Sogatia furcifera*)

1853—This specimen was submitted by A. D. Hinkley, Fiji, on March 14, 1962. Diagnosis: Mycosis caused by *Entomophthora aphidis*. New record.

Colladonus montanus (Van Duzee)

2344—R. Whitcomb, Berkeley, California, submitted several bacterial cultures which had been isolated from *C. montanus* and from celery on December 12, 1964. Diagnosis: *Micrococcus* sp. and *Erwinia* sp.

Deltacephalus sp.

2466—A bacterium isolated from this leafhopper was submitted by R. Whitcomb, Berkeley, California, on July 23, 1965. Identification: *Bacillus cereus*.

Empoasca devastans Distant

2620—A slide containing a fungus isolated from this leafhopper was submitted by R. B. Subba Rao, New Delhi, India, on May 10, 1966. Diagnosis: Mycosis caused by an *Entomophthora* sp.

Macrosteles fascifrons (Stal)

2467—A bacterium isolated from this leafhopper was submitted by R. Whitcomb, Berkeley, California, on July 23, 1965. Identification: *Proteus* sp.

2878—On January 23, 1969, C. F. Koval, Madison, Wisconsin, submitted several adults of the aster leafhopper found in the Entomology Department greenhouse. Diagnosis: Mycosis, caused by *Beauveria bassiana*.

Cicadidae

Diceroprocta apache Davis

2770—Several preserved nymphs of this cicada were submitted by D. M. Tuttle on August 15, 1967. The specimens were collected near Yuma, Arizona. Diagnosis: Mycosis caused by *Cordyceps sobolifera*. (Fig. 10.)

Magicicada septendecim (L.)

1890—Several cicadas were submitted by A. Gray, New York, N.Y., on June 14, 1962. They were infected with a fungus, but were still alive. Diagnosis: Mycosis caused by *Massospora cicadina* Peck.

1933—A single specimen collected in Pilot Mound State Forest, Boone County, Iowa, was submitted by M. Lloyd, Los Angeles, California, on August 24, 1962. No microbial etiology was found. Diagnosis: probably non-microbial.

Coccidae

Nipaecoccus vastator

2616—A culture of a fungus isolated from this insect was submitted by R. B. Subba Rao, New Delhi, India, on May 10, 1966. Identification: *Fusarium* sp. (This fungus was tested against *Gal-leria* larvae with negative results.)

Pseudococcus njalensis Laing

2340—A fungus culture isolated from *P. njalensis* was submitted by J. T. Legg, Tafo, Ghana, November 18, 1964. Diagnosis: Non-entomogenous fungus, *Cephalosporium* sp.

Coccus sp.

2280A—Some specimens were sub-

Fig. 10. Acc. No. 2770: A *Diceroprocta apache* nymph infected with *Cordyceps sobolifera*, showing mature stroma (S) bearing the fertile spore-producing "head" (H). Magnification = 3.5X.

mitted by P. Somar Sekhar, Mysore State, India, on June 19, 1964. Diagnosis: Non-microbial.

2359—Several specimens were submitted by S. Rao, Kuala Lumpur, Malaysia, on February 15, 1965. Diagnosis: Mycosis caused by *Fusarium* sp.

Saissetia nigra (Nietn.)

2358—These specimens were submitted by S. Rao, Kuala Lumpur, Malaysia, on February 15, 1965. All three groups of specimens suffered from mycoses caused by different fungi. Diagnosis: Mycoses caused by *Paecilomyces farinosus* (syn. *Spicaria farinosa*), *Fusarium* sp., and *Sphaerostilbe* sp.

Saissetia oleae (Bernard)

2540—Four dead specimens were submitted by C. S. Davis, Berkeley, California, on December 14, 1965. Diagnosis: Non-microbial.

Delphacidae

Nilaparvata lugens (Stal)

1852—This specimen was submitted by A. D. Hinckley, Fiji, on March 14, 1962. Diagnosis: Mycosis caused by *Entomophthora* sp. New record.

2275, 2293—These specimens were submitted by M. J. MacQuillan, Honiara, Guadalcanal, on June 15 and July 8, 1964. Diagnosis: Mycosis caused by *Hirsutella citriformis*.

Sogatella furcifera

2275, 2293—These specimens were submitted by M. J. MacQuillan, Honiara, Guadalcanal, on June 15 and July 8, 1964. Diagnosis: Mycosis caused by *Hirsutella citriformis*.

Diaspididae

Aonidiella aurantii (Maskell)

2615—A fungal culture isolated from this insect was submitted by R. B. Subba Rao, New Delhi, India, on May

10, 1966. Diagnosis: *Fusarium* sp. (Tests against *Galleria* larvae were negative.)

Aspidiotus destructor Sign.

2797—Several of these scales were received on banana leaves from C. S. Stephens, Changuinola, Panama, on December 29, 1967. Diagnosis: Non-microbial.

Lepidosaphes beckii (Newman)

2078—These specimens were intercepted at the Plant Quarantine Station, San Pedro, California, and submitted by D. M. Peterson on July 2, 1963. Diagnosis: Mycosis caused by *Myiophagus ucrainicus*.

Phenacaspis pinifoliae (Fitch)

2945—Several specimens of the pine needle scale were received from D. G. Nielsen, Ithaca, New York, on April 3, 1970. The submitted specimens exhibited a scurfy appearance which Mr. Nielsen felt was caused by a fungus. Examination showed that this condition was caused by a *Cladosporium* sp., and an *Alternaria* sp. A *Penicillium* sp. was also present. Diagnosis: Saprophytic fungi growing on dead scales. The primary cause of death is unknown.

Flatidae

Siphanta acuta Melichar

2405—These torpedo bugs were submitted by R. T. Cunningham, Hilo, Hawaii, on May 13, 1965. Diagnosis: Mycosis caused by *Hirsutella citriformis*.

Jassidae

Nephotettix sp.

2352—Some adults were submitted by G. Rothschild, Kuching, Sarawak, Malaysia, on January 25, 1965. Diagnosis: Mycosis caused by *Entomophthora* sp.

Membracidae

Telingana varipes (Walker)

2303—These specimens were submitted by G. Rothschild, Kuching, Sarawak, Malaysia, on July 23, 1964. Diagnosis: Mycosis caused by *Isaria* sp.

Pseudococcidae

Mealybug

1833—These specimens were collected in Cambodia and submitted by J. L. Nickel of the United States Operations Mission to Cambodia on January 15, 1962. Diagnosis: Mycosis caused by *Fusarium episphaeria* form *coccophila*.

2317—A. Attafuah, Tafo, Ghana, submitted fungi and bacteria isolated from mealybugs on September 11, 1964 for identification. Diagnosis: Fungi, *Verticillium* sp. and *Neurospora* sp.; bacteria, *Pseudomonas aeruginosa* and *Bacillus megaterium*; a yeast was also present.

Trionymus sacchari (Cockerell)

1893—These specimens were submitted by H. E. Fernando, Peradeniya, Ceylon, on June 26, 1962. Diagnosis: Mycosis caused by *Aspergillus parasiticus*. Possible new host.

Psyllidae

Mesohomotoma tessmanni (Alum.)

2751—Several nymphs were submitted by N. Lodos, Tafo, Ghana, on May 11, 1967. Diagnosis: Mycosis: *Entomophthora* sp. (Fig. 11).

Psila rosae (Fabricius)

2723—Several adults were received from E. Naton, Munich, West Germany, on February 9, 1967. Diagnosis: Non-microbial.

Tettigellidae

Draeculacephala sp.

2348—Several adults were submitted by W. G. Genug, Belle Glade, Florida, on January 11, 1965. Diagnosis: Mycosis: *Entomophthora* sp.

Fig. 11. Acc. No. 2751: Sporophores (S) and conidia (C) of *Entomophthora* sp. dissected from *Mesohomotoma tessmanni*. Magnification = 800X. (Guegen-stained.)

Unidentified

Frog Hopper

2928—Agar slant cultures of an entomophagous fungus, isolated from adult frog hoppers, were submitted by M. Anarca Ruano, Mexico City, Mexico, on December 5, 1969. Diagnosis: The fungus was identified as *Metarrhizium anisopliae*.

HYMENOPTERA

Anthophoridae

Peponapis angelica (Cockerell)

1863—A specimen was submitted by P. D. Hurd, Berkeley, California, on April 18, 1962. The specimen came from a museum collection and contained a white growth. Diagnosis: No pathogens isolated.

Peponatis pruinosa (Say)

2944—Several diseased larvae were submitted by Y. Tanada, Berkeley, Cali-

fornia, on April 3, 1970. Diagnosis: Probably non-microbial, only a *Fusarium* sp. and a *Micrococcus* sp. were isolated.

Apidae

Apis mellifera (L.)

1856—Several specimens were submitted from hives by H. Len Foote, Sacramento, California, on March 19, 1962. Examination revealed that death was probably caused by environmental stress rather than by a microorganism. Diagnosis: Non-microbial.

2479—In September, 1965, a condition called Autumn Collapse of honeybees was reported by W. Stanger, Davis, California, and H. L. Foote, Sacramento, California. Extensive studies were made of the microbiology of infected hives and bees during four seasons along with nutritional studies. It was concluded that the condition was not a microbial disease, but a nutritional

deficiency. In certain locations in northern California in the fall when flowers are scarce bees collect secretions from oak galls. This so-called oak "honey dew" lacked some nutrients that were present in flower nectar, resulting in the collapse of healthy, vigorous hives. Supplemental feeding with drivert and wheat evidently solved the problem. Diagnosis: Non-microbial.

2640—Several adult bees were received from H. L. Foote, Sacramento, California, on June 23, 1966. Diagnosis: Non-microbial.

2812—One honeybee larva was submitted by H. L. Foote, Sacramento, California, on March 11, 1968. Diagnosis: Virosis caused by the sacbrood virus, with secondary bacterial deterioration by *Aerobacter liquefaciens* and a *Proteus* sp.

2834—Two mummified larvae were submitted by H. L. Foote, Sacramento, California, on May 31, 1968. The larvae had been collected in Tehama Co., California. Diagnosis: Mycosis caused by *Ascosphaera apis*. This is the first incidence of *A. apis* on honeybees in the United States. (Fig. 12.) (Thomas and Luce, 1972.)

2836—H. L. Foote submitted a larva on June 4, 1968 from Orange County, California. Diagnosis: Bacteriosis, European foulbrood, caused by *Bacillus alvei*, with associated *Streptococcus apis*.

Braconidae

Bracon hebetor (Say)

1975 — Several laboratory-reared specimens were submitted by R. C. von Borstel, Oak Ridge, Tennessee, on October 26, 1962. Diagnosis: Cause of death undetermined; may be a lethal mutant.

Macrocentrus sp.

2904—Several laboratory-reared pupae of this parasite were submitted on July 30, 1969, by D. Brinkman, Albany,

California. Diagnosis: Protozoan infection by *Mattesia dispersa*.

Opius concolor Szepi.

2335—Pupae of this parasite were submitted by P. Genduso, Palermo, Italy. Diagnosis: Mycosis caused by *Aspergillus flavus* Link., with secondary bacterioses consisting of *Streptococcus faecalis*, and a *Proteus* sp.

Cimbicidae

Cimbex americana americana (Leach)

2434—Specimens of the elm sawfly were submitted by J. D. Stein, Fargo, North Dakota, on July 21, 1965. Diagnosis: Bacteriosis caused by *Bacillus cereus*. New Record.

2627—Two larvae were received from J. D. Stein, Fargo, North Dakota, on May 31, 1966. Diagnosis: Mycosis: unidentified fungus.

2958—Several dead larvae of the American elm sawfly collected from Siberian elm were submitted on August 6, 1970, by J. D. Stein, Bottineau, North Dakota. Diagnosis: Mycosis caused by a *Fusarium* sp. This fungus was tested against *Galleria* larvae for pathogenicity, and was found to be 70 per cent effective.

Cephiidae

Cephus cinctus (Norton)

1952—Several specimens were submitted by R. D. Frye, Fargo, North Dakota, on September 25, 1962. Diagnosis: Undetermined.

Diprionidae

Diprion similis (Htg.)

2801—Several fungal cultures isolated from this sawfly were received from H. C. Coppel, Madison, Wisconsin, on January 22, 1968. Diagnosis: Two cultures of *Beauveria bassiana*; a *Fusarium* sp.; *Monocillium* sp.; and one culture containing two fungi, an un-

Fig. 12. Acc. No. 2834: *Ascosphaera apis*, the causal agent of chalk brood in the honeybee *Apis mellifera*. **A:** Mummified prepupae covered with chalky appearing fungal mycelium. Magnification = 4X. **B:** Spore cyst splitting to release spore balls (asci) (arrow) containing ascospores. Magnification = 800X.

identifiable chlamydospore forming Hyphomycete overgrown by *Rhizopus nigricans*.

2820—On April 15, 1968, fungus cultures isolated from this sawfly were received from H. C. Coppel, Madison, Wisconsin. Diagnosis: *Fusarium* sp.

2863—On October 1, 1968, mounted histological sections, preserved specimens, and dried specimens of sawfly larvae were received from H. C. Coppel, Madison, Wisconsin. Diagnosis: Mycosis caused by an *Entomophthora* sp.

Neodiprion abietis (Harris)

2427—Several specimens of the balsam fir sawfly were submitted by D. Dahlsten, Albany, California, on June 29, 1965. The submitted specimens were a sample from a field population which had been sprayed with a suspension of a polyhedrosis virus. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2641—Several larvae were submitted by D. Dahlsten, Albany, California, on June 27, 1966. Thorough examination and microbial analysis revealed no microbial etiology. Diagnosis: Non-microbial.

2648—Several larvae and pupae from two localities were submitted by D. Dahlsten, Albany, California, on July 11, 1966. Diagnosis: Chalk Mt.—virosis, caused by a nuclear polyhedrosis virus. Brown's Canyon—non-microbial.

2671—Several additional larvae were received from D. Dahlsten on August 12, 1966. Diagnosis: Virosis: nuclear polyhedrosis virus.

Neodiprion lecontei Fitch

2319—Several specimens were received on September 18, 1964 from R. C. Wilkinson, Gainesville, Florida. The cadavers had been dried under incandescent lamps, and we were unable to recover any microorganisms. Diagnosis: Undetermined.

Neodiprion merkei (Ross)

2706—Several larvae and pupae were received from R. C. Wilkinson, Gainesville, Florida, on November 22, 1966. Diagnosis: Polyhedrosis virus, probably cytoplasmic. On December 22, 1966, additional specimens were examined and cytoplasmic polyhedrosis was confirmed.

Neodiprion sp. (probably *abietis*)

2648—Several larvae and cocoons of this sawfly were collected at Chalk Mountain and Brown's Canyon, California, and submitted by D. Dahlsten, Albany, California, July 11, 1966. Diagnosis: Chalk Mountain—virosis caused by a nuclear polyhedrosis virus; Brown's Canyon—non-microbial.

Encertidae

Pentalitomastix plethoricus Caltagirone

2827—Eight pupae of this parasite from *Paramyelois transitella* were submitted by L. Caltageroni, Albany, California, on May 10, 1968. Diagnosis: Protozoan-*Mattesia dispora*, which also had infected the host.

Eulophidae

Dimmockia javanica Ferr.

3034—Several dead adults of this parasite were submitted by H. E. Fernando, Peradeniya, Ceylon, on November 24, 1971. Diagnosis: Non-microbial.

Tetrastichus incertus (Ratzeburg)

2795—Three larvae of this parasite from an insectary culture were submitted by D. Brinkman, Berkeley, California, on December 26, 1967. Diagnosis: No pathogens present.

Eurytomidae

Eurytoma amygdali

2926—Several deteriorated larvae were received from H. N. Plaut, Haifa, Israel, on November 21, 1969. The lar-

Fig. 13. Acc. No. 1888: Adult *Atta texana* infected with *Aspergillus flavus*. Note sporulating fungus protruding from dorsal thoracic segments and around the cervix (arrows). Magnification = 8X.

vae had been reared under artificial conditions. Diagnosis: Predation by a predacious mite, *Pyemotes ventricosus*.

Formicidae

Atta texana (Buckley)

1888—Six adult queen leaf-cutting ants were submitted by J. C. Moser, Alexandria, Louisiana, on June 11, 1962. Diagnosis: Mycoses; 5 were infected with *Aspergillus flavus*, and one was infected with *Beauveria bassiana*. A new host record for both fungi. Dr. Moser reported that only the queens, and not the workers, were infected. (Fig. 13.)

1972—On October 16, 1962, 5 adult major workers of the Texas leaf-cutting ant were received from J. C. Moser. Diagnosis: Mycosis caused by *Beauveria bassiana*. This is the first time this fungus has been reported from the workers of this ant.

Solenopsis saevissima (F. Smith)

1985—Two dead adult fire ants were

received from A. Silveira-Guido, Montevideo, Uruguay, on December 7, 1962. Diagnosis: Mycosis: *Metharrizium anisopliae*; a new host record for this fungus.

Solenopsis saevissima richteri Forel

2326—Three specimens of the imported fire ant were received on October 8, 1964 from A. R. Khanm, State College, Mississippi. The ants were collected in Florida. Diagnosis: Mycosis caused by *Aspergillus flavus* Link.

Unidentified ant

2164—This specimen was collected in Tehama County, California, and submitted by L. O'Brien, Berkeley, California, on September 13, 1963. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Halictidae

Lasioglossus (Sphecodegastra) aberrans (Crawford)

2438—Several specimens from Antioch, California, were submitted by W.

J. Turner, on July 27, 1965. Diagnosis: Bacteriosis caused by *Bacillus cereus* var. *mycoides*.

2461—More specimens were submitted by W. J. Turner, Berkeley, California, on August 24, 1965. Diagnosis: Non-microbial.

Nomia sp.

1881—Several specimens were submitted by C. D. Bechtolt, Caldwell, Idaho, on June 1, 1962. Diagnosis: Non-microbial.

Ichneumonidae

Bathyplectus anurus (Thomson)

3024—Many larvae and adults of this parasite were submitted by C. Legace, Berkeley, California, on November 3, 1971. They were collected from sting cages, where they were parasitizing alfalfa weevil larvae. The submitted material also contained parasitized dead alfalfa weevil larvae with undeveloped parasites. Diagnosis: Bacteriosis caused by *Streptococcus faecalis* var. *liquefaciens*. Evidently, the adult parasites were contaminated with the bacterium and inoculated the host larvae during oviposition, making them unsuitable for development of the parasite.

Diadegma molesta Uchida

2680—Several adults, larvae, and pupae of this parasite were submitted by D. Brinkman, Berkeley, California, on September 6, 1966. Diagnosis: bacteriosis: *Streptococcus faecalis* var. *liquefaciens*.

2875—On December 27, 1968, D. Brinkman, Albany, California, submitted eleven pupae of this tuberworm from his laboratory cultures. Diagnosis: Bacterioses caused by the potential pathogens *Bacillus cereus* and *Streptococcus faecalis*. Infection by these potential pathogens may be indicators of some other predisposing stress factors.

2893—A pathogen check was requested for several pupae of this parasite from laboratory cultures of the potato tuberworm at Albany, California, by D. Brinkman on April 23, 1969. Diagnosis: No pathogens were found. Microbial analysis produced a *Micrococcus* sp., and two strains of *Aerobacter liquefaciens*.

Hypogaster fugitivus (Say)

3000—Three adults from a laboratory culture were submitted by D. Pinnock, Berkeley, California, on July 19, 1971. Diagnosis: Mycosis caused by *Aspergillus delacroixii*.

Therion californicum Cresson

2528—A single dead specimen was submitted by L. Etzel, Berkeley, California, on September 28, 1965. The parasite was dissected from a *Heliothis zea* pupa which had been collected in the field as a larva and reared in the laboratory on an artificial diet. Diagnosis: Mycosis caused by a *Fusarium* sp.

Megachilidae

Megachile rotundata (Fabricius)

2446—Several larvae of this leaf cutting bee were submitted by R. W. Thorpe, Davis, California, on July 29, 1965. Diagnosis: Bacteriosis caused by *Bacillus cereus*. Normally a soil saprophyte, *B. cereus*, can cause septicemia in insects that have been weakened by some other predisposing factor.

2473—Additional larvae of this bee were submitted by R. W. Thorpe, Davis, California, on September 20, 1965. Some of the specimens had been parasitized. All had molds growing on them. Diagnosis: *Aspergillus niger*, *A. sulphureus*, *A. fumigatus*, *A. glaucus* and *Rhizopus nigricans*.

2657—On July 27, 1966, R. W. Thorpe, Davis, California, submitted several more larvae of this leaf-cutting

bee. Diagnosis: Possible virosis caused by a non-inclusion virus.

3016—Thirteen larvae of this leaf cutter bee were submitted by R. Thorpe, Davis, California, on September 20, 1971. Diagnosis: Mycosis caused by the chalk brood fungus, *Ascosphaera apis*.

Pamphilidae

Acantholyda luteomaculata (Cresson)

2276—Five prepupae were collected from white pine in Newark, Ohio, by W. R. Holt, on June 15, 1964. Diagnosis: Mycosis caused by *Beauveria bassiana*. New record.

Pergidae

Perga affinis affinis (Kirby)

2153—Several specimens were submitted by P. B. Carne, Canberra, Australia, on September 4, 1963. Diagnosis: Mycoses caused by *Metarrhizium anisopliae* and *Beauveria bassiana*. New record—new host.

Polistidae

Polistes olivaceus (DeGeer)

1851—One specimen was submitted by A. D. Hinckley, Fiji, on March 14, 1962. Diagnosis: Mycosis caused by *Hirsutella saussurei*.

Scelionidae

Telenomus alsophila Vier

3006—A single adult parasite was submitted by G. F. Fedde, Research Triangle Park, North Carolina, on August 20, 1971. The specimen had been reared in a closed vial with a cotton disc saturated with honey water. Diagnosis: Possible mycosis, or at least a secondary infection by *Aspergillus ochraceous*.

Scoliidae

Scolia procer Illiger

2234—Twenty cocoons were received from R. P. Owen, Koror, Palau, Caroline Islands, on February 19, 1964. The

cocoons were shipped to the Caroline Islands from Malaya for biological control studies of *Oryctes rhinoceros*. In three separate shipments, all but one specimen arrived dead. The condition of the specimens certainly indicated disease, but no microbial etiology was determined. However, there was a bacterium morphologically resembling a *Clostridium* present in all cadavers. Attempts to isolate it on artificial media were unsuccessful. Diagnosis: Indefinite—possible bacteriosis.

Siricidae

Syntexis libocedrus (Rohwer)

2311—These larvae were submitted by B. Wickman from Viola, California, on September 8, 1964. Diagnosis: Probably in diapause.

Rhyssa sp.

2534—Fifteen dead specimens were submitted by F. Wilson, Ascot, Berks, England, on December 6, 1965. Diagnosis: A—*Streptococcus faecalis* var. *liquefaciens*; B—no microbial etiology; C—fungus *Stysanus* sp.; D—same as in C; E—same as in C and a *Verticillium* sp.; F—*Stysanus* sp. plus 2 other saprophytic fungi, a *Trichoderma* sp. and a *Penicillium* sp.; G—*Penicillium* sp. and a *Gliocladium* sp.; H—saprophytic *Verticillium* sp.; acarid mites and *Pseudomonas aeruginosa*; I—*Stysanus* sp., *Verticillium* sp., *Pseudomonas aeruginosa*, and aphelenchoid nematodes; J—same as in I; K—*Stysanus* sp.; L—*Penicillium* sp. and *Gliocladium* sp.; M—same as in L; N—*Streptococcus* sp., probably a potential pathogen; O—*Penicillium* sp.

Tenthredinidae

Athalia proxima Klug

2546—Two bacterial cultures isolated from this sawfly were submitted by B. K. Srivastava, Udaipur, India. Diagnosis: Bacteria identified as *Serratia mercens* in both cultures.

Fenusa ulmi (Sunderall)

1884—These specimens were submitted by R. D. Frye, Fargo, North Dakota, on June 1, 1962. Diagnosis: Non-microbial.

Pontania bozemani Cooley

2963—Several dead larvae of this sawfly were submitted by J. Stein, Bottineau, North Dakota, on September 8, 1970. The larvae were collected from *Populus balsamifera*; Bottineau County, North Dakota, where the insect population averaged five larvae per tree, and about 40 per cent of the population was affected. Examination revealed parasitization by a hymenopterous parasite. Diagnosis: Non-microbial. Death caused by an insect parasite.

Pristophora erichsonii (Hartig)

1835—One dead and dried-out prepupa of the larch sawfly was submitted by A. T. Drooz, Asheville, North Carolina, on January 20, 1962. The specimen had been collected in Renova, Pennsylvania, in August, 1961. Diagnosis: Mycosis caused by *Paecilomyces farinosus*. A new host record for this fungus.

1934—Some specimens collected in Pennsylvania and New York were submitted by A. T. Drooz, Asheville, North Carolina, on August 27, 1962. Diagnosis: Mycoses caused by *Beauveria bassiana* and *Paecilomyces farinosus*.

2047—Some specimens collected in Pennsylvania were submitted by A. T. Drooz on April 27, 1963. Diagnosis: Mycoses caused by *Beauveria bassiana*, *Paecilomyces farinosus* and *Penicillium* sp.

2177—Additional specimens collected at the Tomhannock Reservoir, Rennselaer County, New York, were submitted by A. T. Drooz on October 4, 1963. Of the 77 specimens, twelve prepupae were selected and found to be infected with fungi. Diagnosis: Mycoses caused by

Beauveria bassiana and *Paecilomyces farinosus*.

2322—Specimens collected in Renova, Pennsylvania, were submitted by A. T. Drooz on October 1, 1964. Diagnosis: Mycosis caused by *Beauveria bassiana*.

2864—Thirty-seven prepupae of the larch sawfly were submitted by A. T. Drooz, Research Triangle Park, North Carolina, on October 2, 1968. Diagnosis: Non-microbial. Several saprophytic fungi were isolated including: *Verticillium* sp. *Penicillium* sp., *Rhizopus nigricans*, and a *Monosporium* sp.

Profenusa mainensis

2708—Several larvae were received from L. J. Lipousky, Augusta, Maine, on December 5, 1966. Diagnosis: Mycosis caused by *Paecilomyces farinosus*.

Unidentified Sawfly

2895—Several larvae of a laboratory-reared sawfly were submitted on June 18, 1969 by J. R. Milodragovich, Missoula, Montana, with a request for a virus check. Diagnosis: Non-microbial.

Vespididae

Vespula maculata (L.)

1882—One specimen was submitted by R. D. Frye, Fargo, North Dakota, on June 1, 1962. Diagnosis: Mycosis caused by *Beauveria bassiana*. (Fig. 14.)

Unidentified

Bee

2724—Three adult bees were received from B. Meksongsee, Bangkok, Bangkok, Thailand, on February 9, 1967. Diagnosis: Possible mycosis caused by a *Fusarium* sp.

Wasp

2137—An agar slant of a culture isolated from a wasp was submitted by J.

Fig. 14. Acc. No. 1882: Adult *Vespula maculata* infected with *Beauveria bassiana*. Fungus protrudes from mummified host between sclerites and leg joints (arrows). Magnification = 5X.

C. Basu Choudhuri, Ciombatore, India, on August 22, 1963. Identification: *Isaria* sp.

Wild Bee

2626—One pupa was received from B. J. Donovan, Auckland, New Zealand, on May 27, 1966. Diagnosis: Mycosis caused by *Ascospaera* (*Pericystis*) *alvei*.

2946—Twelve adult wild bees received for taxonomic study were submitted by H. V. Daly on April 17, 1970. Diagnosis: Non-microbial. Saprophytic fungi included *Cladosporium* sp., *Rhizopus nigricans*, and a *Penicillium* sp.

17, 1964. The insects died in sawdust cultures in the laboratory. Diagnosis: Probably non-microbial.

2400 — Several laboratory-reared specimens were submitted by R. V. Smyth, Madison, Wisconsin, on April 28, 1965. Diagnosis: Primary etiology undetermined, but with a secondary bacteriosis caused by *Aerobacter* sp.

Unidentified Termites

2823—Several adult termites were submitted by D. McKay, Redington Shores, Florida, on April 26, 1968. Diagnosis: Non-microbial.

LEPIDOPTERA

Aegeriidae

Bembecia marginata (Harris)

2060—This specimen was submitted by N. L. H. Krauss, Corvallis, Oregon, on May 29, 1963. Diagnosis: Mycosis caused by *Beauveria bassiana*.

ISOPTERA

Rhinotermitidae

Reticulotermes flavipes Kollar

2308—Several dried and preserved specimens were received from R. H. Beal, Gulfport, Mississippi, on August

Sanninoidea exitiosa (Say)

2768—One larva was submitted by G. C. Rock, Raleigh, North Carolina, on August 14, 1967. Diagnosis: Non-microbial.

2857—One mycotic cocoon of the peach tree borer was submitted by S. S. Rosenthal, Fort Valley, Georgia, on August 27, 1968. The specimen was collected from a peach tree 5 miles northwest of Fort Valley on August 12, 1968. Diagnosis: Mycosis caused by *Paecilomyces farinosus*.

Thannosphecia scitula (Harris)

1978—A single specimen was submitted by C. D. Pless, Knoxville, Tennessee, on October 31, 1962. Diagnosis: Mycosis caused by *Cordyceps* sp., possibly *C. elongata*.

Vespamima sequoiae (Hy. Edwards)

2962—Several larvae of the sequoia pitch moth from Los Gatos, California were submitted by S. Rosenthal on September 1, 1970. Diagnosis: Non-microbial.

Vitacea polistiformis (Harris)

2282—These specimens were field collected from vineyards in Northwest Arkansas and Southwest Missouri and submitted by R. L. Combs, Fayetteville, Arkansas, on June 29, 1964. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*.

2844—Several mummified larvae of the grape root borer from Mountain Grove, Missouri, were received on June 26, 1968 from D. Singh Sarai. Diagnosis: Mycoses caused by *Beauveria basiana* and *Metarrhizium anisopliae*.

Vitacea polistiformis polistiformis (Harris)

2866—Fungus cultures isolated from grape root borer larvae were submitted

on October 14, 1968, by E. P. Mason, Fayetteville, Arkansas. Diagnosis: Fungus identified as *Metarrhizium anisopliae*.

Arctiidae

Antarctia sp.

2296—S. Shima, Jr., Palmira, Valle, Colombia, submitted several dead larvae on July 10, 1964. Diagnosis: bacteriosis probably caused by *Streptococcus* sp.

Diacrisia obliqua Wlk.

2934—Seven dead larvae were received from O. S. Bindra; Ludhiana, India, on February 10, 1970. Diagnoses: Two suffered a mycosis caused by *Aspergillus flavus*; three suffered a bacteriosis caused by the potential pathogen *Streptococcus faecalis*, and one suffered a virosis caused by a granulosis virus. The last was non-microbial.

Ecpantheria sp.

2443—These specimens were submitted by F. Lara, Limon, Costa Rica, on July 28, 1965. Diagnosis: Primary etiology obscured by the action of acarid mites.

Estigmene acrea Drury

2916—On September 19, 1969, many larvae of the salt marsh caterpillar were submitted by L. Falcon, Berkeley, California. Diagnosis: Mycosis caused by *Entomophthora grylli*.

2983—A larva of the salt marsh caterpillar was submitted by G. Leon Quant, Leon, Nicaragua, on February 3, 1971. The specimen was collected in the field, and reared in the laboratory. Diagnosis: Mycosis caused by an *Entomophthora* sp.

2995—A larva of the salt marsh caterpillar was submitted from Maragua, Nicaragua, by L. A. Falcon on May 27, 1971. Diagnosis: Non-microbial.

Fig. 15. Acc. No. 2411: Spores (arrows) of a *Nosema* sp. in the fat body of a *Estigmene* sp. Magnification = 1600X.

Estigmene sp.

2411—A larva was submitted by J. Hoy, Berkeley, California, on June 1, 1965. Diagnosis: Microsporidiosis caused by a *Nosema* sp. (Fig. 15.)

Halisdota argentata (Packard)

2088—A fungus culture isolated from this insect was submitted by L. W. Getzin, Puyallup, Washington, on July 28, 1963. Diagnosis: Probably *Paecilomyces farinosus*.

Hyphantria cunea (Drury)

1932—On August 17, 1962, several dead larvae of the fall webworm were received from the laboratory culture of A. D. Oliver, Baton Rouge, Louisiana. Examination of these specimens and of additional specimens received at a later date showed the presence of two different viruses with some individuals infected by both viruses. Diagnosis:

Viroses; a granulosis and a nuclear polyhedrosis. This is the first record of these two viruses in North America. (Fig. 16.)

Isia isabella (J. E. Smith)

2782—Several dead larvae of the banded wooly bear caterpillar collected near Albany, New York, were submitted by H. A. Jamnback on November 2, 1967. The specimens were very deteriorated by secondary saprophytic fungi. Diagnosis: Non-microbial, or if a primary microbial etiology was present it had been masked by the saprophytic fungi.

Unidentified

1983—These specimens were submitted by A. Silveira-Guido, Montevideo, Uruguay, on November 26, 1962. Diagnosis: Undetermined.

Fig. 16. Acc. No. 1932: Virus infection of *Hyphantria cunea*. TOP: *H. cunea* larva killed by a double infection of a nuclear polyhedrosis virus and a granulosis virus. The limp, hanging attitude of the cadaver is a typical symptom of a nuclear polyhedrosis infection. BOTTOM: Electron micrograph showing granulosis virus capsules (C) and a partially dissolved polyhedron revealing rods (R) of the nuclear polyhedrosis virus in a double infection of *H. cunea*. Magnification = 15,600X.

Unidentified

2003—Several specimens were submitted by C. S. Stephens, La Lima, Honduras, on January 19, 1963. Diagnosis: Mycosis caused by *Entomophthora aulicae*.

Bombycidae

Bombyx mori Linn.

2342 — Several laboratory-reared specimens were received from I. Gard, Wasco, California, on November 19 and 30, 1964. Most of the submitted specimens were healthy, but one was infected with a bacterium. Diagnosis: Bacteriosis in one specimen caused by a *Streptococcus* sp.

Castniidae

Castnia licoides (Boisduval)

2017—Several preserved specimens were submitted by J. F. Bates, Georgetown, British Guiana, on February 19, 1963. Diagnosis: Undetermined.

2256—These specimens were submitted by J. F. Bates, Georgetown, British Guiana, on April 24, 1964. Diagnosis: Mycosis caused by *Paecilomyces cossus*. New record.

Coleophoridae

Coleophora parthenica Mey

2988—Three dead larvae were submitted on April 29, 1971 by R. Hawkes, Albany, California. Larvae of this insect were sent to the United States from Egypt in stems of *Salado iberica*, and the dead larvae were found when the stems were dissected. Diagnosis: Non-microbial.

Cossidae

Prionoxystus robiniae (Peck)

2039—Two larvae of the carpenterworm were submitted by J. D. Solomon, Stoneville, Mississippi, on April 9, 1963. They were laboratory-reared on an

artificial diet. Diagnosis: Some gram negative, lactose negative small rods, a gram positive, lactose negative, small rod and a gram positive coccus were isolated. They may or may not have been the cause of death.

2260—One specimen found dead in its entrance hole in overcup oak was submitted by J. D. Solomon, Stoneville, Mississippi, on May 7, 1964. Diagnosis: Bacteriosis: gram negative, non-lactose fermenting, rodshaped bacterium.

2318—Four additional specimens of the carpenterworm were submitted by J. D. Solomon, Stoneville, Mississippi, on September 16, 1964. The submitted specimens were reared on an artificial diet where mortality reached almost 50 per cent in the 5th and 7th instars. Diagnosis: Bacterioses caused by *Serratia marcescens*, with a secondary invader, *Alcaligenes faecalis*.

2331—Two larvae found dead in their galleries near Stoneville, Mississippi, were submitted by J. D. Solomon on October 26, 1964. Diagnosis: Bacterioses: *Streptococcus faecalis*, and *Escherichia coli*. In addition, a yeast and a *Verticillium* sp. were isolated from the specimens.

Xyleutes ceramicus Walker

2594—Two dead larvae of the teak beehole borer were submitted by W. W. Cantel, U. S. Operations Mission to Thailand, on April 7, 1966. The specimens were collected in Sukhothai, Thailand, on March 14, 1966. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Crambidae

Chilo zonellus (Swinhoe)

2323—Several larvae were submitted by T. V. Venkatraman, Khartoum North, Republic of the Sudan, on October 5, 1964. The disease, apparently disseminated by a dipterous fly, affected about 30 per cent of the experimental

field population. Specimens were so deteriorated that a positive diagnosis of the original cause of death was not possible. Diagnosis: Probably non-microbial. Possibly a dipterous parasite.

2478—Slides of a protozoan collected from this insect were submitted by R. B. Subba Rao, New Delhi, India, on September 20, 1965. Identification: A microsporidian.

2610—Several specimens were submitted by R. B. Subba Rao, New Delhi, India, on May 10, 1966. Diagnosis: Bacterioses caused by *Bacillus cereus* and *Streptococcus faecalis* var. *liquefaciens*.

Chilo sp.

2303—These specimens were submitted by G. Rothschild, Kuching, Sarawak, on July 23, 1964. Diagnosis: Mycosis, caused by *Hirsutella barberi*.

Diatraea saccharalis (Fabricius)

2312—Eleven specimens of the sugar cane borer from Montevideo, Uruguay, were submitted by A. Silveira-Guido on September 10, 1964. The specimens were shriveled and quite deteriorated. Diagnosis: Virosis, caused by a granulosus virus. A number of gram negative secondary bacteria and two saprophytic fungi, a *Penicillium* sp., and a *Verticillium* sp., also were present.

Diatraea venosata (Walker)

1943—Bacterial cultures from this species were submitted by Wen-Yi-Cheng, Tainan, Taiwan, on September 12, 1962. Identification: *Pseudomonas aeruginosa*.

Unidentified sugarcane stem borer

1859—One specimen was collected in Takwa Ling, Hong Kong, and submitted by V. P. Rao, Bangalore, India, on March 28, 1962. Diagnosis: Possible bacteriosis caused by *Serratia marcescens*.

Danaidae

Danaus plexippus (L.)

2436 — Several laboratory-reared specimens were submitted by J. Brewer, Newton Highlands, Massachusetts, on July 26, 1965. They were collected in Ontario, Canada, and reared in Massachusetts. Diagnosis: Bacteriosis caused by *Pseudomonas aeruginosa* (Brewer and Thomas, 1966.)

2447—Additional specimens were received from J. Brewer, Newton Highlands, Massachusetts, on August 3, 1965. Cause of death was found to be non-microbial, with a secondary bacteriosis. Diagnosis: Non-microbial.

2454—Several more laboratory reared specimens were submitted by J. Brewer on August 9, 1965. They had been reared under controlled light waves. Diagnosis: Non-microbial.

2455—More laboratory reared specimens were submitted by J. Brewer on August 10, 1965. Examination showed only a secondary bacteriosis. Diagnosis: Undetermined.

2582—One dead specimen, received from J. Brewer, Newton Highlands, Massachusetts, was collected in the summer of 1963 and submitted on March 15, 1966, with the request for a virus check. Diagnosis: No virus present.

2716—Several specimens, adults and pupae, were received from Dr. L. P. Bower, Department of Biology, Amherst College, Amherst, Massachusetts, on January 4, 1967. Diagnosis: Probably bacterioses; cultures from externally sterilized and triturated specimens produced only *Streptococcus faecalis* and *Aerobacter* grp. C.

2846—Larvae and pupae were submitted by P. Samuelson, Pleasantville, Iowa, on July 5, 1968. These specimens were being reared under artificial conditions. Diagnosis: Non-microbial.

2936—On February 12, 1970, seven larvae from an artificial medium were

submitted by C. White, Shafter, California. Diagnosis: Bacteriosis caused by the potential pathogen, *Streptococcus faecalis*.

Ethmiidae

Ethmia sp.

2258—J. Powell, Berkeley, California, submitted eight dead larvae on May 8, 1964. The specimens were field-collected, and died in the laboratory. Diagnosis: Bacteriosis consisting mainly of *Pseudomonas* sp.

Galleriidae

Galleria melonella (L.)

2339—Several larvae were submitted by M. Tamashiro, Berkeley, California, on November 12, 1964. These larvae were laboratory-reared, and had been injected with TIV virus and kept at room temperature. It was found that the TIV suspension was contaminated. Diagnosis: Bacterioses: *Proteus* sp., *Escherichia coli*, and *Shigella* sp.

2532—Two dead specimens were submitted by W. R. Kellen, Fresno, California, on November 30, 1965. The *Galleria* supposedly were infected with *Spirillum* sp. and submitted for confirmation. Diagnosis: No *Spirillum* infection could be found.

Gelechiidae

Pectinophora gossypiella (Saunders)

2614—A fungus culture isolated from the pink bollworm was submitted by R. B. Rao, New Delhi, India, on May 10, 1966. Diagnosis: Saprophytic fungus, *Fusidium* sp. This fungus was tested against *Galleria* larvae for pathogenicity with negative results.

Phthorimaea operculella (Zeller)

1946—Three preserved larvae of the potato tuberworm were received from M. D. deSilva, Gurutalawa, Ceylon, on September 14, 1962. Diagnosis: Virosis

caused by a granulosis virus. New host record.

1977—Several laboratory reared specimens were submitted by L. Anderson, Palisade, Colorado, on October 29, 1962. Diagnosis: Microsporidiosis caused by *Nosema* sp.

2321—Several larvae were submitted by A. Silveira-Guido, Montevideo, Uruguay, on September 22, 1964. Diagnosis: Bacteriosis: *Streptococcus* sp.

2328—Several laboratory reared specimens of the potato tuberworm were submitted by D. Brinkman, Albany, California, on October 9, 1964. Diagnosis: Bacteriosis caused by *Serratia marcescens*.

2417—These laboratory-reared larvae were submitted by D. Brinkman, Albany, California, on June 14, 1965. Diagnosis: Bacterioses caused by *Streptococcus faecalis* and *Aerobacter* sp.

2876—Several laboratory-reared larvae were submitted by L. Anderson, Palisade, Colorado, on January 13, 1969. Diagnosis: Non-microbial.

2888—Some laboratory-reared larvae of the potato tuberworm were submitted by L. Anderson, Palisade, Colorado, on March 27, 1969. Diagnosis: Bacteriosis caused by the potential pathogen *Streptococcus faecalis* var. *liquefaciens*.

2890—Eggs from a laboratory culture of the potato tuberworm were submitted by D. Brinkman, Albany, California, on April 1, 1969, for a pathogen check. Diagnosis: The eggs were contaminated with *Bacillus thuringiensis* var. *thuringiensis*.

2984—Several larvae and pupae of the potato tuberworm again were submitted by D. Brinkman on April 14, 1971. Diagnosis: Bacteriosis caused by *Streptococcus* sp., indicating a possible stress situation in the rearing conditions.

3028—Many laboratory-reared larvae were submitted by S. W. Broodryk, Pretoria, South Africa, on November 19,

1971. Diagnosis: Bacteriosis caused by the potential pathogen *Streptococcus faecalis* var. *liquefaciens*.

Phthorimaea sp.

2595—Several dead specimens were submitted by L. Anderson, Palisade, Colorado, on April 8, 1966. Diagnosis: Bacteriosis: *Streptococcus faecalis* var. *liquefaciens*.

Recurvaria milleri (Busch)

2355—Seventeen specimens of the lodgepole needle miner from Yosemite National Park were submitted by G. R. Struble, Berkeley, California, on February 11, 1965. Diagnosis: Four of the specimens suffered from a granulosis virus. The remaining 13 showed no microbial etiology.

Geometridae

Abraxas grossulariata L.

2976—A few deteriorated larvae were received on December 21, 1970 from T. Edlund, Vollebekk, Norway. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Alsophila pometaria (Harris)

1885—One specimen was submitted by R. D. Frye, Fargo, North Dakota, on June 1, 1962. Diagnosis: Probably non-microbial.

1905—Another specimen was submitted by R. D. Frye on July 20, 1962. Diagnosis: Undetermined.

2261—Several specimens reared from eggs collected at Blue Ridge Parkway, Virginia, were submitted by A. T. Drooz, Asheville, North Carolina, on May 12, 1964. Diagnosis: Non-microbial.

Anomis subulifera (GN)

2665—Several larvae of the jute semi-looper were submitted by A. Islam, Dacca, East Pakistan, on August 2, 1966. Diagnosis: Bacteriosis caused by the potential pathogen *Bacillus cereus*.

Biston marginata Shiraki

2954—Several diseased larvae of the black-headed looper were submitted by C. Chien Hu, Lin-Kou Tea Experiment Station, Taiwan, on July 7, 1970. The larvae were collected from tea plants. Diagnosis: Mycoses caused by *Aspergillus flavus*, and *A. ochraceous*. Both were infective to *Galleria* larvae.

2964—Additional specimens of the black-headed looper collected from tea were received from C. Chien Hu on September 10, 1970. Diagnosis: Mycoses: *Aspergillus sclerotium* and a *Penicillium* sp.

Buzura spp.

1870—Several specimens were submitted by K. W. Brown, Kampala, Uganda, on May 3, 1962. Diagnosis: Undetermined.

Ennomos subsignarius (Hubner)

2061 — Several laboratory-reared specimens were submitted by A. T. Drooz, Asheville, North Carolina, on June 3, 1963. Diagnosis: Probably non-microbial.

2071—One additional specimen was submitted by A. T. Drooz on June 14, 1963. It had been reared in an insectary and had died in the process of moulting after a delayed 4th instar. Diagnosis: Non-microbial.

2255—Several more laboratory-reared specimens were submitted by A. T. Drooz on April 22, 1964. Diagnosis: Mycosis caused by *Paecilomyces farinosus*.

2636—Ten larvae were received on June 21, 1966, from A. T. Drooz. Diagnosis: Several secondary, saprophytic fungi in the genus *Penicillium*.

2808—Four eggs of the elm spanworm were submitted by A. T. Drooz, Asheville, North Carolina, on February 19, 1968. Diagnosis: Non-microbial.

Epirrita (Oporinia) autumnata Bkh.

2493—Some specimens were submitted by O. Tenow, Uppsala, Sweden, on October 12, 1965. They had been collected from the mountain birch (*Betula pubescens* ssp. *tortuosa* Led.) at the Tana River, Finmark, Norway, and at the River Jebrenjakk, Torne Lappmark, Sweden, on July 13 and August 8, 1965, respectively. The larvae would spin their hind extremities firmly to a twig, change body color to yellow-green, and become turgid; then they would bend backwards and bite their sides until the body wall was punctured. Diagnosis: Virosis: cytoplasmic polyhedrosis virus. A new record.

2526—Seven additional specimens of the larch looper from Forde, Sogn og Fjordane Fylke, Norway, were submitted by O. Tenow, Uppsala, Sweden, on November 30, 1965. Diagnosis: Non-microbial.

Lambdina fiscellaria lugubrosa Guen.

2668—Several larvae were received from P. Shea, Berkeley, California, on August 8, 1966. Diagnosis: Virosis: nuclear polyhedrosis virus.

Unidentified Hemlock Looper, probably *Lambdina* sp.

2652—Two larvae were received from B. E. Wickman, Berkeley, California, on July 18, 1966. Diagnosis: Virosis: Nuclear polyhedrosis virus. (Fig. 17.)

Nepytia near *phantasmaria* (Stkn.)

2487—These specimens from Beartrap Creek near McCloud, California, were submitted by D. Dahlsten, Albany, California, on October 1, 1965. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Operophtera brumata L.

2494—Several larvae were submitted by O. Tenow, Uppsala, Sweden, on Oc-

Fig. 17. Acc. No. 2652: Blood of *Lambdina* sp. containing polyhedra (arrows) of a nuclear polyhedrosis virus. Magnification = 2000X.

tober 12, 1965. They had been collected at the River Jebrenjakk, Torne, Lappmark, Sweden, on August 8, 1965. Diagnosis: Virosis: cytoplasmic polyhedrosis virus.

Paleacrita vernata (Peck)

2996—Three spring cankerworm larvae collected from Siberian elm in Bottineau, North Dakota, were submitted by J. Stein on June 21, 1971. Diagnosis: Non-microbial.

Phaeoura mexicanaria (Grote)

2967—Some larvae were submitted by C. E. Carlson, Missoula, Montana, on September 15, 1970. They were collected near Lame Deer, Montana. A bacterium was isolated by K. Hughes (Corvallis, Oregon), who showed it to be pathogenic for larvae of this insect. Diagnosis: Bacteriosis caused by an unidentified gram negative bacterium.

Semiothisa sexmaculata (Pack)

2913—A few larvae were submitted on September 9, 1969 by J. Stein, Bottineau, North Dakota. The larvae were collected from larch trees at Denbigh, North Dakota, where about 1 per cent of the insect population was infected. Diagnosis: Virosis caused by a granulosis virus.

Unidentified

2240—Several specimens were collected in the Caroline Islands and submitted by F. A. Bianchi on March 11, 1964. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2925—Eleven pupae collected from *Pinus ponderosae* near Ashland, Montana, were submitted on November 13, 1969 by J. R. Milodragovich, Missoula, Montana. Diagnosis: Mycosis caused by *Paecilomyces farinosus*.

3011—Several unidentified larvae of a geometrid collected from white fir, and then placed on an artificial medium

were submitted by D. Dahlsten, Berkeley, California, on September 1, 1971. Diagnosis: Non-microbial.

Hepialidae

Oncopera mitocera (Turner)

2272—One larva was collected in Evelyn, Queensland, Australia, by J. H. D. Barnett, Brisbane, Australia, on June 12, 1964. Diagnosis: Mycosis caused by *Fusarium* sp.

Oxycanus sp.

1930—A mummified specimen of this subterranean caterpillar was received from G. A. H. Helson, Wellington, New Zealand, on August 15, 1962. The specimen was collected from pasture grass turf. Diagnosis: Mycosis caused by *Metharrizium anisopliae*. A new host record for this fungus.

Oxycanus sp. (Walker)

2337—These specimens were received from L. D. Crawford, Victoria, Australia, on November 6, 1964. This species is a pest of improved pastures. Diagnosis: Bacteriosis caused by *Pseudomonas aeruginosa*.

Hesperidae

2353—One unidentified hesperid larva was submitted by G. Rothschild, Sarawak, on January 25, 1965. Diagnosis: Mycosis caused by *Spicaria rileyi*.

Hyponomeutidae

Argyresthia cupressella Wlsm.

2623—One specimen collected in the Piedmont Pines District of Oakland, California, was submitted by L. Etzel on May 3, 1966. Diagnosis: Virosis caused by granulosis virus.

Argyresthia sp.

2351—Several larvae from Oakland, California, were submitted by C. S. Koehler, Berkeley, California, on January 25, 1965. Diagnosis: Probably non-microbial.

Incurrariidae*Parategeticula pollinifera* Davis

3008—J. Powell, Berkeley, California, submitted four dead larvae of the yucca moth that were dissected from yucca pods. Diagnosis: Non-microbial.

Lasiocampidae*Dendrolimus spectabilis* Butler

2580—Several specimens of the pine caterpillar were submitted by Je Ho Ko, Seoul, Korea, on February 24, 1966. Diagnosis: Non-microbial. Only the secondary saprophytic fungi, *Penicillium* sp., *Rhizopus nigricans*, *Fusarium* sp., and a Dematiaceae were isolated.

Gonometa sp., probably *nysa* Druce

2488—Five larvae were submitted by K. W. Brown, Kampala, Uganda, on October 1, 1965. Diagnosis: Bacteriosis caused by *Streptococcus faecalis*.

Malacosoma americanum (Fabricius)

2045 — Several laboratory-reared specimens were submitted by A. D. Oliver, Baton Rouge, Louisiana, on April 27, 1963. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Malacosoma constricta Stretch

2902—On July 11, 1969, C. L. Smola, San Francisco, California, submitted eggs and pupae of the Pacific ten caterpillar collected from oak at Jolon, California, on July 9, 1969. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Malacosoma disstria (Hubner)

2257—Several specimens of the forest tent caterpillar were submitted by A. D. Oliver, Baton Rouge, Louisiana, on April 29, 1964. Diagnosis: Probable mycosis caused by *Entomophthora* sp.

2746—Some larvae and eggs were submitted by D. R. Kucera, Pineville, Louisiana, on April 18, 1967. Diagnosis: Larvae: virosis caused by a nuclear

polyhedrosis virus. Eggs: either non-microbial, or if not, then the primary etiology had been obscured by secondary *Penicillium* sp.

2848—K. E. Evans, Twin Falls, Idaho, submitted several tent caterpillar larvae on July 17, 1968. These specimens were collected near Ririe, Jefferson County, Idaho, Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Malacosoma sp.

2408—Several specimens collected in Zion National Park on May 13, 1965, were submitted by W. H. Klein, Ogden, Utah, on May 18, 1965. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* var. *thuringiensis*.

2424—Some specimens were submitted by J. L. Frykman, Ogden, Utah, on June 25, 1965. Diagnosis: Virosis caused by a cytoplasmic polyhedrosis virus.

2435—Some specimens collected in Bryce Canyon National Park were submitted by M. McGregor, Ogden, Utah, on July 23, 1965. Diagnosis: Virosis caused by a cytoplasmic polyhedrosis virus.

2603—Several dead specimens were submitted by J. L. Frykman, Ogden, Utah, on April 20, 1966. They had been collected about 10 miles north of St. George, Utah, and were infected with a nuclear polyhedrosis virus. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2816—Several larvae collected from bitterbrush in the Fish Lake National Forest, Utah, were submitted on April 1, 1968 by A. M. Rivas, Ogden, Utah. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2819—Several larvae collected from chokecherry were received on April 8, 1968 from E. H. Juntunen, Missoula, Montana. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Fig. 18. Acc. No. 2002: Unidentified lasiocampid cocoon showing larvae of a hymenopterous parasite. Magnification = 10X.

Trabala vishnu Lefebvre

2307—Three specimens were submitted on August 7, 1964 by O. S. Bindra, Jabalpur, India. No collection data or related information was supplied. Diagnosis: Non-microbial.

Unidentified

2002—Several laboratory reared specimens were submitted by I. M. Din, Rawalpindi, Pakistan, on January 18, 1963. Diagnosis: Parasitism caused by a hymenopterous parasite. (Fig. 18.)

Limacodidae

Darna trima (Moore)

2057—On May 20, 1963, thirteen larvae were received from B. J. Wood, Johore, Malaya. Diagnosis: Virosis caused by granulosus virus. New record. (Fig. 19.)

2337—Additional specimens were submitted by B. J. Wood on March 5, 1964. The disease appeared to be epizootic. Diagnosis: Virosis caused by a granulosus virus.

2840—Many dried larvae collected in the northern part of Borneo were received from B. J. Wood, Johore, Malaysia, on June 18, 1968. Diagnosis: Possible bacteriosis caused by the potential pathogen *Bacillus cereus*.

Parasa lepida (Constantini)

2242—These field-collected specimens were submitted by U. B. M. Ekanayake, Ceylon, on February 27, 1964. Mr. Ekanayake reported that they appeared sluggish. Diagnosis: Bacteriosis: *Streptococcus* sp.

Parasa sp.

1865—Several hundred specimens were submitted by J. J. H. Szent-Ivany, Konedobu, Papua, on April 18, 1962. Diagnosis: Probable parasitism with secondary saprophytic invaders.

Sibine apicalis Dyar

2568—Two dead larvae were submitted by C. S. Stephens, Changuinola, Panama, on February 14, 1966. Diagno-

Fig. 19. Acc. No. 2057: Electron micrograph of a granulosus virus from *Darna trima*, with virus rods (R) in partially dissolved capsules (C). Magnification = 34,000X.

sis: Bacterioses caused by *Streptococcus faecalis* and *Proteus* sp.

2578—One dead specimen was submitted by C. S. Stephens, Changuinola, Panama, on March 2, 1966. The insects were reported to be abundant and dying in large numbers. Diagnosis: Bacterioses caused by *Serratia marcescens* and *Streptococcus faecalis*.

2951—Several diseased larvae from banana leaves in Panama were submitted by C. S. Stephens, Changuinola, Panama, on June 2, 1970. Diagnosis: Mycosis caused by *Beauveria tenella*.

Sibine stimulea (Clements)

1895—Several specimens were submitted by D. McKay, St. Petersburg, Florida, on July 3, 1962. Diagnosis: Probably non-microbial.

Sibine sp.

2579—One specimen was submitted by C. S. Stephens, Changuinola, Panama. The insects were reported to be

abundant and dying in large numbers. Diagnosis: Bacteriosis: *Streptococcus faecalis*.

Lymantriidae

Dasychira plagiata (Walker)

1873—Over 50 larvae of the pine tussock moth were submitted by J. Childs, St. Paul, Minnesota, on May 10, 1962. Diagnosis: Virosis caused by a nuclear polyhedrosis virus. The first record of a virus infection of this insect in the Americas. (Fig. 20.)

2474—Several specimens were submitted by R. V. Gorsuch, Missoula, Montana, on September 21, 1965. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2704—Some larvae were received from R. L. Lyon, Berkeley, California, on November 16, 1966. Diagnosis: Virosis, caused by a nuclear polyhedrosis virus.

2761—Two larvae were submitted by E. H. Juntunen, Missoula, Montana, on July 21, 1967. Diagnosis: Mycosis; how-

Fig. 20. Acc. No. 1873: Electron micrograph of nuclear polyhedrosis virus rods (arrows) from *Dasychira plagiata*. Magnification = 22,500X.

ever, the fungus was no longer viable and could not be identified. *Penicillium* sp. and *Aspergillus niger*, both saprophytes, were also isolated.

Euproctis lunata Walker

2612—Several specimens were submitted by R. B. Subba Rao, New Delhi, India, on May 10, 1966. The material was divided into two lots, each suffering from a different disease. Diagnoses: 1. Mycosis caused by an *Entomophthora* sp. 2. Bacteriosis caused by *Bacillus cereus*.

Hemerocampa vetusta (Boisduval)

2329—D. Dahlsten, Albany, California, submitted two dead specimens on October 13, 1964, which had been collected on white fir near Canyon Creek road, Modoc County, California. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Orgiia pseudotsugata (McDunnough)

2094—Several specimens of the Douglas fir tussock moth were submitted by H. C. Roffler, Missoula, Montana, on August 5, 1963. The disease appeared to be an epizootic. Diagnosis: Nuclear polyhedrosis virus.

2370—Several larvae from the field that had been laboratory-reared were submitted by D. Wood, Berkeley, California, on March 22, 1965. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2419, 2423, 2429, 2432, 2433—Some larvae were submitted by D. Dahlsten, Albany, California, on June 15, June 23, July 2, July 19, July 21, 1965. Egg masses were collected from various locations throughout California and reared on an artificial diet. Diagnosis: Virosis caused by a nuclear polyhedrosis virus. (Dahlsten and Thomas, 1969.)

2456—Additional specimens collected at various locations in California and reared in the laboratory by D. Dahlsten were submitted on August 10, 1965. Diagnosis: Non-microbial.

2486—Specimens similar to the above were again submitted by D. Dahlsten on October 1, 1965. Diagnosis: General bacterial deterioration—no primary microbial etiology evident.

2600—Numerous dead larvae were again submitted by D. Dahlsten on April 19, 1966. They had been collected at Goose Lake, 10 miles west of New Pine Creek, Modoc County, California, as egg masses and reared in the laboratory on artificial media. Diagnosis: Virosis, caused by a nuclear polyhedrosis virus. (Dahlsten and Thomas, 1969.)

2609 — Several laboratory-reared specimens were submitted by D. Wood, Berkeley, California, on May 5, 1966. Diagnosis: Virosis, caused by a nuclear polyhedrosis virus.

2639—Several more larvae reared in the laboratory from field-collected eggs were submitted by D. Dahlsten, Albany, California, on June 23, 1966. Diagnosis: Virosis, caused by a nuclear polyhedrosis virus. (Dahlsten and Thomas, 1969.)

2659—Several larvae were received from D. Wood, California, on July 27, 1966. Diagnosis: Non-microbial.

2667—A few larvae were submitted by P. Shea, Berkeley, California, on August 8, 1966. Diagnosis: Virosis, caused by a nuclear polyhedrosis virus.

2677—Additional larvae were received from D. Dahlsten on August 28, 1966. Diagnosis: Virosis, caused by a nuclear polyhedrosis virus. (Dahlsten and Thomas, 1969.)

2687–2694—A number of eggs, larvae, and adults of the Douglas fir tussock moth were submitted by D. Wood, Berkeley, California, from September 20 through September 26, 1966. Diagnoses: 2687 (adults) = *Bacillus cereus*; 2688 (eggs) = non-microbial; 2689 (lar-

vae) = non-microbial; 2690 (larvae) = non-microbial; 2691 (adult) = non-microbial; 2692 (larvae) = *Bacillus cereus* var. *mycoides*; 2693 (adults) = *B. cereus*; 2694 (adults) = *B. cereus*.

2713—Some dead adults were received from A. Cameron, Berkeley, California, on December 21, 1966. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* var. *thuringiensis*.

2717—Several larvae were received from A. Cameron on January 5, 1967. Diagnosis: Non-microbial.

3015—Many field-collected larvae collected near Nevada Point, Nevada County, California, were submitted by L. E. Browne, Berkeley, California, on September 15, 1971. Diagnosis: Non-microbial. It is possible that death was due to a severe heat wave since many oak worms had died of heat exhaustion during the same period.

3017—Several additional larvae were submitted by D. Dahlsten on September 24, 1971. These were also collected near Nevada Point, California. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Orgyia turbata Butler

1997—B. Meksongsee, Bangkok, Thailand, submitted specimens on December 27, 1962. Diagnosis: Polyhedrosis virus. A new record for this host. (Fig. 21.)

Noctuidae

Achaea janata (L.)

1938—Laboratory-reared larvae of the castor bean looper were submitted by B. Meksongsee, Bangkok, Thailand, on September 4, 1962. The submitted specimens had been inoculated with a suspected pathogen by oral feeding and were submitted with the request for identification of the pathogen. Diagnosis: Virosis caused by a granulosis virus. (Fig. 22.)

Fig. 21. Acc. No. 1997: Electron micrograph of nuclear polyhedrosis virus rods (arrows) from *Orgyia turbata*. Magnification = 29,000X.

Fig. 22. Acc. No. 1938: Electron micrograph of granulosis virus capsules from *Achaea janata*. Magnification = 26,500X.

2364—Some larvae were received from J. W. Beardsley, Honolulu, Hawaii, on March 11, 1965. Diagnosis: Bacteriosis caused by *Bacillus cereus* var. *mycoides*.

Alabama argillacea (Hübner)

2076 — Several laboratory-reared specimens of the cotton leafworm were submitted by H. Alcaraz, Buga, Valle, Colombia, on June 26, 1963. Diagnosis: microsporidiosis caused by *Nosema* sp.

2289 and 2290—On July 6, 1964, specimens of the cotton leafworm were submitted by R. C. Hunter, Bogota, Colombia. The specimens under accession 2289 were collected at Dorado (Tolima), Colombia, and those under No. 2290 were collected at Palmira (Valle), Colombia. The fungus was identified directly from the specimens, and from cultures on artificial media. Diagnosis: Mycosis: *Spicaria rileyi*.

2291 and 2292—Additional dead larvae were received on July 6, 1964, from R. C. Hunter, Bogota, Colombia. The specimens were deteriorated and putrefied. Diagnosis: Non-microbial. Possible insecticide poisoning.

2297—Several putrid specimens were received on July 10, 1964, from S. Shima K., Jr., Palmira, Valle, Colombia. Diagnosis: Microsporidiosis: *Nosema* sp., and secondary bacteriosis.

2992—On May 27, 1971, three dead larvae of the cotton leafworm were received from L. Falcon, Maragua, Nicaragua. Diagnosis: Mycoses in two larvae, caused by a *Penicillium* sp., and *Spicaria rileyi*. The cause of death in the third larva was evidently non-microbial.

Agrotis orthogonia (Morrison)

2227 — Several laboratory-reared specimens were submitted by L. A. Jacobson, Lethbridge, Alberta, Canada, on February 4, 1964. Diagnosis: Non-microbial.

Agrotis ypsilon (Von Rottenburgh)

1896—One specimen was collected and submitted by M. D. De Silva, Guralalawa, Ceylon, on July 16, 1962. Diagnosis: Undetermined.

Anticarsia gemmatilis (Hübner)

2211—Several specimens of the velvetbean caterpillar were submitted by R. C. Hunter, Palmira, Colombia, on December 16, 1963. Diagnosis: Mycosis caused by *Spicaria rileyi*.

2287—On July 6, 1964, additional specimens were received from R. C. Hunter, Palmira, Colombia. These were collected from a population at Bolo, Colombia, where nearly 100 per cent of the larvae had died of a fungus infection. Diagnosis: Mycosis: *Spicaria rileyi*.

2332—Several larvae were submitted by L. C. Kuitert, Gainesville, Florida, on October 26, 1964. The specimens were infected with a fungus and covered with mycelium and light green spores. Diagnosis: Mycosis caused by *Spicaria rileyi*.

Calophasia lunula (Husn.)

2695—Several larvae were received from R. Hawkes, Albany, California, on October 5, 1966. Diagnosis: Bacteriosis: *Streptococcus* infection.

2931—L. Andres, Albany, California, submitted some laboratory reared larvae on December 19, 1969. Diagnosis: Non-microbial.

Chorizagrotis agrestis (Grote)

2833—Several larvae of the western armyworm were received from K. E. Evans, Twin Falls, Idaho, on May 24, 1968. The larvae had been collected from crested wheat grass north of Kimama, Blaine County, Idaho. Diagnosis: Non-microbial.

Eligma narcissus (Cramer)

2037—Agar slants of fungus cultures isolated from pupae were submitted

Fig. 23. Acc. No. 2243: Electron micrograph of granulosus virus capsules (arrows) from *Eupsilis satellitia*. Magnification = 21,250X.

by J. C. Basu Choudhuri, Coimbatore, India, on April 1, 1963. Identification: *Beauveria bassiana*.

Eupsilis satellitia (L.)

2243—Several specimens were submitted by G. Taksdal, Vollebakk, Norway, on March 23, 1964. Diagnosis: Virosis caused by a granulosus virus. New record. (Fig. 23.)

Euxoa ochrogaster (Guenée)

2284—Several larvae were received from R. H. Washburn, Palmer, Alaska, on July 3, 1964. The larvae were collected in the field after an outbreak. Diagnosis: Bacteriosis: non-chromogenic strain of *Serratia marcescens*.

Heliothis armigera (Hübner)

2564—Six dead specimens were submitted by R. C. Patel, Anand, Gujarat, India, on February 10, 1966. Diagnosis:

Virosis caused by a nuclear polyhedrosis virus.

Heliothis philoxiphaga (Grote and Robinson)

2387—Some laboratory reared specimens were submitted by L. A. Falcon, Berkeley, California, on April 9, 1965. Diagnosis: Bacteriosis caused by *Pseudomonas aeruginosa*.

Heliothis virescens (Fabricius)

2295—Six specimens of the tobacco budworm were received from S. Shima K., Jr., Palmira, Valle, Colombia, on July 10, 1964. The cadavers were completely colonized by a fungus and covered with light green spores. Diagnosis: Mycosis—*Spicaria rileyi*.

2308B—Some laboratory reared specimens were submitted by R. C. Hunter, Bogota, Colombia, on August 25, 1964. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2315—Several specimens which had deteriorated to a fluid mass were received on September 10, 1964, from R. C. Hunter, Palmira, Valle, Colombia. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Heliothis zea (Boddie)

1860—Several specimens were submitted by E. C. Klostermeyer, Prosser, Washington, on April 11, 1962. Diagnosis: Mycosis caused by *Beauveria bassiana*.

2469—One specimen was submitted by W. Kane, Berkeley, California, on August 31, 1964. Diagnosis: Bacteriosis caused by *Serratia marcescens*.

2504—Specimens were submitted by L. Etzel, Berkeley, California, on October 27, 1965. They had been field-collected and reared on artificial medium in the laboratory. Diagnosis: External fungus only.

2516—One dead specimen was submitted by L. Etzel, Berkeley, California, on November 22, 1965, with a request for the identification of a fungus growing on the cadaver. Diagnosis: Saprophytic fungus, *Penicillium* sp.

2684—Several larvae were received from D. G. Bottrell, Stillwater, Oklahoma, on September 19, 1966. Diagnosis: A: A1 and A2—non-microbial; B: B1 and B2—bacteriosis, strain of *Streptococcus faecalis*; C: non-microbial; D: virosis, granulosis virus; E: no apparent microbial etiology.

2838—On June 7, 1968, several larvae and pupae of the corn earworm were received from laboratory cultures of J. J. Ellington, Las Cruces, New Mexico, for a pathogen check. Diagnosis: Non-microbial.

2885—On February 17, 1969, fourteen additional larvae were submitted by J. J. Ellington for a pathogen check. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2910—P. Velez, Davis, California, submitted several deteriorated larvae on August 27, 1969. Diagnosis: Probably non-microbial. The submitted specimens had been well deteriorated by the action of secondary bacteria. If a primary microbial etiology was present, it had been masked by the action of secondary saprophytes.

2911—Additional larvae were submitted by P. Velez on September 4, 1969. The larvae were flaccid and in an advanced state of deterioration. Diagnosis: Non-microbial.

2919—Larvae of the corn earworm collected from various locations in Mexico were submitted by L. A. Falcon, Berkeley, California, on October 1, 1969. Diagnosis: Nuclear polyhedrosis virus present in all lots.

2982—Four larvae were received from G. Leon Quant, Leon, Nicaragua, on February 3, 1971. The larvae were field-collected and reared in the laboratory. Diagnosis: Mycoses caused by *Aspergillus flavus* and *Spicaria rileyi*.

2993—L. Falcon submitted three dead larvae from Managua, Nicaragua, on May 27, 1971. Diagnosis: Microsporidiosis in one specimen, probably caused by a *Nosema* sp. Mycosis in another specimen caused by *Spicaria rileyi*. The cause of death in the third specimen was probably non-microbial.

Heliothis sp.

2133—These specimens, which were field-collected and reared in the laboratory, were submitted by H. Alcaraz, Buga, Valle, Colombia, on August 20, 1963. Insecticides had been applied to the area. Diagnosis: Mycosis caused by *Spicaria rileyi*.

2294—On July 10, 1964, completely deteriorated specimens of *Heliothis* sp. were received from S. Shima K., Jr., Palmira, Colombia. Diagnosis: Virosis: nuclear polyhedrosis virus.

Heliothis sp. (*zea* or *philoxiphaga*)

2420—Some specimens were submitted by L. Ruud, Kerman, California, on June 17, 1965. They had been reared on a semi-synthetic diet in the laboratory. Diagnosis: Some showed no microbial etiology; others had a secondary bacteriosis caused by *Streptococcus* sp.

Laphygma exempta (Walker)

2271—These specimens were submitted by J. H. D. Barnett, Brisbane, Queensland, Australia, on June 12, 1964. Diagnosis: Mycoses caused by *Entomophthora sphaerosperma* and *Spicaria* sp.

Laphygma exigua (Hübner)

2040—Slides of nematodes taken from the beet armyworm were submitted by T. V. Venkatraman, Khartoum North, Sudan, on April 11, 1963. Diagnosis: *Panagrolaimus* sp.

Laphygma frugiperda (J. E. Smith)

2000—Some specimens were submitted by R. C. Hunter, Buga, Valle, Colombia, on January 18, 1962. Diagnoses: Bacteriosis caused by *Aerobacter aerogenes*; Mycoses caused by *Aspergillus flavus* and *Spicaria rileyi*.

2134—Additional specimens were submitted by R. C. Hunter, Valle, Colombia, on August 20, 1963. The area had been treated with insecticides. Diagnosis: Mycosis caused by *Spicaria rileyi*.

2241—Several specimens were received from I. S. de Crouzel, Buenos Aires, Argentina, on March 16, 1964. These specimens were reared in the laboratory from eggs collected in the field. Diagnosis: Probable bacteriosis caused by *Streptococcus* spp. with secondary saprophytic fungus, *Masoniella* sp. and a fortuitous bacterium, *Erwina* sp.

2246—Additional specimens were submitted by I. S. de Crouzel, Buenos

Aires, Argentina, on March 26, 1964. Diagnosis: Non-microbial.

2288—One specimen of the fall armyworm was submitted by R. C. Hunter, Bogota, Colombia, on July 6, 1964. The specimen was completely colonized by a fungus. Diagnosis: Mycosis: *Spicaria rileyi*.

2407—Some specimens were submitted by A. Silveira-Guido, Montevideo, Uruguay, on May 17, 1965. Diagnosis: Bacterioses caused by *Serratia marcescens* and *Pseudomonas aeruginosa*.

Leucania latiuscula (Herrick—Schaffter)

2347—Several larvae were submitted by W. G. Genug, Belle Glade, Florida, on January 11, 1965. The cadavers were completely colonized by a fungus. Diagnosis: Mycosis: *Spicaria rileyi*.

Mythimna sp.

3030—Many field-collected larvae of this noctuid were submitted by A. J. M. Carnegie, Mount Edgecomb, South Africa, on November 19, 1971. Diagnosis: Mycosis caused by an *Entomophthora* sp.

Papaipema pupurifascia (Grote and Robinson)

2450—These specimens were submitted by R. Anderson, Madison, Wisconsin, on August 4, 1965. Diagnoses: Mycosis caused by *Beauveria bassiana* in some of the specimens, by *Hirsutella* sp. in others. Some showed a granulosis virus, while others showed a bacteriosis caused by *Streptococcus faecalis*.

2460—Additional larvae were submitted on artificial media by R. J. Anderson, Madison, Wisconsin, on August 23, 1965. Diagnosis: Bacterioses caused by *Bacillus cereus*, *Proteus* sp., *Aerobacter* grp. C, and *Pseudomonas aeruginosa*.

Peridroma margaritosa (Haworth)

2363—These cutworm larvae were received from J. W. Beardsley, Honolulu, Hawaii, on March 11, 1965. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2385—Specimens were collected at the Kahua Ranch, Waimea-kohala, Hawaii, on March 20 to April 1, 1965, by Y. Tanada, Berkeley, California. Diagnoses: Bacteriosis caused by *Pseudomonas aeruginosa* and another unidentified bacterium; mycosis caused by *Beauveria bassiana*; non-microbial in others.

2395—Some specimens were submitted by W. C. Mitchell, Honolulu, Hawaii, on April 26, 1965. Diagnosis: Bacteriosis caused by *Bacillus cereus*.

Peridroma sp.

2399—Some specimens were collected in Kamuela, Hawaii, on April 14–20, 1965, by Y. Tanada, Berkeley, California. Diagnosis: Bacterioses caused by *Bacillus cereus*, *B. cereus* var. *mycoides* and *Pseudomonas aeruginosa*.

2404—Additional specimens were collected in Hawaii and submitted by Y. Tanada, Berkeley, California, on May 12, 1965. Diagnoses: Mycoses caused by *Entomophthora* sp. and *Beauveria bassiana*; bacteriosis caused by *Streptococcus* sp., *Bacillus cereus* var. *mycoides*, and *Bacillus cereus*; virosis caused by a polyhedrosis virus.

Persectania aversa (Walker)

2027—One larva was submitted by G. A. H. Helson, Wellington, New Zealand, on March 18, 1963. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*.

2085—Several more specimens were submitted by G. A. H. Helson, Wellington, New Zealand, on July 18, 1963. Diagnosis: Mycosis caused by *Entomophthora* sp.

Prodenia androgea (Creamer)

2360—These specimens from La Estrella Valley, Costa Rica, were submitted by F. Lara E., Limon, Costa Rica, on February 19, 1965. Diagnosis: Virosis caused by a granulosis virus. New record.

2445—Additional laboratory reared specimens were submitted by F. Lara E., Limon, Costa Rica, on July 28, 1965. Diagnosis: Primary etiology was obscured by the action of acarid mites.

Prodenia litura (Fabricius)

2097 — Several laboratory-reared specimens were submitted by U. Ekanayake, Lunuwila, Ceylon, on August 9, 1963. Diagnosis: Microsporidiosis caused by a *Nosema* sp. New record.

2217—Eight insectary-reared specimens were submitted by U. Ekanayake, Lunuwila, Ceylon, on December 31, 1963. Diagnosis: Mycosis caused by *Aspergillus flavus*.

2268, 2269 — Additional laboratory-reared specimens were submitted by U. Ekanayake, Lunuwila, Ceylon, on June 5 and June 11, 1964. Diagnosis: Microsporidiosis caused by *Nosema* sp.

2398—Some specimens were submitted by S. Rao, Kuala Lumpur, Malaysia, on April 27, 1965. The area had been treated with endrin. Diagnosis: Bacterioses caused by *Streptococcus* sp. near *faecalis* and *Aerobacter liquidifaciens*.

2832—M. M. Altahtawy, Alexandria, Egypt, submitted several dead larvae collected from cotton on April 24, 1968. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2854—Two bacterial cultures isolated from *P. litura* by M. M. Altahtawy were received on August 12, 1968, with a request for their identification. Diagnosis: The bacteria were identified as *Bacillus cereus* and an *Aerobacter* sp.

2933—Four dead larvae were received from O. S. Bindra, Ludhiana, India, on February 10, 1970. Diagnoses: Two specimens suffered a mycosis caused by *Aspergillus flavus*; one suffered a bacteriosis caused by the potential pathogen *Streptococcus faecalis*; and the fourth suffered a virosis caused by a granulosis virus.

Prodenia ornithogalli (Guenée)

2149—Several specimens were submitted by G. T. Okamura, Sacramento, California, on September 3, 1963. This disease appeared to be epizootic. Diagnosis: Nuclear polyhedrosis virus.

2592—Several dead specimens were submitted by D. G. Bottrell, Stillwater, Oklahoma, on March 29, 1966. Diagnosis: Bacteriosis caused by a *Streptococcus* sp.

2685—Three additional larvae were received from D. G. Bottrell, Stillwater, Oklahoma, on September 19, 1966. Diagnosis: 1. Bacteriosis, strain of *Streptococcus faecalis*. 2. Mycosis with secondary bacteriosis. Attempts to isolate and identify the fungus were unsuccessful.

Prodenia sp.

2001—These specimens were submitted by H. Alcaraz, Buga, Valle, Colombia, on January 18, 1963. Diagnosis: Mycosis caused by *Spicaria rileyi* and bacterioses caused by *Aerobacter aerogenes*, and *Streptococcus* sp.

2077—These specimens were submitted by R. C. Hunter, Buga, Valle, Colombia, on June 26, 1963. Lead arsenate had been applied to the field before collection. Diagnosis: Undetermined, probably non-microbial.

2195—Six specimens were submitted by F. A. Estrada Rizo, Managua, Nicaragua, on November 14, 1963. They had been collected in Los Laureles, where the disease appeared to have reached epizootic proportions. Diag-

nosis: Mycosis caused by *Spicaria rileyi*.

2953—Four dead larvae were submitted by H. Eugene Ostmark, La Lime, Honduras, on June 30, 1970. The larvae were collected from peanuts in Rivas, Nicaragua, and had been fed leaves coated with the ground bodies of other larvae which Mr. Ostmark suspected had been killed by a virus. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Protolevcania albilimia (Hübner)

2631—Three larvae were submitted by E. A. Wood, Stillwater, Oklahoma, on June 3, 1966. Diagnosis: Specimens 1 and 2 showed secondary bacteriosis and mycosis. Specimen 3 was parasitized by a chalcid parasite. It is possible that 1 and 2 were also parasitized.

Pseudoplusia includens (Walker)

2865—Several larvae collected from soybean were submitted by L. D. Newsum, Baton Rouge, Louisiana, on October 7, 1968. Diagnosis: Bacteriosis caused by *Bacillus finitimus*, with associated secondary infection caused by *Streptococcus faecalis* and *S. faecalis* var. *liquefaciens*.

2901—One larva of this semi-looper collected near Belle Glade, Florida, was received from M. J. Janes on July 3, 1969. Diagnosis: Mycosis caused by an *Entomophthora* sp.

Pseudaletia separata

2064—This specimen was submitted by G. A. H. Helson, Wellington, New Zealand, on June 5, 1963. Diagnosis: Mycosis caused by *Entomophthora* sp.

Pseudaletia unipuncta (Haworth)

1955—Several armyworms were submitted by R. D. Frye, Fargo, North Dakota, on September 25, 1962. Diagnosis: Non-microbial.

2026—Eleven larvae and two pupae

were submitted on March 13, 1963, by I. de Crouzel, Buenos Aires, Argentina. The specimens were collected from a natural population suffering a disease epizootic. Diagnosis: Viroses caused by a granulosus virus and a nuclear polyhedrosis virus.

2198—Some specimens were submitted by C. S. Morey and E. M. Caseus, Montevideo, Uruguay, on November 19, 1963. Diagnosis: Mycosis caused by *Entomophthora sphaerosperma*.

2343—Eight dead specimens were submitted with no background information, by Silveira-Guido, Montevideo, Uruguay. The specimens were collected in Rincon del Pino, Uruguay. Diagnosis: Non-microbial.

2557—One dead specimen was submitted by M. Zahurul Alem, Dacca, East Pakistan, on January 5, 1966. Diagnosis: *Bacillus cereus* and *Streptococcus faecalis* var. *liquefaciens*.

Pseudaletia sp.

2401—One larva was submitted by M. Z. Alam, Dacca, East Pakistan, on May 10, 1965. Diagnosis: Bacterioses caused by *Bacillus cereus* and *Pseudomonas aeruginosa*.

Sacadodes pyralis (Dyar)

2154 — Several laboratory-reared specimens were submitted by R. C. Hunter, Buga, Valle, Colombia, on September 5, 1963. Diagnosis: Non-microbial.

Sesamia cretica (Ledebur)

2361—H. N. Plaut, Haifa, Israel, submitted several larvae on March 3, 1965. Diagnosis: Virosis caused by a granulosus virus.

2366—Additional specimens were submitted by H. N. Plaut, Haifa, Israel, on March 15, 1965. Four fungi were isolated from the cadavers, but showed negative results on infectivity tests. Diagnosis: Undetermined.

Spodoptera exempta (Walker)

2194—Several specimens and two vials of a virus suspension from a laboratory colony of this insect were submitted by E. S. Brown, Kikuyu, Kenya, on November 9, 1963. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2300—Several larvae from a laboratory culture were received from G. Swaine, Arusha, Tanganyika, on July 14, 1964. Diagnosis: Probable bacteriosis caused by *Streptococcus* spp.

Spodoptera exigua (Hübner)

2666—Several larvae were received from A. Islam, Dacca, East Pakistan, on August 2, 1966. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

3013—Many dead larvae were submitted by K. Eveleens, Albany, California, on September 13, 1971. The specimens were collected from cotton in an area where many larvae had died of a nuclear polyhedrosis virus. Submitted larvae developed slowly, failed to mature, and gradually died. Diagnosis: Bacteriosis caused by the potential pathogen *Streptococcus faecalis*. A sudden heat wave may be the stress factor that promoted infection by this bacterium.

Spodoptera frugiperda (Abbot and Smith)

3036—Many last instar larvae of this armyworm collected from corn in Palmira, Colombia, were submitted by A. Villacorta, Cali, Colombia, on December 3, 1971. Diagnosis: Mycosis caused by *Metarrhizium anisopliae*.

Spodoptera littoralis (Boisduval)

2940—An agar slant containing a fungus isolated from this noctuid was received from M. M. Altahtawy, Alexandria, Egypt, on February 12, 1970. Diagnosis: The fungus was identified as *Spicaria rileyi*. (Fig. 24.)

Fig. 24. Acc. No. 2940: Phase contrast micrograph of sporulating *Spicaria rileyi* isolated from *Spodoptera littoralis*. Magnification = 300X.

2949—One larva was received from M. M. Altahtawy, Alexandria, Egypt, on April 23, 1970. The larva was covered with a thick mycelial mat producing light green spores. Diagnosis: Mycosis caused by *Spicaria rileyi*.

3026—A number of laboratory-reared larvae were submitted by M. M. Altahtawy, Alexandria, Egypt, on November 19, 1971. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Spodoptera mauritia ssp. *aconyctoides*

2786—Three dead larvae were submitted on November 6, 1967 by G. L. H. Rothschild, Kuching, Sarawak, East Malaysia. Diagnosis: Mycosis caused by *Spicaria rileyi*.

Tiracola plagiata (Walker)

1839—These specimens were submitted by J. J. H. Szent-Ivany, Port Moresby, Territory of Papua and New Guinea, on February 8, 1962. Diagnosis: Non-microbial.

1844—Additional specimens were submitted by A. Catley, Port Moresby, Territory of Papua and New Guinea, on February 23, 1962. Diagnosis: Mycosis caused by *Spicaria rileyi*.

1845—Some specimens were also submitted by A. Catley, Port Moresby, Territory of Papua and New Guinea, on February 25, 1962. Diagnosis: No definite pathogen found. *Flavobacterium rhenanum* was isolated.

1846—These specimens were submitted by F. C. Henderson, Port Moresby, Territory of Papua and New Guinea, on March 7, 1962. Diagnosis: Mycosis caused by *Spicaria rileyi*.

Trichoplusia ni (Hübner)

1963—Several specimens were submitted by J. R. Walker, Baton Rouge, Louisiana, on October 8, 1962. Diagnosis: Mycoses caused by *Spicaria rileyi* and *Entomophthora megasperma*.

2221—These specimens were sub-

mitted by A. Sequeira D., Managua, Nicaragua, on January 17, 1964. Diagnosis: Mycosis caused by *Spicaria rileyi*.

2314—Several specimens received on September 10, 1964, from R. C. Hunter, Palmira, Valle, Colombia, were covered with white mycelium and conidia. The larval bodies were mummified and completely colonized by the fungus. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Trichoplusia ni (Hübner) or *Pseudoplusia includens* (Walker)

2320—Three field-collected looper larvae were submitted by K. Elsey, Raleigh, North Carolina, on September 18, 1964. The specimens were covered with mycelium and light green spores. Diagnosis: Mycosis caused by *Spicaria rileyi*.

Trichoplusia ni (Hübner)

2658—Several larvae on artificial diets were submitted by C. Reiner, Berkeley, California, on July 27, 1966. The containers were contaminated with a variety of fungi. Identifications: *Aspergillus niger*, *A. ochraceus*, *A. flavus*, and a *Penicillium* sp.

2852—On August 2, 1968, several laboratory-reared larvae were received from J. J. Ellington, Las Cruces, New Mexico. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2981—Five larvae of the cabbage looper were submitted by G. Leon Quant, Leon, Nicaragua, on February 3, 1971. The larvae had been collected in the field and reared in the laboratory. Each was infected with a different fungus. Diagnoses: Mycoses caused by *Aspergillus flavus*, *Spicaria rileyi*, *Entomophthora* sp., a *Penicillium* sp. (tested against *Galleria melonella* larvae for pathogenicity with positive results), and one unidentified fungus (deterioration precluded identification in this case).

2994—Four larvae of the cabbage looper were submitted by L. Falcon, from Managua, Nicaragua, on May 27, 1971. Diagnosis: Mycosis caused by *Spicaria rileyi*.

3035—Many dead larvae of the cabbage looper from soybeans in Cauca Valley, Colombia, were submitted by A. Villacorta, Cali, Colombia, on December 3, 1971. Diagnosis: Mycosis caused by *Spicaria rileyi*.

Unidentified

1841—These specimens were submitted by F. McAlister, Clemson College, South Carolina, on February 13, 1962. Diagnosis: Mycosis caused by *Spicaria rileyi*.

1866—These specimens were collected during an epizootic above Placerville, California, and submitted by C. Gonzales, Berkeley, California, on April 19, 1962. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Unidentified (subterranean caterpillar)

1949—These specimens were submitted by G. A. H. Helson, Wellington, New Zealand, on September 18, 1962. Diagnosis: Mycosis caused by *Entomophthora* sp.

1959—Additional specimens were submitted by G. A. H. Helson, Wellington, New Zealand, on October 1, 1962. Diagnosis: Mycoses caused by *Entomophthora* sp. (near *aphidis*) and *Cordyceps* sp.

1982—These specimens were also submitted by G. A. H. Helson on November 21, 1962. Diagnosis: Insect parasitism.

2628—Several larvae were received from C. S. Koehler, Berkeley, California, on June 1, 1966. Diagnosis: Infection by *Streptococcus* sp. as a potential pathogen or secondary invader. Primary etiology undetermined, but evidently non-microbial.

2978—Four larvae were received on December 28, 1970, from S. B. Mathad, Dharwar, Mysore State, India. The specimens were collected from *Sorgum vulgare*. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Notodontidae

Schizura concinna (J. E. Smith)

2686—Several larvae were received from J. E. Dibble, Berkeley, California, on September 20, 1966. Diagnosis: Non-microbial.

Nyctemeridae

Tyria jacobaea (L.)

2831—Many pupae of the cinnabar moth were submitted by R. Hawkes, Albany, California, on May 22, 1968. The pupae were collected in fields of tansy ragwort at Fort Bragg, California. Diagnosis: Microsporidiosis caused by a *Nosema* sp.

2842—Additional specimens (eggs and larvae), collected near Todd Point, Fort Bragg, California were submitted by R. Hawkes on June 24, 1968. Diagnosis: Microsporidiosis caused by a *Nosema* sp.

2845—Another collection of larvae from *Senecio jacobaea* (tansy ragwort) near Todd Point, Fort Bragg, California, was submitted by R. Hawkes on July 1, 1968. Diagnosis: Microsporidiosis caused by a *Nosema* sp.

2956—Several larvae were submitted on July 17, 1970, by R. Hawkes, Albany, California. These larvae were reared in the laboratory from eggs collected near Fort Bragg, California. Unusually high mortality was experienced in the laboratory cultures. Diagnosis: Microsporidiosis caused by *Nosema* sp.

Nymphalidae

Caligo sp., probably *eurilochus*

2638—One larva was received from F. Lara E., Limon, Costa Rica, on

June 21, 1966. Diagnosis: Bacteriosis: *Streptococcus faecalis*.

Limenitis archippus (Cramer)

2989—Two deteriorated larvae of the viceroy butterfly were received on May 31, 1971, from Jo Brewer, Auburndale, Massachusetts. The larvae had been collected in Maine for rearing. Diagnosis: Bacterioses caused by *Bacillus cereus* and *B. cereus* var. *mycoides*.

Nymphalis antiopa (L.)

2299—Several larvae were received from J. D. Stein, Fargo, North Dakota, on July 10, 1964. Diagnosis: Non-microbial—possible parasitism with secondary mycosis by *Fusidium* sp. and bacteriosis by *Aerobacter* sp. (probably *A. liquefacens*).

Nymphalis californica (Boisduval)

2990—One dead larva of the California tortoise shell butterfly was submitted by W. E. Ferguson, San Jose, California, on May 19, 1971. The specimen was dark brown and soft, but intact. Diagnosis: Bacteriosis caused by *Bacillus megaterium*.

Speyeria nokomis (Edwards)

2930—On December 18, 1969, a few larvae of the nokomis fritillary collected from *Viola priceana* and *V. papilionacea* were submitted by S. O. Mattoon, Chico, California. The specimens had been collected in Ruby Valley, Elko County, Nevada, and reared in Chico. Diagnosis: Non-microbial.

Vanessa cardui (L.)

2937—On February 12, 1970, C. White, Shafter, California, submitted four laboratory-reared larvae of the painted lady butterfly. Diagnosis: Non-microbial.

Vanessa virginensis (Drury)

2961—J. Brewer, Auburndale, Mas-

sachusetts, submitted a specimen of the painted beauty butterfly on August 31, 1970. The specimen was collected from *Gnaphalium* sp. in Georgetown, Massachusetts, and was the only dead larva found in a high population of the insects. Diagnosis: Non-microbial.

Olethreutidae

Carpocapsa pomonella (L.)

1960 — Several laboratory-reared specimens of codling moth larvae were submitted by S. C. Hoyt, Wenatchee, Washington, on October 2, 1962. Diagnosis: Bacteriosis caused by *Bacillus megaterium* and *Aerobacter cloacae*.

2070—These specimens were submitted by L. Falcon, Berkeley, California, on June 13, 1963. Diagnosis: Undetermined, but probably non-microbial.

2075—One larva was submitted by L. Falcon, Berkeley, California, on June 20, 1963. The area of collection had been treated with Thuricide 90T on May 17, 1963. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis*.

2080—These specimens were collected in Linden, California, and submitted by L. Falcon, Berkeley, California, on July 5, 1963. They came from an area that had been treated with Thuricide 90T. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis*.

2163—One additional specimen collected in Linden, California, was submitted by L. Falcon on September 11, 1963. The area had been treated with *Bacillus thuringiensis*. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis*.

2166—These specimens were submitted by L. E. Caltagirone, Albany, California, on September 17, 1963. They had been collected in Chihuahua, Mexico. Diagnosis: Nematode infection: *Neoplectana* sp. (probably another strain of *N. carpocapsae*)

2180—A dead larva was submitted by L. A. Falcon, Berkeley, California, on October 7, 1963. It had also been collected from Linden, California. Diagnosis: Probably non-microbial. The bacteria found were saprophytic.

2186—Four larvae collected near Valle de Allende, Chihuahua, Mexico, were submitted by L. Caltagirone, Berkeley, California, on October 17, 1963. Diagnosis: Some suffered a mycosis caused by *Beauveria bassiana*; others were infected with a granulosis virus. The latter is a new record for this host.

2459—These laboratory-reared specimens were submitted by W. Kane, Berkeley, California, on August 19, 1965. Diagnosis: Non-microbial.

2501—Additional laboratory reared specimens were submitted by W. Kane, Berkeley, California, on October 25, 1965. Diagnosis: Non-microbial.

2555—Several more specimens were submitted by W. Kane. These were collected in Placerville, California, on October 26, 1965. Diagnosis: Mycosis: *Beauveria bassiana*.

2714—Several larvae were submitted by R. D. McMullen, Summerland, British Columbia, on December 20, 1966. Diagnosis: Virosis: granulosis virus.

2807—Several dead larvae were submitted on January 23, 1968 by J. A. Quist, Grand Junction, Colorado. Diagnosis: Virosis caused by a granulosis virus.

2939—On March 4, 1970, several larvae of the codling moth from mass rearings on an artificial diet were submitted by M. D. Proverbs, British Columbia, Canada. Diagnosis: Virosis caused by a granulosis virus.

3038—Larvae and pupae were submitted by J. M. Jordon, Farmington, New Mexico. The specimens had died while overwintering in corrugated cardboard bands. Diagnosis: Mycosis caused by *Beauveria bassiana*.

1849—These specimens were submitted by M. A. Ghani, Rawalpindi, Pakistan, on March 12, 1962. Diagnosis: Possible mycosis caused by *Fusarium* sp.

Grapholitha molesta (Busk)

2278—Several larvae originally from Japan were submitted by G. Finney, Berkeley, California, on June 12 and July 3, 1964. Diagnosis: Probably non-microbial, but if the primary etiology was microbial it has been obscured by the action of secondary saprophytic bacteria.

2803—On February 2, 1968, R. Laing, Berkeley, California, submitted three laboratory-reared larvae of the oriental fruit moth. Diagnosis: Non-microbial.

Rhyacionia bouliana (Schiff.)

2824—Several dry laboratory-reared larvae and pupae of the European pine shoot moth were submitted by S. S. Chawla, Pullman, Washington, on May 8, 1968. Diagnosis: Bacteriosis caused by *Bacillus cereus*. This bacterium was isolated in pure culture from externally sterilized specimens, indicating contamination of the rearing medium and possible stress conditions.

2849—Pupae were again submitted by S. S. Chawla on July 17, 1968. Diagnosis: Non-microbial.

2889—Additional larvae, pupae, and adults were submitted by S. S. Chawla on March 31, 1969. Diagnosis: Bacterioses caused by the potential pathogens *Bacillus cereus* and *Streptococcus faecalis*.

Rhyacionia pasadenana (Kearfott)

1973—Several specimens were submitted by C. S. Koehler, Berkeley, California, on October 16, 1962. Diagnosis: Non-microbial.

2166A—Additional specimens were submitted by C. S. Koehler, Berkeley,

California, on September 19, 1963. Diagnosis: Non-microbial.

Rhyacionia zozana (Kearfott)

2231—Some specimens from Placerville, California, were submitted by R. E. Stevens, Berkeley, California, on February 14, 1964. Diagnosis: Mycosis caused by *Beauveria bassiana*. New record.

2244—Several more specimens were collected 15 miles north of Groveland, Tuolumne County, California, by R. E. Stevens on March 26, 1964. Diagnosis: Non-microbial.

2253—Additional specimens were collected in Placerville, California, by R. E. Stevens on April 17, 1964. Diagnosis: Parasitism by an Ichneumonid parasite.

Papilionidae

Papilio ajax (L.)

2737—One pupae was submitted by J. Brewer, Auburndale, Massachusetts, on April 11, 1967. Diagnosis: Non-microbial.

Papilio polyxenes asterius Stoll

2850—On July 24, 1968, one larva of the black swallowtail butterfly from parsley was received from J. Brewer, Auburndale, Massachusetts. Diagnosis: Non-microbial.

2960—One larva was submitted on August 16, 1970 by J. Brewer, Auburndale, Massachusetts. The specimen was collected from parsley in Newton, Massachusetts, where there was evidently an epizootic of the disease. Diagnosis: Microsporidiosis caused by a *Nosema* sp.

Papilio sp.

3018—One dead larva was submitted by M. Thomas, Berkeley, California, on September 28, 1971. Diagnosis: Non-microbial.

Fig. 25. Acc. No. 2023: Electron micrograph of polyhedra of a cytoplasmic polyhedrosis virus from *Cactoblastis cactorum*. The pits containing the spherical virus particles can be seen in some of the polyhedra (arrows). Magnification = 14,500X.

Phycitidae

Anagasta kuhniella (Zeller)

2024—Bacterial cultures were isolated and submitted by P. A. van der Laan, Amsterdam, Holland, on March 11, 1963. Identification: *Bacillus thuringiensis*.

2577—Several specimens were submitted by C. Reiner, Albany, California, on March 10, 1966. Diagnosis: *Bacillus thuringiensis* var. *thuringiensis*.

3023—Several larvae were submitted by G. King, Albany, California, on October 10, 1971. Diagnosis: Non-microbial.

Cactoblastis cactorum (Berg)

2023—Eight laboratory-reared larvae were submitted by M. Tamashiro, Honolulu, Hawaii, on March 6, 1963. Diagnosis: Virosis caused by a cyto-

plasmic polyhedrosis virus. New record. (Fig. 25.)

Ephestia figulilella Gregson

1889—A culture of raisin moths was received from G. H. Spitler, Fresno, California, on June 12, 1962. A disease was causing an unusual amount of mortality in their laboratory colonies. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* var. *thuringiensis*. New record.

Paramyelois transitella (Walker)

1891—On June 15, 1962, a culture of the navel orangeworm was submitted by M. Hussein, Berkeley, California. Many of the larvae in the culture were dying and turning black. Diagnosis: Bacteriosis caused by *Bacillus entomocidus* (*B. thuringiensis* var. *entomocidus*). New host record.

1974—These laboratory-reared spec-

imens were submitted by D. Price, Davis, California, on October 23, 1962. Diagnosis: Microsporidiosis caused by *Nosema* sp. possibly *destructor*. New record.

1986—These specimens were submitted by L. A. Falcon, Berkeley, California, on December 7, 1962. Diagnosis: Non-microbial.

1996—A sample of larvae was submitted by J. A. Goodwin, Berkeley, California, on December 19, 1962. These larvae were from a laboratory culture of about 400 infected navel orangeworms. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* var. *entomocidus*.

2005A—Several specimens were submitted by L. A. Falcon, Berkeley, California, on January 23, 1963. Diagnosis: Probably non-microbial.

2012—These laboratory-reared specimens were submitted by G. Finney, Albany, California, on February 12, 1963. Diagnosis: Bacteriosis caused by *Bacillus entomocidus*.

2083—These specimens were collected in Linden, California and submitted by L. A. Falcon, Berkeley, California, on July 11, 1963. Diagnosis: No pathogens found.

2162—Additional specimens collected in Linden, California, were submitted by L. A. Falcon on September 11, 1963. Diagnosis: Non-microbial.

2181—One larva was submitted by L. A. Falcon on October 7, 1963. Diagnosis: Probably non-microbial.

2213—Several specimens were submitted by F. M. Summers, Davis, California, on December 17, 1963. Diagnosis: No pathogens found.

2345—Two dead larvae were submitted on December 18, 1964, by I. H. Collins, Davis, California. The insects were reared in the laboratory on an artificial diet. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* var. *thuringiensis*.

2346—Several laboratory-reared larvae were submitted by D. Brinkman, Berkeley, California, on January 7, 1965. Diagnosis: Bacteriosis: *Bacillus cereus* var. *mycoides* and a schizogregarine protozoan infection, possible *Mattesia* sp.

2350—These larvae were submitted by K. Shey, Berkeley, California, on January 18, 1965. The primary cause of death was probably non-microbial, but it had been obscured by a secondary bacteriosis. Diagnosis: Bacterioses: *Pseudomonas aeruginosa*, *Streptococcus faecalis*, and *Alcaligenes faecalis*.

2476—Laboratory-reared specimens were submitted by U. Gogia, Berkeley, California, on September 20, 1965. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* var. *thuringiensis*.

2585—Ten dead larvae were submitted by L. Caltagirone, Berkeley, California, on March 23, 1966. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* var. *thuringiensis*.

2586—Several dead specimens were submitted by L. Caltagirone on March 30, 1966. Diagnosis: *Bacillus thuringiensis* var. *thuringiensis*. Parasitized specimens were also infected.

2605—These laboratory-reared specimens were submitted by D. Brinkman, Berkeley, California, on April 28, 1966. Diagnosis: Protozoan infection caused by the schizogregarine, *Mattesia dispersa*.

2715—Several specimens were received from L. A. Falcon, Berkeley, California, on January 3, 1967. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* var. *thuringiensis*.

2777—Several dead laboratory-reared larvae were submitted by D. Brinkman, Albany, California, on October 4, 1967. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* var. *thuringiensis*.

2892—Several laboratory-reared larvae were submitted by D. Brinkman,

Fig. 26. Acc. No. 2316: Electron micrograph of granulosus virus capsules from *Plodia interpunctella*. Magnification = 16,200X.

on April 1, 1969. Diagnosis: Protozoan infection caused by the schizogregarine, *Mattesia dispota*.

3019—Several dead larvae were submitted by D. Pinnock, Berkeley, California, on October 4, 1971. The specimens had been collected from almonds in La Grand and Arbuckle, California. Diagnosis: Non-microbial.

Plodia interpunctella (Hübner)

2309 — Several laboratory-reared specimens were submitted by G. H. Spitler, Fresno, California, on August 27, 1964. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis* and a protozoan infection caused by *Mattesia dispota*.

2316—Several dead laboratory-reared larvae were submitted on September 10, 1964, by W. E. Burkholder, Fresno, California. Diagnosis: Virosis caused by a granulosus virus. New record. (Fig. 26.)

2883—On February 4, 1969, J. A.

Reinert, Clemson, South Carolina, submitted several laboratory-reared larvae. Diagnosis: Virosis caused by a granulosus virus.

Vogtia sp.

2871—On December 2, 1968, one larva, one pupa, and one adult from a laboratory culture were submitted by D. Maddox, Albany, California. Diagnosis: Non-microbial.

Pieridae

Colias lesbia Fab.

2565—Thirteen dead specimens collected between Lujan and Pergamino Buenos Aires, Argentina, on January 24, 1966, were submitted by I. S. de Crouzel on February 2, 1966. Diagnosis: Microsporidiosis caused by a *Nosema* near *polyvora* and polyhedrosis caused by a nuclear polyhedrosis virus.

2740—Several more larvae were submitted by I. S. de Crouzel, Buenos Aires, Argentina, on April 19, 1967.

Fig. 27. Acc. No. 2755: Phase contrast of *Nosema coliadis* spores from *Colias lesbia*. Magnification = 800X.

Diagnosis: Microsporidiosis caused by *Nosema coliadis*.

2750—Four additional larvae were submitted by I. S. de Crouzel, Buenos Aires, Argentina, on May 4, 1967. Diagnosis: Microsporidiosis caused by *Nosema coliadis*.

2755—Several more specimens were submitted by I. S. de Crouzel on June 7, 1967. Diagnosis: Microsporidiosis caused by *Nosema coliadis*. (Fig. 27.)

2758—Several more specimens were submitted by I. S. de Crouzel on July 7, 1967. Diagnosis: Microsporidiosis caused by *Nosema coliadis*.

Delias belladonna Fab.

2818—Some pupae and larvae collected from sandal wood trees in Dehra Dun, India, were submitted by P. N. Chatterjee on April 3, 1968. Diagnosis: No primary microbial pathogens were found, but microbial analysis revealed the potential pathogen, *Streptococcus*

faecalis, as well as a secondary invader, *Aerobacter* sp.

Pieris brassicae (L.)

2480—These specimens were submitted by R. A. Malik, Kashmir, India, on September 27, 1965. Diagnosis: Bacteriosis caused by *Streptococcus faecalis*.

2935—Larvae, pre-pupae, and pupae were received from O. S. Bindra, Ludhiana, India, on February 10, 1970. Diagnosis: Bacteriosis caused by the potential pathogen, *Streptococcus faecalis*.

Pieris rapae (L.)

2884—Two larvae of the alfalfa butterfly were submitted by J. M. Kolyer, Convent, New Jersey, on March 10, 1969. These larvae were from a laboratory culture which suffered extensive mortality. Diagnosis: Bacteriosis caused by *Serratia marcescens*.

Plutellidae*Abebaea subsylvella* (Walsingham)

2248—These specimens were submitted by W. Brooks, Berkeley, California, on April 7, 1964. The area had been sprayed with Malathion. Diagnosis: Toxicosis caused by Malathion.

Psychidae*Metisa plana* (Wlk.)

2262—Several dead larvae were submitted by B. J. Wood, Johore, Malaya, on May 13, 1964. Diagnosis: Bacteriosis caused by *Bacillus cereus*.

Oiketecus kirbyi (Guilding)

2371—Larvae of the banana bagworm were collected in La Estrella Valley by F. Lara E., Limon, Costa Rica, on March 24, 1965. Two of the specimens were collected before the area was treated with *Bacillus thuringiensis* and the rest were collected afterwards. Diagnosis: Bacteriosis caused by *Bacillus cereus* and *Streptococcus* sp. in the untreated specimens. Bacteriosis caused by *Bacillus thuringiensis* in the treated specimens.

2379—Additional specimens were collected in La Estrella Valley, Costa Rica, on March 17, 1965, by F. Lara E. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis*.

2389—These specimens from the Plantacion "San Jose," Buenos Aires, Argentina, were submitted by H. Stjernfalk on March 25, 1965. The area had been sprayed with Thuricide 90. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis*.

2422—These specimens were submitted by C. S. Stephens, Changuinola, Panama, on June 22, 1965. Diagnosis: Mycoses caused by *Beauveria bassiana* and *Aspergillus flavus*.

2567—One dead pupa was submitted by C. S. Stephens, Changuinola, Panama, on February 14, 1965. Diagnosis: Non-microbial.

2745—Two larvae were submitted by C. S. Stephens on April 20, 1967. Diagnosis: Virosis caused by a cytoplasmic polyhedrosis virus.

Oiketecus pratensis Berg

2763—Several larvae were submitted by I. S. de Crouzel, Buenos Aires, Argentina, on July 7, 1967. Diagnosis: Bacteriosis caused by a *Bacillus* sp.

Oiketecus sp.

2810—On February 26, 1968, four larvae of the banana bagworm were submitted by I. S. de Crouzel, Castelar, Argentina. Diagnosis: Bacteriosis caused by a *Bacillus* sp., with a secondary infection by a *Streptococcus* sp.

Pyalidae*Acrobasis tricolorella* (Grote)

2749—Several larvae were submitted by P. E. Boldt, East Lansing, Michigan, on May 5, 1967. Diagnosis: Non-microbial. Fungi present were a *Penicillium* sp., *Alternaria* sp., and a *Hormodendrum* sp. There was evidence of parasitism in a few specimens.

Chilotraea infuscatella (Snellen)

1942—A bacterial and fungal culture isolated from this pyralid were received from Wen-Yi-Cheng, Tainan, Taiwan, on September 12, 1962. Diagnosis: Bacteriosis caused by *Serratia marcescens* and mycosis caused by *Metarrhizium anisopliae*.

Desmia funeralis (Hübner)

2891—Several laboratory-reared larvae of the grape leaf roller were submitted by D. Brinkman, Berkeley, California, on April 1, 1969. Diagnosis: Protozoan infection caused by the schizogregarine, *Mattesia dispersa*.

Herculia nigrivitta (Walker)

1944—Five cultures isolated from this insect were submitted by Feng

Ying Cheng, Tainan, Taiwan, on September 12, 1962. Diagnosis: *Metarrhizium anisopliae*, *Serratia marcescens*, *Pseudomonas aeruginosa* and an unidentified yeast.

Mineola scitulella (Hulst.)

2681—Two specimens were received from P. Boldt, East Lansing, Michigan, on September 8, 1966. Diagnosis: Non-microbial but both were covered with saprophytic Dematiaceae.

Nacoleia diemenalis (Guen)

2402—These larvae were submitted by S. Rao, Selagor, Malaya, on May 10, 1965. Diagnosis: Virosis caused by granulosis virus. New record.

Nacoleia octasema (Meyrick)

2049 — Several laboratory-reared specimens were submitted by R. W. Paine, Honiara, British Solomon Islands, on May 2, 1963. Diagnosis: Probably non-microbial.

Sceliodes laisalis

2325—A single larva was submitted by T. V. Venketraman, Khartoum, Republic of the Sudan, on October 5, 1964. Diagnosis: Non-microbial.

Tryporyza incertulus (Walker)

2970—Three dead specimens of the rice stem borer collected in the Swat Valley and Kala Shah Kaku, Pakistan, were submitted by C. S. Koehler, Berkeley, California. Diagnosis: Mycosis caused by a *Fusarium* sp.

Tryporyza innotata (Walker)

2732—Two specimens of the white rice borer larvae were received from C. S. Li, Darwin, Australia, on March 3, 1967. Diagnosis: No primary pathogens present. Cause of death was probably from a Lindane treatment.

Pyraustidae

Ostrinia kasmirika

2979—Six laboratory-reared specimens were submitted by A. S. Atwal, Ludhiana, India. Diagnosis: Bacteriosis caused by *Serratia marcescens*.

Ostrinia nubialis (Hübner)

1883—These specimens were submitted by R. D. Frye, Fargo, North Dakota, on June 1, 1962. Diagnosis: Microsporidiosis caused by *Glugea pyraustae*.

Saturniidae

Antheraea assamensis (Helfer)

2969—Several dried pupae of the Muga silkworm were received on October 20, 1970, from J. N. Talukdar, Assam, India. The specimens were collected from Som plant (*Machilus odoratissima*) and Soalu plant (*Tetrathera monopetala*) near Assam, where about 20 per cent of the insect population was infected. Diagnosis: Microsporidiosis caused by a *Nosema* sp.

Antheraea eucalypti Scott

1907—One specimen was submitted by G. A. H. Helson, Wellington, New Zealand, on July 24, 1962. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Antheraea morosa Butler x *A. pernyi* (Guérin-Meneville)

2806—Two larvae of the above genetic cross were submitted by H. Flaschka, Atlanta, Georgia, on February 13, 1968. Diagnosis: Non-microbial.

Antheraea mylitta Drury

2881—An aqueous suspension of decomposed tissues from this tassar silkworm was submitted by M. S. Jolly, Ranchi, India, on February 25, 1969. Diagnosis: Microsporidiosis, caused by *Nosema bombycis*.

3022—Several larvae collected from

Terminalis tomentosa, were submitted by S. B. Mathad, Mysore, India. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

Antheraea polyphemus (Cramer)

1953—These laboratory reared specimens were submitted by R. D. Frye, Fargo, North Dakota, on September 25, 1962. Diagnosis: Undetermined. Possible bacteriosis caused by *Flavobacterium* sp.

Attacus ricini Pagenstecher

2566—Cultures were submitted by M. M. Altahtawy, Alexandria, U.A.R., on January 9, 1966. Diagnosis: Mycosis caused by *Aspergillus flavus*. Also present were *Aspergillus ochraceus* and *Aspergillus niger*.

2624—A fungal culture and vial of fungal spores were received from El-Sayed Megahed, Alexandria, U.A.R., on May 13, 1966. Diagnosis: *Aspergillus lutescens*. Tests against wax moth larvae were negative, however.

2625—Another fungal culture and vial of spores were received from M. Altahtawy on May 23, 1966. Diagnosis: Vial 1 (Agar Slant)—*Scopulariopsis* sp. Vial 2a—*Aspergillus flavus-oryzae* group which seems to be intermediate between *A. flavus* Link and *A. effusus*. 2b—*A. flavus-oryzae* group, closer to *A. parasiticus* than to any of the others. Tests against *Galleria* larvae gave negative results.

Automeris sp.

1962 — Several laboratory-reared specimens were submitted by B. O. C. Gardiner, Cambridge, England, on October 4, 1962. Diagnosis: Mycosis caused by *Beauveria bassiana*.

Coloradia pandora (Blake)

2354—G. Downing, Berkeley, California, submitted several specimens collected near Chemult, Oregon, on

February 9, 1965. Original specimens indicated a granulosis virus, but infectivity tests failed to confirm these results. Diagnosis: Inconclusive.

Dirphia amphimome (Fabricius)

2212—Several specimens collected in southern Chile were submitted by G. Olalquiaga, Santiago, Chile, on December 16, 1963. Diagnosis: Mycosis caused by *Entomophthora grylli*. New record.

Hemileuca maia (Drury)

1988—These specimens were submitted by A. D. Oliver, Baton Rouge, Louisiana, on December 10, 1962. Diagnosis: Bacteriosis caused by *Bacillus cereus*.

2046—Laboratory-reared specimens were again submitted by A. D. Oliver on April 27, 1963. Diagnosis: General bacterioses involving a mixture of coliform bacteria.

Hemileuca oliviae Cockerell

2957—Seven diseased larvae of the range caterpillar were received on July 27, 1970 from G. L. Nielsen, Las Cruces, New Mexico. The larvae were collected from snake weed and various grasses. Diagnosis: Bacteriosis caused by *Bacillus cereus*.

3009—Larvae collected from Bermuda grass at Las Cruces, New Mexico, were submitted by J. G. Watts on August 30, 1971. Diagnosis: Bacteriosis caused by *Bacillus cereus* and *Streptococcus faecalis*.

Hyalophora cecropia (L.)

1901 — Several laboratory-reared specimens of the cecropia moth were submitted by R. D. Frye, Fargo, North Dakota, on July 20, 1962. Diagnosis: Non-microbial.

2096—Laboratory-reared larvae were submitted by Warren R. Cothran, Ithaca, New York, on August 7, 1963. Diagnosis: Mycosis caused by *Aspergillus flavus*.

Fig. 28. Acc. No. 2772: Phase contrast of a double protozoan infection by a *Nosema* sp. and a *Thelohania* sp. in *Hyalophora cecropia*. *Nosema* spores (N); *Thelohania* pansporoblasts (T). Magnification = 800X.

2421—These laboratory-reared specimens were submitted by W. R. Harvey, Amherst, Massachusetts, on June 13, 1965. Diagnosis: Bacterioses caused by *Bacillus cereus* and *Pseudomonas aeruginosa*.

2596—Eggs were submitted by J. A. Haskell, Amherst, Massachusetts, on April 8, 1966. A thorough examination of triturated smears under phase and in Giemsa-stained preparations showed no apparent microbial etiology. Cultures set under both aerobic and anaerobic conditions from externally sterilized and triturated eggs gave negative results. Diagnosis: Non-microbial.

2772—Several dead larvae collected from apple leaves were received from S. Samuelson, Pleasantville, Iowa, on September 7, 1967. Diagnosis: Microsporidiosis caused by *Nosema* sp. (Dominant) and a *Thelohania* sp. (Fig. 28.)

2959—On August 17, 1970, six larvae were received from G. B. Black, Pleas-

antville, Iowa. These larvae were from a laboratory culture which had suffered considerable mortality. Diagnosis: Microsporidiosis caused by a *Nosema* sp.

2998—Two larvae were submitted by J. Lowry, Prairie Village, Kansas. Some of the specimens in his culture exhibited symptoms of diarrhea, but the two larvae submitted were evidently in good health, and examinations showed no pathogens. Diagnosis: Non-microbial.

2999—Three dead pupae and one larvae from the culture of G. B. Black, Pleasantville, Iowa, were submitted on July 12, 1971. Diagnosis: Non-microbial.

Hyalophora euryalus (Bdv.)

2426 — Several laboratory-reared specimens were submitted by W. M. Brooks, Berkeley, California, on June 29, 1965. Diagnosis: Bacteriosis caused by *Bacillus cereus*.

Hyalophora rubra (Behr.)

2825—Two laboratory-reared larvae were submitted by G. H. Flaschka, Atlanta, Georgia, on May 8, 1968. Diagnosis: Non-microbial.

Hylesia nigricans Berg

1961—B. O. C. Gardiner, Cambridge, England, submitted 14 larvae from his laboratory culture which was experiencing from 60 per cent to 100 per cent mortality. Diagnosis: Virosis caused by a nuclear polyhedrosis virus. This apparently is a new host record. (Fig. 29.)

Rothschildia orizaba (Westwood)

2007—These specimens from Mexico City were submitted by W. Brooks, Berkeley, California, on February 4, 1963. Diagnosis: Probably non-microbial.

Samia cynthia (Drury)

2452—These specimens were submitted from a laboratory culture by F. Maglio, Oakland, California, on August 6, 1965. Diagnosis: Non-microbial.

2803—A few deteriorated larvae were received from S. Samuelson, Pleasantville, Iowa, on May 21, 1968. Diagnosis: Non-microbial. Microbial analysis produced only a few saprophytic coliform bacteria.

2835—Additional larvae from *Ailanthus* were submitted by S. Samuelson on May 31, 1968. Diagnosis: The specimens were infected by a *Streptococcus* sp. and other secondary coliform bacteria. Any possible primary microbial etiology had been obscured by the action of these secondary invaders.

Sphingidae

Herse convolvuli (L.)

2324—A single larva was submitted by T. V. Venketraman, Khartoum, Republic of the Sudan, on October 5, 1964. Diagnosis: Probable bacteriosis caused by *Bacillus cereus*.

Manduca sexta (Johann.)

2744—One larva was submitted by M. W. McFadden, Oxford, North Carolina, on April 25, 1967, requesting confirmation of possible cytoplasmic polyhedrosis. Diagnosis: A check for cytoplasmic polyhedrosis and other viruses was negative.

Pachyspinx modesta (Harris)

1954—Laboratory-reared specimens were submitted by R. D. Frye, Fargo, North Dakota, on September 25, 1962. Diagnosis: Undetermined. *Flavobacterium* sp. was present, but its relationship to the insect is unknown.

Protoparce quinque maculata (Haw.)

3001—One dead larva from the controls of a laboratory experiment with *Bacillus thuringiensis* was submitted on July 27, 1971 by D. Pinnock, Berkeley, California. Diagnosis: Bacteriosis caused by *Pseudomonas aeruginosa*.

Protoparce sexta (Johannson)

1834—These specimens were submitted by R. L. Rabb, Raleigh, North Carolina, on January 17, 1962. Diagnosis: Bacteriosis caused by *Clostridium saprogenes* and *Bacillus cereus*.

2403—Several larvae collected in Florence, South Carolina, were submitted by S. D. Carlson, Blacksburg, Virginia, on May 12, 1965. Diagnosis: Probably non-microbial with *Penicillium* sp., *Rhizopus* sp., and *Streptococcus* sp. as secondary invaders.

Hornworm

2414—Several dead larvae were submitted by S. D. Carlson, Blacksburg, Virginia, on June 7, 1965. The larvae were field-collected and then stored under refrigeration. Diagnosis: Bacteriosis caused by *Bacillus cereus*, *Streptococcus faecalis*, and a *Proteus* sp.

2545—One dead, deteriorated spec-

Fig. 29. Acc. No. 1961: Electron micrographs of a nuclear polyhedrosis virus from *Hylesia nigricans*. **A**: Polyhedra. Magnification = 10,500X. **B**: Dissolved polyhedron showing included virus rods (arrows). Magnification = 19,000X.

imen was submitted by R. L. Rabb, Raleigh, North Carolina, on December 15, 1965. Diagnosis: Bacteriosis: mainly *Pseudomonas aeruginosa*.

Syntomidae

Ceramidia muscicola (Ckll)

2440—Several specimens were submitted by F. Lara E., Limon, Costa Rica, on July 28, 1965. Diagnosis: Mycosis caused by *Aspergillus flavus* and a secondary, saprophytic *Penicillium* sp.

2637—Eight specimens were received from F. Lara E. on June 21, 1966. Diagnosis: Bacteriosis caused by *Streptococcus faecalis* var. *liquefaciens*.

2753—Several more pupae and larvae were submitted by F. Lara E. on May 29, 1967. Diagnosis: Bacteriosis caused by *Bacillus cereus* and *Micrococcus conglomeratus*.

Tineidae

Nephantis serinopa (Meyrick)

2098—A number of clothes moth larvae were submitted by U. Ekanayake, Lunuwila, Ceylon, on August 9, 1963. They had been treated with Bakthane L-39, a commercial *Bacillus thuringiensis* preparation. Diagnosis: Bacteriosis caused by *Bacillus thuringiensis*.

Tineola biselliella (Hummel)

2598—Several laboratory-reared larvae were submitted by H. Laudani, Savannah, Georgia, on April 18, 1966. Diagnosis: Possible polyhedrosis virus in one larva.

Tortricidae

Archips argirospilus (Walker)

2991—One dead larva collected from red bud was submitted by D. Pinnoek, Berkeley, California, on May 19, 1971. Diagnosis: Virosis caused by a granulosis virus.

Choristoneura fumiferana (Clemens)

2277—Several laboratory-reared specimens of the spruce budworm were submitted by G. Downing, Berkeley, California, on June 18, 1964. Rearing conditions were humid. Diagnosis: Mycosis caused by *Beauveria bassiana*.

2301—Some specimens were submitted by B. Barr, Berkeley, California, on July 22, 1964. The larvae were reared on an artificial diet in conditions of high humidity. Diagnosis: Bacteriosis caused by *Serratia marcescens*.

2451—Several spruce budworm larvae were submitted by G. Downing, Berkeley, California, on August 5, 1965. Diagnosis: Mycosis caused by *Beauveria bassiana*.

2635—Several larvae were received from R. L. Lyon on June 16, 1966. Diagnosis: Non-microbial. Mortality probably due to abnormally long diapause in cold storage.

2733—Several additional larvae were received from R. L. Lyon on March 6, 1967. Diagnoses: Virosis caused by a granulosis virus.

2738—Several larvae were submitted by C. Richmond, Berkeley, California, on April 17, 1967. Diagnosis: Virosis caused by a granulosis virus.

2756—Several more larvae were submitted by C. Richmond on June 28, 1967. Diagnoses: Viroses caused by a nuclear polyhedrosis and a granulosis. Also *Beauveria bassiana* in one case. (Fig. 30.)

2814—R. L. Lyon, Berkeley, California, submitted several larvae of the spruce budworm on March 22, 1968. Diagnosis: Three showed no microbial etiology and one showed a microsporidian infection caused by *Glugea fumiferanae*.

2837—On June 4, 1968, R. L. Lyon submitted more spruce budworm larvae from his laboratory cultures. Diagnosis: Non-microbial.

Fig. 30. Acc. No. 2756: Phase-contrast micrograph of a sporulating culture of *Beauveria bassiana* isolated from *Choristoneura fumiferana*. Note typical zigzag phialide (arrow). Magnification = 800X.

2907—R. L. Lyon again submitted several larvae from his laboratory cultures on August 20, 1969. Diagnosis: Non-microbial.

2975—Several laboratory-reared pupae and larvae were submitted by R. L. Lyon, Berkeley, California, on December 12, 1970. Diagnosis: Non-microbial.

Choristoneura occidentalis Freeman

2762—On July 24, 1967, several specimens were submitted by C. Richmond, Berkeley, California. The specimens had been collected in the Bitter-root Mountains of Idaho. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2870—One larva from the laboratory culture of R. L. Lyon was submitted on November 6, 1968. Diagnosis: Mycosis caused by *Aspergillus flavus*.

2903—On July 23, 1969, two pupae

and ten larvae were submitted by J. R. Milodragovich, Missoula, Montana. The specimens had been collected in the Blackfoot River drainage near Missoula. Diagnosis: Virosis caused by a nuclear polyhedrosis virus.

2918—Eggs and first instar larvae on an artificial medium were submitted by R. L. Lyon, Berkeley, California, on September 24, 1969. Diagnosis: Non-microbial.

Choristoneura pinus Freeman

2811—Four larvae of the jack pine budworm were submitted by R. L. Lyon, Berkeley, California, on February 28, 1968. The larvae were from field-collected stock reared in the laboratory. Diagnosis: Non-microbial.

Pandemis heparana (Schiff)

2368—These larvae were submitted by T. Edland, Vollebakk, Norway, on

March 16, 1965. Diagnosis: Secondary bacteriosis caused by *Streptococcus* sp.

Pandemis ribeana (Hübner)

2367—Additional larvae were submitted by T. Edland on March 16, 1965. Diagnosis: Secondary bacteriosis caused by *Aerobacter* grp. C.

Platynota rostrana (Walker)

2378—These specimens were submitted by F. Lara E., Limon, Costa Rica. They were collected in La Estrella Valley on March 2, 1965. Diagnosis: Parasitism by a Chalcid wasp.

2441—Additional specimens were submitted by F. Lara E. on July 28, 1965. Diagnosis: Possible mycosis caused by *Fusarium* sp. with secondary invasion by acarid mites.

Zygaenidae

Argyrotaenia velutinana (Walker)

2767—Several larvae and pupae of the red banded leafroller were submitted by G. C. Rock, Raleigh, N.C., on August 14, 1967. Diagnosis: Non-microbial.

Unidentified

2029—One specimen was submitted by R. C. Hunter, Buga, Valle, Colombia, on March 18, 1963. Diagnosis: Mycosis caused by *Beauveria bassiana*.

2207—Several larvae were submitted by D. McKay, St. Petersburg, Florida, on December 11, 1963. Diagnosis: Non-microbial.

2223—Some specimens were submitted by J. Powell, Berkeley, California, on January 31, 1964. Diagnosis: Non-microbial.

(Possibly Cankerworm)

2298—One specimen was received from J. D. Stein, Fargo, North Dakota, on July 10, 1964. Diagnosis: Parasitism.

2304—One specimen collected in Blodgett Forest, California, was submitted by R. Stark, Berkeley, California, on July 24, 1964. Diagnosis: Non-microbial; mechanical damage.

2392—Two larvae were collected at Kahua Ranch, Wiameakohala, Hawaii, by Y. Tanada on April 22, 1965. Diagnosis: Mycosis caused by *Beauveria bassiana*.

2411—A single larva was submitted by J. Hoy, Berkeley, California, on June 1, 1965. Diagnosis: Microsporidiosis possibly caused by a *Nosema* sp.

2444—These specimens were submitted by F. Lara E., Limon, Costa Rica, on July 28, 1965. The extent of disease outbreak was over 90 per cent. Diagnosis: Primary etiology was obscured by the action of acarid mites.

2571—One dead specimen was submitted by J. Powell, Berkeley, California, on March 2, 1966. Diagnosis: Bacteriosis caused by *Streptococcus faecalis* with the secondary invaders *Aerobacter* sp. and *Escherichia coli*.

Unidentified tip moth

2899—Two larvae of a tip moth collected at Blodgett Forest, California, were submitted on July 1, 1969 by R. Stark, Berkeley, California. Diagnosis: Non-microbial.

NEUROPTERA

Chrysopidae

Chrysopa carnea Stephens

2425 — Several laboratory-reared specimens were submitted by Mr. Tasan, Berkeley, California, on June 28, 1965. Diagnosis: Bacterioses caused by *Streptococcus faecalis* and *Serratia marcescens*.

2879—Several adults of this lacewing were submitted by R. Tassan, Albany, California, on January 24, 1969. Diagnosis: Microsporidiosis caused by *Plistophora californica*.

Chrysopa vittata Wesmael

2765—One pupa was submitted by P. H. Thompson, New Brunswick, New Jersey, on July 31, 1967. Diagnosis: Bacteriosis caused by *Bacillus cereus*, with *Aerobacter* sp. as a secondary invader.

Chrysopa zastrowi

3029—Larvae of this lacewing were submitted by S. W. Broodryk, Pretoria, South Africa, on November 19, 1971. These were from cultures where mortality reached as high as 50 per cent. Diagnosis: Probably non-microbial, with secondary invasion in some by *Bacillus cereus*.

Chrysopa sp.

1926—Several specimens were submitted by C. A. Toschi, Berkeley, California, on August 10, 1962. Diagnosis: Non-microbial.

2776—A few adults were submitted by K. Hagen, Berkeley, California, on October 4, 1967. Diagnosis: Bacteriosis caused by the potential pathogen *Streptococcus faecalis* var. *liquefaciens*.

Meleoma cavifrons (Banks)

1987—These specimens were submitted by C. A. Toschi, Berkeley, California, on December 7, 1962. They were field-collected and reared in the laboratory. Diagnosis: Non-microbial.

Meleoma delicata Banks

2563—Several dead specimens were submitted by C. A. Toschi, Berkeley, California, on February 9, 1966. Diagnosis: Secondary bacteriosis caused by *Aerobacter* sp. Cause of death was probably non-microbial.

Hemerobiidae

Unidentified (brown lacewing)

1927—One specimen collected at Sagehen Creek, California, was sub-

mitted by C. A. Toschi, Berkeley, California, on August 10, 1962. Diagnosis: Parasitism.

ORTHOPTERA**Acrididae***Aealoplus turnbulli* (Thomas)

1928—One specimen was submitted by R. Pfadt, Laramie, Wyoming, on August 13, 1962. Diagnosis: Mycosis caused by *Entomophthora grylli*.

Aularches miliaris (L.)

1937 — Several laboratory-reared specimens were submitted by B. Mek-songsee, Bangkok, Thailand, on September 4, 1962. Amoeba-like bodies were isolated from the body cavity, but infectivity tests were negative. Diagnosis: No definite pathogen found.

Aulocara elliotti (Thomas)

1910—Two specimens were submitted by R. Pfadt, Laramie, Wyoming, on July 30, 1962. Diagnosis: Non-microbial.

1929—Additional specimens were submitted by R. Pfadt on August 13, 1962. Diagnosis: Non-microbial.

Chorthippus curtipennis (Harris)

2955—Several specimens of this grasshopper were submitted by W. J. Loher, Berkeley, California, on July 10, 1970. The specimens were collected from San Bruno Mt., California, for experimentation. Diagnosis: Probably non-microbial.

Dendrotettix quercus Pck.

2800—Several fungus cultures isolated from this grasshopper were received from H. Coppel, Madison, Wisconsin, on January 22, 1968, with a request for their identification. Diagnosis: Non-sporulating Hyphomycete, a non-sporulating Dematiaceae; two species of *Fusidium*, two Ascomycete

cultures near *Thielavia* and a *Verticillium* sp.

Hieroglyphus banian (Fabricius)

1936—On September 4, 1962, 10 grasshoppers were received from B. Meksongsee, Bangkok, Thailand. They had been collected from corn plants in the Lopburi Province of Thailand, where they were being killed by an epizootic. Diagnosis: Mycosis caused by *Entomophthora grylli*. This is a new host record for this fungus.

Melanoplus bivittatus (Say)

1902—Two adults were submitted by R. D. Frye, Fargo, North Dakota, on July 20, 1962. Diagnosis: Mycosis caused by *Entomophthora grylli*.

Melanoplus occidentalis (Thomas)

1912—A single specimen was submitted by R. Pfadt, Laramie, Wyoming, on July 30, 1962. Diagnosis: Non-microbial.

Patanga succincta (L.)

2185—Ten adult females from the Taklee District, Nakorn-Sawan Province, Thailand, were submitted by B. Meksongsee, Bangkok, Thailand, on October 16, 1963. The disease appeared to be of epizootic proportions. Diagnosis: Mycosis caused by *Entomophthora grylli*.

Schistocerca gregaria (Forsk.) and *S. vaga* Brun.

2514—Several dead specimens of both species were submitted by J. Caraco, Berkeley, California, on November 18, 1965. All the specimens but one had been preserved. Examination of the ventilating system in the rearing facilities showed a direct connection to animal-rearing rooms where insecticides were routinely used. Moving the grasshopper cultures to other quarters solved the problem. Diagnosis: Toxicosis.

Schistocerca gregaria (Forsk.)

2754—Three adults were submitted by a locust entomologist from Bikaner (Rajasthan), India, on June 5, 1967. Diagnosis: Bacteriosis caused by *Pseudomonas aeruginosa*.

2986—Eight adult desert locusts were submitted by M. V. Venkatesh, Bikaner, India, on April 26, 1971. The locusts had been reared in the laboratory on cauliflower leaves and 50 per cent of the colony had become infected. Diagnosis: Bacteriosis caused by *Bacillus cereus*.

Schistocerca obscura Brun.

2912—Two adult grasshoppers were received from W. G. Genung, Belle Glade, Florida, on September 8, 1969. Diagnosis: Microsporidiosis caused by *Nosema locustae*.

Grillidae

Acheta domesticus (L.)

2183—Three adults were submitted by P. C. Stone, Columbia, Missouri, on October 8, 1963. Diagnosis: Bacteriosis caused by *Bacillus cereus*.

Phasmatidae

Anchiale majalis

2974—Ten eggs of this walking stick were submitted by G. O. Bedford, Keravat, New Guinea. The eggs were mummified by a fungus. Diagnosis: Mycosis caused by *Aspergillus flavus*.

Didymuria violescens (Leach)

2719—Many eggs were received from J. L. Readshaw, Albury, New South Wales, Australia, on January 12, 1967. Diagnosis: Mycosis caused by *Paecilomyces farinosus*.

Tettigoniidae

Cordillacris occipitalis (Thomas)

1911—Four adults were submitted by R. E. Pfadt, Laramie, Wyoming, on July 30, 1962. Diagnosis: Non-microbial.

Tryxalidae*Dichromorpha viridis* Scud.

2923—On October 27, 1969, several adult grasshoppers were received from

W. G. Genung, Belle Glade, Florida. Diagnosis: Mycosis caused by *Entomophthora grylli*.

Arachnida**ACARINA****Ixodidae***Amblyomma tuberculatum* (Marx)

2437—Two adult females of the gopher-tortoise tick from Junction City, Georgia, were submitted by J. C. Cooney, Auburn, Alabama, on July 26, 1965. Diagnosis: Non-microbial.

Unidentified

2533—Many dead specimens in a glass jar were submitted by D. McKay, St. Petersburg, Florida, on November 15, 1965. Diagnosis: Non-microbial.

Tetranychidae*Panonychus ulmi* (Koch)

2856—Eggs and immatures of the European red mite were submitted by G. C. Rock, Raleigh, North Carolina, on August 27, 1968. They were collected at Jackson Springs, North Carolina, on August 8, 1968, from apple. Diagnosis: Non-microbial.

Tetranychus cinnabarinus (Boisd.)

2380—These specimens were submitted by H. N. Plaut, Haifa, Israel, on March 31, 1965. Diagnosis: Non-microbial.

2676—Numerous more specimens were received from H. N. Plaut, Haifa, Israel, on August 19, 1966. Diagnosis: Mycosis caused by an *Entomophthora* sp.

2872—Several mites were received from H. N. Plaut, Haifa, Israel, on December 2, 1968. Diagnosis: Possible rickettsiosis. The submitted material was rather deteriorated, but electron microscope studies indicated a possible rickettsial infection.

Tetranychus cinnabarinus Boisdual & *T. urticae* (Koch)

2968—These mites were collected from bean plants near Haifa, Israel, and submitted by H. N. Plaut on September 21, 1970. The specimens were mixed in a single vial. Diagnosis: Mycosis caused by an *Entomophthora* sp.

Tetranychus pacificus McG.

2915—A few adults of the Pacific mite from grape leaves were submitted by M. Hoy, Reedley, California, on September 15, 1969. Diagnosis: Non-microbial.

Tetranychus urticae (Koch)

2386—A single mite was submitted by A. Ota, Berkeley, California, on April 9, 1965. The specimen was reared at a temperature of 86°F with continuous light. Diagnosis: Bacteriosis caused by *Pseudomonas aeruginosa*.

2802—Many adults of the two spotted red mite enclosed in a mat of fungus were submitted by T. Kono, Sacramento, California, on January 22, 1968, with a request for the identification of the fungus. Diagnosis: The fungus was identified as a *Cladosporium* sp. which had physically trapped the mites in a mass of mycelium, but examination showed no invasion of the mites by the fungus.

Unidentified

2176—Several fungal slides and some specimens were submitted by A. L. Morehart, Newark, Delaware, on October 2, 1963. Diagnosis: Mycosis caused by *Entomophthora* sp.

Trombiculidae*Vatacarus ipoides* (Southcott)

2250 — Several laboratory-reared specimens were submitted by F. J. Radovsky, San Francisco, California, on April 14, 1964. Diagnosis: Probably rickettsia with a mycosis caused by *Entomophthora* sp. This is a new host and pathogen record.

Unidentified

1923—This specimen was submitted by D. E. Shaw, Papua, New Guinea, on August 8, 1962. Diagnosis: Mycosis caused by a *Gibellula* sp. near *Gibellula leiopus*.

3010—On August 13, 1971, several unidentified mites were submitted by C. M. Searle, Mazoe, Rhodesia. Diagnosis: Mycosis caused by a *Hirsutella* sp.

3025—Several mites were again submitted by C. M. Searle, Mazoe, Rhodesia, on November 8, 1971. Diagnosis: Mycosis caused by a fungus which was not viable and could not be identified.

ARANEIDA**Unidentified spider**

1924—A single specimen on a leaf of *Coffea arabica* was submitted by J. J. H. Szent-Ivány, Konedobu, Papua, New Guinea, on August 9, 1962. Diagnosis: Mycosis caused by *Gibellula araneorum*. A new area record for this fungus. (Fig. 31.)

2924—Two adult spiders were submitted by F. Ennik, Berkeley, California, on November 5, 1969. Diagnosis: Non-microbial.

Crustacea**ISOPODA****Armadillidiidae***Armadillidium vulgare* (Latreille)

2932—Several specimens of this sow bug were submitted by O. Paris, Berkeley, California, on December 30, 1969. Diagnosis: Mycosis caused by an *Entomophthora* sp.

CIRRIPEDIA**Family Unknown***Elimnius modestus*

2225—Four dead barnacles pre-

served in alcohol were submitted by J. T. Tomlinson, Kaikoura, New Zealand, on January 25, 1964. Diagnosis: infection by the algae *Rhodophyceae bangiaceae* and *Neevea* sp.

DECAPODA**Atyidae**

Crayfish

2664—Many dead specimens from Robbins, California, were submitted by M. D. Miller, Davis, California, on August 2, 1966. Diagnosis: Non-microbial.

Symphyla**CEPHALOSTIGMATA****Scutigerellidae***Scutigerella immaculata* (Newport)

1847—A fungus culture and stained whole mount of the garden symphylan were submitted by L. W. Getzin, Puyallup, Washington, on March 9, 1962. Diagnosis: Mycosis caused by *Ento-*

mophthora coronata. A new host and area record for this fungus.

2259—An agar slant containing a fungus isolated from this garden symphylan was submitted by L. W. Getzin, Puyallup, Washington, on May 5, 1964. Diagnosis: *Metarrhizium anisopliae*. New record.

Fig. 31. Acc. No. 1924: Spider infected with *Gibellula araneorum*. **A:** Infected spider on leaf. Note synnemata of the fungus (arrows). Magnification = 6X. **B:** Single synnematium of the fungus showing sporophores with spore masses (arrows). Magnification = 20X.

ANNELIDA

Oligochaeta

OPISTHOPORA

Lumbricidae

Lumbricus sp.

1861—Several lots of earthworms were submitted by E. Long, Savannah, Tennessee, on March 11, 1962. Diagnosis: There was some evidence of a possible virosis, however, this was not definitely confirmed.

2010—These specimens from commercial worm beds were submitted by H. Stiegler, Humboldt, Tennessee, on February 8, 1963. Healthy worms were submitted and there seemed to be no mortality. Diagnosis: No disease found.

2020—These specimens were collected from commercial worm beds and submitted by E. Long, Savannah, Tennessee, on February 25, 1963. The specimens appeared to be healthy. Diagnosis: Inconclusive. Spherical particles, about 30 millimicrons in diameter, were found in electron microscope preparations from supposedly diseased worms. However, further examination showed the same particles present in healthy worms. No other possible pathogens were found.

Unidentified earthworms

2031—These specimens were collected from commercial worm beds and submitted by H. Stiegler, Humboldt, Tennessee, on March 23, 1963. Diagnosis: Undetermined.

2041—These specimens were collected from commercial worm beds and submitted by H. V. Dunnegan, Kingsburg, California, on April 12, 1963. Diagnosis: Undetermined.

1940—These specimens from Kamuela, Hawaii, were submitted by Y. Tanada, Berkeley, California, on September 10, 1962. Diagnosis: Cause of death unknown, but may have been due to the dry condition of the turf.

2787—Some earthworms were received from D. C. Knutson, Bloomfield, New Mexico, on November 20, 1967. Diagnosis: Non-microbial. Several rather common soil bacteria were isolated, including *Aerobacter* sp. *Pseudomonas aeruginosa*, *Shigella paradyserteriae*, *Bacillus cereus*, *Salmonella paratyphi A*, *Corynebacterium* sp., and *Klebsiella pneumoniae*.

PLESIOPORA

Enchytraeidae

Enchytraeus fragmentosus (Bell)

1864—Several specimens were submitted from both axenic and xenic cultures by E. C. Dougherty, Berkeley, California, on April 18, 1962. Diagnosis: Possible virosis.

1894—More laboratory-reared worms were submitted in axenic culture tubes by E. C. Dougherty on June 27, 1962. It was found that tumors would occur on the specimens when excessive moisture was present on the tubes. Numerous bodies resembling immature worms or vermiform bodies were present. Diagnosis: No microbial cause of death was determined.

1898—Additional specimens from axenic cultures were submitted by E. C. Dougherty on July 19, 1962. Diagnosis: Examination revealed virus-like particles, but identification beyond this was not possible.

MICROORGANISMS

Microbial Cultures

2914—Eight microbial cultures on agar slants were received on September 9, 1969, from G. McClure, Yonkers, New York. The microorganisms were from a study to identify bacteria and fungi associated with pesticide degradation. Those submitted had been isolated from a medium containing iso-

propyl-N-phenyl carbamate as the sole source of carbon. Diagnosis: The microorganisms were identified as follows: *Fusarium solani* var. *minus*, *Pseudomonas aeruginosa*, four species of *Corynebacterium*, *Penicillium stoloniferum*, *Alcaligenes* sp., *Salmonella* sp. nr. *paratyphi*; and an Actinomycete.

Schizomycetes

EUBACTERIALES

Bacillaceae

Bacillus thuringiensis Berliner

2391—Contaminated cultures of *Bacillus thuringiensis* were submitted by H. D. Burges, Slough, Bucks, England, on April 19, 1965. Diagnosis: Bacterium identified as *Pseudomonas aeruginosa*.

PSEUDOMONADLES

Pseudomonadaceae

Pseudomonas aeruginosa (Migula)

2656—A wet mount of this bacterium was submitted by P. Messenger, Berkeley, California, on July 27, 1966. Diagnosis: This bacterium is not considered a primary insect pathogen, but is placed in the category of a potential pathogen. It has no invasive powers of its own, but readily causes a fatal septicemia when it gains entrance into the hemocoel.

CHORDATA CRANIATA

Aveas

NEOGNATHA

Chicken Egg

2942—One chicken egg containing a nematode was submitted by A. Ana-

walt, San Anselmo, California, on March 23, 1970, with a request for the identification of the nematode. Diagnosis: *Ascaridia galli*.

LITERATURE CITED

BREWER, JO and G. M. THOMAS

1966. Causes of death encountered during rearing of *Danaus plexippus* (Danaiidae). J. Lepid. Soc. 20 (4):235-38.

DAHLSTEN, D. L. and G. M. THOMAS

1969. A nucleopolyhedrosis virus in populations of the Douglas fir tussock moth, *Homocampa pseudotsugata*, in California. J. Invert. Pathol. 13 (2):264-71.

STEINHAUS, E. A.

1951. Report on diagnoses of diseased insects 1944-1950. Hilgardia 20 (22):629-78.

STEINHAUS, E. A. and G. A. MARSH

1962. Report of diagnoses of diseased insects 1951-1961. Hilgardia 33 (9):349-90.

THOMAS, G. M. and A. LUCE

1972. An epizootic of chalk brood, *Ascosphaera apis* (Massen ex Claussen) Olive and Spiltoir in the honeybee, *Apis mellifera* L. in California, American Bee J. 112 (3):88-90.

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