**PhD First Year, Fall (11 core credit hours)**

**PHPS-750* PhD Overview of the Pharmaceutical Sciences (3 core credit hours)**

This 3 credit, 45 lecture and written research assignment, course will draw on the basic principles of chemistry, biology and physics to provide an introduction to the basics of the Pharmaceutical Sciences. Some of, but not all, the areas covered include; an overview of the subject as a whole, basic organic functional group chemistry, an introduction to Pharmacognosy, an introduction to Medicinal Chemistry, Combinatorial Chemistry and high throughput technologies in modern drug discovery, architecture of drugs, metabolic changes that occur to drugs, introduction to general Pharmacology, transport of drugs across the biological membranes, introduction to Pharmacodynamics and Pharmacogenomics, general mechanisms of drug action, and variations in drug action.

**PHPS-751* PhD Biochemistry I– Biomolecules (4 core credit hours)**

This course is designed to provide a basic foundation for the understanding of medicinal biochemistry, pharmacology, and the structure and function of various biomolecules. Topics will include physical and chemical properties of amino acids, structural and physical properties of proteins, nucleic acids (DNA and RNA), lipids, and their relationship to their biological function, fundamentals of signal transduction, DNA replication, mutation, and repair, nucleotide biosynthesis, protein synthesis, and transcription. These principles will provide the basic concepts for understanding the biochemical basis for disease states and drug action.

**PHPS-755* Advanced Pharmaceutics I, including Dosage form Design and Processing (3 core credit hours)**

This course will draw on the basic principles of chemistry, biology and physics to provide an understanding of how drug physico-chemical properties at the molecular and macroscopic assembly level are manifest in dosage form properties and performance. Students will integrate these principles to understand issues in the rational selection of dosage forms and drug delivery systems as well as their role in drug product development. Discussions of Good Manufacturing Practices and Good Compounding Practices will carry over into the lab portion of the class. Students will become comfortable with equipment; procedures and records used in the compounding of various dosage forms, and will practice clinical dispensing skills vital to shaping a truly professional pharmacist.

**PHPS 797 Research Laboratory Rotation (1 core credit hour)**

Each PhD candidate will visit with at least six (6) of the Graduate level professors to discuss research possibilities and what they would recommend as a course of study for the candidate to gain the experience and knowledge necessary to be granted the PhD degree in the Pharmaceutical Sciences.

**PhD First Year, Spring (8 core credit hours and 2 elective credit hours)**

**PHPS-N/A Start Research with Primary Advisor (1 core credit hour)**

Once the PhD candidate has selected a Primary Advisor with whom to undertake their remaining PhD studies they will start research in this professor’s laboratory during the Spring Semester.

**PHPS-752* Biochemistry II– Metabolism (4 core credit hours)**

Biochemistry II- Metabolism will delve into metabolism and the interrelationships/integration of metabolic processes. The biochemistry of metabolism focuses on glycolysis, the tricarboxylic acid cycle, gluconeogenesis, and the synthesis and breakdown of biomolecules (carbohydrates, lipids, and amino acids). Metabolic control and regulation of pathways will be emphasized. This includes a discussion of
mechanisms and control of signal transduction pathways, and recurring motifs in metabolism. Clinical correlates and metabolic diseases will be examined, with a substantial emphasis on metabolic syndrome. A sampling of biochemical techniques will also be described.

**PHPS-756* Advanced Pharmaceutics II, including Dosage form Design and Processing (3 core credit hours)**

This course will draw on the basic principles and developmental aspects of drug formulation to deliver the active pharmaceutical ingredient through biological membranes to exert the therapeutic effect at site of action. Understanding of physicochemical properties of active pharmaceutical ingredient and additives or excipients, pharmacological properties and processability of drug delivery systems can be utilized for optimal performance of the drug delivery systems. Understanding of active pharmaceutical ingredient and additive or excipients physico-chemical properties at the molecular and macroscopic assembly level are manifest in dosage form properties and performance.

Students will integrate these principles to understand issues in the rational choice of dosage forms and drug delivery systems as well as their role in drug product development. Discussions of Good Manufacturing Practices and Good Compounding Practices will carry over into the lab portion of the class. Students will become familiar with development aspects of various drug delivery systems, comfortable with equipment, procedures and records used in the compounding of various dosage forms, and will practice clinical dispensing skills vital to shaping a truly professional pharmacy professional scientist.

**PhD First Year Spring to end of Third Year Spring**

**Electives (Listed Alphabetically)**

**PHPS-701 Apoptosis and Angiogenesis in Disease Processes and Drug Development (1 credit hour)**

The course will cover mechanisms of apoptosis, or programmed cell death, and angiogenesis, or new vessel growth, and mechanisms of their regulation in different cell types. Students will learn how unbalanced angiogenic and apoptotic responses contribute to a wide variety of disease conditions, including cancer, neurodegenerative, cardiac, inflammatory and autoimmune diseases. The course will discuss experimental techniques that are used in the studies of these processes. Part of the course is devoted to approaches to development of drugs that will modulate apoptotic and angiogenic processes, and discussions of critical signaling molecules in these pathways as potential targets for drug development efforts.

**PHPS-702 Biological Evaluation of Natural Products (3 credit hours)**

The biological activity of secondary metabolites is central to the process of drug discovery and development from nature. Natural products may be explored as potential sources of food supplements, pharmaceuticals and agrochemicals. The majority of academic-based research efforts are essentially "biologically driven", hinging upon the bioassay-guided separation of crude natural product extracts that have been identified as active through a strategic screening and prioritization process that emphasize potency, specificity and selectivity. The chemically-driven approach that seeks biological activities for purified compounds plays a lesser, but nevertheless, significant role. This course will introduce students to the technologies and procedures useful for the discovery and characterization of potential natural product drugs, and principles of more advanced drug development at the preclinical stage. Lectures will discuss the use of specific assays with target receptors and enzymes involved in the pathogenesis of select diseases, in addition to procedures involving tissues, whole cells and organisms ("functional assays"). Lectures will also include the applications of genetically engineered microorganisms in drug
discovery, as well as animal models where applicable. The genomics era will present opportunities for the exploration of novel assays as new molecular targets for chemotherapy are identified.

**PHPS-703 Cancer Biology (2 credit hours)**

An introduction to cancer biology covering the processes involved in tumorigenesis (oncogenes, mutagenesis, proliferation, apoptosis, angiogenesis, invasion and metastasis). There will be discussion of active areas of interest such as cancer stem cells and the role of inflammation in cancer. Lectures will include descriptions of current therapeutics, describe efforts to design new drugs and recent clinical trials.

**PHPS-704 Combinatorial Chemistry and High Throughput Technologies in Drug Discovery (2 credit hours)**

This course is designed to teach students the essential elements of combinatorial chemistry and evolving high throughput technologies in drug discovery. Combinatorial chemistry and high throughput chemistries are dynamic, rapidly evolving fields that have an important role in drug discovery. Most pharmaceutical companies have now incorporated combinatorial and high throughput platforms into their drug discovery research program. Combinatorial chemistry is a relatively new approach to the synthesis of compound libraries in a highly efficient and automated fashion. The topics of this course will include, but not limited to, combinatorial chemistry and parallel synthesis; solid-phase organic synthesis; solution-phase synthesis with solid supported reagents and scavenger resin technology; diversity-oriented synthesis; dynamic combinatorial chemistry; high throughput screening of combinatorial libraries; microwave-assisted organic synthesis; fluororous technology, fragment-based drug discovery; and automation and instrumentation.

**PHPS-705 Designing Clinical Research (3 credit hours)**

This course introduces the science and methodological principles of doing clinical research. Besides conventional medicine, emphasis is placed upon clinical trials of complementary and alternative medicine therapies. Topics include research question/problem/objective, research hypothesis, research processes, types of clinical research design, measurements, sampling designs, recruitment, sample size determinations, chance and bias, threats to the internal and external validity, monitoring safety and efficacy data, statistical tests and data management, ethical issues, translational research and funding agency. Students will be given the opportunity to identify a researchable idea/question and design his/her own clinical or translational research project by preparing a written mini-proposal and presenting the proposal.

**PHPS-706 Environmental Toxicology (2 credit hours)**

This course is designed to introduce students to the field of environmental toxicology. The emphasis will focus more on ecotoxicology, rather than classical toxicology. Topics that will be covered include toxic and radioactive metal, toxicity of solvents and pesticides, halogenated aromatic compounds, environmental endocrine disruptors, and pharmaceuticals and personal care products in the environment. The environmental impact of global warming will also be addressed. Course format will include student lead discussions and presentations, lectures, and general discussion.

**PHPS-707 Genetics in Medicine (2 credit hours) & Lab (1 credit hour)**

This course will provide an exposition of the fundamental principles of human and medical genetics with emphasis on the genes and molecular mechanisms operating in human diseases. The contributions made by genetic variation to disease susceptibility and treatment outcomes will be discussed. Clinical cases will be used to demonstrate and reinforce the general principles of disease inheritance, pathogenesis, diagnosis, management, and genetic counseling. Students will learn how understanding genetics can lead to new strategies in drug development and treatment. A combined laboratory and
seminar experience will provide students with hands-on experience and keep students abreast of recent developments in the field by presenting current literature.

**PHPS-708 Isolation methods for natural product discovery (2 credit hours)**

This course will examine the theory and practice of the various types of chromatographic and non-chromatographic methods that are commonly used for the isolation of biologically active natural products from plants, microorganisms and marine organisms on scales ranging from microgram to kilograms of pure compound. Starting with simple extraction methods, the course will progress through liquid-liquid interactions to liquid-solid interactions and then to gas-solid interactions. Completion of this course will provide the student an understanding of the application of each of the techniques discussed, as well as their relative advantages and disadvantages.

**PHPS-709 Instrumental methods and structure elucidation of mainly natural products (2 credit hours)**

This course will introduce all of the pieces of spectroscopic equipment relevant to solving the three dimensional structure of organic molecules. Hands on use of the equipment to obtain spectroscopic data will be an emphasis of this course. The other emphasis of this course will be how to interpret this information to enable a viable chemical structure to be proposed. During each session it is anticipated that prepared examples and examples arising from current research will be used enhance participants’ knowledge.

**PHPS-710 Laboratory Animal Care, Management and Medicine I (2 credit hours)**

This course is part one of a two part lecture series and is designed to introduce students to the care and use of laboratory animals in accordance with the National Research Council and the Institutional Animal Care and Use Committee (IACUC). Included in this course are alternatives to traditional use of live animal species and the laws, regulations and guidelines important to laboratory animal research. Emphasis will be placed on the use of rats and mice, rodent anesthesia and analgesia and rodent surgery.

**PHPS-711 Laboratory Animal Care, Management and Medicine II (2 credit hours)**

This course is part two of a two part lecture series and is designed to introduce students to the care and use of laboratory animals in accordance with the National Research Council and the Institutional Animal Care and Use Committee (IACUC). Included in this course is a review of Laboratory Animal Care, Management and Medicine I. Emphasis will be placed on rabbits, Mongolian gerbils, guinea pigs, Syrian hamsters, dogs and cats, and primates.

**PHPS-712 Medical Cell Biology (2 credit hours)**

This course focuses on the scientific aspects of cell biology important to graduate students with primary focus on eukaryotic cell biology. The course will provide a basis to general cell biology principles in the context of organ systems and human and animal disease. Clinical cases will be used to build a framework for the basic concepts of medical cell biology and help reinforce conceptual understanding.

**PHPS-713* Medicinal Chemistry I (2 credit hours)**

Organic Medicinal Chemistry I provides the chemical and structural basis for the interdisciplinary field of therapeutics related to diuretics, autonomic nervous system and cardiovascular system. The topics will include the drug discovery and development process of these important medicines, the chemical and structural basis for the pharmacological and therapeutic action of drugs, structural classifications, molecular mechanism of actions, structure activity relationship, and how the physicochemical properties
of drug molecules affect their route of administration, stability, and absorption, distribution, metabolism and excretion. Synthesis of important drug molecules from each drug class will also be presented.

**PHPS-714* Medicinal Chemistry II (2 credit hours)**

Organic Medicinal Chemistry II provides the chemical and structural basis for the interdisciplinary field of therapeutics related to diabetes, thyroid/pituitary disorders, hormones/osteoporosis/adrenal, asthma/COPD, and infectious diseases. The topics will include the drug discovery and development process of these important medicines, the chemical and structural basis for the pharmacological and therapeutic action of drugs, structural classifications, molecular mechanism of actions, structure activity relationship, and how the physicochemical properties of drug molecules affect their route of administration, stability, and absorption, distribution, metabolism and excretion. Synthesis of important drug molecules from each drug class will also be presented.

**PHPS-715* Medicinal Chemistry III (2 credit hours)**

Organic Medicinal Chemistry III provides the chemical and structural basis for the interdisciplinary field of therapeutics related to antiviral agents, OA/RA/Gout, migraine, CNS agents including Parkinson/Alzheimer/Seizure. The topics will include the drug discovery and development process of these important medicines, the chemical and structural basis for the pharmacological and therapeutic action of drugs, structural classifications, molecular mechanism of actions, structure activity relationship, and how the physicochemical properties of drug molecules affect their route of administration, stability, and absorption, distribution, metabolism and excretion. Synthesis of important drug molecules from each drug class will also be presented.

**PHPS-716* Medicinal Chemistry IV (2 credit hours)**

Organic Medicinal Chemistry I provides the chemical and structural basis for the interdisciplinary field of therapeutics related to gastro-intestinal/genito-urinary, chemotherapy, pain management, radiopharmaceuticals. The topics will include the drug discovery and development process of these important medicines, the chemical and structural basis for the pharmacological and therapeutic action of drugs, structural classifications, molecular mechanism of actions, structure activity relationship, and how the physicochemical properties of drug molecules affect their route of administration, stability, and absorption, distribution, metabolism and excretion. Synthesis of important drug molecules from each drug class will also be presented.

**PHPS-717 Medicinal Chemistry of CNS Drugs and Development of in vivo CNS Tracers (2 credit hours)**

The course will focus on modern aspects of the design and development of compounds for the treatment of central nervous system disorders, and in addition on the development of PET (positron emission tomography) and SPECT (single photon emission computed tomography) tracers to monitor functional processes in vivo in the human body. Important properties and steps for profiling a drug to enhance the access to the brain will be discussed. The course will start with an overview about CNS targets and pharmacophore models for diverse compound families and will provide synthetic aspects of important drug templates. The production of relevant radionuclides, precursor and radiochemical synthesis, quality control and radiopharmacological aspects (in vitro, ex vivo, in vivo experiments) will be discussed.

**PHPS-718 Unused Alpha**

Unused course
**PHPS-719 Molecular Biology Techniques and Applications for Healthcare Professionals (2 credit hours)**

This course will provide students with basic and advanced information regarding DNA, RNA, and proteins, and describe current available techniques used in detecting genetic variation. Potential applications of these techniques to disease screening, drug resistance, and drug discovery and development will be reviewed. Isolation and purification of DNA samples from different cell types and tissues, DNA concentration techniques, restriction digestion and analysis, ligation of DNA to create recombinant molecules and designer genes will be discussed. Students will be provided with access to reference texts and selected online peer-reviewed articles in .pdf format by the Instructor. The Instructor will conduct lectures for sessions 1 and 15 and provide background material. Each student will select a topic from the remaining sessions (2-14) and will lead the discussion for that selected topic on the assigned day. Students may work in pairs (or more if necessary), depending on student enrollment. Students will learn to retrieve information from a variety of sources, comprehend and critically evaluate it, and subsequently lead a discussion on the selected topic. There will be no laboratory component.

**PHPS-720 Natural Products and Cancer Chemoprevention (2 credit hours)**

The course will concentrate on the molecular aspects of chemoprevention as a viable strategy in the fight against cancer. The treatment of many diseases is dependent on natural products. Over half of the currently approved anti-cancer and anti-infective drugs are of natural origin. Active leads from different structural classes such as alkaloids, flavonoids, coumarins, and phenazines will be described. Since carcinogenesis is a multistage process, different approaches to monitor inhibition of cancer initiation, promotion and progression will be characterized. The course will provide the student with an understanding of detailed aspects of research processes leading to the discovery of promising natural as well as synthetic and semi-synthetic chemopreventive compounds. Special attention will be given to ensure students are aware that the science of chemoprevention research is well established and offers great research opportunities.

**PHPS-721 Neuropsychopharmacology (2 credit hours)**

This course is designed as an intense, doctoral level class that amalgamates the disciplines of neuroscience, animal behavior, neurochemistry, and pharmacology. The course will cover the major topics of neuropsychopharmacology such as cellular and molecular foundations of neuropsychopharmacology, behavioral pharmacology, receptor biology, major neurotransmitter systems and antidepressants, anxiolytics, antipsychotics, drugs of abuse, and cognitive and movement disorders. Further, this course will integrate some of the principle topics in behavioral neuroscience, including aggression, fear, stress, memory, internal state, and evolution of sex and mating systems, communication, feeding behavior, anti-predator behavior, and the evolution of behavior. Course format will consist of lectures and exams, student presentations, and require a capstone research review paper.

**PHPS-722 Pharmaceutical Marketing (2 credit hours)**

This course has two major areas of emphasis in pharmaceutical marketing. The first part of the course will introduce the basic theory of pharmaceutical marketing and creative thinking behind product development. Students will learn the basic principles of consumer behavior and evaluation, environmental framework, social, and various other marketing theories to provide an understanding of how these concepts can influence product development in laboratories or drug industries. This section will also integrate these principles and concepts to understand issues related to the distribution and design of an innovative drug product development. The second part of the course is intended to use the principles and concepts learned in the first part to effectively develop a market plan for an innovative product.
**PHPS-723 Pharmacognosy (2 credit hours)**

Pharmacognosy is a highly interdisciplinary field which is one of five major areas of pharmaceutical education. Its scope includes the study of the physical, chemical, biochemical and biological properties of drugs, drug substances, or potential drugs or drug substances of natural origin as well as the search for new drugs from natural sources. This course will focus on chemical aspects of Pharmacognosy. Natural products are normally classified according to their biosynthetic origins and chemical properties. Thus, the objective of the course is to familiarize students with an introduction to and classification of natural products (terpenoids, alkaloids, phenylpropanoids and allied phenolic compounds). The basic metabolic pathways and the origin of secondary metabolites such as the shikimic acid pathways, the acetate-malonate pathway, the mevalonate pathways will be discussed. It is a core course of Pharmacognosy and enable students to use this knowledge in the future to explore Advanced Pharmacognosy. A special emphasis will be placed on how chemical structure affects physiological function of various natural products.

**PHPS-724* Pharmacology I (3 credit hours)**

In this 3 credit, 45 hour lecture, course students will learn pharmacology of specific drug groups. The course uses organ system approach. This course will begin with a discussion of diuretics followed by autonomic nervous system pharmacology and conclude with a discussion of drug groups used for the treatment of cardiovascular disorders. In the autonomic pharmacology unit, students will learn about adrenergic and cholinergic drugs that possess agonist and/or antagonist activities at different types and subtypes of receptors that are present in autonomic nervous system and other tissues in the body. Cardiovascular pharmacology will include drug groups that are used in the management of hypertension, hyperlipidemia, heart failure, disorders of coagulation, cardiac arrhythmias, and ischemic heart disease.

**PHPS-725* Pharmacology II (3 credit hours)**

In this 3 credit, 45 hour lecture, course students will learn pharmacology of specific drug groups. The course uses organ system approach. This course will begin with a discussion of endocrine disorders pharmacology followed by pharmacology of asthma and chronic obstructive pulmonary disease (COPD), and conclude with a discussion of drug groups used for the treatment of infectious diseases. In the endocrine pharmacology unit, students will learn about drug groups that are used in the treatment of diabetes, thyroid and pituitary disorders, osteoporosis, as well as corticosteroid drugs. Respiratory pharmacology unit will include pathophysiology and pharmacology of drug groups that are use in the treatment of asthma and COPD. Infectious disease pharmacology unit will include discussions of antibacterial, antifungal, antiviral, antiprotozoal and antihelmintic drugs.

**PHPS-726* Pharmacology III (3 credit hours)**

This graduate-level course introduces the student to the basis of disease and pharmacology of drugs used to treat viral infections, osteoarthritis, rheumatoid arthritis, gout, and CNS disorders. Course material covers principles of drug action including drug-receptor interactions and mechanism of action, adverse effects, absorption, distribution, metabolism, elimination and pharmacogenomics. The focus of CNS lectures include therapeutics used to treat migraine, schizophrenia, depression, bipolar disorder, attention deficit hyperactivity disorder, sleep disorders, anesthesia, and neurodegenerative diseases. Students will be assigned a scientific article to read in advance of “Special Topics” lectures. For five of these assignments, the student will also be required to write a one-page summary of the article and its main findings.

**PHPS-727* Pharmacology IV (3 credit hours)**

This graduate-level course introduces the student to the basis of disease and pharmacology of drugs used to treat gastrointestinal and genitourinary disorders, fertility and contraception, as well as cancer and pain management. Course material covers principles of drug action including drug-receptor
interactions and mechanism of action, adverse effects, absorption, distribution, metabolism, elimination and pharmacogenomics. Students will be assigned a scientific article to read in advance of “Special Topics” lectures. For five of these assignments, the student will also be required to write a one-page summary of the article and its main findings.

**PHPS-728 Phytochemistry of Terrestrial Plants (2 credit hours)**

This course will survey the chemical structures, spectroscopic properties, biosynthesis/biogenesis and biological activities of a wide range of major and minor chemical classes occurring in terrestrial plants. These compound classes will include alkaloids, terpenoids, steroids, coumarins, Flavonoids, tannins and other polyphenols, pyrones, quinones, phenylpropanoids, lignans, depsides, depsidones, fats, waxes and lipids among others. Completion of this course will provide the student with a basic familiarity with the kinds of chemical structures found in plants enabling her/him to embark on a career in phytochemical research.

**PHPS-729 Receptor Theory and Signal Transduction (2 credit hours)**

This course will provide the student with information concerning the history and use of receptor theory to explain drug action, and to introduce how drug effects are mediated through relevant signal transduction cascades. Topics will include: models for receptor-drug interactions; methods for receptor identification; structure-function analysis of GTP-binding proteins and ligand-operated ion channels; receptor tyrosine kinases; nuclear receptors; and receptor-induced signal transduction cascades. Lab aspect of the course is designed to complement lecture topics.

**PHPS-730 Sample collection, documentation and preservation (1 credit hour)**

Participants in this course will learn strategies for sample collection from both the terrestrial and marine environments and for both macro- and micro-organisms. The course will cover permit application, sample collection, and the various ways in which different sample types are persevered for long term storage and how taxonomic voucher specimens are prepared.

**PHPS-731 Toxicants and Toxicity (3 credit hours)**

This course will provide a general foundation in the understanding of basic toxicological principles. The mechanisms of toxicity and contemporary treatment plans for the most common chemical, environmental and pharmaceutical agents will be presented. Additionally, this course will provide an in-depth review of the neuropharmacology of substances of abuse including stimulants, depressants, hallucinogens and anabolic steroids. Other types of addiction will be discussed. Special emphasis will be given to basic pharmacokinetic and pharmacodynamic mechanisms as they relate to the effects of the individual substances of abuse. Current theories of addiction and tolerance development will be discussed.

**PHPS-732 Toxic plant natural products and their therapeutic potential (2 credit hours)**

This course will draw on the basic principles of organic chemistry and biology to provide an understanding of the biosynthesis of toxic natural products in plants, their bioassay-directed fractionation and isolation, structural identification, and mode of action in mammalian systems. Toxins discussed will be those responsible for heptotoxicity, teratogenicity, cardiotoxicity, lysosomal storage diseases, and reproductive defects. Students will integrate these principles to understand the importance of dose in discriminating between toxicity and therapeutic action, as well as the role of natural products as lead compounds in drug development. The major classes of toxic compounds occurring in plants will be discussed, with particular reference to those occurring in Hawaii. Discussions of proper experimental design, plant sampling and identification, and structural classification will carry over into the laboratory portion of the class. Students will become familiar with procedures for plant collection, extraction and isolation of pure compounds, and structural identification.
(PHPS-800) **Dissertation** (1 – 15 credit hours per semester, minimum 56 credit hours required for graduation)

### PhD Dissertation Topics

<table>
<thead>
<tr>
<th>Supervisor</th>
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| Andre S. Bachmann           | -Cancer Cell Biology of Polyamines  
- Proteasome Inhibitor Drug Development  
- Regulation of PRAF Proteins in Homeostasis and Disease                                                                                                   |
| Robert P. Borris            | -Terrestrial Phytochemistry: Production of metabolites by plant cell and tissue culture  
- Microbial chemistry                                                                                                                                            |
| Leng Chee Chang             | - Evaluation of Natural products as Inhibitors of Raf Targeting Oncogenic Kinases  
- Medicinal plants of Hawaiian as potential sources of Cancer Chemopreventive agents  
- Isolation and Structural Characterization of Potential Smoking Cessation agents from *Vernonia cinerea* Less                                                                 |
| Mahavir Chougule            | - Development and evaluation of targeted nanoparticles for treatment of breast cancer  
- Evaluation of multifunctional nano-carriers for treatment of lung cancer  
- Inhalable nano-spheres for treatment of asthma                                                                                                                |
| Linda Connelly              | - The role of inflammation in tumor progression                                                                                                                                                                     |
| Daniela Guendisch          | - Design, synthesis and in vitro evaluation of novel nAChR ligands with specific subtype pattern for antidepressant activity  
- Using the hybrid concept for the development and synthesis of novel nAChR/NR2B ligands  
- nAChRs as new targets for anti-cancer agents: Design and Synthesis                                                                                      |
| Aaron Jacobs                | - Molecular and phenotypic characterization of novel heat-shock induced gene products  
- Mechanisms of signal transduction cross-talk between heat shock and hypoxia-induced cellular responses                                                                                                     |
| Susan I. Jarvi              | - The role of host genetics in resistance to malaria (*Plasmodium relictum*)  
- Parasite-parasite interactions and influences on virulence                                                                                                    |
| Eugene Konorev             | - The Role of Thrombospondin-1 in the Antiangiogenic Effect of Anthracycline Antibiotic Drugs                                                                                                                         |
| Kenneth Morris              | - Estimation of the strength tensors for small molecular organic crystals  
- Design of solid solutions for the control of crystal properties                                                                                               |
| Anthony Otsuka              | - Role of CLASP2 in *C. elegans* cell biology and neurodevelopment  
- Analysis of the protein phosphatase 2A (PP2A) B’ subunits in *C. elegans*  
- Regulation of the interaction between ankyrin, CLASP2, and PP2A  
- Genetic analysis of lipid-accumulating mutants in *C. elegans*                                                                                             |
| John M. Pezzuto             | - Anti-cancer potential of synthetic indenoisoquinolines in breast cancer cells  
- Anti-inflammatory and chemopreventive potential of synthetic stilbenoids  
- Aromatase induction and cancer chemoprevention by analogs of casimiroin  
- 4-Bromoflavone and the potential benefits of bifunctional inducers of phase II enzymes  
- Marine phenazines as possible chemopreventive compounds  
- Mechanistic studies of NFκB inhibition by resveratrol derivatives  
- Molecular mechanism phenazine inhibition of breast cancer cell lines invasiveness                                                                 |
<p>| Dianqing Sun                | - Design and synthesis of potential anti-tuberculosis agents based on high-throughput screening hits or virtual screening hits                                                                                 |</p>
<table>
<thead>
<tr>
<th>Author</th>
<th>Research Focus</th>
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| Ghee Tan                                   | - Pharmacological evaluation of raphidecurperoxin, an emerging natural product lead against malaria  
|                                             | - Fungi of Hawaii as potential sources of antimalarial agents                   |
| Gary R Ten Eyck                            | - Neuroendocrine and neurochemical studies in aggression and stress.            
|                                             | - Investigations in behavioral neuroscience, particularly parental care and territoriality.  
|                                             | - Pharmacological and/or environmental studies on E. coqui and its effect on the Island of Hawaii. |
| Supakit Wongwiwatthanakit                   | - Clinical research of drugs, complementary and alternative medicine in the areas of tobacco cessation, hyperlipidemia, obesity, diabetes, cancer therapy  
|                                             | - Investigation of the availability and use of medicines, complementary and alternative medicines by consumers in communities.  
|                                             | - Development and validation of an instrument to assess humanistic outcomes and evaluation of the patient-oriented pharmacy services/interventions and/or interdisciplinary teams, and pharmaceutical care. |
| Anthony D. Wright                          | - Endophytic Fungi and Bacteria: Secondary metabolites their structure and biological activities  
|                                             | - Marine Organism ~Macro and Micro~: Secondary metabolites their structure and their biological and ecological activities  
|                                             | - Microbes from Marine Sediments: Secondary metabolites their structure and biological activities  
|                                             | - Analysis, quantification and validation of natural materials currently used or that may be used in the health care industry. |

- Design and synthesis of natural product based libraries toward anti-malarial and anti-cancer screening

- PhD Candidates must complete a minimum of 24 didactic credits hours, including the 19 Core credits and 56 research credit hours to be granted the PhD degree.

- **Seminars:** Each graduate student is required to give three seminars. The first two seminars will be given prior to the oral candidacy exam. An exit seminar, based on the student's completed dissertation research, will also be given. Attendance at the seminars given by students, post docs, and outside speakers is mandatory. Graduate seminars typically will occur fortnightly throughout the Fall and Spring Semesters.

- Core course and must be taken by all PhD Candidates.

- The Primary Advisor is the Professor the PhD Candidate selects to undertake the Dissertation/Research part of their PhD program with.

- There are 32 electives PhD Candidates can select from. The elective selections are to be made in consultation with the candidate’s Primary Advisor.