

1977

Florida Technological University College of Natural Sciences research activities, July 1, 1976-June 30, 1977

Florida Technological University. College of Natural Sciences

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F L O R I D A T E C H N O L O G I C A L U N I V E R S I T Y

C O L L E G E O F N A T U R A L S C I E N C E S

R E S E A R C H A C T I V I T I E S

July 1, 1976

through

June 30, 1977

Florida Technological University

College of Natural Sciences

P. O. Box 25000

Orlando, Florida 32816

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I N T R O D U C T I O N

It is a pleasure for me to present this summary of the research activities of the faculty of the College of Natural Sciences during the 1976-1977 fiscal year. New research funded during this period totaled \$666,583, which is a 4.6 percent increase over the preceding year.

Much of the research described herein resulted in the publication of scientific papers and/or reports, and these are listed in the final section of this document. When these publications are considered in conjunction with the numerous presentations made at various professional meetings, symposia, etc., it is clear that the faculty have again represented Florida Technological University in an outstanding manner.

Also, as has been true every year since the University began, faculty involvement in community affairs and public service ventures has been extensive, and the faculty are to be commended for their participation in this important effort.

Bernard Ostle
Dean

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES

TITLE: Threatened and Endangered Species of the Kennedy Space Center, Section VI of
A continuation of base-line studies for environmentally monitoring space transportation systems (STS) at John F. Kennedy Space Center.

PRINCIPAL INVESTIGATOR: L. M. Ehrhart

SPONSORING AGENCY: NASA

GRANT NO.: 101220006

A B S T R A C T

The programs are providing NASA/KSC with consultation, awareness and evaluation of matters relating to the Endangered Species Act of 1973. There is a special focus on the sea turtle rookery on KSC beaches and on the populations of sea turtles in the lagoons surrounding KSC. Other threatened and endangered species are also being studied. These include especially the raptors and wading birds.

* * * * *

TITLE: The Gordon J. Barnett Professorship of Environmental Science

PRINCIPAL INVESTIGATOR: L. M. Ehrhart

SPONSORING AGENCY: The Gordon J. Barnett Foundation

GRANT NO.: 181210002

A B S T R A C T

The Gordon J. Barnett Professor undertakes a program of work of personal interest to him which will enhance and increase public and student awareness of environmental problems, and will encourage their participation and continued efforts in seeking solutions to these problems.

* * * * *

TITLE: Aquatic Swales

PRINCIPAL INVESTIGATOR: Robert Nash Gennaro and M. P. Wanielista

SPONSORING AGENCY: STAR - 76 (State Board of Regents)

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

GRANT NO.: 111620003

A B S T R A C T

The purpose of the research is to determine the fate of heavy metals and hydrocarbons along the highway. Results from this project will be used to determine whether the swales should be wet or dry in order to best protect our aquatic environment.

* * * * *

TITLE: Assay of Enteric Viruses in Injection Well Samples

PRINCIPAL INVESTIGATORS: Rudy J. Wodzinski and Robert Nash Gennaro

SPONSORING AGENCY: Department of Environmental Regulation,
State of Florida

GRANT NO.: 111220005

A B S T R A C T

Five injection well samples from Pompano Beach, Florida, were assayed for enteric viruses. No enteric viruses were detected. A final report to the supporting agency was submitted December 4, 1976.

* * * * *

TITLE: Detection of Viruses in Environmental Samples

PRINCIPAL INVESTIGATORS: Robert Nash Gennaro and Rudy J. Wodzinski

SPONSORING AGENCY: WED Enterprises

GRANT NO.: 181220016

A B S T R A C T

This project was initiated December 1976. Sixteen samples have been partially processed. An interim quarterly report was submitted April 4, 1977.

* * * * *

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

TITLE: R. G. Thompson Summer Research Fellowships
PRINCIPAL INVESTIGATOR: David T. Kuhn
SPONSORING AGENCY: American Cancer Society, Florida Division
GRANT NO.: 181220016

A B S T R A C T

Two undergraduate premedical students were given the opportunity to pursue cancer related research for the summer of 1976.

* * * * *

TITLE: Biochemistry of the tumorous-head phenotype in D. melanogaster.
PRINCIPAL INVESTIGATOR: David T. Kuhn
SPONSORING AGENCY: Division of Sponsored Research

A B S T R A C T

Enzymatic alterations were investigated for the homeotic mutations "tumorous-head," "engrailed," and the "bithorax" series in D. melanogaster. Gross enzymatic abnormalities were documented as well as tissue specific abnormalities. Tissue specific abnormalities were confined to rigidly defined developmental compartments.

* * * * *

TITLE: Aldehyde oxidase distribution in eye imaginal discs from tumorous-head larvae from D. melanogaster.
PRINCIPAL INVESTIGATOR: David T. Kuhn
SPONSORING AGENCY: Division of Sponsored Research
GRANT NO.: 182000048

A B S T R A C T

Frequency and position of the aldehyde oxidase distribution in otherwise normal aldehyde oxidase negative tumorous-head eye discs were investigated. About 65 percent of the larvae demonstrated the abnormality. Distribution of the enzyme is confined to precise and predictable areas reminiscent of developmental compartments.

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

TITLE: Faculty Development Leave
PRINCIPAL INVESTIGATOR: Harvey A. Miller
SPONSORING AGENCY: Florida Technological University

A B S T R A C T

Leave was granted to learn the basics of electron microscopy in order to employ them in research and teaching by utilizing existing facilities at Florida Technological University. Training was accomplished at the Electron Microscope Center of Washington State University in Pullman. Two papers, one each in Transmission and Scanning Electron Microscopy are in final preparation.

* * * * *

TITLE: Protonematal Differentiation in Mosses
PRINCIPAL INVESTIGATOR: Harvey A. Miller
SPONSORING AGENCY: Institutional Grants for Science
GRANT NO.: 182000019

A B S T R A C T

This project was continued through the summer and into the fall of 1976 with culturing and observation of early developmental stages of numerous species of mosses previously unstudied. Some of this material was used for electron microscopy with success in that we found a very high abundance of plasmodesmata far exceeding two previous reports on totally unrelated species.

* * * * *

TITLE: Editor, Florida Scientist
PRINCIPAL INVESTIGATOR: Harvey A. Miller
SPONSORING AGENCY: Florida Academy of Sciences, Inc.
GRANT NO.: 181220011

A B S T R A C T

Editing of the Florida Scientist, quarterly journal of the Florida Academy of Sciences, has continued with a full year of issues released. In addition, under terms of this grant, I have been named Executive Secretary of the Florida Academy of Sciences for an indefinite term. I have retired from the editorship effective with the end of 1977.

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

TITLE: Flavonoid Phytochemistry Among Mosses
PRINCIPAL INVESTIGATOR: Harvey A. Miller and Roseann S. White
SPONSORING AGENCY: Institutional Grants for Science
GRANT NO.: 182000053

A B S T R A C T

This project was funded late in 1976 and is not completed but the significant progress to date includes: isolation of numerous populations of mosses for extraction and analysis of flavonoid and related phenolic compounds; construction and use of two paper chromatography chambers for use in our analytical work; preliminary determinations of several compounds of interest; and start on preparation of a paper to be given in August at the national meetings of the American Institute of Biological Sciences.

* * * * *

TITLE: Management of emergent and submergent aquatic vegetation in storm runoff retention ponds using the grass carp.
PRINCIPAL INVESTIGATOR: John A. Osborne
SPONSORING AGENCY: Florida Department of Natural Resources
GRANT NO.: 111220003

A B S T R A C T

Nutrient removal by nine species of emergent, submergent, and floating leaved aquatic plants were monitored in three 0.33 acre ponds on the campus of Florida Technological University. Water chemistry, zooplankton, benthos, and small fishes were studied in the ponds and compared to a pond containing no vegetation. White Amur were stocked in two of the three ponds containing vegetation. Growth rates for the fish were noted in December. No statistical difference was found between ponds for water chemistry parameters, zooplankton, benthos, or pelagic algae. The White Amur feed on several species of vegetation, principally cattails, pickerel weed, panic grass, eelgrass, and Brazilian Elodea. The rate of vegetation removal was related to stocking rate of the fish.

* * * * *

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

TITLE: Ground Truth Measurements of Hydrilla verticillata Royle and those factors influencing underwater light penetration to coincide with remote sensing and photographic analysis in Florida lakes.

PRINCIPAL INVESTIGATOR: John A. Osborne

SPONSORING AGENCY: Florida Department of Natural Resources

GRANT NO.: 111220004

A B S T R A C T

A reliable and accurate method for estimating the standing crop of Hydrilla verticillata Royle has been developed for the first time in Florida or elsewhere. The hydrilla biomass sampler was used to (1) obtain data from Lake Martha to coincide with remote sensing procedures, conducted by NASA, for determining aerial biomass from photographs. No correlation between IMAGE 100 signatures (from aerial photographs) and "ground truth" biomass with the hydrilla sampler was determined. Thus, aerial photography is not adequate for determining underwater plant biomass in a lake.

* * * * *

TITLE: Aquatic Plant Research

PRINCIPAL INVESTIGATOR: John A. Osborne

SPONSORING AGENCY: NASA/Kennedy Space Center

GRANT NO.: 101220005

A B S T R A C T

The scope of this project was to direct an ongoing research project conducted by NASA to evaluate the response of growth in water hyacinth to temperature. Due to equipment failure and lack of sufficient time to complete the project by NASA, no conclusions were obtained from the study.

* * * * *

TITLE: A continuation of baseline studies for environmentally monitoring space transportation systems (STS) at John F. Kennedy Space Center: Ichthyological Studies.

PRINCIPAL INVESTIGATOR: Franklin F. Snelson, Jr.

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

SPONSORING AGENCY: National Aeronautics and Space Administration
GRANT NO.: 101220006

A B S T R A C T

This contract work is divided into two major portions. The Molly Reproduction Study concerns the monitoring of reproduction in field populations of the sailfin molly, Poecilia latipinna. The Lagoonal Fish Study is an ecological analysis of the fish fauna in the Indian River Lagoonal system in the Kennedy Space Center area. Separate phases of this project are (1) faunal analysis and documentation, (2) seasonal and spatial changes in relative abundance of epibenthic fishes, (3) an analysis of the effects of physical and chemical water parameters on fish distribution, and (4) an analysis of the commercial fishery in the area.

* * * * *

TITLE: Terrestrial Community Analysis - A continuation of base-line studies for environmentally monitoring space transportation systems (STS) at John F. Kennedy Space Center.

PRINCIPAL INVESTIGATOR I. Jack Stout

SPONSORING AGENCY: National Aeronautics and Space Administration

GRANT NO.: 101220006

A B S T R A C T

This work was designed to analyze the terrestrial plant communities of Merritt Island and east Central Florida. Quantitative descriptions of the vegetation of 10 sample areas have been completed. These data will be used to interpret future dynamics of the vegetation complex of the island.

A second phase of the study concerns a continuous monitoring of small mammal populations in 4 diverse plant communities. These areas have been sampled at monthly intervals by live trap-mark-and-release methods. Data were routinely summarized and updated by use of the computer.

* * * * *

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

TITLE: Development of a technique for plant species identification using spectral reflectance analysis.

PRINCIPAL INVESTIGATOR: Haven C. Sweet

SPONSORING AGENCY: NASA

GRANT NO.: NAS 10-8986

A B S T R A C T

The objective of this project is to determine the feasibility, limitations and potential applications of a new technique for identifying and quantifying the dominant species composition within a complex plant community. The technique involves performing a computerized analysis of the light reflected from 60 both individual species and the entire plant community. The eventual goal is to permit plants to be identified and their coverage measured from an airplane or satellite.

* * * * *

TITLE: Completion of the computerized herbarium of Merritt Island plants.

PRINCIPAL INVESTIGATOR: Haven C. Sweet

SPONSORING AGENCY: FTU

GRANT NO.: 182000026

A B S T R A C T

The objective of this project was to complete the computerization of specimen data from plants collected from Merritt Island.

* * * * *

TITLE: Determination of the nutritional needs and agricultural requirements of a space colony.

PRINCIPAL INVESTIGATOR: Haven C. Sweet

SPONSORING AGENCY: NASA - ASEE - STANFORD

GRANT: Fellowship

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

A B S T R A C T

With the growing interest in orbiting solar collectors which need to be continually manned, NASA is looking at the feasibility of constructing a permanent space colony. Contrary to current life support techniques, NASA is now considering the use of biological life support systems. This project was an initial attempt to determine the nutritional needs of the colonists and to project an agricultural system which would be adequate to meet these needs.

* * * * *

TITLE: Design of a plant growth chamber for orbiting botanical experiments.

PRINCIPAL INVESTIGATOR: Haven C. Sweet

SPONSORING AGENCY: NASA - ASEE - Stanford

GRANT: Fellowship

A B S T R A C T

The space shuttle will be used as an orbiting platform to perform an array of scientific experiments, including plant physiological studies. Conventional growth chambers are inadequately designed to meet the restrictions imposed on shuttle craft and on weightless conditions. This project involved designing a multi-use plant growth chamber which would be suitable for the shuttle.

* * * * *

TITLE: A computer-assisted biogeographic analysis of selected taxa of tropical Pacific Bryophyta (Musci).

PRINCIPAL INVESTIGATOR: Henry Obermanns Whittier

SPONSORING AGENCY: Division of Sponsored Research

GRANT NO.: 062

A B S T R A C T

Phytogeographic data assembled over approximately 20 years' time for 1,459 species of Pacific Islands' mosses is computer analyzed to determine how many taxa are known to exist on any one of 165 geographic

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

area "units" (islands, archipelagoes, or broader areas), how many taxa are shared in common between any two geographic areas and the corresponding coefficients of correlation between any two areas utilizing standard statistical formulae that permit further correlation to pre-existing published research on flowering plants (Phanaerogamae). Results appear in a 165 X 165 unit matrix and in a 40 X 40 matrix, and in two-dimensional dendrographic format. Dendrographic analysis is utilized together with the raw data from the matrices to assess insular biogeographic relationships.

* * * * *

TITLE: Flavonoid Phytochemistry Among Mosses
PRINCIPAL INVESTIGATORS: R. S. White and Harvey Miller
SPONSORING AGENCY: Graduate Studies Institutional Grants
GRANT NO.: 625124

A B S T R A C T

Twenty species of mosses were purified microscopically for extraction with solvents and application to Watman #3 chromatographic paper for descending chromatography in two dimensions. Preliminary identification of flavonoid classes was made by examination of chromatograms under UV, UV-ammonia spray, AlCl₃, etc. Samples were also subjected to hydrolysis before chromatographic analysis. An extensive amount of time and funds were utilized in the construction and assembly of two new chromatographic chambers capable of holding 10 chromatograms each simultaneously.

* * * * *

TITLE: Development of Modified Anaerobic Chamber to Grow Methanogenic Bacteria.
PRINCIPAL INVESTIGATOR: Roseann S. White
SPONSORING AGENCY: FTU Foundation - Academic Advancement Grant.
GRANT NO.:

A B S T R A C T

A chamber was constructed to fit inside one of the present departmental anaerobic chambers to make possible the growth of strict anaerobes such as

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

Methanobacterium. An oxygen removal system was designed and constructed using gas flushing bottles, copper turnings, fluran tubing, etc., to use in conjunction with chamber.

* * * * *

TITLE: Isolation of Thermophilic Cellulolytic Anaerobic Bacteria.
PRINCIPAL INVESTIGATOR: Rudy J. Wodzinski
SPONSORING AGENCY: Division of Sponsored Research, FTU
GRANT NO.: 182000030

A B S T R A C T

Organisms were isolated from anaerobic muds and manure which were able to degrade cellulose at 80°C. A proposal based on the research was submitted to ERDA and they requested a full proposal. The proposal is being prepared.

* * * * *

TITLE: Radioimmunoassay of Environmental Water Samples
PRINCIPAL INVESTIGATOR: Rudy J. Wodzinski
SPONSORING AGENCY: Division of Sponsored Research, FTU
GRANT NO.: 182000061

A B S T R A C T

Several of the major components of the assay have been developed. The critical test of the technique will occur late in 1977.

* * * * *

TITLE: Assay of Enteric Viruses in Injection Well Samples
PRINCIPAL INVESTIGATOR: Robert Nash Gennearo and Rudy J. Wodzinski
SPONSORING AGENCY: Department of Environmental Regulation
GRANT NO.: 111220005

FUNDED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

A B S T R A C T

Five injection well samples from Pompano Beach, Florida were assayed for enteric viruses. No enteric viruses were detected. A final report to the supporting agency was submitted December 4, 1976.

* * * * *

TITLE: Detection of Viruses in Environmental Samples

PRINCIPAL INVESTIGATORS: Rudy J. Wodzinski and Robert Nash Gennaro

SPONSORING AGENCY: WED Enterprises

GRANT NO.: 181220016

A B S T R A C T

This project was initiated December 1976. Sixteen samples have been partially processed. An interim quarterly report was submitted April 4, 1977.

FUNDED RESEARCH 1976-77

CHEMISTRY

TITLE: Faculty-Student Summer Research Participation Project

PRINCIPAL INVESTIGATOR: Chris A. Clausen III

SPONSORING AGENCY: DOW Chemical Company

A B S T R A C T

This grant provided summer salaries for myself and two graduate students.

* * * * *

TITLE: A Research Project to Establish the Toxic Chemical Exposure Levels in Laboratories and Work Areas at F.T.U.

PRINCIPAL INVESTIGATOR: Chris A. Clausen III

SPONSORING AGENCY: Offices of Graduate Studies and Research and Business Affairs

A B S T R A C T

A study was done during Spring Quarter 1977 on the chemistry labs and other work areas to measure the toxic chemical levels.

* * * * *

TITLE: Continuation and Modification of a Research Project to Establish the Toxic Chemical Exposure Levels in Laboratories and Work Areas at F.T.U.

PRINCIPAL INVESTIGATOR: Chris A. Clausen III

SPONSORING AGENCY: F.T.U. Foundation

A B S T R A C T

A continuation of the study started in Spring Quarter.

* * * * *

FUNDED RESEARCH 1976-77

CHEMISTRY (continued)

TITLE: The Development of a Homogeneous Catalytic System for Producing Methanol from Carbon Oxides and Hydrogen Mixtures Under Low Pressure and Temperature Conditions

PRINCIPAL INVESTIGATOR: Chris A. Clausen III

SPONSORING AGENCY: Office of Graduate Studies and Research

GRANT NO.: 182000039

A B S T R A C T

A Ruthenium catalyst has been developed and testing is being continued to observe optimum conditions.

* * * * *

TITLE: Biochemical Basis of the Tumorous-head Trait and Related Maternal Effects in Drosophila melanogaster,

PRINCIPAL INVESTIGATOR: Glenn N. Cunningham (with Dr. D. T. Kuhn)

SPONSORING AGENCY: Florida Division of the American Cancer Society

A B S T R A C T

Biochemical abnormalities were noted in the tumorous head strain as compared to the wild type Drosophila melanogaster. Aldehyde oxidase was found in regions of the eye imaginal disc which presumably will be transformed into tissue normally absent in the eye region. Aldehyde oxidase was absent in wild type eye imaginal discs.

* * * * *

TITLE: Pyridoxal Oxidase and Its Relationship to the Tumorous-head Phenotype of the Homoeotic Mutant of Drosophila melanogaster

PRINCIPAL INVESTIGATOR: Glenn N. Cunningham (with Dr. D. T. Kuhn)

SPONSORING AGENCY: Office of Graduate Studies and Research

A B S T R A C T

A sensitive assay for pyridoxal oxidase was developed. The spectrophotofluorometric assay was many times more sensitive than any published procedure. Pyridoxal oxidase activity was followed through many stages of the life cycle of the tumorous-head strain and compared to the wild type.

FUNDED RESEARCH 1976-77

CHEMISTRY (continued)

TITLE: Biochemistry of the Tumorous-head Phenotype of
Drosophila melanogaster

PRINCIPAL INVESTIGATOR: Glenn N. Cunningham (with Dr. D. T. Kuhn)

SPONSORING AGENCY: Office of Graduate Studies and Research

A B S T R A C T

An enzyme, xanthine dehydrogenase, related to aldehyde oxidase and pyridoxal oxidase was measured and correlated to the tumorous head technique. Development of a most sensitive assay method is allowing for significant strain comparison and a look at regulation of this enzyme. The study is still underway.

* * * * *

TITLE: The Use of Insoluble Polymeric Supports in
Reaction Chemistry: An Energy-related Chemical
Research Investigation

PRINCIPAL INVESTIGATOR: John P. Idoux (with Dr. C. Bied-Charreton)

SPONSORING AGENCY: Centre National de la Recherche Scientifique

A B S T R A C T

This project is aimed at the synthesis and evaluation of an insoluble polymeric reagent capable of functioning as a selective aromatic nitro group reducing agent. Dr. Claude Bied-Charreton is a Research Scientist on leave from the Centre National de la Recherche Scientifique in Paris and has been working as a Visiting Research Associate since October 1976.

* * * * *

TITLE: Variation-Perturbation Method for Chemical
Reaction

PRINCIPAL INVESTIGATOR: Stephen K. Knudson

SPONSORING AGENCY: American Chemical Society/Petroleum Research Fund

GRANT NO.: 181221005

* * * * *

FUNDED RESEARCH 1976-77

CHEMISTRY (continued)

TITLE: Molecular Orbital Treatment of N-monosubstituted Amides

PRINCIPAL INVESTIGATOR: Stephen K. Knudson

SPONSORING AGENCY: Office of Graduate Studies and Research

GRANT NO.: 182000047

A B S T R A C T

CNDO/2 molecular orbital calculations and population analyses studies have been initiated on a series of N-monosubstituted acetamides. These studies are designed to provide electron density data on the O-C-N and C-C-O-N portions of the molecules. These data will then be used in the development of the "mechanism" responsible for the seven-number effect in the title compound.

* * * * *

TITLE: Baseline Studies for Environmentally Monitoring for Effects of Space Transportation Systems at KSC Part D. Chemical Studies of Soil and Rainfall

SPONSORING AGENCY: NASA

GRANT NO.: NAS10-1896

A B S T R A C T

Collection of soil samples from Merritt Island on a quarterly basis and analysis for commonly occurring nutrients was accomplished. Determination of total cation concentrations and studies to establish the effect of hydrochloric acid leaching on these soil samples has begun.

Ersatz collection and analysis of rainfall precipitation from sites in proximity to the soil sampling sites was performed during the summer 1976.

* * * * *

FUNDED RESEARCH 1976-77

CHEMISTRY (continued)

FORENSIC SCIENCE

TITLE: The Forensic Science Grant - Part V
PRINCIPAL INVESTIGATOR: W. W. McGee
SPONSORING AGENCY: LEAA, BCJPA - State of Florida, Planning Agency
GRANT NO.: 111228001

A B S T R A C T

A portion of this grant amount goes for the research program being conducted with Mr. R. Morrison. This research program is aimed at developing an antigenic test for individualizing seminal stains.

COMPUTER SCIENCE

TITLE: The Use of Decompilation Techniques for
Specification and Transportation of
Software

PRINCIPAL INVESTIGATOR: Terry J. Frederick/David Workman

SPONSORING AGENCY: Naval Training Equipment Center

GRANT NO.: 101222001

A B S T R A C T

This proposal addresses the lack of real-time, high-level language resources and the resulting high software costs incurred in the development and maintenance of training devices. Existing software has not been "reusable" and each contractor for a new trainer has "re-invented the wheel" with his machine dependent software design for new target hardware. A process known as decompilation is proposed as a vehicle for transporting existing software efficiently and also for determining the specification of a real-time, high-level language suitable for trainer applications.

While the decompilation process will produce program conversion and documentation, the primary objective of this proposal will be to use decompilation as a means of determining the nature and specification of a high-level, machine independent, meta language suitable for developing and transporting software for training devices.

* * * * *

TITLE: TAXIR - A Management Information System

PRINCIPAL INVESTIGATOR: Dr. Ronald Dutton

SPONSORING AGENCY: Division of Sponsored Research, Function #11

GRANT NO.: 182000042

A B S T R A C T

TAXIR - TAXonomical Information Retrieval - is a Management Information System originally written in CDC Fortran. We propose to acquire and implement TAXIR on the IBM 360/75 at the CFRDC and study its characteristics and potential use with taxonomical type of data bases at Florida Technological University. The main reasons for considering TAXIR are (1) it is a relatively portable system and (2) it can be tailored to accommodate in an optimal fashion the data characteristics and storage requirements of specific data bases. A data base, currently maintained by the Biology Department at Florida Technological University,

COMPUTER SCIENCE (continued)

will be used to access the feasibility and desirability of using TAXIR rather than the MIS they are now using. The feasibility will be measured in terms of whether TAXIR can supply the reports desired. Desirability must be measured in terms of the time, costs and effort of using TAXIR as opposed to the system they now use. An attempt will also be made to try to access the versatility of the system in terms of its potential use with other FTU data bases.

FUNDED RESEARCH 1976-77

MATHEMATICS AND STATISTICS

TITLE: A Controlled Test of Student Learning
and Attitudes in the QUICK CAI Environment

PRINCIPAL INVESTIGATOR: Joby Milo Anthony et al

SPONSORING AGENCY: FTU Division of Sponsored Research

A B S T R A C T

Courseware in algebra was prepared for use with a CAI system. Some student testing of this courseware was done. Statistical design of a classroom experiment was studied.

FUNDED RESEARCH 1976-77

PHYSICS

TITLE: Investigation of Picosecond Pulse Shaping
Techniques for Laser Induced Fusion Energy
Systems

PRINCIPAL INVESTIGATOR: Drs. H. E. Bates and B. J. Henderson

SPONSORING AGENCY: FTU Division of Sponsored Research

GRANT NO.: 18-2000-035

A B S T R A C T

A combined experimental and theoretical effort has been in progress. Fourier transform techniques have been used to determine the optimum efficiency of pulse shaping systems. Single stage performance using a mode-locked laser has been examined.

* * * * *

TITLE: Radioastronomy Observations

PRINCIPAL INVESTIGATOR: Dr. J. C. Katzin

SPONSORING AGENCY: FTU Foundation NASA

GRANT NO.: 18-2000-016 101-224-001

A B S T R A C T

Radio observations of sources such as cometary nebulae which are possible infrared thermal emitters were examined. Interferometer mapping and variability in time were studied to relate to theoretical prediction.

* * * * *

TITLE: Instrumentation for Experimental Gravitation

PRINCIPAL INVESTIGATOR: Dr. W. C. Oelfke

SPONSORING AGENCY: FTU Division of Sponsored Research

GRANT NO.: 18-2000-054

A B S T R A C T

A parametric sensor system for measuring minute displacements has been under design, construction and testing.

FUNDED RESEARCH 1976-77

PHYSICS (continued)

TITLE: LSU Gravitational Wave Detector
PRINCIPAL INVESTIGATOR: Dr. W. C. Oelfke with W. O. Hamilton of LSU
GRANT NO.: N/A (external research at LSU)

A B S T R A C T

A new type of acceleration sensor using a resonant microwave re-entrant cavity has been shown to increase detector sensitivity by orders of magnitude. This design will be incorporated on the aluminum bar in its cryogenic environment as assembled.

* * * * *

NONSPONSORED RESEARCH 1976-1977

BIOLOGICAL SCIENCES

TITLE: Microbial Production of Methane
PRINCIPAL INVESTIGATOR: Julius F. Charba
GRANT NO.: 182000011, Methane production (DSR)
and 615108

A B S T R A C T

The project objective is to determine if solid waste leachate could be utilized as substrate for microbial production of methane gas. The conditions for maximum gas production would be determined. Initial studies failed to show gas production. Gas chromatographic data indicated that the leachates used did not contain high concentrations of methanogenic substrate. It was concluded that the leachate may contain materials inhibitory to methane bacteria since some substrate was available and the pH was appropriately adjusted.

* * * * *

TITLE: Methane production from solid waste leachate
PRINCIPAL INVESTIGATOR: Julius F. Charba
GRANT NO.: 625114 (DSR)

A B S T R A C T

Analysis was undertaken to determine if solid waste leachate was substrate deficient or contained inhibitory agents. Leachates from different sites were employed. Results showed that acetate-ethanol addition to leachates did not stimulate methane production in leachates derived from recently buried waste. Acetate-ethanol did stimulate gas production (0.5 ml gas/hour) from leachates derived from waste buried 4-5 years. Data suggest that inhibitory agents may be present and that the leachates used are deficient in methanogenic substrate.

* * * * *

TITLE: Detection of Beggiatoa in the water hyacinth rhizosphere.
PRINCIPAL INVESTIGATOR: Julius F. Charba
GRANT NO.: 635129 (DSR)

A B S T R A C T

Beggiatoa is capable of utilizing H₂S as a source of energy and

NONSPONSORED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

accumulates elemental Sulfur granules intracellularly. Reports from the literature indicate this organism eliminates toxic concentrations of H₂S in the rhizosphere of plants developing in water saturated soil. The present study showed that Beggiotoa is present in the fibrous roots of the water hyacinth plant and may be partly responsible for the ability of the hyacinth to develop in water containing considerable decomposition materials.

* * * * *

TITLE: Endangered Species Studies

PRINCIPAL INVESTIGATOR: L. M. Ehrhart

GRANT NOS.: 625115 and 135130

A B S T R A C T

The investigator made presentations at 13 public schools and a number of civic, social and environmental, and scientific organization meetings. He also participated in the rescue of a large number of cold-stunned sea turtles.

* * * * *

TITLE: Drosophila Gene Regulation

PRINCIPAL INVESTIGATOR: David T. Kuhn

A B S T R A C T

Evidence supporting the concept of developmental compartments in mature imaginal discs in D. melanogaster has been gathered for the eye disc, antennal disc, wing disc, haltere disc, and leg discs.

* * * * *

TITLE: Phytochemistry in Mosses

PRINCIPAL INVESTIGATOR: Harvey A. Miller

A B S T R A C T

During winter quarter, 0.13 FTE was assigned to this project which is abstracted as Flavonoid Phytochemistry under FUNDED RESEARCH. The work as described continues without recognition by assignment of time.

NONSPONSORED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

TITLE: Prodrumus Florae Muscorum Polynesiae
PRINCIPAL INVESTIGATOR: Harvey A. Miller and Henry O. Whittier

A B S T R A C T

A Prodrumus is a preliminary treatment and this first volume of our Moss Flora of Polynesia (i.e., the tropical Pacific islands) is now being prepared for printing, having been accepted by J. Cramer Verlag, a scientific specialty house which publishes the book series Bibliotheca Bryologica. Our volume of over 300 pages has not yet been announced as a forthcoming book. Some 352 genera and 1430 taxa of mosses are included as well as a key to the genera and citations of localities and all relevant literature for every species included.

* * * * *

TITLE: Bryophyte Systematics and
Biology of Tropical Forms
PRINCIPAL INVESTIGATOR: Harvey A. Miller

A B S T R A C T

Under this broad umbrella falls taxonomic work on mosses and liverworts of Florida, Latin America and the Pacific Islands. Also included are the continuation studies on moss development, phytochemistry and ecology with relation both to community structure and air pollution. Considerable portions of this work involve extensive literature searches and correspondence with colleagues world-wide. Considerable effort now is being focussed upon completion of my new systematic arrangement of mosses to be presented in August 1978 at the International Bryological Congress in Wales, by invitation of the organizing committee.

* * * * *

TITLE: Hydrilla biomass from Little Lake Barton
after stocking with White Amur
PRINCIPAL INVESTIGATOR: John A. Osborne
GRANT NOS.: DSR #635136 and 625121

A B S T R A C T

Sampling for hydrilla commenced in October 1976 after the introduction of 174 (one pound) grass carp were placed in Little

NONSPONSORED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

Lake Barton. By May 1977, approximately six months after initial stocking, hydrilla has been reduced by 86.5% (210 ton/lake to 28.5 ton/lake). A linear reduction in the hydrilla population through time was noted in Little Lake Barton. The greatest reduction on a daily basis was during the winter months (December 1976-February 1977).

* * * * *

TITLE: Description of a new species of minnow
from North Carolina

PRINCIPAL INVESTIGATOR: Franklin F. Snelson, Jr.

A B S T R A C T

A new species of minnow, Semotilus lumbee, was discovered. It has a restricted distribution in North and South Carolina and probably will be treated as a rare or threatened species by concerned agencies. During the year, data collection and analysis was completed and a manuscript prepared.

* * * * *

TITLE: Ecology of Sandpine Scrub

PRINCIPAL INVESTIGATOR: I. J. Stout

GRANT NO.: 625122

A B S T R A C T

During Winter Quarter 1977 an experiment was initiated to ascertain the reliability of current methods of enumeration of small mammal populations. Sampling continuously for three days was compared to a single day's sample. Results were in support of the single day as an adequate sample. The effect of season will be investigated by repeating the experiment during summer and fall.

During Spring Quarter 1977 reference collections were made of likely plant foods of the small mammals. Stomach contents of a small number of animals were examined.

Results of the previous three years' study were prepared for computer analysis.

* * * * *

TITLE: Milk Antibodies and their Detection in
Arteriosclerotic Patients

PRINCIPAL INVESTIGATOR: M. J. Sweeney

NONSPONSORED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

A B S T R A C T

Antibodies towards milk proteins have been found in a significantly higher titer among patients suffering with heart disease. The antibodies have been shown to be of the I G and I M classes, and are specific for milk protein as demonstrated by ^g ^g hemoagglutination inhibition studies. Flurescent antibody has also been prepared to the milk protein antigens and the location and identification of these antigens in vessel walls is under way.

* * * * *

TITLE: Ornithological Investigations in Central Florida

PRINCIPAL INVESTIGATOR: Walter K. Taylor

A B S T R A C T

The overall objective of the research project is to obtain information on many aspects of avian biology, with particular emphasis on breeding biology and migration.

* * * * *

TITLE: Differential Clotting Responses to Mutant and Wild-type Drosophila Homogenates

PRINCIPAL INVESTIGATOR: David W. Washington

A B S T R A C T

Clotting time studies were conducted on rabbits which had been injected with saline or emulsifications from tumorous-head or wild-type strains of D. melanogaster. The preliminary results of the one-step prothrombin time tests suggest a significant reduction in clotting time in rabbits receiving intramuscular injections of tumorous-head flies. Differential examinations of white blood cells revealed apparently significant numerical increases in these cells. This increase was caused by the proliferation of small lymphocytes (T-cells).

* * * * *

TITLE: Methanogenesis from Solid Waste

PRINCIPAL INVESTIGATOR: Roseann S. White

GRANT NO.: 615101

A B S T R A C T

A thermophylic digestion process using solid waste was set up and specialized mylar bags were used to trap gases for gas chromatographic analysis of CO₂, H₂ and CH₄.

NONSPONSORED RESEARCH 1976-1977

BIOLOGICAL SCIENCES (continued)

TITLE: A catalog of tropical Pacific islands
Bryophyta (Musci)

PRINCIPAL INVESTIGATOR: Henry Obermanns Whittier

GRANT NO.: 635142 and 235125

A B S T R A C T

In 1960 the principal investigator joined Dr. H. A. Miller in cataloging the systematic literature treating the Bryophyta (Musci) of the tropical Pacific islands, and a Bryological Bibliography of the Tropical Pacific Islands was published in 1971. Barbara Ann Whittier joined the project in 1971 and condensed approximately 10,000 species' citations into a master file which served as the basis for a 263-page preliminary working draft for the Catalog of Tropical Pacific Islands Bryophyta (Musci). During the 1976-77 academic year, the principal investigator has revised and amended the Catalog to bring the nomenclatural and systematic information to date, and to edit it for publication by H. A. Miller, H. O. Whittier and B. A. Whittier as a Prodrum florae muscorum Polynesiae, by the Cramer Verlag. In completed form, it lists 1459 taxa, provides nomenclatural authorities and literature citations, and cites the known geographic distributions.

* * * * *

TITLE: The Effects of Enzymes in Activated Sludge Floc

PRINCIPAL INVESTIGATOR: Rudy J. Wodzinski

A B S T R A C T

Terry Stoddard, a graduate student, finished his research in the project and reported the results in his thesis. He proposed a new model for the structure of activated sludge floc.

* * * * *

TITLE: Mutations of Microorganisms to Produce
High Concentrations of Lipase

PRINCIPAL INVESTIGATOR: Rudy J. Wodzinski

A B S T R A C T

David Baldwin, a graduate student, has obtained a number of mutants of Candida lipolyticum. He expects to classify these mutants and report the results in a thesis by August 1977.

CHEMISTRY

TITLE: Purification and Characterization of Aldehyde Oxidase

PRINCIPAL INVESTIGATOR: Glenn N. Cunningham

A B S T R A C T

Several methods have been developed and used in sequence to purify aldehyde oxidase. The enzyme has now been purified to near homogeneity as indicated by electrophoresis and significant characterizations are underway.

* * * * *

TITLE: Esterase Isoenzymes in Drosophila melanogaster

PRINCIPAL INVESTIGATOR: Glenn N. Cunningham

A B S T R A C T

Unique esterase was noted in tumorous-head Drosophila melanogaster as compared to wild type. In addition, significant variations in activity of certain isoenzymes were noted even though total activity remained constant. Efforts are continuing to refine the detection of isoenzymes and correlation of them to specific tissues.

* * * * *

TITLE: Mass Spectrometric Analysis of Solids

PRINCIPAL INVESTIGATOR: George R. Hertel

A B S T R A C T

We relocated, rebuilt and recalculated the Mass Spectrometer and developed data handling techniques to use with the computer.

* * * * *

TITLE: Abnormal Electronic Interactions of 2'-Substituted-4-Aminobiphenyls

PRINCIPAL INVESTIGATOR: John P. Idoux (with David E. Sasser)

A B S T R A C T

Ten 2'- and 4'-substituted-4-amino-biphenyls were prepared and pKa's determined. It was demonstrated that 2'- groups have an "abnormal" effect on the pKa's and 4' groups have a "normal" effect.

CHEMISTRY (continued)

TITLE: Synthesis, NMR and IR of a Series of N-Methylamides

PRINCIPAL INVESTIGATOR: John P. Idoux (with Susan Fuhrman)

A B S T R A C T

Eleven N-methylamides were synthesized. Their nmr (in CDCl_3 and in CCl_4) and ir spectra were recorded and analyzed. The chemical shifts of the N-methyl group does not vary with the group attached at the acyl carbon. The amide bond is a one-way transmitter.

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TITLE: Synthesis and NMR of F 4'-Substituted-4-Acetyl-biphenyls, Five 4'-Substituted-4-Acetylbenzanilides and Five 4-Substituted-4-Acetylbenzanilides

PRINCIPAL INVESTIGATOR: John P. Idoux (with Deborah Watlock)

A B S T R A C T

Fifteen of the title compounds were synthesized. Nmr of the acetyl group methyl protons were determined and analyzed.

* * * * *

TITLE: Distance-NMR Deshielding Effect of a Proximate Proton-Triple Bond Interaction

PRINCIPAL INVESTIGATOR: John P. Idoux (with Michael Skinner)

A B S T R A C T

Eleven 2-, 4- and 2,4-disubstituted alkyl alkyne benzenes have been synthesized. Nmr solution studies have been completed and the distance-deshielding effect of the triple bond determined.

* * * * *

TITLE: Synthesis and Flame Retardant Properties of Bromoacids and Esters Derived from 2,4-Pentenoic Acid

PRINCIPAL INVESTIGATOR: John P. Idoux (with Hessam Ghane)

A B S T R A C T

2,4-pentenoic acid and eight ester derivatives have been prepared.

* * * * *

CHEMISTRY (continued)

TITLE: Analytical Comparison of Florida and California
Cold Pressed Valencia Orange Oil

PRINCIPAL INVESTIGATOR: John P. Idoux (with Tony Howell)

A B S T R A C T

California and Florida Valencia Orange Oils were examined by a variety of techniques to determine if a differentiation method could be established. Total aldehyde content of the distilled volatiles is significantly different for the two oils and can be used to differentiate the two.

* * * * *

TITLE: Determination of the Transmission Coefficient of
the Amide Bond

PRINCIPAL INVESTIGATOR: John P. Idoux (with Frank Spence)

A B S T R A C T

A literature search and kinetic method for a series of selected N-monoacetamides was completed. Potentiometric, conductometric and spectroscopic methods were investigated as means of determining the pKa's of substituted oxanilic acids. These methods were not satisfactory. A spectroscopic method for following the kinetics of hydrolysis of the corresponding oxanilates was developed.

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TITLE: Acyl Methyl Group NMR in a Perturbed Amide Bond
System; Transmission Coefficient of the Amide Bond

PRINCIPAL INVESTIGATOR: John P. Idoux (with Kevin Simmons)

A B S T R A C T

A literature search, synthetic and spectroscopic detail relative to N-monosubstituted thioacetamides was completed.

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NONSPONSORED RESEARCH 1976-77

CHEMISTRY (continued)

TITLE: Electron Translation Factors

PRINCIPAL INVESTIGATOR: Stephen K. Knudson

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TITLE: Geophysical Studies

PRINCIPAL INVESTIGATOR: Frank B. Kujawa

A B S T R A C T

In preparation for geophysical studies of subsurface geology in Central Florida, test traverses were run and evaluated in several different locations with the newly acquired Bison 1550 exploration seismograph.

* * * * *

TITLE: Nitrate Ion-Selective Electrodes - Construction and Application to Soil Analysis

PRINCIPAL INVESTIGATOR: Brooks C. Madsen

A B S T R A C T

Several nitrate ion-selective electrodes were prepared and evaluated for determination of nitrate in aqueous soil extracts. Interferences by other commonly occurring anions in soil extracts were evaluated. Most electrodes were very susceptible to interference which precluded successful application of the electrodes for this type of analysis.

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TITLE: Chloride Ion-Selective Electrodes - Construction and Application to Soil Analysis

PRINCIPAL INVESTIGATOR: Brooks C. Madsen

A B S T R A C T

Graphite paste, polyvinylchloride, and solid state chloride selective electrodes were prepared and evaluated for determination of chloride in aqueous soil extracts. The latter was less susceptible to interferences caused by the presence of other anions. The magnitude of these interferences was evaluated.

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NONSPONSORED RESEARCH 1976-77

CHEMISTRY (continued)

TITLE: Quantitative Analysis of Thin-Films by D.C. Arc
Optical Emission Spectroscopy

PRINCIPAL INVESTIGATOR: Brooks C. Madsen

A B S T R A C T

Routine process control methods have been developed for thin-films of different composition using D.C. arc optical emission spectroscopy. The specific methods include determination of nickel/chromium, silicon/aluminum, and phosphorus/silicon layers deposited as thin-films on components used in integrated circuit manufacture.

FORENSIC SCIENCE

TITLE: A Screening Procedure for Identifying Wood
Species Used in the Manufacture of Paper

PRINCIPAL INVESTIGATOR: W. W. McGee

A B S T R A C T

A screening procedure was developed for hard and soft woods based on the morphology of the fibers.

* * * * *

TITLE: Pyrolysis Gas Chromatographic Study of Hair

PRINCIPAL INVESTIGATOR: W. W. McGee

A B S T R A C T

A standard method for quantitative measurement of the peaks produced when hair is pyrolyzed using pyrolysis gas chromatography was developed.

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FORENSIC SCIENCE (continued)

TITLE: The Metabolism of Benzodiazepines in Humans and
the Detection of Benzodiazepine Metabolites in
Urine

PRINCIPAL INVESTIGATOR: W. W. McGee

A B S T R A C T

A liquid chromatography method of detecting liquid metabolites of
Librium in urine was developed.

* * * * *

TITLE: The Polyacrylamide Determination of Haptoglobins
in Dried Blood and Seminal Stains

PRINCIPAL INVESTIGATOR: W. W. McGee

A B S T R A C T

A presumptive test for semen and the development of an antigen system
for detection of seminal fluid was accomplished.

* * * * *

TITLE: Optimization of Conditions for Determining Haptoglo-
bins by Polyacrylamide Gel Electrophoresis.

PRINCIPAL INVESTIGATOR: W. W. McGee

A B S T R A C T

An improved method of detecting haptoglobins by polyacrylamide gel
electrophoresis was developed.

* * * * *

TITLE: An Examination of the Methods of Detecting the Gc
Factor in Dried Body Fluid Stains

PRINCIPAL INVESTIGATOR: W. W. McGee

A B S T R A C T

A method of feasibly detecting Gc factor in dried blood was developed.

* * * * *

COMPUTER SCIENCE

TITLE: QUICK - Computer Assisted Instruction

PRINCIPAL INVESTIGATOR: Dr. Larry K. Cottrell

A B S T R A C T

To develop and implement a Computer-Assisted Instructional System which will permit students access to courseware materials (questions, problems, help items, references, etc.) produced by their instructors. The system will operate in the Batch Mode (punched cards, input and line printer output) when processing student's commands or inquiries.

* * * * *

TITLE: Data Base View Definition Facility

PRINCIPAL INVESTIGATOR: James R. Driscoll

A B S T R A C T

To develop a Data Base Management System (DBMS) which can support more than one data model and permit the users of different data models to access a common data base. It is hoped that such a system will (1) ease the task of implementing a particular user view, (2) isolate common mechanisms used in DBMS implementation, (3) permit analysis of user views and (4) provide some degree of portability.

* * * * *

TITLE: TAXIR Project

PRINCIPAL INVESTIGATOR: Dr. Ronald D. Dutton

A B S T R A C T

Information and storage retrieval systems (TAXIR) and their application to Computer Science studies.

* * * * *

COMPUTER SCIENCE (continued)

TITLE: Curriculum Development for the ZILOG
Microprocessor Lab

PRINCIPAL INVESTIGATOR: Dr. Allan Lang

A B S T R A C T

To develop the needed software and hardware facilities to support graphics/
microprocessor related courses.

* * * * *

TITLE: BCPL Support of Application Software on
VARIAN 73

PRINCIPAL INVESTIGATOR: Dr. Allan Lang

A B S T R A C T

Developing BCPL language support on a variety of minicomputers.

* * * * *

TITLE: Parser Design and Development

PRINCIPAL INVESTIGATOR: Dr. David Workman

A B S T R A C T

Design and development of a Parser Generating System as a tool for
compiler writing.

NONSPONSORED RESEARCH 1976-77

MATHEMATICS AND STATISTICS

TITLE: Fuzzy Groups
PRINCIPAL INVESTIGATORS: J. M. Anthony and H. Sherwood

A B S T R A C T

A paper was prepared for publication modifying the definition of a fuzzy group which was previously presented in the literature. Properties of the new definition and examples illustrating the definition were studied.

* * * * *

TITLE: A New Procedure for Selecting the
Subset Containing the Best Normal
Population
PRINCIPAL INVESTIGATOR: Paul Somerville

A B S T R A C T

Gupta developed a procedure for selecting a subset of the best of k populations based on sample means of these populations. The procedure selects only those populations which differ by a constant from the one producing the largest mean. A new procedure is proposed which is slightly more complicated, but at least for certain configurations results in a subset whose expected size is smaller than Gupta's procedure.

MATHEMATICS AND STATISTICS (Continued)

TITLE: A New Statistic for Testing the Null Hypothesis of a Two-Parameter Weibull vs a Three Parameter Weibull

PRINCIPAL INVESTIGATOR: Paul Somerville

A B S T R A C T

The power of the Mann Fertig statistic P approaches a value $p < 1$, which is a function of the data, as the location parameter $\lambda \rightarrow \infty$. Two new statistics are proposed for which the power equals one for this case. Monte Carlo methods are being used to study the power of the proposed statistic.

* * * * *

TITLE: Probabilistic Normed Linear Spaces

PRINCIPAL INVESTIGATOR: Howard Sherwood

A B S T R A C T

The relationship between two classes of probabilistic normed linear spaces was studied. A paper was presented to the annual meeting of the AMS.

* * * * *

TITLE: Cluster Analysis and Numerical Taxonomy

PRINCIPAL INVESTIGATOR: Ed Norman

A B S T R A C T

Studies in taxonomy and cluster analysis are being undertaken in preparation for a numerical taxonomic study of the New World species of the genus *Buddleia*.

* * * * *

TITLE: Class Groups of Orders

PRINCIPAL INVESTIGATOR: Murray Barr

MATHEMATICS AND STATISTICS (Continued)

A B S T R A C T

Let D be a P.I.D. and let $D_2 = D \times D$ where addition and multiplication are defined componentwise on D_2 . For each $a \neq 0$ in D define the congruence relation $C_a = \{(x, y) \in D_2 : x = y \pmod{a}\}$. Then C_a is a ring with identity $(1, 1)$ whose total quotient ring is $T \times T$ where T is the quotient field of D . In this research we study the class group of C_a .

* * * * *

TITLE: Modules over a Principal Ideal Domain

PRINCIPAL INVESTIGATORS: Murray Barr and Richard Caron

A B S T R A C T

Let D be a P.I.S. and let $D_2 = D \times D$. If addition and multiplication in D_2 are defined componentwise and scalar multiplication by elements of D by $d(x, y) = (dx, dy)$, then D_2 becomes a D algebra. In this research the modules and subalgebras of D_2 that are two dimensional are investigated.

* * * * *

TITLE: Class Groups over Certain Three Dimensional Rings

PRINCIPAL INVESTIGATORS: Murray Barr and Martin Heinzer

A B S T R A C T

Subrings of three dimensional principal ideal rings are investigated with respect to their class groups.

* * * * *

TITLE: Polynomials with Zeros Uniformly Distributed on the Unit Circle

PRINCIPAL INVESTIGATORS: Rene Rodriguez and Pat O'Hara

MATHEMATICS AND STATISTICS (Continued)

A B S T R A C T

Let $\{z_{nk}\}_{k=1}^n$, $n=1,2,3,\dots$ be a collection of points on the unit circle in the complex plane, $|z|=1$, and let $P_n(z) = (z-z_{n1})(z-z_{n2}) \dots (z-z_{nn})$, $n=1,2,3,\dots$. The property that the points $\{z_{nk}\}_{k=1}^n$, $n=1,2,3,\dots$ be uniformly distributed on $|z|=1$ was shown, by relatively elementary means, to be equivalent to certain properties of the polynomials $\{P_n\}_{n=1}^\infty$.

PHYSICS

TITLE: Picosecond Pulse Shaping-Computer Modelling

PRINCIPAL INVESTIGATOR: Drs. H. E. Bates and B. J. Henderson

A B S T R A C T

Gaussian pulse synthesis has been analyzed and various pulse shapes produced.

* * * * *

TITLE: An Analysis of Passive Pulse Shaping Concepts

PRINCIPAL INVESTIGATOR: Dr. H. E. Bates

A B S T R A C T

A report was prepared for Lawrence Livermore Laboratory on performance characteristics of polarizer networks for use in tailoring various time profiles of laser pulses.

* * * * *

TITLE: Development of Computer Examples for Teaching Illustrations in Astronomy and Physics

PRINCIPAL INVESTIGATOR: Dr. J. S. Bolemon

A B S T R A C T

Many classroom aids have been developed, some of which are particularly striking. One such is a set of computer-generated star maps of constellations for each season of the year. The effect of decreasing visibility due to variables such as city lighting or atmospheric absorption is clearly illustrated.

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TITLE: Computer Generated Films for Astronomy and Physics

PRINCIPAL INVESTIGATOR: Dr. J. S. Bolemon

Modification of a camera drive with an intervalometer and variable exposure capability has allowed filming of real time sequences on the graphics display terminal and their playback over extended numbers of frames. Examples of a number of physical problems were chosen for the way student understanding can be enhanced by these visual aids.

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NON-SPONSORED RESEARCH 1976-77

PHYSICS (continued)

TITLE: Continuation of Radioastronomy Research

PRINCIPAL INVESTIGATOR: Dr. J. C. Katzin

A B S T R A C T

Radio observations of cometary nebulae have been analysed and related to theoretical predictions.

* * * * *

TITLE: Functional Analysis of Interbehavioral Systems

PRINCIPAL INVESTIGATOR: Dr. B. J. Henderson (with R. D. Ray and J. D. Upson)

A B S T R A C T

Data analyzed of system behavior has been shown to allow modelling of psychological behavior patterns. This has implications for psychosomatic health and pathology.

* * * * *

TITLE: Uranium Recovery

PRINCIPAL INVESTIGATOR: Dr. B. J. Henderson (with M A. Henderson)

A B S T R A C T

Ways of using bacteria for leaching and recovery of uranium from slime ponds in phosphate mining regions have been examined. Instrumentation needs for experimental work were compiled and a proposal was prepared for external funding.

* * * * *

TITLE: Solar Simulator Analysis

PRINCIPAL INVESTIGATOR: Dr. H. E. Bates

A B S T R A C T

Computer analysis of performance characteristics was carried out to determine the spectral reflectivity properties of a number of surfaces. This information was requested by the Solar Energy Center.

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PRESENTATIONS OF PROFESSIONAL PAPERS

ALLIED HEALTH SCIENCES

GEREN, M. J., "Medications Commonly Used in Radiology", to a nursing group at Kissimmee Community Hospital, Kissimmee, Florida. May 1977.

TUCKER, JEANNE H., "Quality Assurance and Medical Records", to the Iowa Medical Record Association, Little Amana, Iowa. April 22, 1977. (non-refereed, regional).

PRESENTATIONS OF PROFESSIONAL PAPERS

BIOLOGICAL SCIENCES

EHRHART, L. M. and R. G. YODER. 1976. The marine turtles of the Merritt Island National Wildlife Refuge, Kennedy Space Center, Florida. Paper given at Florida and Interregional Conference on Sea Turtles, Jensen Beach, July 24-25.

EHRHART, L. M. 1976. An overview of marine turtle research at the Merritt Island National Wildlife Refuge. Paper given at meeting of Florida Field Biologists, Tallahassee, November 5-6.

EHRHART, L. M. 1976. Reproductive characteristics and management potential of the sea turtle rookery at Canaveral National Seashore, Florida. Paper given at First Conference on Scientific Research in the National Parks, New Orleans, November 9-13.

EHRHART, L. M. and R. G. YODER. 1977. Results of marine turtle studies at the Merritt Island National Wildlife Refuge, Summer 1976. Paper given at annual meeting of Florida Academy of Science, Gainesville, March 23-25.

KOEVENIG, J. L., "Biology of Man: A Non-Traditional Approach to College Teaching." National Association of Biology Teachers Annual Convention, Denver, Colorado. October 1976.

KUHN, DAVID T., "Aldehyde oxidase abnormalities in D. melanogaster imaginal discs," American Cancer Society, Jacksonville, Florida. October 1976.

KUHN, DAVID T., "Aldehyde oxidase distribution in imaginal discs, histoblasts, and rings of imaginal cells in D. melanogaster," 20th Annual Drosophila Research Conference, San Diego, California. March 1977.

KUHN, DAVID T., "Use of aldehyde oxidase for studies of determination and compartmentalization in D. melanogaster," 1st Annual Southeastern Drosophila meeting, Helen, Georgia. April 1977.

MILLER, HARVEY A., "Principles of Plant Geography and the Role of the Herbarium." British Museum of Natural History staff lecture series, London, England. November 17, 1976.

MILLER, HARVEY A., "Bryological Gossip Through the Sands of Time" British Museum of Natural History public lecture series, London, England. November 23, 1976.

MILLER, HARVEY A., "Report of the Editor and Executive Secretary," Annual Meeting of the Florida Academy of Sciences, Gainesville, Florida. March 24, 1977.

MILLER, HARVEY A., "Manufacturing Alternatives for Academy Publications". Symposium on Problems of Running an Academy of Science. Annual Meeting of the AAAS in Denver, Colorado. February 21, 1977.

PRESENTATIONS OF PROFESSIONAL PAPERS

BIOLOGICAL SCIENCES (continued)

OSBORNE, J. A. Limnological Studies in Florida Lakes. Presented at the Third Youth Environmental Conference, America's Tricentennial, SEEK, 1976, at Florida Technological University, Orlando, Florida. August 1976.

OSBORNE, J. A. Water Quality and the White Amur in Four Experimental Ponds. Presented at the 2nd Annual Grass Carp Workshop at the University of Florida, Gainesville, Florida (sponsored by the University of Florida and the Florida Game and Freshwater Fish Commission). September 1976.

OSBORNE, J. A. Biology of the White Amur and its status in weed control in Florida's lakes. Presented to the Maitland Lakes Advisory Committee. November 1976.

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