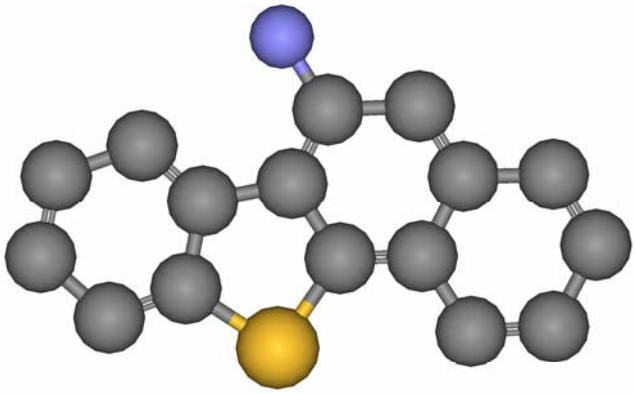
Sixth Annual
Raymond N. Castle
Student Research Conference

Department of Chemistry

University of South Florida

2008



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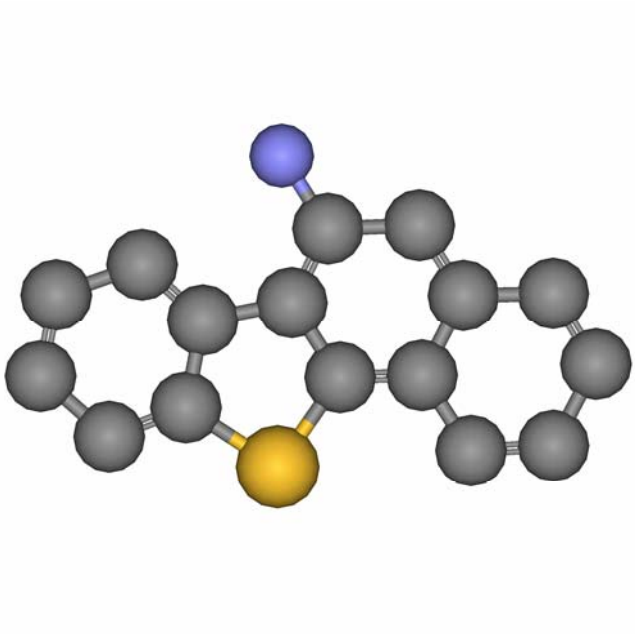

Welcome

Dear Colleagues,

Welcome to the Sixth (nearly) Annual Raymond N. Castle Student Research Conference. In honor of Dr. Raymond N. Castle, this conference was created to promote his goals of scientific collaboration and science education. A pioneer in the synthesis of heterocyclic compounds, Dr. Castle published well over 200 articles, including collaborations with other USF Department of Chemistry researchers, Andrew S. Zektzer, Milton Johnston, and Ron Federspiel, as well as chemists from Japan. On this year's cover, Dr. Castle's synthetic efforts are illustrated through his heterocyclic molecule, 6-aminobenzo[b]naptho[2,1-d]thiophene.

The Raymond N. Castle Conference was designed to be organized by students for students as an excellent opportunity for both undergraduate and graduate students to present their scientific research in a familiar, amiable environment, as well as provide leadership experience for those interested in the conference organization. Students within the department are encouraged to not only gain presentation experience and hone their communication skills to effectively convey their results to a broad audience, but also to discover more about their colleagues' research. We encourage everyone to take advantage of this opportunity and attend both the poster and oral presentations. Additionally, we are all excited to attend our plenary lecture, and we are particularly grateful to have Dr. Vern Schramm, Professor of Biochemistry and Chair of the Department of Biochemistry at the Albert Einstein College of Medicine as our plenary speaker and distinguished guest.

Lastly, we would like to personally thank all of the committee members involved for their help in the coordination of this year's event. Particularly Dr. Muisener has provided invaluable support and donated much of her time to this effort. In addition, any conference could not be successful without financial support, and as such we are grateful to our sponsors and the University of South Florida Department of Chemistry, who have generously contributed to our event. Most importantly, this conference would not exist without the efforts of those of you presenting research today, graduate and undergraduate alike. Therefore, we gratefully acknowledge you and your major professors, as well as all in attendance. Thank you all and we hope you enjoy the Sixth Annual Raymond N. Castle Student Research Conference.

Sincerely,
Chunyan Wang and Emma Farrell
Castle Conference co-Chairs

Raymond N. Castle Research Conference Committee

Faculty Advisor:
Dr. Patricia Muisener

Co-Chairs:
Chunyan Wang
Emma Farrell

Committee Members:
Laura Anderson
Jason Cuce
Sumit Handa
Jaime Heimbegner
Matthew Lebar

Web Support:
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Schedule of Events

Saturday, April 19th, 2008

Time	Event
8:30 - 9:00 A.M.	Registration and Breakfast **(NES 1st Floor Lobby)**
9:00 - 11:30 A.M.	**Morning Session** – Oral presentations by Graduate students **(CHE 100)**
11:40am – 12:40 P.M.	**Plenary Speaker** – Dr. Vern Schramm, "Designing New Drugs from Transition State Theory" **(CHE 100)**
12:45 – 2:45 P.M.	Lunch / Poster Session **(NES 1st Floor)**
2:45 – 5:30 P.M.	**Afternoon Session** – Oral Presentations by Graduate Students **(CHE 100)**
5:30 P.M.	Awards Ceremony **(CHE 100)**

Professor Raymond N. Castle

1916 – 1999

Raymond N. Castle was born on June 24, 1916, in Boise, Idaho where he attended Boise High School and Boise Junior College. A 1938 graduate in pharmacy from the University of Idaho, Southern Branch, in Pocatello, he completed the M.A. degree in Chemistry at the University of Colorado at Boulder in 1941. Shortly thereafter, he became a Chemistry instructor at the University of Idaho, then in 1943, returned to the University of Colorado in Boulder for a Ph.D. in Chemistry with a minor in Microbiology. After two years as a research chemist at the Battelle Memorial Institute in Columbus, Ohio, Dr. Castle accepted a position at the University of New Mexico as an Assistant Professor of Chemistry. He served as chairman of the Chemistry Department from 1963 until 1970, before moving to Brigham Young University as Professor of Chemistry.

In 1981, Dr. Castle joined the faculty at University of South Florida as a Distinguished Research Professor. He and his wife, Ada, have been a vibrant part of the Chemistry Department and for many years sponsored the Castle Lecture Series, which brought in numerous prominent scientists for lectures at USF.

A prolific researcher, Dr. Castle was an internationally recognized father figure in heterocyclic chemistry, both for his research and his involvement in meetings, symposia, and editorial boards. In 1964 he founded the Journal of Heterocyclic Chemistry and served as its editor. He also edited the Lectures in Heterocyclic Chemistry series, a publication of plenary lectures given at the International Congresses of Heterocyclic Chemistry, and as the American advisory editor for the English translation of the Russian Journal of Heterocyclic Compounds. He was in great demand as a speaker, lecturing at hundreds of institutions worldwide. He was general chairman of the First International Congress of Heterocyclic Chemistry held in Albuquerque (1967), secretary of the Second International Congress held in Montpellier, France (1969), vice-president of subsequent congresses held in Sendai, Japan, Salt Lake City, Utah, Ljubljana, Yugoslavia, and Tehran, Iran. He was chairman and committee member for the American Chemical Society. In addition, he was cofounder of the International Society of Heterocyclic Chemistry, which he served as chairman of the executive committee, and president (1973-1975). Professor Castle received numerous awards and honors, including the prestigious International Award in Heterocyclic Chemistry (1983) for outstanding contributions to the field of heterocyclic chemistry, presented in Tokyo, Japan. Dr. Castle was listed in the first edition of Who's Who in World Science and in Who's Who in the World.

The Chemistry Department remains deeply indebted to Professor Castle for his many outstanding contributions to the Department, and to science overall. He would have been a strong supporter of this student symposium, and thus, it is fitting that we dedicate this and future symposia to his memory.

Plenary Speaker

Dr. Vern Schramm, Albert Einstein College of Medicine

Dr. Vern Schramm, a native of South Dakota, earned his bachelor's degree from South Dakota State College. He then earned a Master's degree from Harvard University and a Ph.D. in the mechanism of enzyme action from the Australian National University. Upon returning to the United States, Dr. Schramm served as a NSF-NRC Postdoctoral Fellow at the NASA Ames Research Center. He then joined the faculty of Temple University School of Medicine, where he began fundamental research designed to understand enzymatic transition state structure. In 1987, he moved to the Bronx to become Professor and Chair of Biochemistry at Einstein. He was appointed to the Ruth Merns Chair of Biochemistry in 1995. At Einstein, his research on transition state structure has developed to become a powerful method for drug design.

Dr. Schramm is world-renowned for his research into the "transition-state structure" of enzyme-catalyzed reactions -- the shapes that reacting molecules assume when enzymes catalyze chemical reactions. As he describes it, "By knowing the transition-state structure of enzyme-catalyzed reactions, we can design powerful inhibitors of enzymes to be used as drugs or antibiotics." Two of the inhibitors designed by the Schramm laboratory have entered clinical trials. One of the antibiotics shows promise for treating leukemia that does not respond to other therapy. The second is in clinical trials for eventual application to autoimmune diseases. These include psoriasis, rheumatoid arthritis, multiple sclerosis, inflammatory bowel disorders, insulin-dependent diabetes and tissue transplant rejection. New agents are being explored for malaria, solid tumors, and as bacterial antibiotics.

Dr. Schramm has received numerous honors in recognition of his contributions for both research and teaching in biochemistry and enzymology. These include a ten-year Merit Award from the NIH for work on transition states, the Repligen Award from the American Chemical Society, election as a Fellow of the American Association for the Advancement of Science, the Rudi Lemberg Award from the Australian Academy of Science, the Election to the Davidoff Society at Einstein, the George A. Sowell Award for Excellence in Teaching from Temple University School of Medicine, the Harry Eagle Award for Outstanding Basic Science Teaching from the Albert Einstein College of Medicine, and most recently his election into the National Academy of Sciences. Dr. Schramm has served as the Chair of the Division of Biological Chemistry of the American Chemical Society and is an Associate Editor of the Journal of the American Chemical Society. He serves as a scientific advisor to national research resources and several biotechnology companies.

Discussion Title: "Designing New Drugs from Transition State Theory"

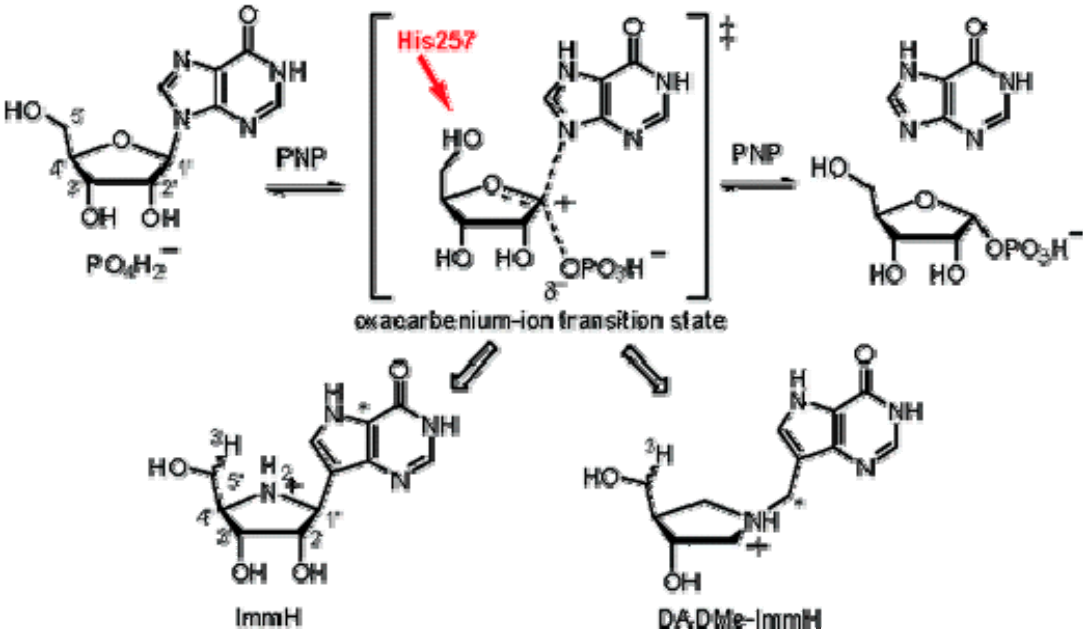


Figure 1. Phosphorolysis of inosine catalyzed by PNP. The oxacarbenium-ion transition state, its chemically stable analogues, ImmH and DADMe-ImmH, and positions of isotopic and remote labels are shown.

Figure taken from: Taylor, E. A.; Clinch, K.; Kelly, P. M.; Li, L.; Evans, G. B.; Tyler, P. C.; and Schramm, V. L. "Acyclic Ribooxacarbenium Ion Mimics as Transition State Analogues of Human and Malarial Purine Nucleoside Phosphorylases" *J. Am. Chem. Soc.*; (Communication); 2007; 129(22); 6984-6985.

Dr. Dean F. Martin, Special Thanks

Dean F. Martin is Distinguished Service Professor and Director of the Institute for Environmental Studies at the University of South Florida, where he has been a member of the faculty since 1964. Dr. Martin received his B.A., with Honors, from Grinnell College (1955), where he met his future wife Barbara while both were chemistry majors. They were married in 1956 while both attended Pennsylvania State University as graduate students and in 1958 Dr. Martin received his Ph.D. and Mrs. Martin her Masters degree. In 1958-59, he was a National Science Foundation Post-Doctoral Fellow at University College, London after which he returned to the States and accepted a faculty position at the University of Illinois, Urbana-Champaign, as Instructor and Assistant Professor of Inorganic Chemistry (1959-1964). He received (1969-1974) a Career Development Award from the Division of General Medical Sciences, NIH, to study the chemistry and chemical environment of algal toxins. In 1970-71, he was a Visiting Professor of Physiology and Pharmacology at Duke University Medical Center.

Dr. Martin and his wife share research interests concerned with the coordination chemistry of natural water systems, including problems of red tide and aquatic weeds and they have collaborated in research involving the properties of coordination compounds, as well as aspects of environmental chemistry. Currently, they are investigating the removal of arsenic by means of supported chelated iron compounds. Dean Martin is the author or co-author of over 300 publications, including four books. He was the recipient of the 1975 Florida Award and the 1987 Civic Service Award of the Florida Section, ACS; in 1978, he received the F. J. Zimmermann Award in Environmental Science from the Central Wisconsin Section, sponsored by Zimpro Inc.; and in 1983, he was elected Fellow of the American Association for the Advancement of Science. Dean and Barbara Martin were the co-recipients of the 1994 Medalist Award of the Florida Academy of Sciences, its highest award. Dean Martin has been active in the Florida Section of the American Chemical Society (Chairman,1986), and he has held several positions in the Aquatic Plant Management Society (President,1986-87). Both of the Martins have received the Alumni Award of Grinnell College.

The Martins have personally funded the George Bursa Award given annually to a deserving graduate student within the Chemistry Department who has demonstrated notable professional dedication and consideration for others, as well as a Graduate Student Travel Award the past two years. In addition, they have been the benefactors of the annual Barbara and Dean Martin Lecture Series. Together the Martins have edited *Florida Scientist* since January 1984. Dr. Martin initiated and continues to edit the departmental newsletter and has written a departmental history to coincide with the 40th Anniversary of the founding of the department.

The Martins have six children; Diane, Bruce, John, Paul, Brian, and Eric, and four grandchildren.

Session Schedule

Morning Session (CHE 100)
Session Chair: Emma Farrell

9:00 – 9:15 **Chunyan Wang**
"The in vitro and in vivo Evaluation of Implanted Glucose Sensors with Hydrogel Coatings"

9:15 – 9:30 **Mariangela Dametto**
"Computer simulations of the refolding of apomyoglobin from high temperature unfolded state"

9:30 – 9:45 **Jeremy Beau**
"*Drug Discovery from Floridian Mangrove Endophytes"*

9:45 – 10:00 **Laura Anderson**
"Design and Synthesis of Peptidomimetics for the Disruption of Bcl-2-family Proteins"

10:00 –10:30 Break

10:30 – 10:45 **Jonathan Belof**
"*Theoretical studies of hydrogen sorption in porous nanomaterials"*

10:45– 11:00 **Justin Moses**
"*Promiscuous oxidative activity of a metallohydrolase"*

11:00 – 11:15 **Christi Young**
"Molecular Dynamics Simulations of Influenza A Non-structural Protein 1 (NS1) RNA Binding Domain"

11:15 – 11:30 **Alaa Hashin**
"Investigating Oxidative Activities of Minimalistic Catalytic Metallopeptides"

11:40 Plenary Speaker

12:45 Lunch/Poster Session

Afternoon Session (CHE 100)
Session Chair: Jaime Heimbegner

2:45 – 3:00 **Sung Wook Yi**
"*Cysteine based PNA (CPNA): Design, synthesis and Application"*

3:00 – 3:15 **Ryan Cormier**
"Polyacrylate Nanoparticles for Potential Delivery of Chloroquine Resistance Reversal Agents"

3:15 – 3:30 **Ruizhi Wu**
"Novel synthesis and polymerization of protected dihydroxy 7-member cyclic carbonate"

3:30 – 3:45 **Divya Ramamoorthy**
"*Inhibitors of SHP2, a protein tyrosine phosphatase"*

3:45 – 4:00 **Matt Lebar**
"Degradation and Partial Reconstruction (C3-14) of Cytotoxic Macrolide Palmerolide A"

4:00 – 4:15 Break

4:15 – 4:30 **Arun Babu Kumar**
"Development of a Labeling Probe for the Discovery and Identification of Saccharide-Binding Proteins"

4:30 – 4:45 **Shawn Hamm**
"Role of the Disulfide Bridge on the Stabilization and Dynamics of Human Cu, Zn Superoxide Dismutase Upon Loss of Zn"

4:45 – 5:00 **Pasha Khan**
"Pd catalyzed allylic alkylation- Application towards synthesis of new bioactive compounds"

5:00 – 5:15 **Sameer Kulkarni**
"Application of Target Guided Synthesis (TGS) approach : Targeting protein-protein interactions"

5:30 Awards Ceremony

The Barbara and Dean F. Martin Undergraduate Poster Session

(NES First Floor)

1. **Jeremy Aguinaldo**
   "Further study involving the removal of selected nuisance anions using different of metal derivatives of immobilizing ligands (IMLIGs)"
2. **Yaniel Cabezas**
   "Sol-gel Titania poly-tetrahydrofuran Coating in Capillary Microextraction On-line Hyphenated with High-Performance Liquid Chromatography"
3. **Ryan Centko**
   "Active Chemical Elucidation from the Extracts of Paphiopedilum lowi
4. **Kevin Clifford**
   "Induction Based Fluids and Quantitation of Charge"
5. **Matthew Chandler**
   "Biomimetic Model of Cytochrome C Oxidase' Binuclear Center"
6. **Jason Cuce**
   "The isolation of palmerolide biomolecules from Synoicum adareanum and their effectiveness as drugs against select pathogens."
7. **Amer Kassas**
   "Ligand Design Approach to Zeolite-like Metal Organic Framework (ZMOFs)"
8. **Jericho de Mata**
   "Corrole Synthesis, Analysis and Applications"
9. **Douglas Doane**
   "Novel Crystal MOM Structures"
10. **Adam Flanery**
    "Search for Covalent Inhibitor of Proenzyme S-Adenosylmethionine Decarboxylase"
11. **Anita Frankhauser**
    "Design and Synthesis of New Chiral Porphyrins"
12. **Kenneth Grandalski**
    "Neutral and Anionic Metal-Organic Frameworks from Co-crystal Controlled Solid State Ligands"
13. **Kris Hahn**
    "Synthesis of the C3 – C14 Portion of Palmerolide A"
14. **Roxanne Hastings**
    "Capillary Microextaction Applications in Riverine Dissolved Organic Matter Studies"
15. **Matthew Hight**
    "(3,24)-Connected Nets: Targeted Synthesis of isoreticular rht-MOFs and Investigations into their Porosity and H2 Storage Capabilities"
16. **Benjamin Holt**
    "Effect of High Temperature on the Structure of Cu, Zn Superoxide Dismutase Studied with Molecular Dynamics"

17. **Nicholas Kondis**
"Removal of aqueous nuisance ions using Cuprilig(copper attached to immobilized ligands, IMLIGs)"

18. **Jason Kuczynski**
"Using Alkoxy Bridged Tetracarboxylates to Create Novel MOFs"

19. **Michael Manasterski**
"Scaled-Up Synthesis of Cuprilig"

20. **Jeffrey Many**
"Applications and Synthesis of Peptide Nucleic Acids"

21. **Lissette Marshall**
"Zwitterionic co-crystals of L-ascorbic acid"

22. **Mario Martinez**
"Synthesis of Chemical Tools for Photoaffinity Labeling of AMP-Binding Pro"

23. **Hai Nguyen**
"The effect of mutation of residues on molecular bynamics of the RNA binding domain of influenza A virus Non structural protien 1"

24. **Patrick Nugent**
"Co-crystal Controlled Solid-State Synthesis of a Diimide, Designed for Supramolecular Chemistry"

25. **Amanda Okolo**
"Bio-catalytic Transformations in Organic Synthesis- A route to new bioactive compounds "

26. **Nik-Chay Reithma**
"Germania Based Capillary Microextraction (CME)"

27. **Ian-Anthony Rusiana**
"Design and Synthesis of Cyclic β-Hairpin Peptides as MDM2-P53 Interaction Inhibitors"

28. **Daniel A. Schultz**
"Crystal Engineering of Co-crystals of Curcumin"

29. **Alison Stargel**
"Comparison of Deposition Methods for MALDI Mass Analysis of Intact Proteins and Tryptic Digests"

30. **Misbahuddin Syed**
"Microsporidia: A Common Link Between Manatee and Man"

31. **Peter Toth**
"Computation Molecular Dynamics Involving Harmonic Oscillation"

32. **MinhPhuong Tran**
"Sol-gel 3-aminopropyltrimethoxysilane /polydimethylsiloxane Coating for capillary microextraction of trace organic compounds"

33. **Kristen A. Wheeler**
"Further investigations into abeohyousterone, a new ecdysteroid from the Antarctic tunicate Synoicum adareanum"

The Barbara and Dean F. Martin Graduate Poster Session

(NES First Floor)

34. Jonathan Belof
"Canonical Monte Carlo simulation of a Metal-Organic Framework utilizing a polarizable potential"

35. Ryan Cormier
"Polyacrylate Nanoparticles for Potential Delivery of Chloroquine Resistance Reversal Agents"

36. Michelle Cortes-Salva
"The Design, Synthesis and Evaluation of 1,3-di-o-tolylguanidine (DTG) Analogues as Potential Active Anti-Stroke Therapeutics"

37. Emma Farrell
"Uncovering the biosynthetic pathway of primary fatty acid amides"

38. Shawn Hamm
"The Role of the Disulfide Bridge on the Conformational Relaxation of Cu, Zn Superoxide Dismutase Upon Loss of Metals Studied by Molecular Dynamics"

39. Milena Ivkovic
"N-Acylethanolamines as substrates for ADH3"

40. Pasha M Khan
"Pd(0)-catalyzed intramolecular alkylation: Stereoselective synthesis of furan and isoxazoline-2-oxide analogs

41. Matt Lebar
"On the stereochemistry of palmerolide A"

42. Edward W. Lowe, Jr.
"Elucidation of ascorbate binding sites in peptidylglycine α-amidating monooxygenase through molecular dynamics simulations"

43. Shikha Mahajan
"Synthesis of biotinylated-azido-Adenine-Ribose derivatives analogues: Potential activity based protein profiling probes"

44. John Maschek
"Marine extracts with antiviral activity"

45. David Z. Myers
"Design and synthesis of piperazines with potential modulation of Bcl-X_L-protein interactions"

46. William A. Maza
"Photophysical properties of three □alyx[4]resorcinarenes of amphiphilic character"

47. John Perry
"Building with Bigger Blocks: Nanoscale molecular faceted polyhedra as nodes in extended metal-organic materials"

48. Joshua V. Ruppel
"Cobalt-Catalyzed Asymmetric Cyclopropanation"

49. Sung Wook Yi
"Regioselective Mono Acylation of the Electronically Less Reactive Nitrogen of Aryl Hydrazines via Temporary Protection with Carbon Disulfide"

50. Christi Young
"Molecular Dynamics Simulations of Influenza A Non-structural Protein 1 (NS1) RNA Binding Domain"

Session Abstracts

Saturday, April 19th, 2008

Morning Session (CHE 100)

Session Chair: Emma Farrell

9:00 – 9:15 **Chunyan Wang**

"The in vitro and in vivo Evaluation of Implanted Glucose Sensors with Hydrogel Coatings"

In order to protect implanted glucose sensors from biofouling, novel hydrogels (VP30) produced from a monomeric mixture of 34.5% HEMA, 34.5% DHPMA, 30% VP and 1% EDGMA were coated on two kinds of VP30-coated sensors, Pt/GOx/VP30 and Pt/GOx/Epoxy-Polyurethane (EPU)/VP30 sensors. They were examined in glucose solutions during a period of 4 weeks. The hydrogel coating was about 40 μm thick and was firmly attached to both types of sensors during experiments. Due to the poor response linearity of the Pt/GOx/VP30 sensors, the hydrogel coating could not be used as a diffusion-limiting layer. Therefore, the further studies were focused on the Pt/GOx/EPU/VP30 sensors. With a diffusion-limiting epoxy-polyurethane membrane, the linearity was improved (2-30 mM) and the response time was within 5 min. Eight Pt/GOx/EPU/VP30 sensors were subcutaneously implanted in rats and tested once per week over 4 weeks. 100% of the implanted sensors kept functioning for at least 21 days and 3 out of 8 sensors still functioned at day 28. We previously tested 68 Pt/GOx/EPU sensors in rats and only 13.5% of the sensors survived at day 21. The histology analysis revealed that the fibrous capsule formed surrounding the hydrogel-coated sensor was thinner than that formed around the Pt/GOx/EPU sensor. Inflammatory cells were no longer present in the capsular tissue when the sensor was coated with hydrogels.

9:15 – 9:30 **Mariangela Dametto**

"Computer simulations of the refolding of apomyoglobin from high temperature unfolded state"

Folding mechanisms of apomyoglobin were studied by performing computer simulations with atomic detail. The mechanisms of folding of this protein have been extensively studied by experiment, providing a large amount of data that allows comparison with simulations. In the present study, four folding trajectories of apomyoglobin were computed starting from coiled structures. A crystal structure taken from the Protein Data Bank was used as the final native conformation and the initial unfolded conformations were obtained from high temperature molecular dynamics simulations. Room temperature folding trajectories at neutral pH were obtained using the Stochastic Difference Equation in Length algorithm. The folding trajectories are compared with experimental results and two previous molecular dynamics studies at low pH. In contrast with the previous simulations, an extended intermediate with large helical content was not observed. These results suggest that apoMb follows a different folding pathway after high-temperature denaturation.

9:30 – 9:45 **Jeremy Beau**

"*Drug Discovery from Floridian Mangrove Endophytes"*

Recent studies have shown that within the leaves, bark, roots and seeds of mangroves exists an immense world of endophytic organisms. These microscopic communities are complex, providing a great diversity of secondary metabolites with special functions that combat the microbe-plentiful seawater. These secondary metabolites have the potential to be potent and highly selective drug candidates. A collection of endophytes from Floridian mangroves is currently being developed. The microorganisms are cultured in the laboratory and then systematically screened against various illnesses such as cancers, infectious diseases and common pathogenic microbes. After novel compounds are identified they can be characterized by NMR or X-Ray diffraction. Finally, synthetic routes from commercially available reagents can be explored. This paper reports on the preliminary collection of these organisms and the results obtained from the bioassays.

9:45 – 10:00 **Laura Anderson**

"Design and Synthesis of Peptidomimetics for the Disruption of Bcl-2-family Proteins"

Disregulation of the apoptotic processes is one of the major causes of diseases, such as cancer, inflammatory, autoimmunity, and neurodegenerative disorders. Within the B-cell lymphoma-2 (Bcl-2) family, the balanced interactions between anti and pro-apoptotic proteins play a major role in regulating apoptosis. Several studies have indicated that overexpression of anti-apoptotic Bcl-2 and Bcl-xL proteins is associated with tumor progression and drug resistance. Previously reported compounds that inhibit the interaction between pro-apoptotic BH3 domains and Bcl-2 family proteins contain hydrophobic scaffolds that can diminish their use as potential drug leads. Herein, we present the design and synthesis of hydrophilic alpha-helix mimics based on hydrazine linked piperazine-dione repeat units for the disruption of Bcl-2 proteins. Several of these compounds have been synthesized in our lab, and the most promising lead has a biological activity of 4.7 μM in fluorescence polarization assays.

10:00 – 10:30 Break

10:30 – 10:45 **Jonathan Belof**

"*Theoretical studies of hydrogen sorption in porous nanomaterials"*

Massively parallel supercomputing has been employed to numerically solve for the fundamental interactions between hydrogen and several interesting crystalline materials. Current theories in use by our group have an emphasis on including quadrupolar and many-body effects toward the resolution and prediction of thermodynamic properties.

10:45– 11:00 **Justin Moses**

"*Promiscuous oxidative activity of a metallohydrolase"*

Copper substituted amino peptidase derived from streptomyces griseus (CuCu-SgAP) exhibits several varied enzymatic abilities. The ability of this enzyme to perform peptide hydrolysis, phenol oxidation, and phosphoester hydrolysis all within the same site is interesting not only because it can give us greater insight into the chemistry involved in these reactions, but may also allow us to better understand how comparable enzymes function within the human system. Our research intends to explore only one aspect of this enzymatic promiscuity. We attempt to elucidate the mechanism by which CuCu-SgAP oxidizes chlorinated phenols to enhance our understanding of oxidation chemistry.

11:00 – 11:15 **Christi Young**

"Molecular Dynamics Simulations of Influenza A Non-structural Protein 1 (NS1) RNA Binding Domain"

Six 50-ns molecular dynamics simulations of the RNA binding domain of the Non-structural protein 1 (NS1) of influenza A virus, a homodimer, were performed at 298K. We focused our analysis on helices 2 and 2', which are involved in RNA binding. A salt bridge displaying instability was identified between Aspartate-29 of chain A and Arginine-46 of chain B, where a "flipping" out and in occurred in half of the trajectories. A recent experimental paper described the presence of a cavity in the surface of the side chains of helices 2 and 2'. In our simulations we observed a change of size and shape of this cavity with time, correlated with the salt bridge motion. Principal component and normal mode analysis were done to support this correlation. Our results could have implications in computational screening studies searching for potential molecules that interfere with RNA binding.

11:15 – 11:30 **Alaa Hashin**

"Investigating Oxidative Activities of Minimalistic Catalytic Metallopeptides"

Alzheimer's disease related peptide β-amyloid (Aβ) is believed to play a major role in the pathogenesis of the disease. The Aβ exhibits chemical activities upon binding with certain metal ions, such as Cu+2 and Fe+3, to form 1-20 were usedβ1-16 and Aβredox-active metal complexes The Cu+2 complexes of A to investigate its hydroxylation and oxidation activities toward phenols, catechols, and polyphenol 1,2,3-trihydroxyl benzene, THB. The results peptides exhibit catechol oxidase and phenolase likeβdemonstrate that the A wasβactivities, and the tri-His is a smallest unit for metal binding. Thus, A used as a blueprint in designing short peptides, HH(x)nH, where $0 < n > 6$, to serve as minimalistic catalytic metallopeptides. In this study, the oxidative activities toward catechol were investigated for two short peptides, one being hydrophilic, DHHNKHA, and another hydrophobic, DHHNWHW. These studies suggest that the Cu-DHHNKHA and Cu-DHHNWHW complexes can serve as catalysts for oxidation chemistry. The oxidation of catechol by either one of the complexes requires O2, as has been investigated by an anaerobic study.

Afternoon Session (CHE 100)

Session Chair: Jaime Heimbegner

2:45 – 3:00 **Sung Wook Yi**

"*Cysteine based PNA (CPNA): Design, synthesis and Application"*

Peptide nucleic acids (PNA), a pseudopeptide DNA mimic, was discovered by Nielsen and his coworker in 1991. PNA is proved to sequence-specifically form a very stable duplex with complementary DNA and RNA strands through Watson-Crick base paring, and it is also capable of binding to duplex DNA by helix invasion. However, due to its acyclic, achiral and neutral nature of the backbone, PNA has shown problems such as its poor aqueous solubility, poor cell permeability and instability of PNA-DNA duplexes and triplexes. Accordingly, many synthetic approaches have been directed toward developing modified backbones of PNA. Among those PNA analogs, only few examples including lysine-based monomers, guanidine-based peptide nucleic acids (GPNA) and the aminoethylprolyl PNA (aep-PNA) showed noticeable enhancements with regards to the daunting challenges mentioned above. I will present our research endeavor to develop the CPNA oligomers with the great water-solubility and cell permeability.

3:00-3:15 **Ryan Cormier**

"Polyacrylate Nanoparticles for Potential Delivery of Chloroquine Resistance Reversal Agents"

A very important target for drug discovery is Malaria, especially strands that are resistant to cheaper drugs for poverty stricken areas of the world. While the drug chloroquine is becoming increasingly outdated due to resistance, it remains a very good target due to its very beneficial characteristics. Previous work has been done to identify agents that reverse resistance of chloroquine however there is a broad area of work that needs to be done. Herein, we have applied our nanoparticle delivery system to these reversal agents in hope that this system will provide an alternative transport for these molecules, and allow us to help bring back a very important drug to many areas of the world.

3:15 – 3:30 **Ruizhi Wu**

"Novel synthesis and polymerization of protected dihydroxy 7-member cyclic carbonate"

Polymer studies were carried out on a new monomer 9,9'-dimethyl-3,5,8,10-tetraoxa-bicyclo[5.3.0]decane-4-one. This 7-membered cyclic carbonate was synthesized from naturally occurring L-tartaric acid, in high enantiopurity. The new monomer was polymerized under bulk condition using chemical and lipase catalyst.

3:30 – 3:45 **Divya Ramamoorthy**

"*Inhibitors of SHP2, a protein tyrosine phosphatase"*

Tyrosine phosphatases play an important role in regulating the phosphorylation status of signaling proteins, thereby controlling cellular growth, proliferation and differentiation. Whilst the modulation of kinase activity is a clinically proven therapeutic strategy for blocking signaling pathways, the design of inhibitors of protein tyrosine phosphatases (PTPs) has received considerably less attention. PTP inhibitor design is a new area in the field of drug development. Chemical genetic studies of most PTPs are not yet possible because of the lack of specific inhibitors.

SHP2, a non-receptor protein tyrosine phosphatase, is a signal-enhancing component of growth factor, cytokine, and extra-cellular matrix receptor signaling, and plays an important role in cell cycle. It has been found that Shp2 dephosphorylates Gab1 and partially dephosphorylates EGFR indicating that Gab1 and EGFR can be the substrates for SHP2. RasGAP has been found to be a downstream target of SHP2 since SHP2 dephosphorylates RasGAP to facilitate Ras activation. This suggests that SHP2 is a great target for cancer therapy since, inhibiting the dephosphorylation of Gab1 by SHP2 may ultimately stop the PI3K/MAPK/ERK signaling cascade, thereby preventing the alteration of gene expression. Therefore, the search for small molecules that can restore the basal state of Shp2, by interacting with the PTP catalytic domain, represents an exciting and novel area for anti-cancer drug development.

Based on high throughput screening of the NCI diversity set and the Moffitt ChemDiv 20000 compound collection, NSC-87877 (IC_{50}: 0.35 μM for both Shp2 and Shp1) and NSC-117199 (IC_{50}: 61.5 μM for Shp2 and 96.2 μM for Shp1) and other small molecules were identified as hits, capable of inhibiting EGF-induced activation of Shp2 PTP, Ras and ERK 1 & 2 in cell cultures. Based on these hits, and a HePTP hit incorporating an isooxindole scaffold, obtained from the SanDiego centre for chemical genomics (via Pubchem), some small molecules were synthesized and tested for Shp2 activity. The synthesis and SAR studies of these compounds will be discussed.

3:45 – 4:00 **Matt Lebar**

"Degradation and Partial Reconstruction (C3-14) of Cytotoxic Macrolide Palmerolide A"

As part of our program to investigate the chemical diversity of cold-water marine organisms, we recently reported the structure of palmerolide A, an enamide-bearing macrolide isolated from the Antarctic tunicate Synoicum adareanum. The structure of palmerolide A was elucidated using a combination of spectroscopic and derivatization techniques. We have subjected palmerolide A to degradative studies to confirm the stereochemical assignments which has resulted in re-assignment of the C7, 10 and 11 stereocenters. Analogs of the expected degradation products were prepared via a chiral pool synthetic approach. With the correct absolute configuration at C7, 10, and 11 determined, our efforts were directed toward the reconstruction of palmerolide A using similar synthetic routes devised to generate the chiral polyols in our degradation study. Partial synthesis (C3-C14) of palmerolide A was achieved by means of the above mentioned chiral-pool approach.

4:00 – 4:15 Break

4:15 – 4:30 **Arun Babu Kumar**

"Development of a Labeling Probe for the Discovery and Identification of Saccharide-Binding Proteins"

Proteins that interact with carbohydrates in a non-covalent fashion occur widely in nature. Such proteins, which have come into the forefront of biological research in recent years, belong to the class of the lectins. We discuss the design and development of a versatile chemical tool for the selective labeling of carbohydrate-binding proteins. The long term goal of our research is to develop versatile labeling probes and methodologies, which are applicable for studies targeting entire proteomes. Photoaffinity labeling is a biochemical approach that allows a ligand to form a covalent bond with the target receptor upon irradiation. Despite progress in the design of photoaffinity probes and methods for separating cross-linked peptide fragments, photoaffinity labeling experiments in which labeled peptides or amino acids have been identified are relatively limited. The herein proposed project introduces a novel class of multifunctional photoaffinity probes, which guarantee the highest possible affinity combined with a straight forward purification procedure by a fluorous tag. Herein we report our synthetic efforts for the preparation of the multifunctional photoprobe. In a proof of concept, we will test our labeling probe on Concanavalin A (Con A), a commercially available lectins. Con A is probably one of the best known saccharide binding proteins, and therefore ideally suited for this purpose. Although our research endeavors are still ongoing, we speculate that our labeling strategy may be utilized in a variety of labeling applications and in particular the discovery of receptors with unknown functions. Additionally, the proposed enrichment of labeled protein fragments from non-labeled via a fluorous tag has potential to accelerate the discovery and identification of unkown saccharide binding proteins. If a particular group of proteins can be isolated from the whole proteome mixture, it would reduce the complexity that is involved in the subsequent 2D-gel electrophoresis studies.

4:30 – 4:45 **Shawn Hamm**

"Role of the Disulfide Bridge on the Stabilization and Dynamics of Human Cu, Zn Superoxide Dismutase Upon Loss of Zn"

Human Cu, Zn Superoxide Dismutase is an antioxidant enzyme whose misfolding has been implicated in the familial form of Amyotrophic Lateral Sclerosis (FALS). In this study we investigate the structural changes of this 32kDa homodimer after removing the Zn ion from Cu-deficient structures. Eight 20ns explicit solvent molecular dynamics trajectories were generated: four each for the wild type protein and a doubly mutated, bridge-reduced structure. It was found that the disulfide bridge significantly stabilized the loop containing all four Zn-binding ligands. It is hypothesized that this bridge stabilizes the Zn-binding loop to increase the probability of Zn rebinding in the event of dissociation.

4:45 – 5:00 **Pasha Khan**

"Pd catalyzed allylic alkylation- Application towards synthesis of new bioactive compounds"

Pd catalyzed alkylation of allylic substrates is one of the most synthetically useful reactions and has been extensively used in organic synthesis. Hence, in quest of synthesizing new bioactive compounds, organopalladium chemistry was utilized in conjunction with enzyme catalyzed reactions. New optically pure isoxazoline-2-oxide and furan analogs can be synthesized starting from a meso-diol via Pd(0) catalysis. Pd(0) catalyzed allylic alkylation was also applied to nitroalkanes and other nitroesters to obtain unnatural amino acids and amino alcohols. This methodology is compatible with wide spectrum of functional groups like NO2, COOR, COR, SO2R. The work presented provides a new route for enantioselective synthesis of new bioactive amino acids , amino esters, furan and isoxazoline-2-oxide analogs.

5:00 – 5:15 **Sameer Kulkarni**

"Application of Target Guided Synthesis (TGS) approach : Targeting protein-protein interactions"

Protein-protein interactions have key importance in many biological processes and modulation of particular protein-protein interactions has been shown to have therapeutic effects. Recent discovery of various low-molecular-weight compounds interfering with Bcl-xL-protein complexes launches and validates a viable route for inducing apoptosis in cancer cells. Herein, we report our progress towards the development of a novel lead discovery and synthesis method that generates only biologically active compounds. After testing various reactions, we discovered that an amidation reaction between thio acids and sulfonyl azides is applicable for Bcl-xL-templated screening to develop inhibitory compounds. Bcl-xL demonstrated the selective formation of bidentate compounds from various sublibraries containing complementary reactive functionalities. We are now exploring an amidation reaction using thio acids and alkyl or aryl azides to develop potent inhibitors of Bcl-xL. Also, we hope to apply our TGS approach to Mcl-1, which is another biologically important member of the Bcl family of proteins.

Poster Exhibit Abstracts

Undergraduate Posters (NES First Floor)

1. Jeremy Aguinaldo

"Further study involving the removal of selected nuisance anions using different of metal derivatives of immobilizing ligands (IMLIGs)"

Analysis of different metal derivatives of immobilizing ligands (IMLIGS) of Octolig® have shown to remove certain types of selected anions in water. Ferrilig, an iron (III); Cobaltilig, a cobalt (III) and Cuprilig, a copper (II) showed successful removal of arsenate. Other anions such as chromate, phosphate, sulfate, borate nitrate and nitrite varied in results. Experiments are being conducted to determine the potential of Nickelig. The possibilities of these Metalloligs can help remove numerous types of anions that could be considered as a health hazard and detrimental to the environment.

2. Yaniel Cabezas

"Sol-gel Titania poly-tetrahydrofuran Coating in Capillary Microextraction On-line Hyphenated with High-Performance Liquid Chromatography"

A sol-gel titania poly-tetrahydrofuran (p-THF) capillary coating was prepared. The capillary was utilized for capillary microextraction on-line hyphenated with high-performance liquid chromatography (HPLC). In the development of this coating, titania isopropoxide was used as the sol-gel precursor and p-THF was the organic component. As a result, p-THF became chemically bonded into the titania sol-gel network, which was covalently bonded to the inner surface of a 0.25 mm i.d. fused silica capillary. This coating was especially efficient in performing extractions of polar analytes, such as phenols, alcohols, and amines. Most significantly, underivatized aromatic carboxylic acids were most effectively extracted using this capillary. In addition, this coating was capable of extracting moderately polar and non-polar analytes, such as ketones and polycyclic aromatic hydrocarbons (PAHs), respectively. This observed extraction behavior could be attributed to the polar and non-polar components of p-THF. Extracting these compounds can be important for many environmental and medical applications.

3. Ryan Centko

"Active Chemical Elucidation from the Extracts of Paphiopedilum lowii"

Inflorescences (flowers and flower stalks) of Paphiopedilum lowii, a herbaceous epiphyte of the Orchidaceae family, are know to cause contact dermatitis to certain individuals upon touching the plant. We have prepared chemical extracts of the inflorescence to collect the surface chemicals, which occur all along the flowering stalk. The extract was studied via NMR spectroscopy and mass spectrometry and was found to contain a single major component, which after HPLC fractionation yielded a new isomer of a previously identified catechol. These extracts were also found to be very active in antimicrobial assays. Subsequently the whole inflorescence was extracted yielding more of the same catechol. This is the first natural product to be reported from a Paphiopedilum, both the structure and its biological activity will be reported.

4. Kevin Clifford

"Induction Based Fluids and Quantitation of Charge"

The properties of induction based fluids (IBF), a novel technology, are studied to verify the creation of a surface charge in dispensed volumes. IBF is "green" in its capacity to dispense small volumes, significantly reducing waste of sometimes highly toxic solvents and chemicals. In MALDI mass spectrometry, IBF has been shown to improve results by making solutions homogeneous, resulting in greater signal-to-noise ratios. The induced charge can also be used in the

production of certain types of polymers. It is necessary to know the magnitude of the charge and the charge distribution to accurately design self-assembling polymers. This research is focused on determining the magnitude and location of that charge by designing an apparatus to quantify the induced charge in these dispensed nanoliter volumes.

5. Matthew Chandler

"Biomimetic Model of Cytochrome C Oxidase' Binuclear Center"

The use of cavitand molecules, specifically calixarenes, bound to copper, presents a novel biomimetic model of the catalytic active site within the cytochrome c oxidase (CcO) enzyme. The calix[4]arene structure is characterized through spectroscopic steady-state absorption and fluorescence. The cavitand molecule was found to have an absorption maximum of 280 nm with a quantum yield of 0.0153. Fluorescence quenching with copper (II) chloride indicates the formation of a copper-calix[4]arene complex. The anaerobic reduction of Cu(II)-cavitand with sodium dithionite revealed no change in the quenched emission spectrum, indicating the successful reduction of copper (II) to copper (I) with the complex intact. Subsequent biomimetic studies of the CuB prosthetic group within the catalytic active site of CcO hinge on retaining the complex under both copper oxidation states. A Stern-Volmer plot revealed the binding between copper (II) and calix[4]arene to exhibit sigmoidal kinetic, indicating cooperative binding with multiple binding sites.

6. Jason Cuce

"The isolation of palmerolide biomolecules from Synoicum adareanum and their effectiveness as drugs against select pathogens."

Palmerolide A, a polyketide macrolide from the Antarctic tunicate Synoicum adareanum, is a selective cytotoxin toward melanoma in vitro. Additional polyketide macolides have recently been isolated from S. adareanum and tested against selected pathogenic agents to evaluate their effectiveness as potential drugs. This paper reports the isolation and bioactivity of these palmerolides.

7. Amer Kassas

"Ligand Design Approach to Zeolite-like Metal Organic Framework (ZMOFs)"

A novel Metal-Organic Framework (MOF) was constructed from cadmium nitrates and 4,5-(1,4,5,6-tetrahydro-pyrimidin-2-yl)-imidazole formulated under solvothermal conditions as [Cd(C11 N6 H13)(DMF)](NO3). The structure was confirmed by single X-Ray studies. The organic bi-dentate, di-topic linker used was synthesized through a solvent-free process and represents a modified 4,5-imidazoledicarboxylic acid, previously employed in the synthesis of several zeolite-like metal organic frameworks, ZMOFs. The compound described herein shows infinite 1D chains of hexa-coordinated divalent cadmium cations in a distorted octahedral environment. Chelating nitrate ions fulfills the charge requirements of such coordination polymer to produce an overall neutral framework. The 1D chains are held together in form of a 2-D network in the solid presumably through hydrogen bonds and weak dispersion forces as indicated by the crystal structure. The Organic bridging ligand was prepared using a solvent process and represented as a functionalized derivative.

8. Jericho de Mata

"Corrole Synthesis, Analysis and Applications"

Corroles are fully conjugated analogues to the corrin ring in vitamin B12 and are related to the porphyrin ring in hemoglobin. The study of corroles has recently increased since the advent of a more efficient synthesis. More specifically, we have developed a general synthesis of corroles

formed from brominated dipyrromethanes and various benzaldehydes. These brominated corroles can be further functionalized by utilizing the palladium catalyzed Buchwald-Hartwig Cross-Coupling Reaction. Utilizing this modular design approach, corroles can be an ideal ligand with tunable electronic and steric properties. We have shown that Cobalt (III) corroles can be employed as catalysts in intramolecular C-H amination. These Cobalt (III) corroles have shown unique regio-selectivity compared to their porphyrin counterparts. Recently we have synthesized asymmetric corroles and expect they will provide enantiomeric selectivity in addition to regio-selectivity currently observed. In further studies, we will expand our research to include screenings for catalytic cyclopropanation, aziridination, and epoxidation.

9. Douglas Doane

"Novel Crystal MOM Structures"

Metal-organic materials (MOMs) have stimulated chemists as a promising class of materials. Their uses include gas storage/delivery materials, biomolecular sensing, drug delivery systems and other critical developments in science. They can be crafted using the principles of self-assembly. In particular is the interest of green chemistry. Some of the classes of organic ligands used in MOMs can be made through cocrystal-controlled solid-state synthesis (C3S3) yielding little to no waste. One such molecule, BIPA-DC, has been made via C3S3. Cobalt(II) Nitrate, along with BIPA-DC, and 4,4-dipyridyl (Bipy) through a solvothermal reaction produced a novel pillared MOM structure. The new crystalline material was characterized via IR spectroscopy, PXRD, TGA, and x-ray single crystal diffraction.

10. Adam Flanery

"Search for Covalent Inhibitor of Proenzyme S-Adenosylmethionine Decarboxylase"

Polyamines are a class of alkylamines that stimulate tumor growth. Therefore inhibition of their production provides a potential route to cancer treatment. S-Adenosylmethionine decarboxylase (SAMdc) is a crucial enzyme in the biosynthesis of the polyamines spermine and spermidine. The proenzyme of SAMdc (proSAMdc) is cleaved at the Ser68 residue by autoproteolytic activation to form the active enzyme SAMdc. The thiol group of Cys82 is the essential target for covalent inhibition of proSAMdc due to its role in the autocatalytic serinolysis reaction, in addition to its degree of accessibility within the active site. Beginning with the crystal structure of the human S68A mutant, we have found potential inhibitors of proSAMdc via computational methods. These methods included docking the NCI Diversity Set to back-mutated proSAMdc to produce a list of low energy scaffolds that can potentially be used to create reactive inhibitors. Selected inhibitors were then modified in silico to create analogues mimicking known covalent cysteine binding moieties. From the list of hits, we propose two lead molecules having low docking scores as well as positioning and orientation appropriate for covalent binding to Cys82.

11. Anita Frankhauser

"Design and Synthesis of New Chiral Porphyrins"

Chiral porphyrins are useful in a wide range of fields such as medicine, biology, and materials chemistry. In the past, many methods of porphyrin synthesis were impractical because of their low yields and inability to prevent the formation of unwanted side products. We present an alternative approach that utilizes a modular design of the peripheral substituents and mild conditions resulting in substantially higher yields. This design involves palladium-catalyzed cross-coupling of bromoporphyrins with amines, amides, alcohols, and thiols. These chiral porphyrins have been successful in a variety of atom/group transfer reactions, asymmetric organic synthesis, cancer therapeutics, and metal organic frameworks.

12. Kenneth Grandalski

"Neutral and Anionic Metal-Organic Frameworks from Co-crystal Controlled Solid State Ligands"

Co-crystal Controlled Solids State Synthesis (C3S3) reactions produce cyclic imides in high yields while reducing or eliminating solvents and/or solvent waste. Benzoimide Phenanthroline m-Dicarboxylic Acid (H2BIPA-DC) was choosen for this synthesis because it possesses similarities to other dicarboxylic acids currently used for Metal-Organic Frameworks (MOF's). The H2BIPA-DC from solvent-drop grind of 1,4,5,8-Napthelentetracarboxylic Dianhydride and 3-Aminobenzoic Acid milled in the presence of micro amounts of DMF, followed by heating. Two novel structures form using solvothermal reactions of H2BIPA-DC with Cd(NO3)2.6H20 under specific reactions produce either anionic or neutral frameworks. The structures of the anionic and neutral frameworks were characterized with single crystal x-ray diffraction

13. Kris Hahn

"Synthesis of the C3 – C14 Portion of Palmerolide A"

Extractions of Synoicum adareanum, a tunicate indigenous to Antarctica and commonly found in the shallow waters near Palmer Station, has yielded polyketide macrolides known as the palmerolides. Palmerolide A is of particular interest due to its potent cytotoxicity and selectivity against melanoma cells which in turn makes it a viable candidate for use as an anti-cancer drug. In anticipation of laboratory preparation of palmerolide A, a retrosynthetic scheme has been devised to yield three subunits that when combined will result in the total synthesis of the macrolide portion of the compound. The synthesis utilized a chiral pool starting material which ensures a quick, reliable route to enantiopure product. This paper reports on efforts toward the synthesis of the C3 – C14 portion which will later be joined with the other two subunits to generate palmerolide A.

14. Roxanne Hastings

"Capillary Microextaction Applications in Riverine Dissolved Organic Matter Studies"

The purpose of this project is to investigate the potential applications of capillary microextraction in characterization studies of chromophoric dissolved organic matter (CDOM) in natural waters. There are many challenges associated with the study of this material such as loss and alteration of chromophores during sample preparation, storage, and analysis. The commonly used method of solid phase extraction (by tC18 SEP-PAK) is labor intensive and requires large volumes of sample. In contrast, capillary microexraction offers faster extractions with less sample manipulation.
Reversed-phase high-performance liquid chromatography is used to separate a complex mixture of DOM in a water sample from the Suwannee River, a highly colored river in Florida. The river sample has been subject to solid phase extraction as well as MTMS sol-gel and titania-PEG

capillary microextractions. Capillary mircoextraction gives higher signal to sample volume ratios, indicating a potential for the use of this technique in DOM studies.

15. Matthew Hight

"(3,24)-Connected Nets: Targeted Synthesis of isoreticular rht-MOFs and Investigations into their Porosity and H2 Storage Capabilities"

The design of porous 3-dimensional Metal Organic Frameworks (MOFs) has become a popular area of study in recent years partly in due to the frameworks' potential applications as hydrogen storage materials. Towards this endeavor a highly porous MOF with a (3,24)-connected rht-net topology was recently developed using copper (II) and 5-tetrazolylisophthalic acid (H3TZI). Here it will be discussed how an iso-structure possessing this same crystal topology was synthesized via

replacement of the TZI bridging ligand and TZI-copper trimer with 5,5',5"-[1,3,5-phenyltri(methoxy)]tri-isophthalic acid (H6BTMOI). Comparisons between these two iso-structures will be made in reference to crystal synthesis, crystal porosity, and hydrogen adsorption properties.

16. Benjamin Holt

"Effect of High Temperature on the Structure of Cu, Zn Superoxide Dismutase Studied with Molecular Dynamics"

In this study we simulated the essential human antioxidant enzyme, Cn, Zn superoxide dismutase. Immature and mutant forms of the enzyme may misfold and aggregate. These aggregates are believed to be toxic, and are linked to Familial Amyotrophic Lateral Sclerosis. Four 5-ns Isobaric-Isothermal ensemble molecular dynamics trajectories of the wild type apo protein were created at 300K, 305K, 310K, and 315K. Fluctuations in the structure of the enzyme were studied as a function of temperature.

17. Nicholas Kondis

"Removal of aqueous nuisance ions using Cuprilig(copper attached to immobilized ligands, IMLIGs)"

The present study describes the synthesis of a copper(II) salt of a commercially available immobilized ligand (IMLIG), Octolig-21® and the efficacy of this composite, called Cuprilig to remove various nuisance ions from aqueous solutions. The ions attempted in this study include nitrate, nitrite, perchlorate, nitrogen (as ammonium chloride), sulfate, arsenate, chromate, and phosphate. The synthesis was accomplished by treating an aqueous suspension 82 g of Octolig-21® in 150 ml of deionized water with 0.2 moles of copper(II)acetate monohydrate in 450 ml, shaken overnight, filtered through a sieve, and rinsed to remove excess copper salts. Standard solutions of the aforementioned ions were prepared in various concentrations ranging from 30 ppm to 1 ppm. The solutions were pumped to the 2 cm x 22 cm column at rate of 10 ml per minute, and effluents were collected in 50- mL aliquots. Samples were tested for total dissolved salts. After allowing for dilution effects, the effluents were tested for final concentrations of nuisance species. Commercial laboratories were used fro analyses of sulfate and perchlorate. Significant reductions occurred for nitrite, sulfate, perchlorate, and phosphate, with some reduction in nitrate and no discernible change in ammonium. The results show promise in the use of Cuprilig for remediation of contaminated drinking water globally for both its effectiveness and reusability. The differential separation of nitrate versus sulfate is promising for an atomic waste application. This study continues the previous work of Martin et al., J. Enviorn. Sci Health, 2007, 42A,97-102.

18. Jason Kuczynski

"Using Alkoxy Bridged Tetracarboxylates to Create Novel MOFs"

Metal-organic compounds are a useful tool in crystal engineering because their properties can be controlled, they can form useful building blocks, and they can self-assemble. One method of generating metal-organic frameworks (MOFs) involves the use of tetracarboxylates. Herein a novel alkoxy-bridged tetracarboxylate was used to create new MOFs. The ligand, 1,6-(5-alkoxy isopthallic acid) hexane, was synthesized because the large alkyl group provides a flexibility not inherent in other common templates and the effect of said flexibility on MOF generation was the focus of the project. Various solvathermal reactions were attempted and from them two new MOFs were made with the ligand, zinc, and a pyridine base. These MOFs were then characterized by single crystal X-ray diffraction, powder X-ray diffraction, and other techniques.

19. Michael Manasterski

"Scaled-Up Synthesis of Cuprilig"

This study describes the effectiveness of efforts to produce a compound called Cuprilig on a large scale. This compound is the copper (II) derivative of a commercially available immobilized ligand (IMLIG) called Octolig®, which consists of polyethylenediamine moieties covalently bound to a high-surface area silica gel. Cuprilig is useful for removing arsenate and orthophosphate from water. To synthesize this compound, Octolig® is saturated with copper (II) solution. In this experiment, the effectiveness of Cuprilig in the removal of arsenate was tested for different volumes. The anions tested were able to remove arsenate (300 ppb, > 99% removal) effectively. Arsenate contamination has been linked to a host of health problems, and the usefulness of such a material is evident, as is the need to be able to produce it on a larger scale, and efforts to do so are explored in this experiment.

20. Jeffrey Many

"Applications and Synthesis of Peptide Nucleic Acids"

Peptide Nucleic Acids (PNAs) are synthetic compounds with similar properties to DNA and RNA. PNA can recognize and bind to other PNA, DNA, and RNA molecules with complementary base pairs in the same way DNA and RNA are able to bind to complementary strands. PNA differs from DNA and RNA in the composition of its backbone. PNA is made up of repeating N-(2-aminoethyl)-glycine units connected by peptide bonds while DNA and RNA are made of deoxyribose and ribose sugars. The absence of a charged phosphate group in the PNA backbone allows it to bind much more strongly to other PNA, DNA, or RNA molecules. This strong binding allows PNA to be used in antisense therapy by binding to a particular gene's mRNA strand. It can also be used in antigene therapy to bind to DNA sequences and block the expression of a gene.

21. Lissette Marshall

"Zwitterionic co-crystals of L-ascorbic acid"

Pharmaceutical Co-Crystals are formed via non-covalent interactions between an Active Pharmaceutical Ingredients (API) and a co-crystal former that is solid under ambient conditions. They have recently been a topical area of research as they can enhance the bioavailability and solubility of API's without the need to create or break covalent bonds. Many drugs exist in a zwitterionic form and there have been very few reports of co-crystals formed with zwitterions. Herein, we report a systematic study of zwitterionic co-crystals including an analysis of relevant structures in the Cambridge Structural Database and zwitterionic co-crystals we have synthesized.

22. Mario Martinez

"Synthesis of Chemical Tools for Photoaffinity Labeling of AMP-Binding Pro"

The use of chemical probes to elucidate the amino acid sequence of a protein's binding site is a recently-developed technology termed Activity-Based Protein Profiling (ABPP), since only those proteins which are enzymatically active are targeted. The methods discussed herein incorporate similar technology and describe the synthesis of a photoaffinity probe specifically designed to target AMP-binding proteins, which are biologically relevant cofactors. The probe incorporates an azide moiety as the photoreactive group for covalent attachment, an AMP analogue for protein affinity, and a biotin tag for purification. The two aforementioned components are joined together by a linker of length sufficient enough in order prevent biotin from intervening with the protein's binding site. Three separate strategies have been attempted in the synthesis of the targeted biotinylated AMP photoaffinity analogue.

23. Hai Nguyen

"The effect of mutation of residues on molecular bynamics of the RNA binding domain of influenza A virus Non structural protien 1"

The main goal of this project is to study the effect of mutations of specific residues on the interactions between the monomers of the RNA binding domain of the influenza A virus non structural protein 1, a homodimer. Several specific Alanine mutations,such as Arginine 46, Arginine 38, and Aspartate 29, were simulated by computer programs. The molecular dynamics simulations were performed through several steps; were minimization, heat, equilibriation, and then run. Each step required certain input files in order to run. After the simulations finished, the distances between atoms of residues involved in the mutationswere determined through the VMD program. The distances measured were compared to distances from the original, non-mutated RNA binding domain.

24. Patrick Nugent

"Co-crystal Controlled Solid-State Synthesis of a Diimide, Designed for Supramolecular Chemistry"

Benzoimide pyromellitic tetracarboxylic acid, H4BIPRO-TC, has been formed via co-crystal controlled solid-state synthesis, C3S3, for the purpose of creating a species that can readily form co-crystals and coordination polymers. This diimide synthesis is carried out by grinding reactants in minute amounts of solvent, culminating in high yields while creating little to no waste. The product was characterized via IR, PXRD, 1H-NMR, and x-ray single crystal diffraction. H4BIPRO-TC was functionalized with carboxylic acids to participate in non-covalent interactions (i.e. hydrogen bonding) that have been shown to sustain supramolecular synthons. The species was observed to form a 1:2 cocrystal with 4,4'-dipyridyl. By design, H4BIPRO-TC has a sterically limited torsional angle between the imide and N-phenyl planes upon crystallization.

25. Amanda Okolo

"Bio-catalytic Transformations in Organic Synthesis- A route to new bioactive compounds "

The proposed work involves the synthesis of new, optically pure compounds through the use of lipases (hydrolytic enzymes). This work further enhances the importance of green chemistry in organic synthesis. The synthesis will involve the use of commercially available cyclic compounds, which will be converted to meso diacetates in high yield. These diacetates will be hydrolyzed using hydrolytic enzymes namely lipases to yield mono esters in high yield and enantioselectivity. The final enantiopure products will serve as starting material for synthesis of new bioactive compounds.The main emphasis of this work will be to limit the use of expensive metal catalysts and induce high enantioselectivity via biocatalysis, thereby promoting the concept of green chemistry.

26. Nik-Chay Reithma

"Germania Based Capillary Microextraction (CME)"

Traditional gas and liquid chromatography use silica based stationary phases for extraction. The traditional stationary phases can pose problems when looking at particularly polar analytes or for solutions which may contain extreme levels of hydronium ion or hydroxide ion concentration as, over time, various analytes may adsorb onto the stationary phase or otherwise chemically react with the stationary phase inhibiting the stationary phases's ability to systematically seperate analytes across trials. Germania based stationary pases aim to overcome the limitations inherent in silica based stationary phases while maintaining properties under extreme operating conditions including high temperature, highly acidic and basic solutions, and "agressive solvents". Research now is

focused on extending the family f germania based stationary phases and developing germania based monoliths using PEG-600 and TMOS.

27. Ian-Anthony Rusiana

"Design and Synthesis of Cyclic β-Hairpin Peptides as MDM2-P53 Interaction Inhibitors"

Many proteins exhibit protein-protein interactions involving relatively small regions of their exposed surfaces. The design of small molecules that target these exposed surfaces and inhibit protein-protein interactions is challenging. The use of peptidomimetics in the design of protein-protein interaction inhibitors has been previously reported. *β*-Hairpin mimetics have been known as excellent inhibitors for protein-protein interactions. Previously reported studies have suggested that introduction of N-methylated amino acid residues at specific positions in the scaffold causes an increase in cell permeability. Herein, we present the design and efforts towards synthesis of cyclic *β*-Hairpin mimetic which can serve as potential drugs for inhibiting MDM2-P53 interactions and thus enable the normal p53 tumor-suppressor activity.

28. Daniel A. Schultz

"Crystal Engineering of Co-crystals of Curcumin"

Curcumin, the main component of the spice turmeric, has been successfully used as a therapy to treat human multiple myeloma in a recent study. However, curcumin has extremely poor water solubility and bioavailability. The goal of this study is to use crystal engineering protocols to make co-crystals of curcumin with a biologically inert or beneficial compound to improve its physical properties. A series of generally recognized as safe (GRAS) compounds are under investigation as co-crystal formers to screen for co-crystal formation. Single crystal and powder x-ray diffraction (SCXRD, PXRD), differential scanning calorimetry (DSC), and fourier transform infrared spectroscopy (FTIR) are used for routine screening and characterization.

29. Alison Stargel

"Comparison of Deposition Methods for MALDI Mass Analysis of Intact Proteins and Tryptic Digests"

Matrix assisted laser desorption ionization mass spectrometry has proven to be a powerful tool for biological and clinical research. However, challenges exist in competing with LC-MS/MS techniques based on the sensitivity. MALDI sample preparation is the key step that must be optimized to improve the sensitivity; most notably, the ability to deposit smaller volumes with concentrated analytes must be developed. Many experiments have been performed to determine the best matrices, additives, and solvent systems, but few investigators have pursued comparison of MALDI deposition techniques. In our experiment we used dried droplet, two-layer, electrospray, and induction-based fluidics (IBF) to produce MALDI samples. The signal intensity and reproducibility are compared for proteins and tryptic digests.

30. Misbahuddin Syed

"Microsporidia: A Common Link Between Manatee and Man"

A manatee lymphocyte cell line was established in culture and found to be infected with Encephalitozoon hellem, a microsporidian species known to infect humans and birds. This finding, taken with previous detection of microsporidia in a septic tank, suggests their prevalence in the environment, and humans as their carriers. Considering that microsporidia have been recognized as water-borne and air borne emerging opportunistic pathogens, a survey of their prevalence in the sputum of healthy volunteers and within patients with asthma-like symptoms was conducted in the present study. Detection was performed by a specific chitin-staining method for observation via

light microscopy, and species identification by polymerase chain reaction analysis. Preliminary data showed the presence of microsporidian spores in the sputum of healthy individuals, and replicative forms of these organisms were observed in the patients with chronic asthma-like symptoms. The findings obtained confirm the widespread and opportunistic nature of microsporidia.

31. Peter Toth

"Computation Molecular Dynamics Involving Harmonic Oscillation"

My work involves computing computation molecular dynamics involving harmonic oscillation using a Linux based software program called Emacs. I devise equations and analyze how harmonic oscillation works using different variations of equations using simple calculus and a programming knowledge based on C plus. My work involves understanding why a Harmonic Oscillator has a velocity of zero at the points that it meets its maximum height, and how the acceleration of the object affects the overall equilibrium of the oscillator. To show the mechanics of the process, a computational equation must be derived using Emacs and programming other various equations and being able to derive components needed to evaluate the object, which is a simple harmonic oscillator.

32. MinhPhuong Tran

"Sol-gel 3-aminopropyltrimethoxysilane /polydimethylsiloxane Coating for capillary microextraction of trace organic compounds"

Sol-gel chemistry is used to prepare a surface-bonded sol-gel coating on the inner walls of a fused silica capillary. In this work, 3-aminopropyltrimethoxysilane (APTMS) and methyltrimethoxysilane (MTMOS) were used as the sol-gel precursors. Hydroxy-terminate polydimethylsiloxane (PDMS) served as the sol-gel active polymer by serving as the source of the organic component of the hybrid coating. APTMS and MTMOS formed a sol-gel network through hydrolytic polycondensation reactions followed by aging and drying. The sol-gel coating involved hydrolysis of the precursor and polycondensation of the hydrolyzed precursor molecules among themselves within a fused-silica capillary. While PDMS offered efficient extraction of nonpolar analytes (such as fluorene), AMPMS provided successful extraction of polar analytes ranging from ketones to alcohols directly from aqueous sample. For both polar and nonpolar analytes, parts per trillion level detection limits were achieved by coupling sol-gel coated microextraction capillaries with gas chromatography-flame ionization detector.

33. Kristen A. Wheeler

"Further investigations into abeohyousterone, a new ecdysteroid from the Antarctic tunicate Synoicum adareanum"

Five new ecdysteroids were isolated in our laboratory, from the Antarctic tunicate Synoicum adareanum. Ecdysteroids are widely known as hormones which regulate growth and molting in arthropods. Among S. adareanum ecdysteroids, abeohyousterone, hyousterones A-D and diaulusterol B were tested for solid tumor selective cytotoxicity using colon (Colon 38, H-116), lung (H-125M) and leukemia (L1210) cell lines in a soft-agar disk diffusion assay. Abeohyousterone exhibited considerable cytotoxicity against leukemia, Colon 38 and H-116. The zones exhibited in the primary assay for abeohyousterone were 400 (250 = 6.5 mm zone) against leukemia, Colon 38, and H-116.

Previously 1.3 mg of abeohyousterone was isolated from 9g of crude in the butanol partition. Current efforts are aimed at the isolation and purification of further abeoecdysteroids and their analysis in the National Cancer Institute's 60 cell line cytotoxicity panel.

Graduate Posters (NES First Floor)

34. Jonathan Belof

"Canonical Monte Carlo simulation of a Metal-Organic Framework utilizing a polarizable potential"

Monte Carlo simulations of hydrogen interacting with a Metal-Organic Framework were performed using a polarizable potential energy function. Massively parallel supercomputing resources were employed toward the numerical solution of this many-body problem. The results illustrate the importance of induction effects and give insight into the design of new materials for hydrogen storage.

35. Ryan Cormier

"Polyacrylate Nanoparticles for Potential Delivery of Chloroquine Resistance Reversal Agents"

A very important target for drug discovery is Malaria, especially strands that are resistant to cheaper drugs for poverty stricken areas of the world. While the drug chloroquine is becoming increasingly outdated due to resistance, it remains a very good target due to its very beneficial characteristics. Previous work has been done to identify agents that reverse resistance of chloroquine however there is a broad area of work that needs to be done. Herein, we have applied our nanoparticle delivery system to these reversal agents in hope that this system will provide an alternative transport for these molecules, and allow us to help bring back a very important drug to many areas of the world.

36. Michelle Cortes-Salva

"The Design, Synthesis and Evaluation of 1,3-di-o-tolylguanidine (DTG) Analogues as Potential Active Anti-Stroke Therapeutics"

The purpose of this study is the development of new analogues of DTG. The major focus of this research project is the development of a mild, cost-efficeint method for the synthesis of di-substituted guanidines. The use of a catalytic amount copper (I) iodide in the presence of a ligand has shown great promise as a system for the coupling of aryl halides with guanidine salts. The synthetic analogues of DTG are being screened for potential biological activity against ischemic stroke. The synthetic DTG analogues will be tested for sigma receptor effects on [Ca 2+] elevations, increase the sigma receptor affinity and lowering the adverse effects caused by peripheral sigma receptor.

37. Emma Farrell

"Uncovering the biosynthetic pathway of primary fatty acid amides"

Primary fatty acid amides (PFAMs) have been discovered in many organisms from plants to mammals and have been shown to serve important roles as neural regulators. As of yet the in vivo mechanism of PFAM biosynthesis has not been determined. Working from the hypothetical model in which fatty acid -> fatty acyl-CoA -> fatty acylglycine -> PFAM, RT-PCR and western blotting were employed to determine which enzymes are expressed in several cell lines that produce oleamide from oleic acid.

The expression of ACS and PAM, and not bile acid:amino acid transferase or acyl CoA:glycine N-acyltransferase (ACGNAT) in the cells supports the proposed biosynthetic pathway which involves an enzyme yet to be discovered: a long chain-specific ACGNAT. A metabolite quantification system has also been developed to monitor the flux of these metabolites. Future directions of this project include the use of RNAi to target these enzymes and show the accumulation of metabolic precursors.

38. Shawn Hamm

"The Role of the Disulfide Bridge on the Conformational Relaxation of Cu, Zn Superoxide Dismutase Upon Loss of Metals Studied by Molecular Dynamics"

Cu, Zn Superoxide Dismutase (SOD) is an essential cytosolic, anti-oxidant enzyme found in eurokaryotic cells. This 32kDa, homodimer contains one catalytic copper and one structural zinc ion per monomer. Misfolding and subsequent aggregation of SOD has been linked to neurodegenerative disorders such as Amyotrophic Lateral Sclerosis (ALS). Experimental evidence suggests loss of zinc and reduction of the intra-subunit disulfide bridge are correlated with aggregation and toxic gain of function. The conformational relaxation of a bridge-reduced, copper-depleted, mutant structure was studied via a 20ns molecular dynamics in explicit solvent after Zn ion removal. The dynamics of this mutated, bridge- reduced variant was then compared to a similar, but shorter (10ns) simulation of apo-SOD (bridge present). These two simulations were then analyzed via principal component analysis. It was found that the region with the most difference (50-72) contains one of the Cysteine (C57) residues that form the disulfide bridge. The backbone dihedral angles of these residues were analyzed as a function of time. These residues unwound, "flipped over" and wound back up, leading to a partial unfolding when this bridge was broken. The presence of this increased flexibility surrounding C57 suggests the disulfide bridge is essential at stabilizing loop IV.

39. Milena Ivkovic

"N-Acylethanolamines as substrates for ADH3"

N-Acylethanolamines (NAEs) are important mammalian signaling molecules that have been proposed to also serve as precursors to N-acylglycines (NAGs). N-Acylglycinals are likely to be intermediates between the NAEs and the NAGs. The sequential actions of a fatty alcohol dehydrogenase and a fatty aldehyde dehydrogenase are thought to affect the NAD+-dependent oxidation of the NAEs to the NAGs. Our hypothesis is that alcohol dehydrogenase 3 (ADH3), an enzyme known to oxidize mid- and long-chain alcohols to aldehydes, could catalyze NAE oxidation.

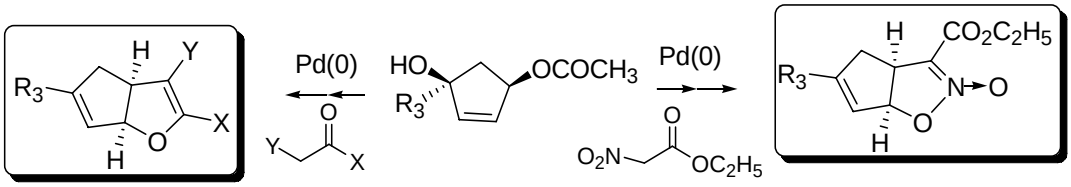
In order to evaluate the possibility of ADH3 involvement in NAE metabolism, variable chain length NAEs were synthesized and found to be substrates for bovine liver ADH3, yielding the corresponding N-acylglycinals. Vmax/Km values for assayed NAEs were low relative to the preferred substrate, cinnamyl alcohol. Our data suggest that the ADH-mediated oxidation of the NAEs could occur in vivo, but that ADH3 is unlikely to be the in vivo catalyst.

40. Pasha M Khan

"Pd(0)-catalyzed intramolecular alkylation: Stereoselective synthesis of furan and isoxazoline-2-oxide analogs

New optically pure isoxazoline-2-oxide and furan analogs have been synthesized via Pd(0) catalysis. Starting from a meso-diol, optically pure compounds were prepared without utilizing chiral ligands at any stage of the synthesis. The stereochemical outcome of the product (>99 % ee) was influenced by desymmetrization catalyzed by Pseudomonas cepacia lipase and the stereoselective nature of the palladium catalyzed transformations. The work presented provides a new pathway to optically pure furan and isoxazoline-2-oxide analogs which are rather difficult to

obtain.



41. Matt Lebar

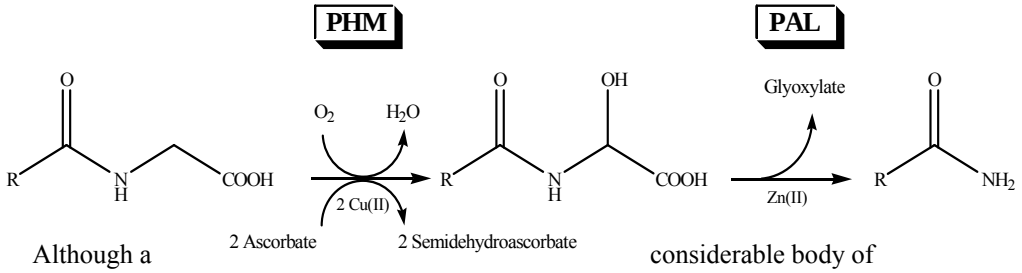
"On the stereochemistry of palmerolide A"

Palmerolide A, an enamide-bearing macrolide isolated from the Antarctic tunicate *Synoicum adareanum*, is a potent inhibitor (2 nM) of vacuolar-ATPase (V-ATPase). In the National Cancer Institute's 60 cell line panel, palmerolide A displays potent and selective cytotoxicity toward melanoma and cytotstatic activity toward leukemia, CNS, renal and breast cancer cell lines, as well as melanoma. The structure of palmerolide A was elucidated using derivatization techniques as well as various nuclear magnetic resonance experiments. We have subjected palmerolide A to degradative studies to confirm the stereochemical assignments which has resulted in re-assignment of the C-7, C-10 and C-11 stereocenters. Synthetic analogs of the expected degradation products were prepared from the chiral pool.

42. Edward W. Lowe, Jr.

"Elucidation of ascorbate binding sites in peptitylglycine α-amidating monooxygenase through molecular dynamics simulations"

Peptidylglycine alpha-amidating monooxygenase (PAM) is a copper- and zinc-dependent, bifunctional enzyme that catalyzes the cleavage of glycine-extended peptides to the corresponding amides and glyoxylate. The sequential action of hydroxylating the glycyl alpha-carbon and then cleaving the carbon-amide bond are dependent upon the peptidylglycine alpha-hydroxylating monooxygenase (PHM) and peptidylglycine alpha-amidating lyase (PAL) domains, respectively. PAM is responsible for activating peptide pro-hormones *in vivo*.

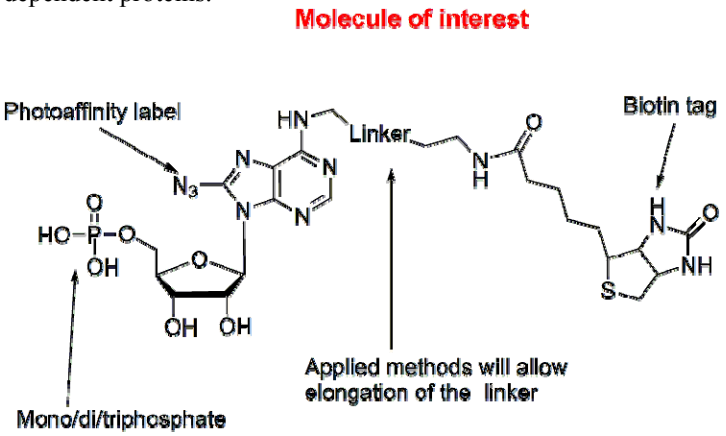


Although a considerable body of mechanistic and structure/function data has been generated in an attempt to understand this redox chemistry, there are still crucial unanswered questions regarding electron transfer, dioxygen activation, and radical formation during C-H bond cleavage that preclude a comprehensive understanding of glycine hydroxylation. Crystallographers have stated that reduction PAM by ascorbate is collisional as they have been unable to identify a binding site for ascorbate. Mimosine, however, has been shown to be a competitive inhibitor against ascorbate leading enzymologists to believe a binding site must exist. This study attempts to reveal the binding sites of ascorbate and mimosine through a series of long molecular dynamics simulations using NAMD.

43. Shikha Mahajan

"Synthesis of biotinylated-azido-Adenine-Ribose derivatives analogues: Potential activity based protein profiling probes"

Adenine nucleosides and nucleotides (ADoR's) are key molecules in virtually every metabolic and cell signaling pathway. Thus, ADoR-dependent proteins correlate to many human diseases including cancer, cardiovascular diseases, diabetes, and obesity. Activity based protein profiling (ABPP) is an emerging powerful technique to study protein functions on a proteome-wide scale and synthesis of these ABPP probes is designed based on considerable knowledge of their enzymology to label a mechanistically related family of enzymes.
Herein, we report our efforts to synthesize biotinylated azido-ADoR analogues for the study of ADoR-dependent proteomes. The design of these AdoR probes includes a photolabile azide moiety for covalent attachment of the probe to the target proteins as well as a biotin moiety for the isolation of the probe-protein conjugates using avidin affinity chromatography. Also, we aim at optimization and validation of the use of our ADoR-specific probes against a set of purified ADoR-dependent proteins.



44. John Maschek

"Marine extracts with antiviral activity"

With the estimated 3 to 5 million infections and as many as 500,000 deaths from the complications of influenza infections each year, there lies a critical need to identify novel drug classes and structures, which can be exploited for antiviral development. Natural products continue to play a critical role in drug discovery as more than 60% of new small molecule drugs are either natural products or natural product derivatives. We have a unique and diverse collection of more than 2,500 marine organism extracts collected from diverse habitats, including Antarctica, the Caribbean, the East and West coasts of the US and Hawaii. Active natural product extracts are identified by a cell-based primary screening assay to rapidly identify exhibiting inhibitory activity on viral growth evidenced by reduction in the development of cytopathic effect (CPE) on susceptible cultured cells evaluated under microscope in combination with the colorimetric viability method based on formation of soluble formazan adducts. Extracts found to reduce CPE by ≥50% are subjected to a secondary screening consisting of evaluation of dose response, plaque reduction, one-step growth curve inhibition, and cytotoxicity. Extracts active in the secondary assay have been fractionated using a bioassay-guided approach. Progress on the identification of anti-influenza compounds from our collection will be presented.

45. William A. Maza

"Photophysical properties of three calix[4]resorcinarenes of amphiphilic character"

Here we report the photophysical properties of three resorcinol derived cavitands. Steady-state absorption and fluorescence spectra for the three cavitands studied displayed absorption maxima ranging from 270nm to 290nm and emission maxima between 300nm and 320nm. The absorption/emission spectra are attributed to excitation of the substituted phenyl rings that constitute the cavitand cavity. The similarity of the absorption/emission spectra and fluorescence quantum yields between the cavitands and 5-hydroxy-1,3-benzenedicarboxylic acid (Hbdc), an analoguos substituted benzene, indicate weak intramolecular interactions between the monomers of the cavitand core. Fluorescence lifetimes were found to increase from ~4 ns to ~12 ns upon functionalization with groups with greater electron donating ability. Combined with polarization data, we find that the inclusion volume is related to the O···H interactions at the upper rim of the cavitand.

46. David Z. Myers

"Design and synthesis of piperazines with potential modulation of Bcl-X_L-protein interactions"

The Bcl-2 family of proteins, which consists of both anti- and pro-apoptotic molecules, plays a pivotal role in the regulation of the intrinsic (mitochondrial) pathway of apoptosis. These proteins include Bcl-2, Bcl-X_L, and Mcl-1. Bcl proteins are central regulators of programmed cell death, and they have been validated as attractive targets for cancer therapy. They are over expressed in many cancers and contribute to tumor initiation, progression, and resistance to therapy.
Several independent studies have recently shown that it is possible to design low-molecular-weight ligands of Bcl-2 and/or Bcl-X_L that disrupt BH3 domain-mediated heterodimerizations between anti- and pro-apoptotic Bcl-2 family members. Herein, we present the design, the synthesis, and the characterization of a small library of piperazine compounds displaying good affinity to the Bcl-X_L binding site.

47. John Perry

"Building with Bigger Blocks: Nanoscale molecular faceted polyhedra as nodes in extended metal-organic materials"

In recent years metal-organic materials (MOMs) have received great attention because of their ease of synthesis, diversity of structure and that they can be fine-tuned to address physical and chemical properties. An important paradigm shift occurred when carboxylato secondary building units (SBUs) were adopted in lieu of single metal ions to act as larger rigid, directional nodes for the construction of nanoporous structures. In this contribution we present a new design strategy for novel 3D MOMs constructed from hollow, spherical nanoscale molecular faceted polyhedra and flexible tetracarboxylate ligands designed to simultaneously assemble and cross-link these nanoballs *in situ*. This strategy allows nodes to be faceted polyhedra ca. 3nm in diameter with built-in symmetry for controlling how these nanoballs cross-link and, ultimately, the resultant network topology. In short, high symmetry large nodes can be more amenable to crystal design than smaller building blocks.

48. Joshua V. Ruppel

"Cobalt-Catalyzed Asymmetric Cyclopropanation"

Metal-catalyzed cyclopropanation of olefins with diazo reagents has attracted great research interest because of its fundamental and practical importance. The resulting cyclopropyl units are recurrent motifs in biologically important molecules and can serve as versatile precursors in organic synthesis. We have previously reported the cobalt-catalyzed cyclopropanation of styrene and styrene derivatives with diazo reagents. With the use of a new class of D_2-symmetric chiral porphyrin ligands, the resulting cyclopropane units are produced in high yields with excellent diastereo- and enantioselectivities. The dimerization of diazo compounds is minimized in the cobalt-mediated system, allowing for a one-pot protocol and eliminating the need for slow addition of diazo reagents. In our continuing effort to further improve and expand the scope of the cobalt-catalyzed system, we will present our new results on asymmetric cyclopropanation of electron-deficient olefins and the use of diazo reagents other than ethyl diazo acetate and *t*-butyl diazo acetate.

49. Sung Wook Yi

"Regioselective Mono Acylation of the Electronically Less Reactive Nitrogen of Aryl Hydrazines via Temporary Protection with Carbon Disulfide"

Hydrazines are an important class of compounds that contain the reactive nitrogen-nitrogen bond. Hydrazines and analogues such as, hydrazides and hydrazones, are well known for their highly active biological profiles. For example, a substantial number of hydrazines and their analogues are known to have antineoplastic activity. Hydrazines are also frequently used in synthetic chemistry to make pyrazoles, oxadiazoles, triazoles and indoles. However, alkylating and acylating hydrazines can be cumbersome especially when one needs to selectively acylate the electronically less reactive nitrogen of the hydrazine. In the presentation, we will report a novel protocol which facilitates mono-acylation particularly on the less nucleophilic nitrogen of aryl hydrazines. The cheap and readily available carbon disulfide used in the procedure takes the important role of temporary protecting group and promotes acylation of the electronically less reactive nitrogen of aryl hydrazines.

50. Christi Young

"Molecular Dynamics Simulations of Influenza A Non-structural Protein 1 (NS1) RNA Binding Domain"

Six 50-ns molecular dynamics simulations of the RNA binding domain of the Non-structural protein 1 (NS1) of influenza A virus, a homodimer, were performed at 298K. We focused our analysis on helices 2 and 2', which are involved in RNA binding. A salt bridge displaying instability was identified between Aspartate-29 of chain A and Arginine-46 of chain B, where a "flipping" out and in occurred in half of the trajectories. A recent experimental paper described the presence of a cavity in the surface of the side chains of helices 2 and 2'. In our simulations we observed a change of size and shape of this cavity with time, correlated with the salt bridge motion. Principal component and normal mode analysis were done to support this correlation. Our results could have implications in computational screening studies searching for potential molecules that interfere with RNA binding.

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