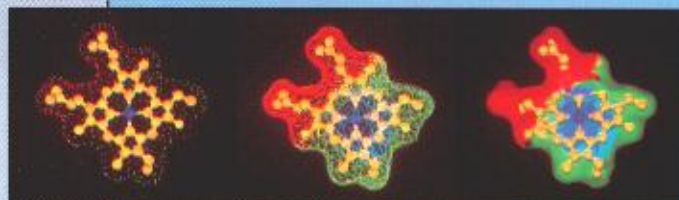


# BIOCHEMISTRY



## The University of Georgia



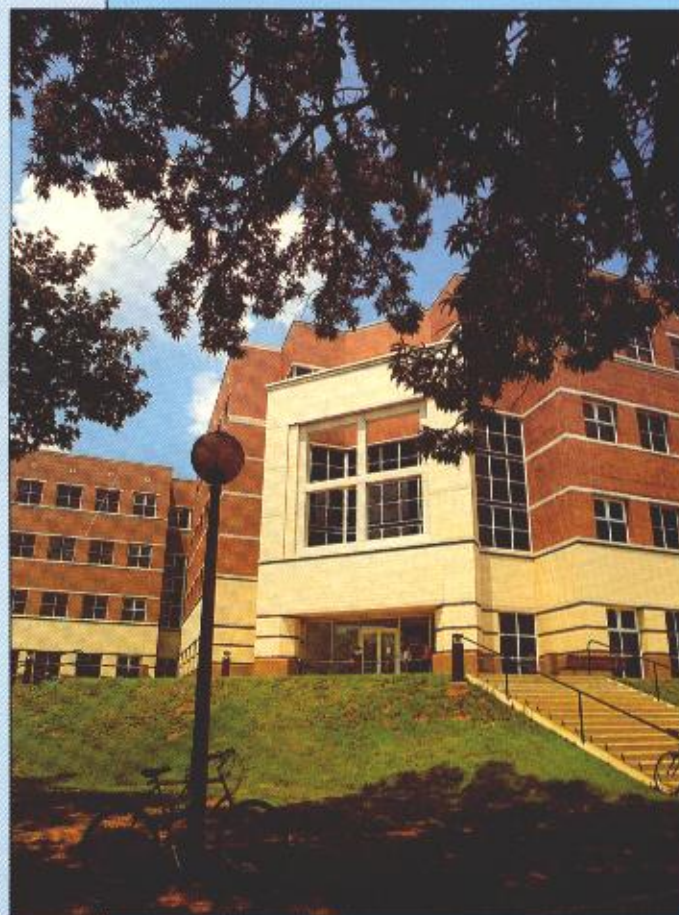
### The University of Georgia

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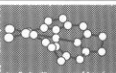
If you have a disability and need assistance in order to obtain this brochure in an alternative format, please contact the Department of Biochemistry at (706) 542-1334.

May 1993



# Introduction

General Information/Resources



**T**he Department of Biochemistry is one of six departments comprising the Division of Biological Sciences in the Franklin College of Arts and Sciences at The University of Georgia. The department was organized in 1965 and degree programs are offered presently with a major in biochemistry at the B.S., M.S. and Ph.D. levels. Research interests of the staff are briefly described in the following section with a listing of the faculty, and it may be seen that these interests are varied and present a well-rounded program appropriate to a department in the College of Arts and Sciences.

## Facilities

The faculty of the Department of Biochemistry is currently housed with the Department of Genetics in the Life Sciences Building, a \$32 million laboratory complex. In addition to 80 modern research laboratories, the building contains teaching laboratories, administrative areas, lecture rooms, a library area, extensive animal quarters and a fermentation plant containing two 400-liter fermenters, a 100-liter fermenter and a 30-liter "seed" fermenter, plus the necessary equipment for harvesting and processing kilogram quantities of bacteria.

In addition, the building has a centralized computer facility; molecular graphics terminals; a molecular sequencing facility containing two gas phase protein sequencers, two peptide synthesizers, an automated DNA sequencer and two nucleotide synthesizers; a membrane inlet mass spectrometer;

### Cover Photos

*Top:* Computer-generated representations of the electrostatic potential surface of a heme group from cytochrome  $c_5$  of the bacteria *Desulfovibrio vulgaris*. The surfaces were calculated using the Molecular Surface Package by Dr. Michael Connolly and software for electrostatic potential coloring written by Dr. Paul Weiner of Alliant Computer Systems and Dr. Steve Gallion of the University of Georgia. All images were produced on the Alliant VFX system. Photos used courtesy of Dr. Paul Weiner.

*Bottom:* The Life Sciences Building, a \$32 million laboratory complex, houses 80 modern research laboratories, teaching laboratories, administrative areas, lecture rooms, a library and extensive animal quarters.

# Introduction

## Resources

two EPR spectrometers; a large-scale high-pressure liquid chromatography system; a picosecond fluorescence spectrometer; and an image intensification microscope. At the Complex Carbohydrate Research Center, 500 and 600 MHz NMR spectrometers and mass spectrometers are available. A broad spectrum of spectrophotometers, centrifuges, counters, HPLC equipment and other equipment needed for modern research in biochemistry and molecular biology is available within the Department.

Supporting facilities available at the University, but not located in the department, include the electron microscopy laboratory, which contains a high-resolution scanning electron microscope and three transmission microscopes as well as EDAX, freeze-etch and other ancillary support equipment; the computer center, which houses an IBM 3090, Model 400E, Control Data 850 and Control Data 205, and ETA 10 Computers, plus supporting facilities and services; the electronic design and maintenance shop; the glassblowing shop; the machine shop; and Central Research Stores. The Science Library, with approximately 850,000 volumes of the total University holding of more than 2.7 million volumes (ranked 26 among all U.S. research libraries), is conveniently located in a wing of the nearby Graduate Studies Building and occupies about 100,000 square feet in four floors of stacks, reading rooms, carrels and study areas. Greenhouses and plant growth chambers are also available for plant biochemistry research, and the University maintains a marine research station at Sapelo Island on the Georgia coast.



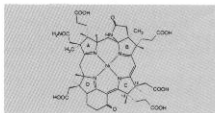
*The Complex Carbohydrate Research Center*

# Introduction

## Appointments, Assistantships

### Visiting Professors

Appointment as visiting professor is available for persons on sabbatical leave who wish to collaborate on a research problem with faculty members in the department. These appointments have ranged from three months to a calendar year.



### Graduate Students

The number of graduate students enrolled in the department during the past few years has varied between 50 and 60. These students are recruited nationally, and to a lesser extent internationally.

Graduate students making normal progress toward their degrees have been financially supported from a number of state, federal and private sources. Summer stipends are available for students on academic year appointments. In addition, tuition is waived for all graduate students receiving support.

### Seminar Program

An active seminar series is supported by the department as an important part of the research and graduate teaching program, with all faculty, post-doctoral fellows and graduate students participating. Interest groups have been organized for seminars to supplement the general interest seminars. Topics covered in the special seminars include developmental biochemistry, photobiology, intermediary metabolism, molecular genetics and complex carbohydrates. Everyone participates in the Monday and Friday general seminars, with interest groups meeting at various times during the week. Guest speakers normally meet with the Monday or Friday noon general interest seminars.

The faculty also sponsor a Winter Seminar Series with invited outside speakers discussing a different topic of intense biochemical interest each year.



# Introduction

## Curriculum

### Undergraduate Program

The undergraduate major in biochemistry is designed primarily for the student with superior aptitude and motivation who plans to continue his/her education past the baccalaureate degree in medicine, dentistry, or some other professional school, in graduate school in biochemistry or in some closely related discipline in the life sciences. The curriculum is rigorous and is designed to give a good background in both the physical and the biological sciences. In the major, students take a one-quarter introductory biochemistry course plus a two-quarter sequence at the advanced undergraduate-beginning graduate level. At least one quarter of laboratory work is also required. This requirement may be satisfied either by taking a formal five-hour laboratory techniques course or through independent research under the supervision of a faculty member. A number of students have prepared honors theses using results obtained in the independent research course. Frequently students become so intellectually involved in their apprentice-like projects that they elect to continue them for two additional quarters.

### Graduate Studies

The graduate curriculum emphasizes both academic scholarship and the acquisition of independent research skills, with individual programs adjusted to meet the needs and interests of each student. Electives in specialized fields are offered both by Biochemistry and by other departments in the Division of Biological Sciences. Some of the courses offered include advanced



# Introduction

## Curriculum

enzymology, nucleic acid metabolism, advanced biochemistry, biophysical chemistry, carbohydrate metabolism, reproductive biochemistry, phytochemistry, mammalian biochemistry, cellular biochemistry, molecular genetics, molecular genetics of the eukaryotes, plant physiology, plant molecular biology, electron microscopy, immunology and insect physiology. Many additional courses are offered by the Chemistry Department, the School of Pharmacy and the School of Veterinary Medicine.

Major emphasis is placed on research and an active seminar series. Students are encouraged to participate in research programs as soon as possible, and many begin their training after their first quarter in the department. All students must demonstrate laboratory proficiency as partial fulfillment of degree requirements and doctoral candidates must become competent, creative investigators. Students entering the department are placed in Master's or Doctoral tracked programs depending on previous achievements, academic records and student goals. Students entering the M.S. program prepare a thesis after two or three years and may develop the same problem for a dissertation with approval of the department and the major professor.

An active postdoctoral program has also been developed in the department. Postdoctoral fellows have been supported by grants from a number of different state and federal agencies. Fellows participate in all laboratory activities and have become an integral part of the graduate training program. Their participation has become particularly significant in developing the research skills of prospective doctoral candidates.

Generous support from both the state of Georgia and various federal agencies has allowed the Department of Biochemistry to acquire creative and productive staff, adequate physical facilities and most of the specialized equipment required for modern biochemical research. Federal research grants to faculty in Biochemistry are now approximately \$4 million per year. The undergraduate, graduate and postgraduate training programs are well-established and are producing individuals well-trained in biochemistry at each level. In this environment the department has developed into an intellectually self-sustaining group who interact well and make significant academic and economic contributions to the University, the state, and the nation.

## Introduction

### Curriculum

### Molecular Biology

The Biochemistry department remains committed to training graduate students in the area of molecular biology. Although a formal curriculum is not required, several electives in Biochemistry as well as other departments in the Division of Biological Science are available to students. In addition to academic courses, at least two thirds of the biochemistry faculty are employing molecular biology in their research programs. Students working in these laboratories are assured of receiving intensive training in this technology as a part of their research programs. To complement individual research programs, state of the art facilities for DNA and protein analysis are maintained for the general use of the department. These facilities include a VAX main-frame computer dedicated to DNA and protein analysis, a Molecular Biology Facility dedicated to sequence analysis and synthesis of DNA and proteins and Computer Graphics Facilities and work stations dedicated to analysis and modeling of DNA and protein structures. Thus courses, facilities and faculty research interests make molecular biology a strong area of interest in the Department of Biochemistry.

### Structural Biology

The Department of Biochemistry is continuing to develop its interest in structural biology by creating, along with the center for Metalloenzyme Studies, a state-of-the-art macromolecular x-ray crystallography facility. Two new faculty members are currently being recruited to develop this important aspect of structural biology. The addition of this technology to our department will complement present modeling capabilities as well as the analysis of protein structure by nuclear magnetic resonance (NMR). This rapidly developing area is also becoming an important component of the molecular biology program.

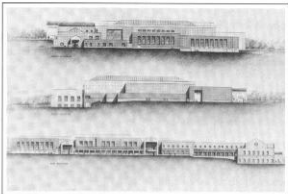
## Introduction

### Lifestyle

### Location and Quality of Life

The University of Georgia is located in Athens, a town of about 75,000 approximately an hour east of Atlanta by car, which provides a convenient air link with all cities in the United States and many direct flights to all parts of the world. The seashore is within five hours drive and the north Georgia mountains, with peaks of nearly 5,000 feet, are less than two hours away. Numerous lakes and rivers for boating and swimming are within an hours drive of the campus.

Athens has significant cultural diversity. The city's music scene, home of REM, B-52's and other nationally known rock groups, is vibrant and invigorating. The Student Physical Activities Center, currently under construction, is a 425,000-square-foot building on River Road. It will include facilities for gymnastics, basketball, racquetball, squash, volleyball, jogging, weight training and other recreational sports. The SPACenter will include Olympic-sized pools for swimming and diving, as well as office and classroom space for the UGA School of Health and Human Performance. A wide range of restaurants serve the community, including Chinese, continental, Greek, Italian, Japanese, Mexican and New Orleans-style. College Square (opposite the University's main entrance—the Arch) is the locale of many outdoor concerts, festivals and events.



Architect's model of the Student Physical Activities Center

## Faculty

Adams, Albersheim



### Michael W.W. Adams

Associate Professor of Biochemistry  
Ph.D. (1979) King's College, University of London

Dr. Adams' research concerns the metabolism of hydrogen and other gases by hyperthermophilic bacteria. These organisms grow optimally near and above 100°C and are found in deep sea and shallow submarine volcanic vents. Their gas-metabolizing metalloenzymes and electron transport proteins are characterized by a variety of biochemical, recombinant DNA and electron/nuclear magnetic resonance techniques. The aims are to understand structure/function relationships at extreme temperatures and to assess the biotechnological potential of extremely thermostable enzymes. A second aspect of his research is a physico-chemical study of the  $H_2$ -activating iron-sulfur cluster of mesophilic hydrogenases. His research is supported by DOE, NSF, NIH and the Navy.

Full Publications: 85

### Peter Albersheim

Co-Director of the Complex Carbohydrate Research Center  
Research Professor of  
Biochemistry  
Ph.D. (1959) California  
Institute of Technology

Dr. Albersheim's research focuses on the determination of the structure and function of complex carbohydrates. A major interest is the structural elucidation of complex carbohydrates located within primary cell walls of plants. Mass spectrometric and NMR techniques are used to analyze the oligo- and polysaccharides that are



## Faculty

Black

isolated from the cell wall. A second area of interest is the regulatory activity of complex carbohydrates in plants. Such regulatory molecules are called oligosaccharins. A third area of interest is biomedical complex carbohydrate research, including investigation of the structure and function of the AIDS virus glycoprotein. Dr. Albersheim, Co-Director of the Complex Carbohydrate Research Center, has received the Charles A. Shull Award from the American Society of Plant Physiologists and the Kenneth A. Spencer Award from the American Chemical Society for outstanding achievement in agricultural chemistry. His research is supported by NIH and DOE.

Full Publications: 242

### Clanton C. Black, Jr.

Research Professor of Biochemistry  
B.S., M.S., Ph.D. (1960) University of Florida

Dr. Black's research is centered around understanding the biochemistry of carbon, nitrogen, sulfur, phosphorus and calcium assimilation in plants. Emphasis is placed upon the  $C_4$  pathway of photosynthetic metabolism, the daily regulation of Crassulacean acid metabolism and sucrose metabolism in higher plants. His laboratory normally is staffed by graduate students, postdoctoral students and visiting scholars with a decided international emphasis.

He has served as president and in other national and regional offices of the American Society of Plant Physiologists, as an editor of *Plant Physiology and Weeds*, and study sections of NSF. In 1982 he was chairman of the Gordon Research Conference on "CO<sub>2</sub> Fixation by Green Plants." He is a Fellow of the AAAS and a recipient of the Merit Award from the Botanical Society of America in recognition of distinguished achievement in and contributions to the advancement of botanical science. His research is supported by NSF, AID and the USDA.

Full Publications: 190



## Faculty

*Brewer, Darvill*



### **John M. Brewer**

Professor of Biochemistry  
B.A., Ph.D. (1963) Johns Hopkins University

His research is in (the areas of) protein structure and function, particularly the mechanism of activation of enzymes by metal ions. His investigations employ site-directed mutagenesis, chemical modification and physical biochemistry techniques such as steady-state and dynamic fluorescence, sedimentation, and high-field NMR. His research has been supported by NIH, USDA and NSF.

Full Publications: 70



### **Alan Darvill**

Co-Director of the Complex Carbohydrate Research Center  
Professor of Biochemistry  
Ph.D. (1976) University College of Wales, Aberystwyth

Dr. Darvill's primary research interest is the isolation and structural characterization of plant cell wall complex carbohydrates that have biological activity. In these investigations, extensive use of mass spectrometry, NMR spectroscopy, plant bio-assays and enzyme and chemical techniques for carbohydrate structural characterizations is required. His research is supported by DOE and NIH.

Full Publications: 122

## Faculty

*DerVartanian/Dure*



### **Daniel V. DerVartanian**

Professor of Biochemistry and Microbiology; Chairman,  
Division of Biological Sciences  
A.B. (1956) Boston University, Chemistry  
M.S. (1959) Northeastern University, Chemistry  
Sc.D. (1965) University of Amsterdam

Dr. DerVartanian's research interests center on respiratory mutants of nitrogen-fixing bacteria and the study of respiratory lesions. The function of unusual redox metals (nickel, etc.) is studied by electron paramagnetic resonance spectroscopy in key biological enzymes such as hydrogenase, carbon monoxide dehydrogenase, etc. He held an NIH Career Development award from 1971 until 1976, and has served on the editorial boards of the *Journal of Bioenergetics* and *Biomembranes* and the *Journal of Bacteriology*. He is presently on the editorial board of *Biochimica Biophysica Acta*. His research has been supported by NIH and NSF. He has received awards for advanced study from the French government, the Netherlands government, and NATO.

Full Publications: 99



### **Leon Dure III**

Franklin Professor of Biochemistry  
B.A., M.A., University of Virginia  
Ph.D. (1960) University of Texas

Dr. Dure's research interests center on molecular biology of higher plant development, specifically, regulation of

## Faculty

Eriksson

expression of genes during seed embryogenesis, sequence analysis of developmentally regulated genes and their flanking regions, and structure and function of abscisic acid induced proteins. Dr. Dure was an NIH Career Development Awardee, has served as president of the International Society for Plant Molecular Biology, and has been a member of the NSF panel for Developmental Biology. He was Co-Director, NATO Advanced Study Institute on Structure and Function of Plant Genomes (Porto Portese, Italy, 1982), organizer of the First International Congress of Plant Molecular Biology (Savannah, 1985), and has had research support from NIH, NSF, and industry. Dr. Dure has also served on the editorial boards of *Plant Physiology* and *Planta* and is North American editor of *Plant Molecular Biology*.

Full Publications: 80

### Karl-Erik L. Eriksson

Professor of Biochemistry, Eminent Scholar in Biotechnology  
B.S. University of Uppsala  
Ph.D. (1962) University of Uppsala  
Dr. of Sci. (1967) University of Stockholm



The principal aim of work in Professor Eriksson's lab is to develop biotechnological processes for use in the pulp and paper industry, forestry and agriculture. The various research projects are thus of both basic and applied nature. Lignin, a component of plant cells walls, is the focus for most of the projects. One major project seeks to understand lignin biosynthesis both *in vivo* and *in vitro*. How

the cell walls of loblolly pine became lignified during the defense response against fusiform rust, a major fungal pathogen, is also under study. Enzyme mechanisms involved in fungal degradation of lignin is another major area of study. Development of new, environmentally benign, pulp bleaching techniques in which enzymes and oxygen-based chemicals are substituted for chlorine and chlorine-derivatives, is a further example of lignin based research.

## Faculty

Glover

Dr. Eriksson received the International Marcus Wallenberg Award in 1985. Eriksson is a member of the Royal Swedish Academy of Engineering Sciences, the International Academy of Wood Science, and the World Academy of Arts and Sciences.

Full Publications: 210

### Claiborne V.C.

#### Glover III

Professor of Biochemistry and Genetics  
B.A., Duke University  
Ph.D. (1979) University of Rochester

Dr. Glover was an N.I.H. Postdoctoral Fellow at Stanford University before joining the faculty in 1984. His research interests are in biochemistry and molecular genetics.

Dr. Glover's group is involved in the study of protein phosphorylation as a regulatory mechanism in eukaryotic cells. His group is currently focusing on a ubiquitous and highly conserved protein kinase known as casein kinase II, which phosphorylates a broad spectrum of both nuclear and cytoplasmic substrates. The physiological role of this enzyme is being explored via a combined biochemical, molecular and genetic approach using two different experimental systems, *Drosophila melanogaster* and the yeast *Saccharomyces cerevisiae*. The enzyme has been purified to homogeneity from both organisms and extensively characterized, and genes encoding the enzyme subunits have been cloned and sequenced. Null alleles of the yeast catalytic subunit genes have been generated via gene disruption and reveal that casein kinase II is essential for cell viability. Site-specific and temperature-sensitive mutations are currently being constructed in order to analyze casein kinase II function *in vivo*. Second-site reversion of various temperature-sensitive alleles is also being used to identify other genes in the casein kinase II pathway. His research has been supported by NIH and ACS.

Full Publications: 31





## Faculty

Ingle, Lee



### John Ingle

Professor of Biochemistry and Assistant Vice President for Research  
B.Sc., Ph.D. (1962) The University of Bristol

Dr. Ingle's main interest is the structure and function of the plant genome during development. In addition to an academic research career at the University of Edinburgh he was the scientific advisor in biochemistry and molecular biology to the Agricultural Research Council in the United Kingdom. He was vice president for research and director of the research laboratory of Agrigenetics Advanced Science Company, a plant biotechnology company focusing on the improvement of plant varieties by transformation and molecular mapping, before joining The University of Georgia in 1989 as director of the Biological Resources and Biotechnology Program and Director of the Industrial Interface Program.

Full Publications: 58



### John Lee

Professor of Biochemistry  
Ph.D. (1960) University of New South Wales

Dr. Lee's research interests are centered on biophysical aspects of bioluminescence of bacteria, and applications of laser spectroscopy to biochemical problems. He utilizes an

## Faculty

LeGall

NIH-University picosecond laser fluorescence facility for these studies. The properties of lumazine protein from the luminous bacteria are also under detailed study, including its spectral properties, primary sequence from chemical and DNA methods, and growth of a crystal for 3-dimensional X-ray structure. Collaborative research with groups in Holland and Germany concerns high-field NMR studies of lumazine protein and luciferase. His research has been supported by NIH and NSF.

Full Publications: 94

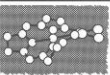


### Jean LeGall

Research Professor of Biochemistry and Microbiology  
B.S., M.S., Ph.D. (1967) University of Aix-Marseille

The central theme of Dr. LeGall's research is the study of the interactions between proteins and transition metals such as iron, copper, molybdenum, and nickel. These metals are present in enzymes which activate molecular hydrogen (hydrogenases), reduce nitrite to nitric oxide or to ammonia (nitrite reductases), reduce sulfite to sulfide (sulfite reductases), and are implicated in the reduction of CO<sub>2</sub> to methane. They are also present in electron transfer proteins such as mono- and multiheme cytochromes and non-heme iron-proteins such as rubredoxin, desulforedoxin and ferredoxins. Current research projects, well supported by NSF and NIH, include the role of nickel and iron in the catalytic site of hydrogenase, the biological interconversion of three and four iron-sulfur centers, the mechanism of nitrite reductases, the determination of the structure of the newly discovered rubrerythrin, and the role of molybdenum in aldehyde oxidases. Dr. LeGall has served on the editorial board of *Biochimie* and of the *Annales de l'Institut Pasteur*, has received the Louis Pasteur gold medal from the French Academy of Sciences, and serves on study sections for both the U.S. and French governments.

Full Publications: 254



## Faculty

Ljungdahl

### Lars G. Ljungdahl

Georgia Power  
Distinguished Professor  
of Biochemistry and  
Microbiology  
B.S., Stockholm  
Technical Institute  
Ph.D. (1964) Case  
Western Reserve  
University

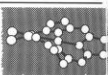
Dr. Ljungdahl's research concerns the enzymology of the net formation of acetate from carbon dioxide via a newly discovered autotrophic pathway involving folate and vitamin B<sub>12</sub> and the biochemistry and physiology of new types of anaerobic fungi and thermophilic bacteria capable of degrading biopolymers such as starch and cellulose. Current research projects include catalytic roles of iron, selenium and tungsten in formate dehydrogenase, the role of nickel in carbon monoxide dehydrogenase, characterization of active sites of folate- and B<sub>12</sub>-requiring enzymes involved in acetate synthesis, the generation of energy in autotrophic acetogens and the characterization of cellulolytic enzyme systems of anaerobic microorganisms. Dr. Ljungdahl received a Von Humboldt Award from the German government (1974-75) for advanced study at the University of Göttingen and an award from the Swedish government for advanced study at the Swedish Forestry Products Research Laboratory (1982-83). He was elected foreign member of the Swedish Academy of Engineering Sciences in 1987. He is since 1986 editor-in-chief for *Applied and Environmental Microbiology*. He serves on an NIH study section in Microbial Physiology, has research support from NIH and DOE, and is the director of the Center for Biological Resource Recovery.

Full Publications: 125



## Faculty

Mendicino



### Joseph F. Mendicino

Professor of Biochemistry  
B.S., Case Institute of Technology  
Ph.D. (1958) Western Reserve University

Dr. Mendicino was a Polio Foundation Postdoctoral Fellow at the Institute for Biochemical Investigation in Buenos Aires with Dr. Luis Leloir until 1960 and an NIH Postdoctoral Fellow at Western Reserve University until 1962 before joining the Department of Biochemistry at Ohio State University. In 1968, he joined the Department of Biochemistry at The University of Georgia and is currently a Professor in the Department of Biochemistry.

Dr. Mendicino's research is concerned with the regulation of mucin glycoprotein biosynthesis in trachea. Current studies include cultivation of mucus-secreting cells, determination of the structure of oligosaccharide chains in mucin glycoproteins and the translation of mRNA and cDNA coding for mucin glycoproteins and glycosyltransferases. This research is funded by NIH. The primary emphasis of his teaching is to provide students with an in-depth multidisciplinary background in molecular and cell biology. He has edited more than 80 papers and has served on many study sections reviewing research applications. He has received numerous travel awards including a recent Fulbright Fellowship.

Full Publications: 77

## Faculty

Meyer



### Bernd Meyer

Member of the Complex Carbohydrate Research Center  
Associate Professor of Biochemistry  
Ph.D. (1979) University of Hamburg

Dr. Meyer studies the conformational analysis of oligosaccharides and glycoconjugates using computational methods and NMR spectroscopy. His research deals with the analysis and prediction of the three-dimensional structures of complex carbohydrates and glycoproteins. Glycoprotein knowledge of the structure of the protein part is necessary to account for its influence on the structure of the carbohydrate portion and hence its biological role. It is possible to determine the tertiary structure of the glycoconjugate by computational methods from knowledge of the glycosylation sites of a protein and the primary structure of an attached oligosaccharide. Chemical synthesis of model compounds and NMR spectroscopic methods are used to complement the computational results. His program GESA is in use by over 20 research groups worldwide.

Full Publications: 44

## Faculty

Mohnen



### Debra Mohnen

Member of the Complex Carbohydrate Research Center  
Assistant Professor of Biochemistry  
B.S. Lawrence University  
Ph.D. (1985) University of Illinois, Urbana. Research conducted at the Friedrich Miescher Institute, Basel, Switzerland

Dr. Mohnen's research focuses on the molecular basis for the plasticity of plant development, a plasticity exemplified by *de novo* meristem formation in tobacco thin-cell layer explants (TCLs). TCLs can be induced by the phytohormones auxin and cytokinin to produce *de novo* roots, shoots or flowers within 24 days of culture. Research efforts include studying changes in gene expression during TCL organogenesis and studying how morphogenetically active plant cell wall-derived oligosaccharides ( $\alpha$ -1,4-linked oligogalacturonides) can inhibit root formation and/or induce *de novo* flower information in TCLs. Another research area is the study of plant cell wall polysaccharide biosynthesis. Current emphasis is on studying the enzyme that synthesizes homogalacturonan, a major component of pectin in the cell wall.

Full Publications: 11

## Faculty

Moremen



### Kelley W. Moremen

Member of the Complex Carbohydrate Research Center  
Assistant Professor of Biochemistry  
Ph.D. (1984) Vanderbilt University

Dr. Moremen's research concerns the structure, regulation, and localization of enzymes involved in the biosynthesis and catabolism of mammalian glycoproteins. Oligosaccharides have been shown to be involved in biological recognition events and influence the bioactivity of glycoconjugate structures. Alterations in the synthesis and degradation of these structures can also occur in human genetic diseases and cancer. His lab has isolated the genes encoding several of the enzymes involved in glycoprotein biosynthesis and catabolism and these enzymes have been organized into several multi-gene families. The functions of these enzymes are being addressed by biochemical approaches *in vitro* and by expression studies *in vivo*. The molecular basis of human genetic defects in these enzymes is also being assessed. A second area of interest is the use of enzymes expressed by recombinant approaches for *in vitro* enzymatic synthesis of oligosaccharides. His research is supported by NIH.

Full Publications: 14

## Faculty

Orlando



### Ron Orlando

Member of the Complex Carbohydrate Research Center  
Assistant Professor of Biochemistry  
B.S. (1983) St. Mary's College of Maryland  
Ph.D. (1988) University of Delaware

Dr. Orlando's research interests focus on the analysis of biologically active materials by a variety of advanced mass spectrometric techniques. One area of interest is in the detection of non-covalent complexes by electrospray ionization mass spectrometry. This technique allows *in vitro* studies of a number of phenomena, including deposition of the  $\beta$ -amyloid protein in people suffering from Alzheimer's disease, and cataract formation in diabetic patients. A second aspect of his group's research is to develop new methodologies that increase the information provided by these MS experiments while decreasing the sample quantities required for analysis.

Full Publications: 27

## Faculty

Peck



### Harry D. Peck, Jr.

Franklin Professor of Biochemistry  
B.S., M.A., Wesleyan University  
Ph.D. (1956) Western Reserve University

The biochemistry and bioenergetics of strictly anaerobic bacteria involved in the conversion of biopolymers such as cellulose to carbon dioxide and methane is the main area of Dr. Peck's research interest. He is particularly interested in the interactions between the sulfate-reducing bacteria and the methanogenic bacteria in these complex microbial associations responsible for methane production. Current research projects supported by NSF, NIH and DOE include the enzymatic mechanisms of hydrogenase structures and liganding of their redox centers, molecular biology of hydrogenase in *E. coli* and other bacteria, the sulfate-reducing bacteria and the role of hydrogenase in energy generation by the sulfate-reducing bacteria. Dr. Peck has served on the editorial boards of the *Journal of Bacteriology* and *Biochimica et Biophysica Acta*, has been a Foundation for Microbiology Lecturer, and has received awards for advanced study from the NSF, NIH and DOE.

Full Publications: 145

## Faculty

Pierce



### Michael Pierce

Member of the Complex Carbohydrate Research Center  
Associate Professor of Biochemistry  
Ph.D. (1980) The Johns Hopkins University

Dr. Pierce's research focuses on identifying oligosaccharide-receptor interactions and understanding their functions, particularly those that regulate the adhesion and metastatic potential of tumor cells. A fundamental observation about tumor cells is that the expression of specific oligosaccharides on their surfaces is significantly altered, and many studies suggest a link between some of these changes and the ability of the cells to metastasize. The oncogenes, v-src and H-ras, for example, cause specific changes in asparagine-linked oligosaccharide expression. Dr. Pierce's laboratory has developed molecular tools to test this hypothesis, which involved the isolation of cDNAs encoding several glycosyltransferases, those enzymes responsible for the synthesis of cell surface oligosaccharides. The interaction of oligosaccharides and their receptors is clearly critical for many normal adhesive events involving platelets, lymphocytes and endothelial cells, and the future challenge is to discover and investigate additional examples of this class of receptor-ligand recognition. His research group is now exploring the regulation of several of these adhesive interactions by changes in glycosyltransferase expression, and as a result of these studies, several reagents are being developed for the biotechnology industry. Their research is supported by the NIH, ACS, and several biotechnology companies. Dr. Pierce is the recipient of a five-year Faculty Research Award from the American Cancer Society.

Full Publications: 26



## Faculty

Przybyla



### Alan Przybyla

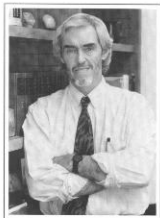
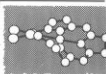
Professor of Biochemistry  
B.S., University of California at Berkeley  
Ph.D. (1973) University of California at Berkeley

Dr. Przybyla's research interests are concerned with the regulation of hydrogenase synthesis in prokaryotic cells and the role of hydrogenase in cellular metabolism. An 8 Kb operon for one *E. coli* hydrogenase has been sequenced and used to generate an 8Kb deletion mutant. Studies with this mutant have shown that at least four genes are required for the expression of active enzyme. Two genes code for the catalytic subunits of the enzyme while the other two genes code for integral membrane proteins. In vitro expression of these genes is being used to define the cellular localization and role of each subunit in hydrogenase activity. In vitro mutagenesis of the genes for the two catalytic subunits is also being used to investigate the liganding of metal ions to the peptides and the roles of these metals in enzyme functions. He presently serves as graduate coordinator for the Department. His research has been supported by NSF and NIH.

Full Publications: 32

## Faculty

Puett



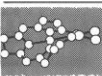
### J. David Puett

Professor and Head of Biochemistry  
Ph.D. (1969) University of North Carolina, Chapel Hill

Dr. Puett's research is primarily concerned with molecular and cellular biochemical endocrinology. Current emphasis is on the glycoprotein hormone, human chorionic gonadotropin (hCG), the peptide hormone, endothelin (ET), their receptors, the nature and mechanism of the intracellular signaling pathways, and gene activation, particularly protooncogene induction, in response to hormone binding. Site-directed mutagenesis is used to prepare mutant hormones and receptors for detailed molecular investigation of hormone-receptor recognition determinants. There is also considerable interest in the G protein-coupled receptors, including the mode of hormone-mediated signaling via the seven transmembrane helical segments. hCG is required for the maintenance of early pregnancy and is necessary for male phenotype differentiation; interestingly, it is also a product of certain types of cancer. ET has potent vasoconstrictive properties and is mitogenic to various cell types, including smooth muscle cells and certain tumor cells. Thus, research on these hormones has important implications in reproductive, cardiovascular, and pulmonary biochemical endocrinology, as well as in certain types of hormone-responsive/producing neoplasms. Dr. Puett was a Research Career Development Awardee of NIH and is currently Chairperson of the NIH Biochemical Endocrinology Study Section. His research is supported by NIH and AHA.

Full Publications: 190





## Faculty

Robson



### Robert L. Robson

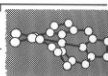
Associate Professor of Biochemistry  
Ph.D. (1974) University College of Wales

Dr. Robson studies the biochemistry and the genetics of nitrogen fixation. Some bacteria contain two genetically distinct systems, one using molybdenum and the other vanadium. The objectives are to isolate and characterize genes for both systems to find out what they do at the biochemical level and to determine how their expression is regulated. This involves the employment of modern molecular biology techniques such as DNA sequencing, site-directed mutagenesis, computer-assisted gene analysis and protein structure modeling. Other interests include metalloprotein systems such as hydrogenase. His research is supported by N.I.H.

Full Publications: 38

## Faculty

Sansing, Srivastava



### Norman G. Sansing

Associate Professor of Biochemistry  
B.S., M.S., Auburn University  
Ph.D. (1962) Iowa State University

Dr. Sansing spent 1962 to 1964 as a research associate at the biology division of the Oak Ridge National Laboratory with Dr. E. Volkin. He came to The University of Georgia in 1964 where he has been largely concerned with development of the undergraduate instructional program in biochemistry and student advising. He presently serves as chief health professions advisor for the College of Arts and Sciences and has served as president of the National Association of Advisors for the Health Professions.

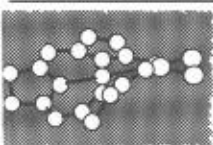
Full Publications: 2

### Prakash N. Srivastava

Professor of Biochemistry  
B.S., M.S., Lucknow  
University, India  
Ph.D., (1965) Cambridge  
University, U.K.

Dr. Srivastava's research interest centers on enzymology of sperm and of the female reproductive organs, isolation of sperm membranes and lysosomal enzymes, role of sperm acrosomal enzymes in the penetration of the ovum and fertilization, the immunocontraception and hormonal regulation of lysosomal enzymes in the female reproductive tract. He was a World





## Faculty

Travis

Health Organization Fellow at Cambridge in 1975, a United Nations Development Program expert in 1988. He serves in the Peer Review Committee of NIH and his research is supported by NIH.

Full Publications: 59

### James Travis

Research Professor of Biochemistry  
B.S., University of Manitoba  
Ph.D. (1964) University of Minnesota

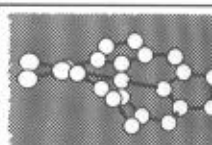
Dr. Travis' current research involves the determination of the biochemical basis for the development of pulmonary emphysema, including the role of plasma proteinase inhibitors, neutrophil and mast cell proteinases, and connective tissue proteins in abnormal lung turnover. In addition, projects are also being continued which involve the role of proteolytic enzymes and inhibitors in the development of rheumatoid arthritis and periodontitis. Dr. Travis has served on study sections of NIH and his research is supported by an NIH Merit Award. He is on the editorial board of Journal of Biological Chemistry and he has been a Career Development Awardee of the NIH.

Full Publications: 170



## Faculty

van Halbeek



### Herman van Halbeek

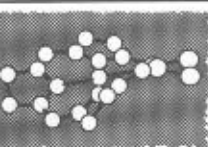
Member of the Complex Carbohydrate Research Center  
Associate Professor of Biochemistry and Chemistry  
Ph.D. (1982) University of Utrecht

Professor van Halbeek is interested in the structure and function of the carbohydrate side chains of glycoproteins, mainly in relation to disease processes such as cancer and AIDS. His research group is

developing methods for structure determination of complex carbohydrates using nuclear magnetic resonance (NMR) spectroscopy. Dr. van Halbeek is a member of the Complex Carbohydrate Research Center. He is supported by grants from NIH.

Full Publications: 153





## Faculty

Wampler



### John W. Wampler

Professor of Bio-chemistry

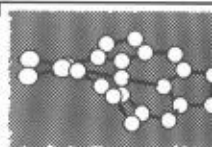
B.S., Ph.D. (1969) University of Tennessee

Trained in the molecular spectroscopy of biological compounds, Dr. Wampler's general area of interest is in computer applications to biochemical problems. In recent years these interests have focused primarily on molecular modeling and computational chemistry as applied to redox proteins. These studies are giving insights into the structure/function relationships of proteins involved in electron transport in bacteria. In support of the molecular modeling efforts, algorithms are being studied for predicting structures of homologous proteins based on known X-ray structure and amino acid sequence and a variety of physical measurements are being used to probe the interactions and behaviors of these proteins. A member of the Computational Center for Molecular Structure and Design, and the Center for Metalloenzyme Studies, his research is supported by NIH.

Full Publications: 74

## Faculty

Adjunct Faculty



### Jointly Staffed/Adjunct Faculty

- Dr. Russell Carlson**, Adjunct Associate Professor of Biochemistry and Complex Carbohydrate Research Center
- Dr. Marcus Fechheimer**, Assistant Professor of Zoology
- Dr. B.H. (Vincent) Huynh**, Associate Professor of Physics, Emory University, Atlanta
- Dr. Michael K. Johnson**, Associate Professor of Chemistry
- Dr. Joe L. Key**, Vice President for Research and Professor of Botany
- Dr. Donald M. Kurtz, Jr.**, Associate Professor of Chemistry
- Dr. Isabel Moura**, Associate Professor of Biochemistry, New University of Lisbon, Portugal
- Dr. Jose Moura**, Associate Professor of Biochemistry, New University of Lisbon, Portugal
- Dr. Franz Muller**, Adjunct Professor of Biochemistry, Sandoz Chemicals, Basel, Switzerland
- Dr. Gordhan L. Patel**, Professor of Zoology and Dean of the Graduate School
- Dr. Robert S. Phillips**, Assistant Professor of Chemistry
- Dr. Robert A. Scott**, Associate Professor of Chemistry
- Dr. Charles H. Stammer**, Professor of Chemistry
- Dr. Aladar A. Szalay**, Adjunct Professor of Biochemistry, University of Alberta, Canada
- Dr. William B. Whitman**, Associate Professor of Microbiology
- Dr. Juergen Wiegel**, Associate Professor of Microbiology
- Dr. Antonio Xavier**, Head and Professor of Biochemistry, New University of Lisbon, Portugal

