Creighton University
Faculty Bibliography

[2004-2005]
This edition of the Faculty Bibliography was produced by the Creighton University Graduate School and documents the scholarly accomplishments of University faculty for the 2004-2005 academic year. Included are summary reports showcasing research endeavors taking place throughout the Creighton campus, individual faculty publications and grants, and student dissertations and theses, with acknowledgment to faculty advisors. An index beginning on page 121 identifies those faculty members whose citations appear in this edition.

We would like to thank Barbara Braden, PhD, for her steadfast support of this ongoing project during her tenure as Dean of the Graduate School. Dr. Braden will be stepping down as the Grad School Dean in June 2006, and we wish her well as she seeks out new adventures and new challenges. Special thanks go to Linda Hanson, Assistant to the Dean, who keeps the day-to-day operations of the Grad School ... and this project ... on track. Kudos to Chris Petit whose campus photographs grace the pages of this publication.

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Chemistry

The Chemistry Department has a broad range of research projects, all of which involve undergraduate students. Please see the descriptions below for individual faculty member’s research interests.

Dr. Bruce Mattson is currently interested in developing and establishing safe and convenient methods for generating and manipulating small samples of gases for classroom demonstrations, laboratory experiments, and study. Along with undergraduate students performing the research, we have developed classroom demonstrations and laboratory activities suitable for use at a variety of levels ranging from the middle school and high school levels up through university-level freshmen chemistry students and chemistry majors taking descriptive inorganic chemistry. The results of this work have been published in a series of articles in Chem13 News, the Journal of Chemical Education, and two books. Altogether, over 150 experiments have been devised for the variety of gases including CO₂, H₂, O₂, N₂, NH₃, NOₓ, C₂H₂, H₂S, SO₂, Cl₂, HCl, CO, C₂H₄, CH₄, and N₂O.

Dr. Julie Soukup's laboratory has an interest in nucleic acid structure and function. The lab is investigating both natural and in vitro selected RNA and DNA molecules. Utilizing Nucleotide Analog Interference Mapping (NAIM) and Nucleotide Analog Interference Suppression (NAIS), Dr. Soukup is investigating the important functional groups within ribozymes, deoxyribozymes, and riboswitches that are needed for the activity of these molecules. Her recent work on riboswitches is a new direction for the lab. The recently discovered RNA elements termed riboswitches control the metabolic state of microorganisms (such as Bacillus anthrax, a pertinent bioterror threat) by directly binding metabolites and regulating gene expression of essential metabolic pathways. A novel catalytic riboswitch has been identified, and it undergoes self-cleavage in the presence of the metabolite glucosamine-6-phosphate. The Soukup laboratory has elucidated some of the mechanistic details of metabolite binding and self-cleavage of the RNA. In addition, they have designed a technique to study interactions between the catalytic riboswitch and its metabolite in the hopes of being able to design non-natural metabolites as potential antibiotics.

Dr. Mark Freitag’s research focuses on theoretical and applied quantum chemistry. Theoretical quantum chemistry is the development of new methods of quantum chemical evaluation. In this area, we have developed a method to quickly calculate the nuclear magnetic resonance (NMR) chemical shifts of nuclei in the presence of a discrete solvent potential. Basically, we try to predict chemical shifts in solution. We model the interactions of the solvent using the Effective Fragment Potential method. These theoretical methods have recently been incorporated into the quantum chemistry package GAMESS.

Dr. James Fletcher’s research is based on the design, synthesis, and analysis of interesting organic and organometallic molecules. This work often draws upon a wide range of the traditional areas of chemistry, including organic and organometallic syntheses, physical organic analysis, bioorganic
chemistry and combinatorial chemistry. Currently, active projects include the design, synthesis, and analysis of organic compounds that display permanent and prescribed three-dimensional shapes, the creation of new organometallic ligands using common bioorganic chemical reactions and transition metal complexes, and the development of new peptide-containing aromatic molecules capable of serving as fluorescent chemosensors.

Dr. Erin Gross’ research interests involve the combination of electrochemical and spectroscopic analytical techniques to study chemiluminescent reactions. We ultimately would like to perform chemical analysis on a microchip. This would involve the separation, identification, and quantitation of an analyte mixture via capillary electrophoresis with chemiluminescent detection on a microchip. The first analytes we are studying are a class of antibiotics called fluoroquinolones which are used to treat infections in both humans and animals.

Dr. Stephen Gross’ research focuses on three different areas of polymer chemistry:

- The development of ionic liquid containing composites for use in advanced energy conversion applications (lithium polymer batteries, solar cells).
- In collaboration with Dr. Latta and Dr. Shaddy at the Creighton School of Dentistry, our lab looks at the adhesion of resin modified glass ionomer cements to dentin. We are also currently engaged in the development of new composites with dental applications.
- In collaboration with Dr. Singh in the School of Pharmacy and Health Professions, we are synthesizing polymers that can be used for subcutaneous drug delivery.

Dr. Marty Hulce’s laboratory specializes in synthetic organic chemistry, investigating new methods to prepare carbon-carbon bonds and the creation of novel structural motifs. Exploiting the power techniques of modern metalloorganic chemistry, students in his laboratory currently are exploring:

- The synthesis and reactions of mixed hybridization state, conjugated systems with unique topologies that interfere with tumor cell growth;
- The synthesis of modified amino acids used to build bioactive peptides, that can augment bioactivity relative to the unmodified peptide;
- Peptidomimetic synthesis, especially as it applies to cholecystokinin and neuropeptide Y2 receptor antagonists;
- Greener approaches to amide bond synthesis; and
- Beneficial chemical modifications of the outermost layer of the skin.
Fine and Performing Arts

Members of the Department of Fine and Performing Arts extend the concept of teacher-scholar to incorporate the role of artist. Faculty members pursue activity in each of these areas, with regional, national, and international recognition.

Notable artistic achievement within the visual arts is witnessed by invited participation at regional and national exhibitions as well as the inclusion of work in various museum and gallery acquisitions. Recent faculty projects have included significant commissions of two- and three-dimensional pieces. Additionally, faculty are engaged in photographic imaging in nineteenth century historical techniques (e.g. platinum, palladium, iron, and silver salts), glass-casting, print making, drawing, ceramics, and visual imaging made possible through emerging technologies. Faculty routinely supervise student exhibitions throughout the area and encourage student participation in local, regional, and national professional artistic organizations.

Performing artists are active in dance, theatre, and music. Among recent faculty achievements are appearances at a variety of venues, including award-winning dramatic roles on Omaha stages. Work associated with costuming, make-up design, and technical theatre has been critically acclaimed in productions throughout the region. During the past year, music faculty have appeared with numerous Omaha-based organizations (e.g., the Omaha Symphony and Mannheim Steamroller) and in various international venues. Additionally, most performing artists annually direct, conduct, and supervise student productions, concerts, and recitals. Adding to the department’s complete collection of Javanese court gamelan instruments, unique within the state of Nebraska, are performances on the first set of Surinamese gamelan instruments found in the United States.

Scholarly work includes traditional academic research as well as arts-specific activity. Music faculty produced new musical scores and presented papers at professional society conferences. Dance faculty are not just highly sought performers but choreographers, adjudicators, and pedagogues as well, with numerous appearances and works evidenced in the United States and abroad. Theatre faculty projects include direction and video/broadcast production. Art historians are engaged in both curatorial and scholarly work. Additionally, research associated with the University Gallery has resulted in the selection and presentation of exhibits routinely reviewed by regional critics.

Departmental faculty are committed to sharing their work and craft as artists within various educational settings. Professional activity for departmental members includes participation as jurors, reviewers, judges, clinicians, and presenters for local, regional, and national arts councils, workshops, evaluations, and conferences. The artist-faculty of Fine and Performing Arts believe their work is best described by the departmental mission statement: “We believe in the value of the arts as the voice of the human soul. The arts educate, communicate, and inspire us to know more about ourselves, each other, and our place in creation. We believe in the unity of the arts and in the crucial role of arts in education.”

For more information about the Department of Fine and Performing Arts, visit the department’s webpage at: http://finearts.creighton.edu/
Political Science and International Studies

Dr. Terry Clark has focused for over a decade on issues of democratization in the post-communist states of Europe. In the last four years he has transitioned from empirical tests of hypotheses drawn from theories to work on the theories themselves, particularly those based on formal models of democratic stability conditions. In 2005, he and Dr. John Mordeson (Creighton’s Department of Mathematics) signed a contract to produce a book on the topic, *Employing Fuzzy Mathematics to Formal Models in Comparative Politics*. They are seeking a National Science Foundation (NSF) grant to support their effort. Dr. Clark remains strongly committed to the idea that the most effective education is one that links the classroom with research. That commitment is underscored by his strong record of including undergraduate and graduate students in his research agenda. Since 1999, he has co-authored five articles in refereed professional journals, three book chapters, and twelve articles in other sources with Creighton students. He currently employs three undergraduates and two graduate students in his research program. At mid-2005, he and his research team had two articles under review, a book chapter in press, and three articles at various stages of development.

Dr. Sue Crawford's research has largely focused on the interplay of religion and politics in U.S. politics. A book on the political activities of women clergy has just been published. She has recently been working on projects that examine the application of a new interest group theory to religious interest groups and the involvement of religious groups in local coalitions. Another element of her research examines the incentives of different institutional structures. She is co-author of two chapters in a recent book on institutional analysis methods. She is currently exploring fuzzy math applications in institutional analysis.

Dr. Phil Meeks has been a wide ranging generalist for the past twenty-five years in three very different research areas including international security, international economics, and science and technology policies. Most of his current analyses are in the hybrid subfield of comparative political economy and international relations. His research is policy focused and mostly qualitative, although reinforced with statistical data. His early publications were focused on Western Europe, but he has since expanded to studies on Japan, the Caribbean, and the Middle East. Research articles updated during his spring 2005 sabbatical and out review include such topics as Haitian politics, French-U.S. policies toward Iraq, and the relationship between MNC success and national trade deficits. From May through July, he did research and interviews in Jerusalem on a new book manuscript, *Who Killed Oslo?*, on the Israeli-Palestinian peace process. In May of 2006, he will travel to Japan to present a revised chapter on U.S.-Japanese economic competition to be published in a book on Japanese “Soft Power” and international relations.

Dr. Graham Ramsden’s research examines the influences that affect competition in state legislative elections. The impact of public financing in Minnesota and elsewhere has been the subject of four of his journal articles. Another on the public financing of legislative candidates in Arizona is currently under review. Dr. Ramsden’s sabbatical next year will be spent examining gubernatorial elections in Vermont and state legislative elections in Maine.

Dr. Ken Wise, the keynote speaker for the Nebraska Secretary of State’s Foreign Trade Conference, Lincoln, October 4, 2005 has been involved with a number of ongoing projects including consulting with DuEXcel Research, Dubai, UAE. He has also organized and presented his research on a panel covering antiterrorism policies of international organizations in April 2005 for Dubai Consultancy and
Media Services. His ongoing research includes international organizations and antiterrorism, policy
studies organizations common problems, and Machiavelli the Liberal.

Dr. Rick Witmer’s current research agenda includes work on congressional-presidential relations and
the impact of these relations on international treaties and executive agreements. The first article from
this collaborative project is in press at the journal International Politics. His other area of research
interest is American Indian politics and law. He is currently writing a book on Indian political
participation, focusing on interest group strategies employed by tribes and non-tribal actors.
Importantly, this includes campaign contributions and lobbying efforts at both the federal and state
level. His is also working with four Creighton students on projects in American Indian law that
analyze the asymmetrical relationship between tribes and the federal government and its implications
on federal Indian policy. Finally, Dr. Witmer is part of the Creighton research team that was recently
awarded a $750,000 grant by the United States Agency for International Development to study
Cuba’s transition to democracy.

Dr. James Wunsch focuses his research on two recurring issues: state failure and reconstruction in
Africa, and development policy and programming throughout the developing world. He has
published two co-authored books and more than two dozen articles and reviews in peer-reviewed
journals and chapters in scholarly anthologies on the first topic, and another dozen articles and
chapters on the second. He has held research grants from the National Science Foundation, the
United States Agency for International Development, the National Endowment for the Humanities,
the Council on Foreign Relations (New York), the American Philosophical Society, the African
Development Bank, and the Fulbright Program. Currently, he is working on issues affecting grassroots
development and governance in Africa, and he recently spent several months in Uganda and Nigeria
doing field work on these topics. In addition, he served as editor of the report of the Joint Africa
Institute and the African Development Bank’s Conference on Poverty and Local Governance, held in
Tunis in the summer of 2005. Dr. Wunsch has done field research in more than a dozen countries in
Africa and South and Southeast Asia.

For more information about the Political Science and International Studies Department, visit the
department’s webpage at: http://puffin.creighton.edu/pls/index.htm

Physics

Research in the Department of Physics covers a spectrum from the theoretical discussion of the
physical meaning of quantum mechanics to experiments in high energy nuclear physics. The high
energy project involves several faculty in collaboration with Brookhaven National Laboratory in New
York, Lawrence Berkeley Laboratory in California, and the European Center for Particle Physics
Research in Switzerland. It investigates the theoretical production of particles from intense fields and
the experimental study of nuclei at very high temperatures and pressure. It is hypothesized that, by
recreating the conditions present a fraction of a second after the Big Bang, a state of matter not
present in the universe since that time, a quark-gluon plasma, might be recreated as well. Observing
this previously unseen state will provide information that is relevant to not only particle physics but
also cosmology. The quark-gluon plasma is studied using boson interferometry and measurements of
strangeness production, work that requires the development of large scale real time control and monitoring systems.

Another line of research seeks to determine the details of the x-ray production from atomic inner-shell ionization using a particle accelerator to produce low energy positive ions for bombarding atoms in solids. Very soft, low energy x-rays are measured with a Si(Li) detector equipped with an ultra-thin entrance window. Collateral information about the general interaction of ions moving in solids is also derived from these studies. The research has importance for basic studies of atomic interactions and has wide application to the nondestructive quantitative analysis of materials by measuring proton-induced x-ray emissions (PIXE) and to modifications of materials for use in the semiconductor industry. Inner-shell ionization in atoms is also being investigated through the photo-ionization process using a radioactive source of x-rays.

Research is currently being developed in the area of liquid-to-glass and liquid-to-gel transitions, one of the major unresolved problems in condensed matter physics. In this research, dynamic light scattering will be used to measure structural relaxation of liquids, gels, and epoxies on approach to the transition point. Another developing area of research is the rapidly growing field of “solid state ionics.” It will involve experimental and theoretical components aimed at tracing elementary steps of ion motion and understanding how the structural environment affects the dynamics of the mobile ions. The chief experimental technique is dielectric (or conductivity) spectroscopy which measures the dielectric response of mobile ions to an applied electric field.

The Department of Physics also has an active research program in the field of biophysics. Research in the biophysical optics lab is currently focused on the development and application of innovative optical techniques to study cellular and tissue environments. So far, we have developed a fully configurable three-channel, laser-scanning confocal microscope that works in both reflectance and fluorescence modes. In addition, we have built an all-solid-state Titanium:Sapphire laser that produces 1 W tunable output in the infrared from 730-900 nm. These two instruments are currently being used together to study the wavelength dependence of cellular response to intense (currently up to $10^{-11}$ W/cm$^2$, CW) near-infrared radiation, and we anticipate multiphoton microscopy in the near future. Finally, in collaboration with the Department of Biomedical Sciences, we have recently built an optical stretcher facility for biomechanical studies of outer hair cells, osteocytes, and cancer cells.

Several topics in the field of astro-particle physics are also under investigation in the department. One of the greatest mysteries of our time is dark matter; evidence shows that the Universe is dominated by a form of matter which does not interact electromagnetically and which is not composed of the familiar protons, neutrons, and electrons. Using theoretical models which propose particle physics candidates for the dark matter, detection rates in current and future detectors are calculated through extensive computer simulations. Such calculations can shed light on the distribution of dark matter and rule out classes of theories which are not yet testable directly at accelerators. In addition to the research on dark matter, the composition of extremely energetic cosmic rays is also being studied to determine realistic backgrounds at neutrino telescopes which are opening new windows on the Universe. In particular, the energy and angular dependence of prompt muons, those created in the decay of charmed particles, is being simulated numerically.

For more information about the Physics Department, visit the department’s webpage at:
http://physics33.creighton.edu/
Psychology

The Department of Psychology has numerous faculty involved in research, and typically these projects are tied to the department’s mission. For example, research is being conducted that examines children at risk for school failure and, in addition, looks at protective factors that may serve to prevent school failure. Other mission-driven research has investigated adolescent risk-taking, and has also looked at adolescent decision-making in the areas of drinking and driving, and teenage pregnancy.

Physiological research is being conducted in the Psychology Department’s new lab in Rigge Science. Work is being done examining cognitive, behavioral, and neurological pathology, as well as the processes involved in recovery from traumatic brain injury.

Research is also being done at the intersection of gender schema theory, cognition, and education. Research has shown that beliefs about gender have a pervasive influence on children’s behaviors and memories, and specifically that gender schemas can bias one’s judgments and memories for sex-linked information. Consequently, gender schemas may help or hinder the encoding and retrieval of information that is relevant to one’s own sex, but they may also interfere with the processing of information not consistent with one’s own gender. Thus, if children have difficulty remembering material associated with the other sex, then textbooks, computer software, and other school activities that make use of gendered material could easily lead to sex differences in the retention of the material. This type of work has both a theoretical and applied focus.

Other research in the Psychology Department focuses on group dynamics and teamwork, environmental design, prediction of violence in at-risk populations, and an examination of the link between the development of one’s faith and one’s identity.

For more information about the Psychology Department, visit the department’s webpage at: http://puffin.creighton.edu/psy/index.htm

Sociology and Anthropology

Rev. Raymond Bucko, SJ, is currently finishing research on an article on religion and violence which focuses on Saint Peter the Aleut, a native of Kodiak Island, AK who was purportedly martyred in 1815 in southern California by Catholic missionaries while on an otter hunting expedition. He is also researching how Lakota pass on religious tradition to children with his hunka (brother by adoption), Roger Iron Cloud, for an edited volume on early childhood and religion. Fr. Bucko continues to research the Buechel Museum collection and build its database along with an undergraduate research assistant and to amplify an ongoing visual biography of Fr. Eugene Buechel, SJ, for the museum website. Fr. Bucko is also researching early mission documents and history for a book introduction to a collection of early writings by German Jesuits and Franciscan Sisters who worked on the Lakota missions. The book material was collected and edited by Dr. Markus Kreis; the University of Nebraska Press invited Fr. Bucko to write the book introduction.
Dr. Barbara Dilly is writing the social and cultural history of the American family farmer’s daughter from diverse ethnic perspectives. She is also writing the cultural history of an Old Order Amish farming community in Northeast Iowa. Her ongoing action research in a small rural community in Northeast Iowa helps local residents define and implement appropriate economic development agendas, namely those associated with river recreation, cultural, and environmental tourism.

Dr. Dawn Irlbeck is conducting research on racial profiling for the Nebraska State Patrol (NSP). She has collected observational data on the interactions between road troopers and both minority and non-minority motorists in order to identify factors that increase the likelihood of a vehicle search. Results of the quantitative analyses have been released in an executive summary, and she is working on a journal article on her findings. In the next phase of the research project, qualitative analyses of the same data will be conducted and reported to the NSP, as well as submitted for journal publication. This summer, Dr. Irlbeck will conduct research for the University of Nebraska at Omaha’s Office of Latino/Latin American Studies (OLLAS) focusing on interactions between Latinos and law enforcement officers.

Dr. Charles Harper is revising a book for its fifth edition with co-author Kevin Leicht (a former Creighton Sociology major, now a sociology professor at the University of Iowa): *Exploring Social Change: American and the World*. He is also revising *Environment and Society: Human Perspectives on Environmental Issue* for the fourth edition. Finally, he is continuing research on a journal article: "Limits to Growth and Ecological Modernization: The Case of Food and Agriculture."

Dr. Rebecca Murray is currently researching the effects of urban structures on crime in Omaha, specifically focusing on the effects of alcohol-serving establishments on assault and auto theft and the effects of schools on violent crime. Dr. Murray continues to work closely with the Juvenile Justice Institute on several projects, including mapping gun-related violence within Omaha for Project Safe Neighborhood and mapping police-initiated contacts with youth from the Juvenile Assessment Center.

Dr. Lisa Riley continues to design and provide research for the Center for Marriage and Family (CMF). Current projects include evaluating the Nebraska Healthy Marriage Initiative (NHMI) and the Helping Every Adult Reveal the Truth of Sexuality (HEARTS) for Parents. The NHMI is an ongoing three-year project (2003-2006) to provide relationship and marriage preparation and education for those living in the Omaha Enterprise Community. The CMF is evaluating the effectiveness of this initiative. For the HEARTS program, Dr. Riley is evaluating the nine individual sessions as well the entire program for 2005-2006 for its effectiveness in increasing parents’ communication with children about sexuality. As a faculty member of the Creighton University Health Services Research (CHRP), Dr. Riley will serve as a research mentor in statistics and research design and methods for the proposed Building Research Infrastructure Capacity (BRIC) research project.

Dr. Sue Schuessler continues her research on how traditional healers in Zimbabwe integrate new knowledge (such as biomedical knowledge) into African indigenous medical knowledge. She is also researching how the trance state in African healing helps the healer in developing leadership and healing abilities. She continues to research the healers’ responses to the social problems resulting from the high prevalence of HIV/AIDS and malaria. She is also investigating religion and healing in the United States.
The Center for Health Policy and Ethics is a multidisciplinary group of scholars dedicated to the study and teaching of ethical dimensions of health care and health policy. Scholarship at the Center for Health Policy and Ethics responds to the challenge of ethical issues raised by the health care system, patient care, and public health. The multidisciplinary nature of the Center for Health Policy and Ethics encourages a variety of perspectives and resources for topics of scholarly inquiry, conceptual analysis, and discussion. The research interests of the faculty of the center reflect the stereoscopic vision implied in its name—the ethics of health policy and health care. Global topics of public policy as well as the traditional details of clinical decision making are addressed.

Areas of sustained research are: (1) ethical issues at the end of life, palliative care and chronicity; (2) issues of justice, especially those dealing with the marginalized in the health care system; and (3) disciplinary focus on professional and clinical ethics. Key examples of the outcomes of multidisciplinary seminars and conferences in health policy and ethics are the following edited books produced by the center faculty. The center was involved in planning and implementing the Dreamcatchers Conference, a national working group of experts in occupational and physical therapy. From this workgroup, a book of contributed papers was assembled, Educating for Moral Action: A Sourcebook in Health and Rehabilitation Ethics (Ruth Purtilo, PhD; Gail Jensen, PhD; and Charlotte Royeen, PhD; editors) published by F. A. Davis in 2005 with Dr. Amy Haddad, director of the center, and Dr. Linda Gabriel Franck, center faculty affiliate, as contributors. In response to the scarcity of literature on health sciences education in Jesuit universities, Dr. Jos Welie and Dr. Judith Lee Kissell edited a book, Jesuit Health Sciences and the Promotion of Justice: An Invitation to a Discussion, published by Marquette University Press in 2005. Following an international conference on dental ethics held at Creighton University in 2004, Dr. Jos Welie is editing a book titled, Justice in Oral Health Care: Ethical and Educational Perspectives, to be published by Marquette University Press in early 2006.

Issues of health policy and ethics will continue to demand scholarly inquiry and public attention. Critical concerns about ethics education will require closer examination of student learning and outcomes. The health care system will continue to develop, and these changes will inevitably lead to new moral considerations. Faculty at the center will continue to make important contributions in these challenging areas as they have done significantly in the past.

For additional information about the Center for Health Policy and Ethics, visit the center’s webpage at: http://chpe.creighton.edu.
Rev. Andrew Alexander, SJ, Maureen McCann Waldron of the Collaborative Ministry Office, and Larry Gillick, SJ, of the Degman Center for Ignatian Spirituality, are researching background for two publications. The first is a printed version of their current web-based Online Retreat. The second publication consists in the three-year cycle of Sunday Daily Reflections by Rev. Larry Gillick, SJ, which also currently resides on their website.

Rev. Raymond Bucko, SJ, is currently finishing research on an article on religion and violence which focuses on Saint Peter the Aleut, a native of Kodiak Island, AK who was purportedly martyred in 1815 in southern California by Catholic missionaries while on an otter hunting expedition. He is also researching how Lakota pass on religious tradition to children with his hunka (brother by adoption), Roger Iron Cloud, for an edited volume on early childhood and religion. Fr. Bucko continues to research the Buechel Museum collection and build its database along with an undergraduate research assistant and to amplify an ongoing visual biography of Fr. Eugene Buechel, SJ, for the museum website. Fr. Bucko is also researching early mission documents and history for a book introduction to a collection of early writings by German Jesuits and Franciscan Sisters who worked on the Lakota missions. The book material was collected and edited by Dr. Markus Kreis; the University of Nebraska Press invited Fr. Bucko to write the book introduction.

Rev. Don Doll, SJ is currently collaborating with a professional video husband/wife team, Chris Bell and Anne Burke, to document what Jesuits are doing to assist Tsunami victims. They are researching and compiling materials for a thirty-eight minute broadcast video entitled The Spirit of Tsunami. Fr. Doll is also preparing photographs he took in the Jesuit Research Service (JRS) camps for a forthcoming book celebrating twenty-five years of educational work by JRS among refugees. In addition, he photographed St. Thomas Manor and St. Ignatius Church for the celebratory posters and print material about early Jesuits in America. As part of an ongoing project, Fr. Doll is preparing photo shoots and accompanying text for his annual Native regalia calendars for Red Cloud Indian School and St. Augustine’s school.

Rev. Dennis Hamm, SJ, recently appointed holder of the Amelia B. and Emil G. Graff Faculty Chair of Catholic Theology, is researching the theory and practice of faithful citizenship in the Catholic social tradition, the Jewish roots of Christian language in the New Testament, and creation theology, especially in current discussions about the relationship between religion and science and religion and ecology.

Rev. William Harmless, SJ, is in the thick of three major book projects, each at various degrees of completion. He has completed six of the ten proposed chapters for his new book, Mystics—which was formally accepted for publication by Oxford University Press last March. Secondly, he is editing a new one-volume anthology of the writings of St. Augustine. Finally, he is serving as bibliographic editor for the forthcoming English edition of a major reference work, Hubertus R. Drobner’s Lehrbuch der Patrologie. This has meant translating (and expanding) over 175 pages of bibliographic entries on all the Church Fathers and on early Christian history. Last summer, Fr. Harmless completed all the remaining proofreading for this longstanding project. The book, entitled The Fathers of the Church: A Comprehensive Introduction, is on track to be published by Hendrickson in early 2006. In addition to these three books, Fr. Harmless contributed to two other projects as well. Last spring, he completed a
chapter tracing the history of scholarship and methods of research on “monastic life” for the forthcoming Oxford Handbook of Early Christian Studies (edited by David Hunter and Susan Ashbrook Harvey); the volume should be published in late 2006 by Oxford University Press. Also during the fall 2005, he delivered a paper entitled “Christ the Pediatrician: Augustine, Original Sin, and the Endangered Vocation of the Child” at a conference, “The Vocation of the Child,” sponsored by the Emory University Center for the Study of Law and Religion. This paper will be published as part of the proceedings of the conference in a book to be edited by John Coons and Patrick Brennan; the book will be published by either Cambridge University Press or Eerdmans.

Rev. Charles Jurgensmeier, SJ, is currently writing an article on Franz Schubert’s setting of Psalm 92 for the Reformed Jewish Temple in Vienna, Austria. In addition, he is conducting research on the Magnificat settings of the eighteenth-century German composer, Johann Valentin Rathgeber, OSB, a contemporary of J. S. Bach. He is also researching materials for a lecture on vocal music of the late medieval period in cooperation with the viewing of the newly illuminated manuscripts from St. John’s University, Collegeville, MN, and is preparing a lecture-recital at the Joslyn Art Museum on seventeenth- and eighteenth-century French vocal music in February 2006.

Rev. Charles Kestermeier, SJ, who works with the English Department, continues to amplify and update his comprehensive on-line annotated bibliography on Raymond Queneau, a modern French author. He has recently added a section on the location of manuscripts and other personal and archival material. Fr. Kestermeier edits an on-line bulletin on Queneau, as well, and published an article on the apparent reciprocal influences between one of Queneau’s novels and a novel by Boris Vian.

Rev. Roc O’Connor, SJ, instructor in the Theology Department and liturgist for Campus Ministry and St. John’s parish, has had his book series proposal accepted by Liturgical Press, Collegeville, MN. The two-to-three books will deal with aspects of “full, active, and conscious participation” in the Roman Catholic liturgy. He is collaborating with two other liturgical theologians on an article on the psalms of the Liturgy of the Hours, to be published in 2006 in Liturgical Ministry magazine. Fr. O’Connor joined three other members of the “St. Louis Jesuits” who contributed three songs each for a three-and-a-half week recording session in Portland, OR, during July 2005. Oregon Catholic Press will publish and distribute their collection, Morning Light, due to be released in early December 2005. Fr. O’Connor also has refined his work developing criteria for the theological adequacy of lyrics for entrance songs/hymns for the Catholic liturgy. He plans to deliver the article to a publisher in summer 2006.

Rev. John Zuercher, SJ, continues to research and write support material on Ignatian spirituality for his work with Christian Life Communities. He has recently completed a four-part series on Ignatian discernment to be used primarily by small groups.

To learn more about the Jesuit Community at Creighton University, visit the Community’s webpage at: http://magis.creighton.edu/cujesuits/index.html.
Biomedical Sciences

Research Overview

Some examples of the wide variety of research specialties of the faculty are: design and chemical synthesis of analogs of regulatory peptides; the role of peptides in the regulation of gastrointestinal and cardiovascular functions and of bone growth and development; the molecular evolution of peptide hormones; the role of proteolytic enzymes in the biosynthesis of peptide hormones; nucleic acid catalysis and molecular engineering; the molecular biology of collagen synthesis; the regulation of gene expression and molecular diagnostics; the cellular and genetic basis for differentiation of the brain, inner ear, and cardiovascular system; comparative neuroanatomy; cellular mechanics; intracellular electrophysiology; and respiratory mechanics and control. The research is supported by facilities, including cores for bioimaging, structural bioinformatics, proteomics, genomics, and molecular diagnostics. The department encourages collaborative research interaction with faculty in the Departments of Pharmacology, Medical Microbiology, Medicine, and Surgery; the Osteoporosis Research Center; the Boys Town National Research Hospital; the University of Nebraska Medical Center; and the Veterans Administration Hospital.

Skin Cancer

The largest organ in the body, the skin, functions as a major sensory organ and protects the body from exogenous insults. Our research is examining the role of a family of receptor tyrosine kinases in the skin during development and in skin carcinogenesis in response to solar radiation. Members of this receptor tyrosine kinase family include the epidermal growth factor receptor and erbB2/neu, which regulate cell survival, migration, and proliferation. We are investigating the mechanisms of non-melanoma skin cancer development by focusing on the role of erbB2 and the epidermal growth factor receptor in this process. Since non-melanoma skin cancer is the most common form of cancer in the United States, with more than one million new cases diagnosed per year nationwide, this research may have important implications for human health.

Faculty: Laura Hansen, PhD.

Comparative Ion Transport

Research on the ion transport mechanisms that underlie the adaptation of organisms to their environment focuses on the role and regulation of the sodium/hydrogen exchange proteins in yellow fever mosquitoes and the sodium/potassium ATPase in Antarctic fish. Both projects are aimed at identifying the mechanisms of ion transport responsible for the adaptation, including physiological, biochemical, and anatomical measurements; regulation of the ion transport mechanisms by primary and secondary messengers, including analysis of intracellular cAMP, calcium, and pH; and molecular basis for the regulation the ion transporter of interest, including cloning and sequencing of cDNA, mRNA, and protein expression studies.

Faculty: David Petzel, PhD.
Airway Hyperresponsiveness

Research on mechanisms on airway hyperirritability is focused on whether C-fiber endings in reactive airways become hyperirritable, using single nerve fiber monitoring of sensory receptors in airway and parenchyma of small animals. The involvement of neuropeptides in the response of the hyperirritable airway is examined using whole animal nerve recording in vivo and tracheal smooth muscle strips. The pulmonary research also includes pharmacological evaluation of possible therapeutic agents for asthma using whole-body plethysmograph, isolated airway smooth muscle preparations to measure the protection and reversal of airway mediator induced contraction. Changes in reflex control of ventilation and pulmonary sensory receptors of the airway and lung parenchyma during the progression of disease of the lung are also studied.

Faculty: Dale Bergren, PhD.

Cardiac Development

Congenital heart defects are the most common life-threatening birth defect, and many times are accompanied by craniofacial anomalies. In this department, investigators are studying the role of cell-cell and cell-extracellular matrix interactions during normal craniofacial and cardiac development, particularly with regard to neural crest morphogenesis and migration (cells pivotal in the development of both the face and heart). Studies using in situ hybridization, immunocytochemistry, gene misexpression, enzyme assays, and time-lapse imaging show growth factors, proteases, and protease inhibitors are important overseers of neural crest cell formation and migration. Investigation into the effects of elevated homocysteine on neural crest morphogenesis and mechanisms responsible for folic acid's protective effect on cardiovascular and craniofacial development are also ongoing. In order to develop preventative strategies for congenital defects, we must understand the mechanisms driving neural crest and cardiac morphogenesis and how nutritional elements are involved. These studies also enhance our understanding of adult diseases because many diseases have etiological elements of embryologic origin.

Faculty: Philip Brauer, PhD.

Circadian Rhythms

Our daily rhythms of sleep and wakefulness are driven and regulated by two small nuclei in the hypothalamus, the suprachiasmatic nuclei. In a brain slice preparation, we are now investigating the cellular mechanisms of circadian rhythm regulation and how circadian rhythms are modulated by the brain hormone melatonin.

Faculty: Richard Hallworth, PhD.

Developmental Neuroscience: Ontogeny and Phylogeny

Molecular cues control the proliferation, migration, and specification of neuronal groups. To understand the dynamics that control the development of the brain, we are examining the interactions of a variety of early-onset genes in the formation of the rhombic lip and pallium of normal and mutant mice. The evolution of these brain domains forms a second focus of our research. Comparative studies of gene and peptide expression patterns in developing chicken and mice provide another perspective of the genetic controls of neural domains.

Faculty: Laura L. Bruce, PhD; David H. Nichols, PhD.
Ear Development

The inner ear contains two important sensory systems: the vestibular system for orientation in space and the auditory system for hearing. Progress in recent years has been dramatic regarding the molecular governance of ear development, in particular of the pathways of innervation in this organ, and the genetics of hearing-related disorders. Our research focuses on mouse mutations that cause developmental ear defects and those that affect either the formation or the maintenance of sensory neurons in the hearing or vestibular systems. This research will enable us to understand the molecular machinery that makes and brakes ear formation, especially the innervation. In a parallel avenue, we are investigating the activity-dependent connectional dynamics. For this we make use of micro- and hypergravity exposure as well as several neurotrophin mutant mice with altered connections. This research is conducted in collaboration with Boys Town National Research Hospital, Millennium, Regeneron, and various universities. It is funded by the National Aeronautical and Space Administration and the National Institute on Deafness and Other Communication Disorders.

One of the central questions in developmental neurobiology of the sensory systems is how the receptor cells develop and whether their development is regulated by innervation. Research in the laboratory focuses on the development of cochlear hair cells. Specifically, we want to determine when somatic motility, membrane conductances, and ACh receptor of outer hair cells develop. Recordings are made from solitary hair cells isolated from developing animals. Tissue culture technique has also been used to address the question of whether the maturation of hair cells is regulated by innervation. The research is funded by the National Institute on Deafness and Other Communication Disorders.

Faculty: Kirk Beisel, PhD; Laura Bruce, PhD; M.-D. Crapon de Caprona, PhD; Bernd Fritzsch, PhD; David He, PhD; and David Nichols, PhD.

Molecular Biology of the Inner Ear and Hereditary Deafness

The mouse inner ear offers an excellent paradigm to characterize and analyze the functional genomics of unique and rare cell types in the inner ear. These include inner hairs cells, outer hair cells, inner phalangeal, border cells of the inner sulcus, pillar, Deiters’, Hensen’s and Claudius’ cells. Gene discovery and differential expression will focus on global expression analysis using microarray analyses in combination with null and spontaneous mutant mice. Quality assessment of these cDNAs will be accomplished by using *in silico* microarray analyses to detect expression of ion channel genes, rare to common housekeeping genes, developmentally expressed genes, cell-specific genes of the OC, and genes expressed in only non-sensory/non-neuronal cells. Using bioinformatics approaches candidate genes for hereditary deafness will also be identified. One component of the research program will also focus on the development and testing of genetically engineered mouse mutant lines to determine and molecularly dissect the structure functional relationship of the altered genes in normal and dysfunctional auditory responses. This research is conducted in collaboration with Boys Town National Research Hospital, RIKEN, the National Institutes of Health, University of Iowa, and various other universities. It is funded by the National Institute on Deafness and Other Communication Disorders.

Faculty: Kirk Beisel, PhD.
**Hearing Loss**

Hair cells are the essential first step in hearing, and damage to hair cells is the cause of age-related and traumatic hearing loss. In work funded by the National Institutes of Health and the Richard J. Bellucci, MD, Medical Research Fund, the basic science of hair cells and the mechanisms underlying their loss are being studied, with a view to finding rescue and repair methods. This work is being pursued in collaboration with investigators at Boys Town National Research Hospital, Harvard University, Baylor College of Medicine, St. Jude’s Hospital in Memphis, University of Colorado at Boulder, University of Texas at Austin, University of Texas Health Science Center at San Antonio, University of Maryland, Oregon Health Sciences University, Boston University, and Northwestern University.

*Faculty: Kirk Beisel, PhD; Bernd Fritzsch, PhD; Richard Hallworth, PhD; David He, PhD; and David Nichols, PhD.*

**Biophysics of Cochlear Hair Cells**

The outer hair cell (OHC) is one of two kinds of receptor cells in the inner ear, and plays a critical role in mammalian hearing. OHCs enhance basilar membrane motion through a local mechanical feedback process within the cochlea, termed the “cochlear amplifier.” It is generally believed that the basis of cochlear amplification is a voltage-dependent somatic length change of OHCs. In this scheme, receptor potentials produced by transducer current in response to acoustic stimulation provide the input to the cell’s motor activity. Consequently, the OHC is thought to perform two transducer functions, a conventional mechano-electrical or forward transduction in the stereocilia, and a specialized electromechanical or reverse transduction in the basolateral membrane. Funded by the National Institute on Deafness and Other Communication Disorders, research in the laboratory focuses on the two transduction processes in OHCs. Recordings are made from isolated hair cells, cultured hair cell preparations, and hemicochlea, in conjunction with molecular, morphological, and other novel techniques to investigate properties of these cells and their roles in cochlear function in mammals. The research is conducted in collaboration with Northwestern University, Harvard University, the National Institute on Deafness and Other Communication Disorders, and St. Jude Children’s Research Hospital.

*Faculty: Richard Hallworth, PhD; and David He, PhD.*

**Control of Gene Expression**

This research is centered on the developmental regulation of hemoglobin gene expression with correlative gene therapy approaches. The mechanism by which transcriptional regulatory proteins are involved in switching the various hemoglobin genes on and off at different stages of development is being studied. The results from these investigations will contribute to knowledge of red cell maturation and disease states which result from gene defects. New gene therapy vectors which are erythrocyte specific and use endogenous retrotransposons, which are expressed in red blood cells, are being developed. This is a novel gene therapy approach to genes in target cells, which have long-term expression capabilities as well as tissue specificity.

*Faculty: Joseph Knezetic, PhD.*
Molecular Genetics of Hereditary Cancers

This research is focused on finding mutations at the DNA sequencing level for various hereditary cancer patient families. Studies so far have shown that each family has unique mutations causing the cancers. The laboratory facilities used for the work have been developed into a Molecular Diagnostic Laboratory which is fully accredited by the Clinical Laboratory Improvement Amendments (CLIA) and certified by the College of American Pathologists (CAP). This laboratory examines patient DNA samples for known mutations in each family and provides reports for subsequent genetic counseling. WAVE-DHPLC technology and CHIP instrumentation are being used to assay for new mutations in families where the original causative mutation has yet to be determined.

Faculty: Joseph Knezetic, PhD.

Engineering RNA Catalysts

This research is focused on development of controllable RNA catalysts as genetic regulatory switches and cellular biosensors. These catalysts, termed allosteric ribozymes, require the binding of specific effector molecules to elicit activity and are generated using rational design and in vitro evolution strategies. The ability of allosterically self-cleaving ribozymes and self-splicing introns to regulate gene expression is of particular interest. Toward this goal, model systems for yeast and mammalian cells are presently being developed. Moreover, such catalysts afford a unique opportunity to investigate the structural dynamics of RNA folding and ligand interaction.

Faculty: Garrett Soukup, PhD.

Osteoporosis

Collaboration between Creighton faculty in the Departments of Biomedical Sciences and Internal Medicine focuses on osteoporosis and the cellular basis of how skeletal mass is achieved and maintained: bone mass changes in response to varying loads—disuse reduces and heavy use increases bone density; how loads placed on the skeleton are detected and converted into biological signals that affect the balance between bone formation and resorption is not understood. Studies currently underway use bromodeoxyuridine to characterize the proliferation and differentiation of osteoprogenitor cells in response to biomechanical loading in adult rats. The role of prostaglandin E (PGE) as a local mediator of load induced bone formation is also being evaluated. Another project is designed to elucidate how smoking tobacco reduces bone mass and increases the risk for osteoporosis. This project combines an assessment of bone structure, strength, and cell function using in vivo and in vitro models.

Faculty: John Yee, PhD.

Cell Mechanics

It has long been known, but not widely appreciated, that light exerts force on living tissue. Intense laser light can be harnessed to produce a novel method, called the optical stretcher, for the measurement of the mechanical properties of single cells. In a joint project of the Department of Biomedical Sciences, the Osteoporosis Research Center, and the Creighton University Physics Department, an optical stretcher facility will be constructed in the Department of Biomedical Sciences in the coming year. Initial studies will address the mechanics of hair cells of the inner ear, the mechanism by which bone density is regulated by osteocytes, and the mechanisms underlying
photodynamic therapies. This work is being pursued in collaboration with the University of Texas at Austin and the University of Leipzig, Germany.

Faculty: Richard Hallworth, PhD.

Control of Appetite and Digestion

Our research focuses on the question: How does the gastrointestinal tract communicate with the brain to control food intake and energy reserves (adiposity; body weight)? Meal initiation is typically preceded by sensations of hunger and followed by sensations of fullness and satiety, which affect the timing of meals and amount of food consumed. Various gastrointestinal hormones and nerves are postulated to play important roles in conveying information to the brain about the quantity and quality of food consumed. Less is known about the brain substrates that receive this information, produce hunger and satiety sensations, and regulate adiposity. Our research specifically focuses on the role of various gastrointestinal peptides (cholecystokinin, amylin, peptide YY(3-36), glucagon-like peptide-1, ghrelin) and nerves (vagus) in control of food intake, gastric emptying, and body weight. Most of our studies use the rat as an experimental model. Rats are prepared with chronic indwelling cannulas in specific areas of the gastrointestinal tract, vascular system, and/or brain for computer controlled delivery of test substances and withdrawal of blood. Food intake and meal patterns are determined from continuous computer recordings of changes in food bowl weight. Many of the peptides and peptide antagonists are synthesized either locally in the Veterans Administration Peptide Core Facility or by Dr. Martin Hulce in the Department of Chemistry at Creighton University. Our research is supported by the Medical Research Service of the Department of Veterans Affairs, the National Institutes of Health, and the National Science Foundation.

Faculty: Roger Reidelberger, PhD.

Regulatory Peptides

Structure-activity relationships of selected regulatory peptides are examined using synthetic peptide chemistry, physical, chemical and computerized theoretical analysis of conformation and biological characterization of activity.

◊ Studies on the interactions of antimicrobial peptides with the chaperone protein DnAK, using MD simulations, revealed the interaction site on the protein and a possible basis for antimicrobial action and design of new peptide-based antibiotics.

Faculty: Sándor Lovas, PhD.

◊ Studies of gastrin and gastrin gene-products are focused on their significance in colonic cancer and on a novel receptor for carboxymethyl gastrin which mediates promotion of growth of the cancer cells.

Faculty: Sándor Lovas, PhD; and Richard F. Murphy, PhD.

◊ Studies of variants and derivatives of gonadotrophin releasing hormone variant, GnRH III, have led to development of a conjugate of the peptide with a synthetic polymer. This suppresses growth of cancers, including breast and colonic, which have receptors for the hormone. The technology is being optimized for therapeutic application.

Faculty: Sándor Lovas, PhD; and Richard F. Murphy, PhD.
Studies of the vasodilatory neuropeptide, calcitonin gene-related peptide (CGRP), have led to the development of the most potent, peptide-based CGRP antagonists reported to date. These will be useful for determining the physiological role of CGRP and the design of therapeutics for treatment of hypertension and migraine.

Faculty: D. David Smith, PhD.

**Structural Bioinformatics and Proteomics**

Eighteen Alpha cpu-based and 80 Athlon cpu-based clusters are used to study conformational properties of peptides proteins and the effect of weakly polar interactions on peptide and protein structures by Molecular Dynamics simulations, bioinformatics, and high level quantum chemical calculations.

Faculty: Sándor Lovas, PhD; and Richard F. Murphy, PhD.

**Protein Processing**

Communication between cells of the nervous, endocrine, and immune systems is frequently conducted through biologically active peptides. Many of these peptides are initially synthesized as larger, inactive propeptides which are subsequently cleaved by extremely specific endoproteases. The structural basis for this specificity is unknown. We are presently examining the processing of proinsulin and proglucagon by the converting enzymes PC1 and PC2 in an attempt to uncover clues to the specificity of substrate recognition. The ultimate goal of this work is to describe, at the molecular level, those interactions for the differential processing of peptide hormones.

Faculty: Robert Mackin, PhD.

**Bioimaging**

The Nebraska Center for Cell Biology in the Department of Biomedical Sciences in 2004 obtained a Zeiss multi-photon confocal microscope. Investigators in the department and other departments of the Medical School, the Departments of Physics and Biology, Creighton University, Boys Town National Research Hospital, the University of Nebraska Medical Center, and outside centers such as the University of South Dakota, St. Jude Children’s Research Hospital (Memphis, TN), and the Virginia Military Institute (Lexington, VA) are using the instrument to extend their knowledge of the inner workings of cells.

Faculty: Bernd Fritzsch, PhD; and Richard Hallworth, PhD.

For more information about the Department of Biomedical Sciences’ current research activities, visit the department’s webpage at: [http://www.biomedsci.creighton.edu/research/areas.html](http://www.biomedsci.creighton.edu/research/areas.html)

**Cancer**

The Creighton University Medical Center – Cancer Center was established in 2002 under the direction of Dr. Brian W. Loggie. The main goals of the Cancer Center are: a) to cover basic cancer services, develop areas of excellence or distinction, and provide specialty niches of care not currently provided in the Omaha metro and region, and b) to establish premier programs in basic research.
The basic science faculty consists of Zhao-Yi (Charlie) Wang, PhD, and Venkatesh (GV) Govindarajan, PhD. Clinical faculty consists of Brian Loggie, MD; Edibaldo Silva, PhD, MD; and Jason Foster, MD.

The theme of the basic and translational research at the Cancer Center is signal transduction, also known as molecular signaling. During the 2004-2005 academic year, research was fully supported by funding from the National Institutes of Health, U.S. Department of Defense, and State of Nebraska-sponsored Cancer and Smoking Disease Research Programs (LB595 and LB692). This funding supports the Cancer Center’s post-doctoral fellows, a research associate, and laboratory technicians. In the fall of 2004, the Cancer Center moved into newly renovated laboratories, consolidating several smaller labs throughout the Criss complexes. The Cancer Center is proud of its state-of-the-art molecular biology and immunohistochemistry laboratories.

The focus of Dr. Zhao-Yi (Charlie) Wang’s research is to delineate the molecular mechanisms underling the initiation and progression of human breast cancer. In the past year, Dr. Wang’s laboratory worked on dissecting the signaling pathways involved in the activation of estrogen receptor expression during the early development of human breast cancer. They isolated several genes whose dysregulation may contribute to the initiation and progression of estrogen-stimulated breast cancer. Dr. Wang’s laboratory also identified, cloned, and initially characterized a novel isoform of human estrogen receptor-alpha. Further investigation of the biological function of this novel estrogen receptor revealed a significant discovery—the previously characterized ER-negative breast cancer cells still respond to estrogen signaling. These preliminary studies led to a successful application of a new National Institutes of Health RO1 grant. Further investigation and fundamental knowledge of how estrogen-signaling functions in mammary tumorigenesis and how estrogen signaling is regulated by this novel receptor will lay a foundation for the development of novel approaches to intervene with the neoplastic transformation of breast epithelial cells.

A second area of focus in Dr. Wang’s laboratory during the past year was on the Wilms’ tumor suppressor, WT1. Dr. Wang’s laboratory was able to demonstrate that WT1 functions as a strong anticancer gene in breast cancer development by strongly inhibiting estrogen-stimulated mammary tumorigenesis. It was also demonstrated that WT1 suppresses the expression of the novel estrogen receptor, which was recently cloned in the laboratory. This research revealed a complex signaling network by which anticancer genes work together with cancer genes, and suggests that dysregulation of this network contributes to development of human breast cancer.

In Dr. Venkatesh (GV) Govindarajan’s laboratory, several areas of research are being pursued. Broadly, the interests are in a) molecular mechanisms that underlie cell fate determination and proliferation, and b) understanding how deregulation of these molecular events leads to tumorigenesis. The studies are performed by generation and characterization of transgenic mice.

- Malignant mesothelioma (MM). Malignant mesothelioma (MM) is a tumor that arises in the cells (mesothelia) that line the pleura, peritoneum, and pericardium. A transgenic mouse model for MM is being generated through the use of a promoter that is active in the mesothelial
cells. This mouse model will be a useful tool for analyzing the early molecular events that are critical for initiation and progression of MM.

◊ **Skin tumors.** Transgenic lines with targeted expression of an activated version of H-Ras in the lens were generated to study the role of Ras in regulation of proliferation and differentiation of lens epithelial cells. These mice develop lens epithelial hyperplasia and cataracts. Mice from one transgenic line, in addition to ocular defects, also develop skin tumors (squamous cell carcinomas) by three weeks. These tumors are predominantly seen in homozygous transgenic mice. Experiments are in progress to determine if the tumors are the result of ectopic expression of the transgene or due to insertional inactivation of an endogenous gene that suppresses tumor formation.

◊ **Ocular development.** The interest is in understanding how fibroblast growth factor signaling (FGF) regulates differentiation of ocular tissues, in particular corneal/conjunctival differentiation. Previous work has identified FGF-10 as the inducing signal that induces the conjunctival epithelial cells to initiate the lacrimal gland differentiation program. FGF-10 is both necessary and sufficient for initiation of the glandular differentiation program in the conjunctival cells. We are currently investigating the role of downstream effectors and targets of FGF-10 signaling in the conjunctival epithelial cells that are relevant to proliferation and glandular differentiation. We have also developed a GAL4/VP16 bigenic system for inducible transgene expression in ocular tissues.

◊ **Skeletal development.** Expression of FGF-9, a member of the FGF family, was targeted to the lens to study the role of FGF-9 during ocular development. Of the different transgenic lines, one line showed altered differentiation of the parietal bones. In these mice, the cranial mesenchymal cells that form parietal bones undergo endochondral (initial formation of cartilage and later formation of bone) program of ossification rather than the usual intramembranous differentiation (direct formation of bone). Our studies have shown that the alterations in skull development in these transgenic mice are due to ectopic expression of the transgene in the cranial mesenchymal cells. Experiments are underway to a) trace the developmental origins of the parietal mesenchymal cells that respond to FGF stimulation, b) replicate the skeletal phenotype by using alternative promoters, and c) identify the regulatory elements in the vicinity of the transgene integration site that allow cranial mesenchymal expression of the FGF9 transgene.

Jason Foster, MD, Assistant Professor of Surgery, and Ye Ye, MD, surgical research resident for the Cancer Center, conducted research to understand mucins and their production. Mucins are high-molecular weight glycoproteins made by cells in the gastrointestinal (GI) tract and are integral for normal lubrication, digestion, absorption, and protection of the GI tract. In many tumors of the GI tract (colon, pancreas, gastric), when mucin over-expression is identified, it has been associated with more advanced disease, distant metastasis, and poor survival. There are many subtypes of mucin glycoprotein, but MUC-2 and MUC-1 specifically have been associated with aggressive tumor behavior in colorectal cancers that appear to be more resistant to our best contemporary therapies. Additionally, a unique subtype of gastrointestinal malignancies, pseudomyxoma peritonei (PMP) that commonly arises from the appendix, literally translated as “false mucinous tumor of the peritoneum,” has also been found to overexpress MUC-1 and MUC-2. Clinically, this is manifested by the copious production of mucin in the abdominal cavity that results in symptomatic presentation of these
patients. Management of this disease requires extensive surgical debulking and subsequent intraperitoneal delivery of hyperthermic chemotherapy to relieve symptoms and control disease recurrence. A significant subset of these patients can present or recur with disease that is not amenable to cytoreductive surgery; currently, no standard effective systemic therapies are available for these PMP patients. Unlike other tumors which lead to cancer mortality by spreading to distant organs such as the lung and/or the liver, these tumors recur in the abdomen with a low tumor volume but secrete large amounts of mucin which eventually overrun the abdominal cavity. As a result of this tumor behavior, many of these patients suffer from significant pain, enterocutaneous fistulae, severe malnutrition, and cachexia in the end stages of this disease.

Because of the lack of effective systemic therapies for colorectal carcinoma (CRC) patients with mucin overexpression and PMP patients, our lab is primarily interested in understanding how these proteins result in this unfavorable biological behavior and in developing targeted therapeutics to treat tumors that overexpress these proteins. In our lab, we have employed a new technology which can silence genes that are expressed called small interfering RNA (siRNA) technology to down regulate mucin production in human cancer cells. We have studied the effects of siRNA MUC-2 inhibition in human cell lines known to overexpress MUC-2 and found that we can reduce the production of mucin by 60 to 80 percent. Most importantly, when mucin production is inhibited, it results in decreased tumor growth in vitro. Recently, we have been able to use siRNAs to reduce tumor growth in a mouse model system making this technique a potential therapeutic option for tumors that express high levels of MUC-2. Currently, we are investigating the biological mechanisms and pathways that lead to the aggressive behavior in mucin over-expressing tumors. Our goal is to use this translational model to develop safe, novel biological therapies that target the mucin proteins and/or pathways.

Brian Loggie, MD, Professor of Surgery, is Chief of Surgical Oncology and Director of the Cancer Center. Dr. Loggie established a center for the treatment of peritoneal neoplastic disease. Patients from virtually every state have been evaluated and treated at the Cancer Center for a variety of conditions, including pseudomyxoma peritonei (PMP), peritoneal carcinomatosis, appendix cancer, and peritoneal mesothelioma. Translational research at Cancer Center has lead to national and international presentations, and patent applications. Dr. Loggie has broad clinical experience in surgical oncology and in clinical and translational research in cancer.

Edibaldo Silva, PhD, MD, Associate Professor of Surgery, is the Program Director for the Breast Clinic and the Melanoma and Skin Cancer Clinic. Additional areas of expertise are in gastrointestinal malignancy, pancreatic cancer, sarcoma, thyroid and parotid tumors. Dr. Silva is the principle investigator for the Sunbelt Melanoma Trial, a multicenter trial of Adjuvant Interferon Alfa-2b for melanoma patients with early lymph node metastasis detected by sentinel node mapping and sentinel lymph node biopsy. He is also the principal investigator for the American College of Surgeons Oncology Group (ACOSOG) Protocol Z0010 and Z0011, which is a prognostic study of sentinel node and bone marrow micro metastasis in women with clinical T1 or T2NoMo breast cancer. Additionally, Dr. Silva is a participant in MammoSite Radiation Therapy System Evaluation Trial with Methodist University Hospital.

For additional information about the Cancer Center, visit the center’s webpage at: http://www.creighton.edu/CancerCenter/
Internal Medicine

The faculty and research programs in the Department of Internal Medicine had many significant accomplishments in the 2004-2005 academic year. The department faculty received numerous awards from both federal and non-federal research funding sources. The department’s productivity is manifested by the fact that 34 percent of all research dollars awarded to the School of Medicine and 27 percent of all research dollars awarded to Creighton University were due to funding of Internal Medicine faculty. Overall, the Department of Internal Medicine faculty was awarded close to 11 million dollars in grants and contracts, representing a 28 percent increase over the previous year. Twelve individual investigators received awards totaling over $100,000, and six received funding from the National Institutes of Health. The leading divisions for research productivity were Endocrinology and Allergy/Immunology.

The Department of Internal Medicine research efforts have been fostered by collaborative interactions within and outside the department. The Divisions of Allergy/Immunology, Dermatology, and Rheumatology have collaborated on several clinical research protocols examining the role of immunomodulators in inflammatory diseases. The Divisions of Allergy/Immunology and Pulmonary Diseases have collaborated on studies to identify new treatments for airway diseases. In addition, the Division of Allergy/Immunology has continued to investigate and publish about novel therapies for asthma and allergic disorders using both animal and human models. The Division of Cardiology is actively engaged in examining new treatments and preventive strategies for cardiovascular diseases. Under Dr. Mohiuddin’s leadership, the Cardiology Division has also been engaged in health disparities research [see below for more details]. The Hematology/Oncology Division continues to be very active in clinical research, especially with the Missouri Valley Cancer Consortium. The Division of Endocrinology has continued to have a very strong research program in several important areas, including osteoporosis, bone metabolism and diabetes, resulting in many important grants and publications. The Division of Pulmonary and Critical Care Medicine is emerging as a strong research group engaged in researching new management strategies for chronic obstructive pulmonary disease and community as well as ventilator-acquired pneumonias. The Divisions of Gastroenterology and Nephrology have begun active research programs as well. The general Internal Medicine Division continues to be among the leaders in educational research projects, including studies on establishing the most effective ways to teach in a clinical setting.

All of these research efforts have not only led to increased funding by the Department of Internal Medicine, but increased local, national, and international recognition. The faculty have been extremely productive in publishing original research, invited reviews, text book chapters, and clinical case reports. Many of the faculty have also been invited speakers and lecturers throughout the world.

For additional information about the Department of Internal Medicine, visit the department’s webpage at: http://medicine.creighton.edu/medschool/medicine/main.html

Cardiology

The Division of Cardiology, under the direction of Syed Mohiuddin, MD, builds upon its commitment to provide superior clinical services, participate in sponsored clinical research, and take part in community-focused intervention programs.
The Cardiac Center provides referring physicians, healthcare professionals, patients, and their families with the opportunity to utilize the area’s first freestanding facility dedicated to cardiovascular research and education, risk modification, diagnosis, and treatment.

Services at the Cardiac Center include: patient evaluation, treatment and management; electrocardiography; x-ray; exercise testing; cardiovascular sonography services; implantable cardiac defibrillator (ICD) and pacemaker management; pharmacologic interventions (including the availability of compassionate drugs); laboratory services; risk reduction education and smoking cessation services.

Clinical Operations

The Cardiac Center has made great strides in offering new technologies and improving care practices to its patients.

The Cardiac Center now offers myocardial perfusion imaging, a technique that may be used during an exercise or resting echocardiogram that visualizes actual or lack of blood flow to the myocardium. The advantages of this technique include earlier detection of ischemia in the testing process at a lower heart rate before wall motion is affected. Echo-guided atrial ventricular optimizing for biventricular pacing in heart failure patients and three-dimensional echo cardiography were also added this year.

Carotid stenting was first performed by Cardiology faculty in Spring 2005. Carotid stenting is a minimally interventional procedure in which a physician uses a combination of balloon angioplasty and a stent implant to unblock and reopen the carotid artery, a major supplier of blood to the brain. Carotid stenting is a new therapy recently approved by the FDA for prevention of stroke for patients at high risk for carotid endarterectomy. Creighton Cardiology was the first in Nebraska to utilize the newly approved stent device.

In January 2005, an updated emergency alarm system was put into operation in the CUMC Hospital cardiac nursing units. This system, designed by the CCC Information Technology team, is compatible with the hospital monitoring system installed in July 2003. The stand-alone alarm system allows cardiac technicians to notify the nursing unit of life-threatening arrhythmias using a touch screen monitor. Once the alarm is enabled, the bed number is displayed and a distinct audible tone is activated until it is manually disabled by a nurse.

Research

The Division of Cardiology continues to build upon its superior clinical services by participating in sponsored clinical research and community focused intervention programs under the direction of Syed Mohiuddin, MD, and Aryan Moos, MD. The Cardiac Center initiated thirteen new research studies during the past year, including phase III and IV pharmaceutical and device trials, as well as investigator-initiated research. Those topics include anemia, heart failure, acute coronary syndromes, hypertension, endothelial function, lipid lowering agents, C-reactive protein, acute MI, and intervention and post-intervention studies.
Funded Programs in Minority Cardiovascular Risk

The Cardiac Center recognized a need to provide educational and preventive programs to the local community and responded with multiple initiatives. These programs enhance Creighton’s visibility in the Omaha community and establish the university as a partner willing to share its resources to improve health care in the minority community.

◊ **Creighton Heart Education Center (CHEC)**, in partnership with the National Heart Lung and Blood Institute, created the Enhanced Dissemination and Utilization Center (EDUC) to improve cardiovascular health at the community level, especially in communities at high risk for cardiovascular disease (CVD). CHEC uses a community-oriented approach based on an alliance between CUMC, community centers, and places of worship to implement CVD risk factor education, prevention, intervention, and reduction in the African-American population.

◊ **The Cardiovascular Risk Factor Screening and Intervention in African-American Adults (CARS.) Program** provides cost-efficient, straightforward education and support to a large segment of Omaha’s African-American population. The project focuses on cardiovascular disease prevention through healthy eating, physical activity, and strong culturally-sensitive partnerships with health care providers and agencies. A network of community-based educators guide and support participants through the program.

**Commit To Quit Smoking Cessation Program**

Commit To Quit, the area’s premier smoking cessation program, continues to help participants stop tobacco use by offering eight one-hour small group sessions held over a two-month period. The program is lead by Tim Grollmes, MPA, who was recently certified as a master tobacco treatment specialist through the University Of Massachusetts. Master tobacco treatment providers must have a minimum of 2,000 hours of experience in tobacco treatment and meet stringent certification requirements. Grollmes is currently the only master level tobacco treatment specialist in the region. Other smoking cessation projects include the Peer 2 Peer Tobacco-Free Support Groups, which offer additional support to tobacco-dependent individuals, with a particular focus on the unique needs of women. Commit to Quit also provides assistance and information to various research studies which measure changes in cardiovascular disease risk factors before and after the cessation program.

For more information about cardiac care and research at Creighton University, visit the Cardiac Center’s webpage at: [http://thecardiaccenter.creighton.edu/](http://thecardiaccenter.creighton.edu/)

**Medical Microbiology and Immunology**

The Department of Medical Microbiology and Immunology consists of eleven PhDs and three MDs with primary appointments and six PhDs and four MDs with secondary appointments. The department is multi-institutional, encompassing the Creighton University Medical Center (CUMC), the University of Nebraska Medical Center (UNMC), Children’s Hospital, and the Veterans Administration Medical Center (VAMC).
The research programs of the department are multi-disciplinary, with expertise in a variety of areas broadly related to medical microbiology and immunology. In addition, collaboration with faculty of other departments within Creighton University School of Medicine, the Veterans Administration Hospital, the University of Nebraska at Lincoln, and the University of Nebraska Medical Center provides an opportunity for innovative research opportunities and supports an integrated graduate program. These collaborative efforts include research in the general areas of antimicrobial agents and chemotherapy, molecular biology, genetics, immunology, microbial toxins, virology, bacterial pathogenesis, diagnostic and clinical microbiology, adult infectious diseases, epidemiology, microbial physiology, and nosocomial infections. The range of research interests extends from clinical trials to test the efficacy of antimicrobial agents to the basic aspects of cellular and subcellular microbiology. The diversity of faculty research interests and scientific pursuits, including a listing of publications and research grants in progress, is summarized in the individual faculty bibliographies. Major areas of emphasis within the department include:

**Infectious Disease**

Overall, the Infectious Disease Division provides clinical services in four broad areas: clinical infectious disease consultations, laboratory management, infection control services, and advisory support to public health agencies and organizations. Patient consultations are provided by the adult disease services at several regional hospitals. The adult service is under the direction of Gary Gorby, MD and provides all adult (nineteen years and older) inpatient and outpatient consultations at the Creighton University Medical Center and the Veterans Administration Medical Center-Omaha. Members of the department provide consultation in infectious disease at each of these institutions. *Faculty: Marvin Bittner, MD; Gary Gorby, MD; and Laurel Preheim, MD.*

**Center for Research in Anti-Infectives and Biotechnology (CRAB)**

The Center for Research in Anti-Infectives and Biotechnology (CRAB) is an association of researchers within the Department of Medical Microbiology and Immunology, Creighton University School of Medicine. The research interests of the center are on many aspects of antimicrobial chemotherapy ranging from drug discovery to studying the molecular mechanisms of antibacterial resistance among bacteria, solving problems of detecting antibacterial resistance in the clinical laboratory, and evaluating new drugs and novel drug combinations to effectively treat resistant bacteria. For over eleven years, CRAB faculty have been studying the super-bug strains that are resistant to antibiotics. Members of the center include specialists in clinical microbiology, molecular biology, and pharmacodynamics. In addition to research endeavors, members of CRAB are active in the teaching of many courses within the Schools of Medicine, Dentistry, and Pharmacy and Health Professions. Courses taught include medical microbiology and immunology, and antimicrobial agents and chemotherapy. Center associates also teach a summer “minicourse” in antimicrobial agents and chemotherapy to pharmaceutical and industry professionals.

*Faculty: Nancy Hanson, PhD; Philip Lister, PhD; and Kenneth Thomson, PhD.*

**Flow Cytometry Core Facility**

The Creighton University Flow Cytometry Core Facility is located in and administered by the Department of Medical Microbiology and Immunology. The facility was established in 2001 to serve research investigators of any department at Creighton University and Boys Town National Research
Hospital, as well as researchers outside of the Creighton system such as UNMC and Children’s Hospital. Within Creighton, the facility routinely provides service to investigators in a number of departments, including Medical Microbiology and Immunology, Biomedical Sciences, Allergy and Immunology, Cardiology, and the Cancer Center. The centerpiece of the facility is a state-of-the-art, three-laser, twelve-parameter, high-speed sorting FACSAría flow cytometer from Becton Dickinson. When installed, this instrument was the first FACSAría in the world to have UV capabilities. This instrument is capable of routinely performing ten-color analysis (plus two scatter parameters). The presence of the UV laser allows the instrument to be used with UV compatible dyes for DNA analysis or hematopoietic side population sorting experiments. In addition to its analysis capabilities, the strength of this instrument is its ability to sort to purity any cell populations defined by any combination of its twelve parameters. Up to four populations can be sorted simultaneously. Sort purities of greater than 99.5 percent are common, even at sort rates of over 30,000 cells/second. Sorted cells can be collected in bulk, or any number of cells can be put directly into microtiter plates (any number of wells), PCR plates, or directly onto microscope slides or Petri dishes. The instrument also allows the investigator to control the temperature of both the input sample and the sorted cell populations.

In addition to the FACSAría, the facility houses a Becton Dickinson FACSCalibur dual laser, four-color flow cytometer. This instrument is used for the bulk of the routine cell analysis in the facility. It is equipped with both sorting capabilities and a multiwell autosampler. A separate computer workstation is available in the facility for off-line data analysis using any of several advance data analysis packages.

The facility is also equipped with a Beckman Coulter Z1 particle counter, a Nikon E-400 microscope, and an IEC Centra-GP8R refrigerated centrifuge. The cell enrichment capabilities of the facility have also been enhanced through the purchase of two magnetic separation units (a VarioMACS and a QuadroMACS) from Miltenyi Biotech. Using magnetic particle techniques, these units allow the enrichment/purification of specific cell populations for further analysis or culture. All of these additional items are available for use by any investigator.

*Faculty: Patrick C. Swanson, PhD; Technical Director: Greg A. Perry, PhD.*

For more information about the Department of Medical Microbiology and Immunology, visit the department’s webpage at: [http://mmi.creighton.edu/](http://mmi.creighton.edu/)

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**Pharmacology**

The Department of Pharmacology serves as the primary resource for pharmacological expertise at Creighton University. The faculty conveys knowledge about the interaction of living systems with drugs, toxins, and other substances to all students at Creighton University, including those in the Schools of Medicine, Pharmacy and Health Professions, Dentistry, and Nursing. The department maintains, supports, and actively engages in the development of new pharmacologists through its graduate programs. The faculty, fellows, staff, and students perform original research to extend pharmacological knowledge.
Cell signaling through G-protein coupled receptors and ion channels are major research foci. The alpha- and beta-adrenergic receptors mediating the effects of the sympathetic nervous system, the muscarinic receptors stimulated by the parasympathetic nervous system, and the sensory/pain receptors stimulated by the neuropeptide calcitonin gene-related peptide are among the receptors studied. Potassium-selective channels are among the ion channels whose function is being characterized. The functional significance of these receptors, channels, and regulatory pathways are examined in the cardiovascular system, salivary system, uterus, prostate gland, cornea, and kidneys. Cultured mammalian cells expressing recombinant proteins and knockout or transgenic mice are utilized to expand the range of questions that can be answered. Intra- and interdepartmental collaborations enable research on: a) novel synthesized compounds; b) gene transcription, alternative splicing and protein expression; c) various intracellular, cell membrane, and extracellular pathways and components that mediate and govern both appropriate and inappropriate responses to cell stimuli; and d) the responses of isolated organs or intact animals to pharmacological agents. Successful integration of molecular discoveries into verifiable and predictable changes in cellular function at the organ or whole animal level represents a major stepping stone in translational medicine, the pathway for getting scientific discoveries into clinical practice.

Faculty: Frank. J. Dowd, DDS, PhD; Peter W. Abel, PhD; Charles S. Bockman, PhD; Michael E. Bradley, PhD; William B. Jeffries, PhD; Margaret A. Scofield, PhD; Yaping Tu, PhD; Dennis W. Wolff, PhD; and Wanyun Zeng, MD.

For more information about the Department of Pharmacology, visit the department’s webpage at: http://medicine.creighton.edu/pharmacology/

—— PHARMACY AND HEALTH PROFESSIONS ——

The faculty of the School of Pharmacy and Health Professions (SPAHP) guide the development of excellence in the clinical professions of occupational therapy, pharmacy, and physical therapy. The school also offers courses of study that lead to a certificate in health services administration and grants the degree in emergency medical services. The school consists of four academic departments: Occupational Therapy, Pharmacy Practice, Pharmacy Sciences, and Physical Therapy. These departments work collaboratively and collectively to achieve excellence in these professional program offerings. The scope of research is broad—with active research programs and projects in the biomedical sciences, health services research, clinical research, and educational research areas of emphasis. Interdisciplinary and interprofessional approaches characterize our research models and culture throughout the scope of research. The faculty is composed of both basic scientists and clinician scientists who provide a framework for basic, translational, and applied research opportunities. Faculty engage in national, regional, state-wide, and local research initiatives, with several holding appointments on federal grant review panels and providing consultation and service for agencies within the U.S. Department of Health and Human Services, National Institutes of Health (NIH), Health Resources Services Administration (HRSA), Agency for Healthcare Research and Quality (AHRQ), Indian Health Service (HIS), as well as the National Science Foundation (NSF) and the U.S. Department of Defense (DoD). The school’s Office of Research was established in mid-2004 to provide faculty support and services to assist faculty with quality and productivity in research efforts. This past year, the Research Seminar Series was expanded to include a campus-wide
invitation to faculty, students, and staff. A new Student Summer Research intensive program was launched.

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Research Funding and Cross Campus Collaborations

Both internal and external funding have been received by the faculty in the broad research categories of biomedical sciences, health services research, clinical research, and educational research. In the July 2004 through June 2005 period, twenty-five externally funded research and training grant awards and nineteen internal grant awards were attained by our faculty [see SPAHP Faculty Research Grant Development Program]. The total award amount for this period was $1,056,286, a significant increase over 2003-2004. There were thirty-four projects where SPAHP faculty co-investigated or collaborated with principal investigators external to Creighton University. Twenty-four of these were funded projects. There were six funded projects where SPAHP faculty served as principal investigators and worked collaboratively with co-investigators from other schools.

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SPAHP Faculty Research Grant Development Program

The school continues building research and scholarly capacity by nearing completion of its first year of the internal seed money grant program which is supported by the Health Futures Foundation and entitled the SPHP Faculty Research Grant Development Program. The purpose of this program is to facilitate faculty research efforts for high impact, high value, and potentially externally fundable works. This program is conceptualized as a quality building effort using the peer and administrative review process to enhance faculty competitiveness and productivity in research. The program launched this first year has been an overwhelming success. The grant application was announced to the SPAHP faculty in June of 2004. A workshop for preparation of the grant application was held prior to award submission time. A campus-wide scientific peer review panel was assembled, and reviewers provided critiques. An administrative review completed the selection process. Nineteen of twenty-three applications were funded. The SPAHP Office of Research provided the complimentary education and project management expertise to launch this successful venture. Ongoing project-investigator support is provided by the office. Interim progress reports have been submitted, and final reports will be due in June of 2006. An impact analysis of year 1 will be completed.

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Student Research

◊ **Graduate Student Research.** The school has both undergraduate and graduate students actively engaged and mentored by faculty in research. At present, eight students are enrolled in the Master of Science Program in Pharmaceutical Sciences. A research thesis is required for the partial fulfillment of the requirements of the program. The research areas include pharmaceutics, immunology, pharmacology, anatomy, toxicology, and pharmacokinetics. The specific areas of interest include drug delivery systems, regulation of T helper cells, pharmacology of the eye and TCDD toxicity. To date, nine students have graduated from the
program. Doctor of Philosophy (PhD) candidates, in a joint program with the School of Medicine, participated in faculty-mentored projects during this past year.

◊ **Clinical Doctorate Student Research.** Research project completion is a required activity within the Doctor of Occupational Therapy and Doctor of Physical Therapy programs and encouraged in the Doctor of Pharmacy Program. The faculty provides mentorship and guidance in skills development for all forms of research, with common areas of emphasis being service-learning, reflective practice, and applied outcomes research.

◊ **Student Summer Research Program.** A faculty mentor-student sponsored summer research program was established this year. Students enrolled in the occupational therapy, pharmacy, and physical therapy professional degree programs were provided with the opportunity to competitively apply for a summer research intensive experience. This experience was planned with a faculty member who gave oversight and guidance to the student’s research skills development by engaging the student in components of active, ongoing research projects. In the first year of the program, the SPAHP Office of Research received sixteen applications, with eleven applicants being awarded stipends. No campus housing or meals are included in this program.

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**Creighton University Health Services Research Program (CHRP)**

The school received a second year of capacity building funding from the Health Futures Foundation to further develop the Creighton University Health Services Research Program (CHRP). The intent of the program is to develop a community of ambitious and dedicated faculty with compatible health services research interests and complimentary research skills by providing both structural and cultural support for their efforts. CHRP is as interdisciplinary faculty core with representatives from all departments within SPAHP and other campus schools (i.e., School of Medicine, School of Dentistry, College of Arts and Sciences). CHRP facilitates researchers and scholars to come together for interprofessional collaboration and faculty research development. Several specific areas of study are health care safety, health care quality, the impact and implementation of health information technology, health policy, effectiveness of health care, organizations and health, work force issues, access to care, economics of care, health care disparities, health care literacy, cultural health, health care promotion, disease prevention, and the science of translating research to practice.

Developing community relationships that build capacity to answer questions that test application of research findings to generalized practice is central to CHRP’s mission. Relationships have been established with the State of Nebraska Health and Human Services Medicaid Division and the Eastern Nebraska Office on Aging, the Nebraska State Quality Improvement Organization (QIO), CIMRO of Nebraska, the Nebraska Health and Human Services Office of Rural Health, the Omaha Veterans Affairs Medical Center, and the BUROS Institute of Mental Measurements at the University of Nebraska at Lincoln. Four faculty have completed short-course training in human factors engineering and patient safety at the University of Wisconsin System Engineering for Patient Safety Program.
CHRP was formed to provide the infrastructure and resources necessary to identify external funding sources, to prepare and submit grant applications, and to support project management through staff and technology support to achieve future growth. CHRP supports a research administrator and a database management specialist, in addition to various data and information technology (IT) infrastructure resources. CHRP maintains a centralized repository for research data, a HIPAA compliant research server with daily back-up for data management, analysis and archiving. There is a data entry and analysis center with four workstations and installed software applications for statistical and qualitative data analysis. Analytic software applications within CHRP are SPSS and SAS statistical software, MS SQL server programming, GIS mapping, LISREL, and SPSS text analysis. Dissemination of research findings—to include publications, presentations, and research grants and projects being conducted with CHRP support—is available on the department website [http://chrp.creighton.edu].

A three-year research subcontract for $43,000 was awarded by the State of Nebraska through the Medicaid Division and with the University of Nebraska Medical Center for the project, “Real Choice Quality Assurance: Program Development and Evaluation.” A two-year Health Futures Foundation award for $20,000 was received by CHRP faculty from the School of Medicine and SPAHHP to study changing the patient safety culture and teamwork in the peri-operative area. Additional federal funds totalling $27,000 were awarded for the third year of the Agency for Healthcare Research and Quality grant to study technologies and patient safety. The study was entitled Impact of Hand Held Technologies on Medication Safety in Primary Care—R18HS11808-1, Agency for Healthcare Quality and Research. A no-cost extension beyond this also allowed continuation of the research for the federal initiative in health information technologies and patient safety ($928,000). Two multi-year research projects involving faith-based interventions in African-American persons for chronic disease management and prevention and obesity and depression research are active and supported through internal grant funds. Workforce research with an emphasis on rural needs and organizational culture influence on professional work are other active research areas sponsored through internal grants. A highly successful sustained research effort in the area of pharmacy benefits management and research and the impact of mail-order pharmacy services is ongoing. Other active research projects involving pilot data collection or grant application preparation include the impact of e-prescribing and health information technology on quality and patient safety, patient safety in the hospital and peri-operative area, and bioterrorism and emergency preparedness and response in collaboration with the University of Nebraska Medical Center School of Allied Health Professions. An ongoing collaboration was established between several universities in the Midwest region to work with Medicaid program research questions. The CHPR infrastructure serves to support the data management, HIPAA compliance, and research proposal and submission processes related to this work.

In 2004-2005, Creighton University and CHRP received recognition at several national meetings, among them the Annual American Pharmacists Association, the Nebraska Research Exposition in Omaha, NE, and the Annual Academy Health meeting. The CHRP faculty hosted a summer research student from the Creighton University Health Sciences-Multicultural and Community Affairs (HS-MACA) HRSA-funded program for minority students. The student had her IT and patient safety project accepted for presentation at the 2005 Annual Biomedical Research Conference for Minority Students (ABRCMS) in Atlanta, GA. Several internal and external funding applications have been submitted and are pending. These projects have been submitted to granting agencies such as the Creighton Health Futures Foundation, the Agency for Healthcare Research and Quality, and the U.S. Department of Health and Human Services/Health Resources and Services Administration.
Office of Interprofessional Scholarship, Service and Education (OISSE)

The Office of Interprofessional Scholarship, Service and Education (OISSE) was formed in 2001 as a resource to support, plan, organize, and implement the school’s interprofessional education, service learning, and scholarship initiatives related to community engagement. Outreach activities during 2004-2005 included partnerships with the Omaha and Winnebago Tribes of Nebraska and participation with the Institute for Latin American Concern (ILAC) in the Dominican Republic. The allied health project, entitled Dreamcatchers and the Common Good: Allied Health Leadership in Generational Health and Ethics (HRSA Grant #1 D37HP00824, 1 July 2001-30 June 2005) received a no-cost extension for 2004-2005, to end a three-year funding cycle which garnered $486,000. A second Quentin N. Burdick Interdisciplinary Rural Training Grant was awarded to SPAHP. The grant, entitled Circles of Learning: Community and Clinic as Interdisciplinary Classroom (HRSA Grant #1 D36HP03158, 1 July 2004-30 June 2007), totals $173,333 for the first year of funding and expands interdisciplinary training to include the Schools of Medicine and Nursing. Community partners involved in these projects include the Omaha and Winnebago Tribes of Nebraska, the Four Hills of Life Wellness Center, Valentine Parker Jr. Prevention Center, Omaha Nation Community Response Team, Carl T. Curtis Health Education Center, Macy Senior Center, Walthill Senior Center, Walthill School, Omaha Nation School, and Winnebago Public Health Service Hospital, extending Creighton’s mission of developing capacity in underserved communities. A five-year clinical contract (2005-2010) was awarded to the school by the U.S. Department of Health and Human Services Indian Health Service. This provides $182,084 annually to sustain physical and occupational therapy services at the Indian Health Service facility. Two internally funded awards targeting course development as preparation for professional formation and interdisciplinary community engagement experiences were obtained:

- Midwest Consortium for Service Learning in Higher Education ($4,000)–Preparation for Transcultural Experiences: Purposeful Professional Formation; and
- Cardoner vFellowships Grant ($4,600)–Channeling a Cardoner Tributary: Facilitating the Awareness of Vocation and Professional Formation Across the Health Professions.

Eleven scholarly presentations at national and international venues were delivered related to topics such as rural health, cross-cultural and community-based practice, health care access, social justice implications, and interprofessional student training and service learning. OISSE publications for 2004-2005 include “Effects of Interprofessional, Rural Training on Students' Perceptions on Interprofessional Health Care Services” in the Journal of Allied Health and a chapter entitled “American Indian Culture” in Developing Cultural Competence in Physical Therapy Practice (F. A. Davis, publisher). A twenty-seven chapter book, entitled Educating for Moral Action: A Sourcebook in Health and Rehabilitation Ethics, was also published by F. A. Davis and is based on proceedings from the HRSA grant-funded National Interdisciplinary Ethics Institute for Occupational and Physical Therapy.
Department of Occupational Therapy

The Department of Occupational Therapy consists of two administrative assistants, approximately 100 on-campus and 100 distance students, and thirteen faculty, including twelve faculty with doctoral degrees and one clinical faculty holding a bachelor’s degree. Faculty engage in a variety of teaching, service, and scholarly activities each year. During 2004-2005, faculty were engaged in the following areas of scholarship productivity:

- Scholarship of practice: Increasing occupational therapy services in rural areas, interprofessional geriatric care, error reporting, and patient safety;
- Scholarship of teaching and learning: Outcomes of service learning activities, benefits of videotaping patient care sessions as a tool for student learning during Level II FW experiences; and
- Scholarship of engagement: Health disparities, migrant workers, occupational patterns and disability, interprofessional care of the Native Americans through participation in OISSE grants and contracts, and occupational therapy service delivery to adolescents.

Extramural funding sources for current research projects include HRSA, National Patient Safety Foundation, Consejo Nacional de Discapacidad, Harvard University Center of Developmental Psychology, United Nations High Commission on Refugees, Amnesty International, and Midwest Consortium for Service Learning in Higher Education. Intramural funding was provided through faculty grants from the SPAHP.

Annual professional development plans for each faculty member includes at least one goal targeted at scholarship development and productivity. During 2004-2005, faculty publications included seventeen chapters, nine peer reviewed articles, and three abstracts. Six external and five internal grants were funded. Professional conference presentations by faculty included the following venues: ten international, seventeen national, ten state, and fifteen local. For 2006, the department is focusing on establishing faculty groups with similar research pursuits. Faculty will continue to garner support from institutional infrastructures such as CHRP and OISSE.

Department of Pharmacy Practice

The Department of Pharmacy Practice is primarily responsible for the clinical education of students enrolled in the Doctor of Pharmacy program. The large majority of the forty-three faculty are clinician scientists whose research efforts are integrated within their clinical practice community. Faculty maintain practices at CUMC, hospitals in the Alegent Health system, Children’s Hospital, Methodist Hospital, Omaha and Lincoln Veterans Administration Medical Centers, and Bryan LGH in Lincoln, NE. In addition, we have a joint relationship with Walgreens in Omaha for clinical model development in the community. Our clinical faculty have established collaborative relationships with faculty in the Department of Medicine for a number of general and specialty clinics, the Department of Family Practice, and the Departments of Neurology, Psychiatry, and Anesthesiology. The Drug Informatics Center, located in the Health Sciences Library, is a key service and research partner with
CHRP in the Office on Aging collaboration. The department has established and maintains three residency positions in pharmacy practice who complete their training throughout the CUMC and community partner health systems and organizations. One fellow in the area of cardiology and three residents in the areas of drug informatics and clinical pharmaceutical care complete training within the department. From July 2004 to June 2005, the faculty produced twenty-seven publications; provided sixty-seven national, regional or state presentations; and received three national recognitions.

Research and scholarship emphases are in educational assessment and outcomes research, clinical outcomes research, pharmacogenomics, nanomedicine for blood-brain barrier penetration, infectious diseases, clinical research in chronic disease management of areas such as diabetes, dyslipidemia, pain management, and public health research related to immunizations and disease prevention. Very recent progress in the research area of nanoparticle formation and production has been made that holds promise for the development of a new treatment for Parkinson’s disease. This work is possible through a collaboration between scientists in pharmacy practice and pharmaceutical sciences, faculty in the biomedical sciences at the School of Medicine, and faculty at the University of Nebraska Medical Center. Research is active in the area of drug interaction detection and drug toxicity prevention through pharmacogenomics. This work is being conducted collaboratively with the School of Medicine Cancer Center. Clinical outcomes research in the areas of implementing practice guidelines to improve drug therapy management and smoking cessation programs at the time of hospital discharge are examples of some active research within the clinical scientists in the department.

Department of Pharmacy Sciences

The Department of Pharmacy Sciences has twenty-one faculty who are either PhD, PharmD, or PhD-trained, with backgrounds in pharmaceutics, pharmacology and toxicology, medicinal chemistry, health services research and administration, educational, behavioral and social, and administrative sciences in pharmacy. The department is home to the MS in Pharmaceutical Sciences.

Faculty in the basic sciences have engaged in cross collaborations within Creighton and at other universities. Drug and dosage pre-formulation, characterization of the solid-state properties of drugs and delivery systems, drug delivery system design, pharmaceutical analysis, and nutraceuticals are funded research areas within the department. Controlled deliveries of therapeutic protein and peptides in their conformational stability and biological activity form using smart polymer based delivery system is an active area of work. Another area is transdermal drug delivery using chemical enhancers and physical enhancers like iontophoresis, electrooratation, sonophoresis while preserving skin reversibility, as well as percutaneous absorption of chemicals (toxicants, pollutants) and associated dermatotoxicity and skin irritation.

Research related to diseases and conditions under study include cancers, asthma, glaucoma, infectious disease, addictions such as cigarette smoking, and molecular mechanism of normal embryo and fetal development. Research focuses on the role of TH-1/TH-2 cytokine imbalance to the etiology of asthma and allergic disease. These investigations will further inform about treatment approaches that may be effective in the disease. Faculty are investigating the effect of cigarette smoke
extract (CSE) on the conformational stability and biological activity of a model protein lysozyme, so that we may understand the mechanism of genesis of the diseases caused by smoking. Ocular diseases may have new treatment opportunities through the research of faculty who are studying the role of isoprostanes on neurotransmitters in ocular tissues (NIH funded research area). Research is active in the synthesis and in vitro and in vivo biological evaluation of bicyclic octahydroisoquinolines as b2 selective adrenoceptor agonists and in the synthesis and biological evaluation of bicyclic hexahydroaporphines as a intraocular pressure lowering and neuroprotective agent. Other research focuses on the control and regulation of gene expression during embryonic development. The role of Hox genes in the development of the craniofacial region of the embryo is researched to better understand how various embryonic structures develop, how the coordination of gene activities in both time and space is critical, and how disruption of these events can lead to birth defects. These and other accomplishments have been achieved through collaboration and work with the Nebraska EPSCoR (Experimental Program to Stimulate Competitive Research) Program, the University of Nebraska, and various departments (Chemistry, Biomedical Sciences, and others) within Creighton University.

Faculty with emphases in the behavioral, social, and administrative sciences conduct much of their work through the support and collaborative infrastructure of the Creighton Health Services Research Program (CHRP). Active funded research is occurring with a core group of faculty in the study of pharmacy benefits management policies and practices, pharmacy practice models—such as mail order services and therapeutic drug monitoring services—and drug therapy adherence and compliance. Other funded research is focused on organizational theory, workforce and culture issues, and teamwork skills related to patient safety. Some of the faculty have focused on a longitudinal effort in educational research related to pharmacy and professionalism development. Work is also being conducted in the area of educational technologies and student learning.

Department of Physical Therapy

The Department of Physical Therapy is composed of nineteen faculty, one resident, 180 students (128 entry level program; fifty-two transitional program) and two staff. Thirteen faculty are “core” as defined by the American Physical Therapy Association program accreditation standards. Eight core faculty have teaching-research classification appointments. One of the core faculty is an associate dean in the school. Five core faculty have clinician-educator classification appointments. Of the six faculty not designated as core, two associated faculty have clinician-educator classification appointments and three faculty have contributed service appointments, primarily in selected teaching or clinical areas. One of these appointments supports faculty scholarship at Madonna Rehabilitation Hospital in Lincoln, NE. One faculty member has a Visiting appointment.

The core faculty have identified four areas of emphasis for scholarship: a) community engagement, b) health services research, c) teaching/learning, and d) rehabilitation sciences, with an emphasis on the Creighton Biodynamics Laboratory. The department strategic plan states that all core and associated faculty not supported by extramural funding will participate in one of the scholarship emphasis areas. The community engagement area is supported by the Office of Interprofessional Scholarship, Service and Education. Work in this area is centered on activities supported by HRSA training grants in Native American health and student immersion in domestic and international underserved
environments. The health services research area is supported by the Creighton Health Services Research Program and focuses on patient safety, building a health services research infrastructure, and professional discipline/malpractice. The teaching/learning research area is supported by the Office of Faculty Development and Assessment and is focused on the scholarship of teaching. Rehabilitation science in the Biodynamics Laboratory is a department initiative with a focus on investigating the effects of therapeutic interventions on movement dysfunction with a primary focus on the adult population. Active areas of study include the biomechanical impairments, functional limitations, and therapeutic strategies associated with neurologic disorders (such as those secondary to Parkinson’s disease, diabetes, and peripheral vascular disease) and the use of pressure sensors for robotic/prosthetic control. Rehabilitation research is being conducted in collaboration with the CUMC Department of Neurology, the Omaha Veterans Administration Medical Center, and Rutgers University.

During the 2004-2005 academic year, department faculty produced forty presentations, two papers published, one book published, one book chapter published; participated in nine grants; generated $475,000 funding (estimate); and received twelve awards and/or appointments (eight national, three regional, and one local). Two faculty served on federal scientific or grant review panels. One faculty member has a productive, extramurally funded collaboration with scientists in the School of Medicine in basic science, non-rehabilitation related research.

In 2006, the department is focusing faculty recruitment on individuals who have rehabilitation research interests that will be supported by the department and the Biodynamics Laboratory. Faculty are working toward a formal relationship in rehabilitation research with the Veterans Administration, including a partnership with the Biodynamics Laboratory. Each faculty member is asked to establish a scholarly agenda that will define a plan for maintaining and increasing the breadth and depth of their own and the department’s scholarship consistent with the department and school strategic plans.

For more information about the programs and research endeavors at the School of Pharmacy and Health Professions, please visit the school’s webpage at: http://spahp.creighton.edu/
Publications

— Arts and Sciences —


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Limpach, A. [Principal Investigator]. Presentation of genes involved in cartilage differentiation and maturation identified by microarray technology. National Science Foundation; EPSCoR — $1,800 — (1 June 2005-31 December 2005).


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Bruchas, M. R. Characterization of α1-adrenergic receptors in rat submandibular gland acinar cells. Doctor of Philosophy (Pharmacology) — Dr. Peter Abel (Major Advisor).

Hill, B. P. An investigation into ionizations through L-shell x-ray transition ratios. Master of Science (Physics) — Dr. Sam J. Cipolla (Major Advisor).

December 2004

Edwan, J. H. Immunomodulation of allergic airway inflammation by FLT-1L. Doctor of Philosophy (Medical Microbiology) — Dr. Devendra Agrawal (Major Advisor).

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Wolter, D. J. Molecular mechanisms of antibacterial resistance among pseudomonas aeruginaos: Multi-drug efflux pumps and their interactions with other resistance mechanisms. Doctor of Philosophy (Medical Microbiology) — Dr. Philip D. Lister (Major Advisor).

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Berro, A. B. CD30: A novel receptor to induce apoptosis in human blood eosinophils. Doctor of Philosophy (Medical Microbiology) — Dr. Devendra Agrawal (Major Advisor).

Kertsburg, A. Design and application of novel-ligand-dependent RNA catalysts toward regulating gene expression. Doctor of Philosophy (Biomedical Sciences) — Dr. Garrett Soukup (Major Advisor).

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