Name of Cluster: Genomics and Bioinformatics from Biomedicine to Biodiversity.
Cluster Leader: Christopher L. Parkinson, Professor, Dept. of Biology, College of Sciences

Core Cluster Faculty: Anna Savage, Assist. Prof., Dept. of Biology, COS; Sean Moore, Assoc. Prof., Burnett School, COM; and Shaojie Zhang, Assoc. Prof., Computer Science, CECS.

Affiliated Cluster Faculty: L. Von Kalm, Ken Fedorka, & E. Hoffman Biology, COS; M. Jewett, A. Cole, R. Chakrabarti, K. Rohde, Burnette School COM; J. Gibson, Med. Ed. COM; M. Pensky, Mathematics; Xin Yan, Statistics; J. Harper, Chemistry, COS; A. Randall, Civil & Environmental Eng. CECS

Proposal Goal:
Create a Genomics & Bioinformatics (hereafter, G&B) cluster that is focused on biodiversity as the epitome of a multidisciplinary field as it lies at the interface of biology, computer science, engineering, mathematics, medicine, and statistics. This proposal fills an extremely large gap in UCF's life science programs with regards to methodology; it would also create an opportunity for UCF to extend existing strengths in biological and biomedical research into a focused cluster of investigators with overlapping interests and expertise in biodiversity. We define "biodiversity" in a very broad sense; that is, the variability among living organisms that creates the foundation of ecosystem services to which human health is intimately linked. The term biodiversity conjures images of diverse plants and animals in lush tropical jungles, but in reality the majority of earth's diversity comes from vast ecosystems of microbes colonizing larger host organisms. This includes you and your very own microbiome, or all of the bacteria, viruses, and eukaryotes that live in and on each human being. Of recent it has been discovered that your microbiome interacts with many systems of the human body (for example your immune system or your GI system) to shape those components, to the extent that we have co-evolved with our microbes and are dependent on them for normal system function. Our genome, evolutionary history, and current health concerns are thus intimately linked with our microbial communities, as are those of other plants and animals. Thus, understanding genomics in any meaningful way, whether to explain species radiations in different regions of the world, human cancers and their causes, or the consequence of your failed microbiome causing GI issues, requires consideration of all the biotic genetic units that are continually interacting. All core faculty and many affiliated cluster faculty incorporate various aspects of biodiversity investigation in their research programs. Sean Moore (COM) investigates microbial physiology and microbial biodiversity; Anna Savage (COS) focuses on the evolution of host resistance in amphibians fighting a new fungal disease that is wiping out hundreds of species worldwide; a major component of Chris Parkinson's (COS) research program focuses on the conservation genetics of local fauna, which is paramount with sea-level rise in Florida, as well as discovering new species based on genetics in the tropics of Central and South America; and a branch of Shaojie Zhang's (CECS) research, in collaboration with Dr. Mollie Jewett (affiliated faculty COM) is focused on discovering and characterizing "riboswitches" and other non-coding RNA elements in bacterial genomes and the pathogen that causes lyme disease. Thus, our cluster will be locally relevant and also have national and international impact in the arena of biodiversity and biomedical G&B.

Applicability to the Faculty Cluster Initiative:
Genomics and Bioinformatics are uniquely tied together; researchers generating genomic data must have bioinformatics expertise to analyze their data, while bioinformaticians must have data to analyze and to compare the performance of different algorithms and pipelines. Thus, transformative research in genome biology and advancement of bioinformatics only happens when these sub-disciplines are truly integrated, which means effective communication and understanding among individuals from both sides of the aisle. Even better, training undergraduate and graduate students in environments where emphasis on advancing knowledge of both the biological systems and the best methodologies to analyze them is what produces truly integrative scientists who live with one foot firmly in each camp. Our goal is unique in that we want a co-located space where we house both genome biologists and bioinformaticians plus their students side by side so that our academicians work collaboratively and our students are trained in the ways of interdisciplinary academics. Imagine a genomics wet lab graduate student having a major data analysis problem; they explain their problem to the computer scientist sitting next to them; the CS student writes a quick script to experimentally solve the analytical problem while learning about the biological problem in the process; it is a win:win. The G&B cluster proposal is ideally suited to be funded by the Faculty Cluster Initiative because it is truly an interdisciplinary approach to changing lives and livelihoods and we guarantee that this cluster will "move the needle" in UCF's life sciences.

Introduction:
Over the last decade, there has been an explosion of new and cost-effective methodologies to sequence the genetic material of life. Originally, high-throughput sequencing was used to sequence the genomes of model organisms, whereas today genome-scale datasets are a requirement for fundable and publishable life science research. UCF currently lacks any genomics infrastructure: no core facilities, no support staff and no high performance bioinformatics capabilities are available to life scientists. The field of genomics focuses on understanding the collective function of all components encoded in an organism's genomic blueprint, whereas bioinformatics focuses on developing computational tools to analyze these massively large data sets. Researchers from all areas of the life sciences utilize genomics today and generate such "big data" - on the order of several terabytes per project, creating the epitome of a multidisciplinary field as they lie at the interface of biology, computer science, engineering, mathematics, medicine, and statistics. Therefore, all life science professionals, and engineers/computer scientists working with biological data require an operational knowledge in G&B. From the M.D. or bio-engineer trying to cure a cancer patient to the computer scientist utilizing genomic data to predict the next human induced wildlife extinction, today's students must have multidisciplinary training to become employed within any life science affiliated field.

Our goal in creating a G&B cluster is to enable cross-cutting research that leverages UCF's strengths in medicine, evolution & ecology and computer sciences by providing the technical expertise and collaborative opportunities necessary to ask and answer the majority of today's life science questions. Examples include understanding the genetic basis and evolution of diseases, identifying emerging pathogens, determining genomic hallmarks of species extinctions, and developing algorithms and statistical models to improve analysis and interpretation of these fantastic amounts of data. Accomplishing these goals requires the

training of students at undergraduate and graduate levels by academicians across disciplines to be able to think and operate in interdisciplinary teams. The G&B cluster addresses the aforementioned goals by bringing together researchers from multiple colleges and departments across campus, including the Burnett school of biomedical sciences, biology, chemistry, computer science, engineering, mathematics, medical education, and statistics. We are a cluster united by distinct, complementary skill sets that, when combined, enable us to tackle the most complex questions in the life sciences today with a direct focus on biodiversity, *which will set UCF apart from existing genomics & bioinformatics programs*. The G&B core faculty will collaborate with the large base of affiliated faculty and our local industry partners to develop courses, develop new technology, and create pioneering, undergraduate and graduate certificate programs. Thus, having a G&B cluster will finally position UCF as a leader in interdisciplinary genomics and bioinformatics research and education.

Short term cluster objectives:

1. *Integrate G&B into UCF faculty research programs.*

We conducted an internal faculty survey and discovered that while 49% of respondents (35 UCF faculty) utilized G&B in their research, 82% of them do it via collaboration outside of UCF. The main stated reason is that UCF does not have sufficient infrastructure. Additionally, 88% of the respondents stated they would collaborate with members of the proposed G&B cluster to facilitate their own research program and educate their students.

2. *Provide G&B infrastructure and knowledge for current and future faculty.*

Our goal is to seed the G&B cluster by hiring five faculty in genomics and bioinformatics and also to create the necessary infrastructure (including life science equipment and computational requirements) to generate and analyze genomic scale data.

3. Integrate G&B into curricula at the undergraduate, graduate and medical school levels.

Working with big data requires advanced interdisciplinary skills, and all STEM fields are now big data dependent. Physicians need to understand genomics because personalized genomic medicine is the future of healthcare, bioinformaticians need to understand biology to make them competitive for pharma and biotech employment, and molecular biologists need to understand bioinformatics in order to interpret their data. Incorporating G&B training into College of Sciences, College of Medicine and College of Engineering and Computer Science curricula at every stage (from classroom to bench to computational pipeline) will prepare our students as leaders in careers that span these disciplines.

Long term cluster objectives:

1. *Organic emergence of specialized research clusters utilizing G&B*

By creating an initial cluster focused on G&B research that is explicitly distributed across colleges, we will promote integration and collaborations among core, affiliated, and other faculty members; in addition to forming a more cohesive group of biodiversity-focused collaborative teams among medical, molecular biology, and computation focused life scientists,

these interactions will eventually create additional specialized interdisciplinary teams. Some faculty will be exposed for the first time to how current G&B technologies could be transformative for their research; others will be able to shift G&B collaborations from external to in-house, enhancing the prominence of their research programs. Thus, a natural product of this cluster will be new cluster formations based around specific needs speaking to UCF's strengths when paired with G&B. Likely examples include Personalized Medicine, One Health, Big Data, Biological Systems Engineering, and Statistical Genomics clusters, but many additional and intuitive collaborations are likely to emerge.

2. *Undergraduate and Graduate interdisciplinary degree program development*
If economic indicators suggest creation of G&B terminal degrees, the cluster will collaborate with the College of Graduate Studies to propose interdisciplinary MS and PhD graduate programs.

Strategic goal alignment among the University and the participating units:
Formation and co-location of the G&B cluster in the biological sciences building will facilitate all of President Hitt's five goals and reduce academic "silos" among the three participating Colleges. All three Colleges have strategic plans to increase research funding, increase student's career potential and have Big Data as a strategic area of emphasis. The goals of the G&B cluster merge directly into these strategic priorities. This cluster will directly impact current faculty "competitiveness" for life science funding, increase the number and range of G&B courses and will prepare our students for high-wage careers and the G&B faculty will be involved in "Big Data" research which should lead to many exciting discoveries. Specifically, we will achieve the five cluster initiative goals as follows:

1. Achieve national and international prominence
By focusing this cluster on biodiversity we will be able to integrate many life science research programs at UCF, which will not only make this cluster locally relevant, but also allow UCF to amplify its national and international presence. For example, Drs. Worthy and Hoffman are conducting a project in collaboration with Disney's Animal Kingdom (DAK) where they are using G&B to investigate food sources in the giraffe enclosures at DAK which the giraffe are eating and causing them to become sick. These two investigators had to send out all of their G&B work because UCF does not have the infrastructure to carryout all aspects of the project. Dr. Parkinson is the leading authority on New World venomous snakes, and if this cluster is funded he will be able to carryout all aspects of his research here on campus, not at FSU as he currently does, thus bringing both funding and recognition to UCF for his work. Dr. Moore has developed an Applied Industrial Microbiology program wherein UCF students integrate molecular biology, engineering, chemistry, and bioinformatics to characterize microbial populations in complex environments. These students are already partnered with regional companies, but they have to out-source their G&B work, so they do not gain hands-on training in this critical technology. Again, by advancing our on-site bioinformatics capabilities, such programs will be able to take a national lead in STEM integration and student learning. There are many other similar situations, but the examples above highlight the problems being addressed by this cluster and they

provide a conceptual framework for understanding how having G&B capabilities will elevate UCF's national prominence.

2. Increased scholarly and creative works addressing problems in the coming century
Climate change is among the top global challenges we face in the coming century. UCF's location in Florida makes us poised to investigate the impact of shifting climate and weather patterns. Florida is the most vulnerable U.S. state to sea level rise, with the Intergovernmental Panel on Climate Change projecting up to a 2 foot increase by the year 2099. Reduced coastlines and shifting habitats have already begun to impact local species and are expected to continue at an elevated rate, but we still know little about the genomic basis of adaptation to these rapid ecological changes. Having a G&B cluster emphasizing biodiversity would enhance Dr. Parkinson's and Dr. Savage's genetics research on adaptation in reptiles and amphibians, which are "cold-blooded" and thus especially vulnerable to climate shifts. Or particular concern is the impact of climate change on infectious diseases, because temperature increases allow tropical pathogens to migrate into new areas, often via insect vectors. In fact, Florida's Climate Adaptation Strategy (http://www.nrdc.org/health/climate/fl.asp#ap_disease) includes in its priorities the assessment of increases in the transmission of vector-borne infectious diseases due to the spread of vectors from other climate change affected areas. Our proposed G&B cluster would improve biomedical studies of pathogen genomics, epidemiology, and host immunity by enabling in-house microbial metagenomics analyses to directly address this regional and global concern. Current work by G&B cluster affiliate member Mollie Jewett (COM) focuses on understanding the genetic basis for pathogenesis of the emerging tick-borne bacterial pathogen *Borrelia burgdorferi*, the causative agent of Lyme disease. Lyme disease is an example of an infectious disease that has documented range expansion in the United States and the entire world over the past 10-20 years. Although Dr. Jewett is working with G&B cluster core faculty Shaojie Zhang to examine non-coding RNA regulatory elements in *B. burgdorferi*, due to the absence of a UCF-based genomics and bioinformatics facility, Dr. Jewett currently collaborates with colleagues outside of UCF and Florida to be able to incorporate genome-wide genetic analyses into her research. The G&B cluster will greatly benefit Dr. Jewett's current work as well as allow UCF to be at forefront of biomedical research focused on other emerging and re-emerging vector-borne pathogens, including the mosquito-borne viruses Chikunuguya and Dengue, which are likely to significantly impact Florida residents.

3. Enhanced research capacity that will create a robust funding base
Funding the G&B cluster will have a direct impact on all life science research carried out at UCF. Funding directly to UCF will increase as the need for external G&B collaborators decreases. Many life scientists at UCF will be able to incorporate new G&B approaches into their research programs, which will make them more competitive for external funding. Lastly, by marketing our partnerships with local corporations (DAK, Sanford Burnham) and governmental agencies (Florida Fish and Wildlife Conservation Commission, US Fish and Wildlife Service) we will be able to publicize an exceedingly strong life science program, which will help attract better students, additional faculty, and new research funding.

4. Increased number of interdisciplinary publications
Today, almost all high impact life science publications are almost entirely interdisciplinary – immunology and genomics, conservation and genomics, human disease genomics and bioinformatics applied to particular biological datasets, etc. One strong advantage UCF has in this regard is the convenient co-location of researchers from each of the STEM disciplines that are integrated in G&B efforts. So, not only will this cluster increase interdisciplinary publications and publication impact, but it will also and provide a cohesive glue that will meld unique collaborations between historically disparate fields.

5. Strengthening our life sciences educational programs
See curriculum statement below.

Graduate and Undergraduate Curriculum statement:
In 2014, Science magazine published an article titled "An Explosion of Bioinformatics Careers" in which the demand for bioinformaticians who understood biology, and vice versa, was emphasized as the interdisciplinary skill set that will land the next generation of life scientists successful and impactful employment (http://sciencecareers.sciencemag.org/ career_magazine/previous_issues/ articles/2014_06_13/science.opms.r1400143). The G&B cluster will facilitate training our life sciences undergraduate and graduate students, whether headed for medical, pharmacological, biotech, software, research, or academic trajectories, to understand the relevance, interpretation and analysis of genomic data for their respective career needs. Currently, specialized courses in G&B are taught in all three colleges. Additionally Jane Gibson (cluster affiliate) teaches modules in which medical diagnostics using G&B methods are taught to our medical students. A major problem in UCF's current bioinformatics and genomics offering is that the courses are designed and taught for the specific department offering the course and they typically become centered around a particular research expertise. Formation of the G&B cluster will allow coordination of these classes, and increase technical specificity by team teaching within those classes. Additionally, specialized new courses will also be offered, as well as G&B concentrations within undergraduate and graduate degree programs to provide a broader perspective to students. If economic indicators support the creation of G&B terminal degrees, then in collaboration with the College of Graduate Studies the cluster would propose interdisciplinary graduate programs at both a MS and Ph.D. level. For details see the appendix.

Strategic hiring plan:
We will advertise five positions for a newly created G&B cluster, but set the advertisement up with two specific timelines, one for the senior faculty member and a second for the remaining hires. We will solicit faculty that work in all areas of G&B, stressing biodiversity genomics, comparative genomics, genomics of disease, medical bioinformatics, and biodiversity bioinformatics. The goal is to hire one senior person who would anchor the cluster and be involved with the subsequent junior hires. For example, one specific area that we plan to pursue is the genomics/bioinformatics of the human microbiome. This is a burgeoning area of study and unites biomedicine, evolution & ecology into biodiversity.

We plan to advertise at the beginning of the fall semester (2015) for the senior hire, then re-advertise in December for the remaining hires. The senior hire would be involved in the search process to help facilitate hiring the best team. There are numerous list-serves and society job boards that we will utilize for advertising. Additionally, we plan to contact several institutions that have top programs in genomics and bioinformatics, like UC San Diego, Duke, Washington University St Louis, Johns Hopkins University, and the National Human Genome Research Institution to advertise our cluster, which will increase the diversity and strength of our pool.

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Mentoring plan:

All newly hired cluster faculty members will be assigned a cluster mentor (appropriate to rank); the junior faculty will also be enrolled in the COS mentoring program which has become the flagship junior faculty mentoring program at UCF. Further, our current cluster lead will be the cluster ombudsman if issues arise during annual reviews and evaluation between our cluster and the multiple colleges. The Dept. of Biology has already added language to their Policy and Procedures manual stating that collaboration and interdisciplinary work are valued and this will be a consideration in cluster faculty evaluations. Dr. Parkinson will be requesting policy changes in all units participating in this cluster.

Evidence-based impact statement:

According to the National Center for Biotechnology Information (NCBI), life scientists are currently generating 15 petabases of DNA per year. That's 15 thousand billion new DNA letters that need to be analyzed, interpreted and archived. Genomics is driving this explosion of data, and the explosion has only begun. This shift towards big data biology creates a three-pronged demand for all life scientists working today: access to the technology needed for generating genome-scale datasets, access to the computational power needed to analyze those datasets, and access to the bioinformatics expertise needed to manipulate and interpret the data. This demand is not being met. In the words of David Green, director of the National Human Genome Research Institute, "The life sciences are becoming a big data enterprise," and "Most people who know the disciplines don't necessarily know how to handle big data." (quotes from http://www.wired.com/2013/10/big-data-biology/all/). The article in which Green is quoted states the issue succinctly in its title: "Biology's Big Problem: There's Too Much Data to Handle."

Awareness of this need has prompted initiatives from major funding agencies such as the NIH's Big Data to Knowledge Initiative and the NSF's Advances in Biological Informatics and Critical Techniques program, Technologies for Advancing Big Data Science program, and Plant Genome Research program. However, to be eligible for funding through these and other life science-related opportunities, basic infrastructure and networks of collaborating interdisciplinary biological researchers is essential. UCF does not have these resources or networks in place. However, we have the capacity to create them through a G&B cluster hire of new experts. This cluster will provide the backbone of up-to-date technology, life sciences-optimized computational resources, and analytical capabilities that will launch UCF into position to become a leading life sciences institution. Additionally, the courses and graduate student research opportunities that will arise from this cluster will enable UCF to train the next generation of top tier life scientists. "Everyone getting a Ph.D. in America needs more

competency in data than they have now," is how Green states the problem. "This is not a transient issue. It's the new reality."

Metrics and Outcomes of Success:

We plan to measure success of the G&B cluster utilizing a multitude of metrics on a short term and long term basis. Initially, we would utilize our job candidate pools average number of publications, funding amounts and graduate and postdoctoral institutions compared to the candidates hired to measure first year success. We would expect the hired candidates to increase UCF's prominence in the life sciences immediately. Each year for the next five years we would quantify funding rates, publication rates, invited talks, student interest and acceptance, graduation rates and collaboration webs for the core G&B faculty; the goal would be all core are above the standard averages for each metric and there would be a high level of collaboration among the core faculty. We will quantify collaboration in three ways: number of co-PI grants, co-authored publications among cluster-core and affiliated faculty and co-advised graduate students (a) within the same department, (b) within the same college, and (c) across colleges. Additionally, we will gather federal funding submissions and success from the UCF office of research from 2010-2017; then compare these data to 2017-2021 and see if there is an increase in these metrics. The proposals we would target are only ones that have a G&B aspect. For example, Parkinson has submitted or spent over $250,000 dollars; Savage has submitted over $1.5 million dollars in federal funding for the 2015-16 cycle, over half of which would be spent by collaborators at other institutions do to the lack of G&B infrastructure here at UCF. Therefore, we would expect a direct increase in the amounts of funding brought to UCF because faculty will be able to collaborate with G&B faculty to carryout their G&B portions of their research.

We will also track the impact of G&B on undergraduate and graduate student learning and competitiveness in the work force. For undergraduates, we will do this by integrating new course assessment metrics into the new and revised courses with G&B content. In addition, the relevant BS degree assessments and student exit exams within the participant Colleges will be modified to track retention and scope of knowledge on key G&B topics. These assessments will be combined with student course feedback and used in debriefing sessions with the course instructors so they can improve teaching efficacy and address shortcomings. In a major sense, these efforts will become part of G&B faculty mentoring and development in education, something that is often overlooked in the shaping of our research-active faculty. In addition to these strategies, G&B graduate students will be additionally evaluated by comparing the average number of publications, impact factors of journals manuscripts are published in, federal grants received by their repsecting PIs (e.g., NSF GRFPs), and post-degree employment in the life sciences.

Every year, the core cluster faculty will meet to debrief the year's productivity measures and, if necessary, determine ways to too increase areas of concern. Additionally, at this meeting we will openly share mentoring strategies for each faculty member in the cluster to help all faculty be successful in all three areas: research, teaching & service. Not only will this important overview allow the development and impact of the cluster to be established, but it will also be used to ensure the cluster faculty's annual efforts are in line with the established promotion and tenure guidelines of their respective units.

Space Plan:
The current plan is that new hires will co-locate; and any current UCF core faculty may relocate if they choose to and if there is available space. We believe that the G&B cluster will work most effectively if core cluster faculty are housed on the same floor with a large open collaborative space for equipment. This arrangement will reduce genomic equipment costs as all major instrumentation is standard across sub-disciplines and can be shared in a collaborative- lab facility. Co-location will also facilitate connectivity from lab bench to analytical pipeline, ensuring computational and molecular components remain tightly linked. Two of the three proposing colleges (COM and COS) are currently located in the Biological Sciences building, which is situated directly next to the third (CECS), thus the logical location for this cluster would be in the biological sciences building. In addition, this positioning would nestle the cluster among the business, engineering, and physical sciences buildings, which house adjust cluster members. One potential housing location is the first floor NE wing, which has an open floor plan with several adjacent offices and small equipment rooms. Additionally, there are high speed computer network lines currently running into the Biological Sciences Building and into the Harris Building where EECS is housed thus housing all computational resources in CECS as they have agreed to do will not affect the data analyses pipeline. There are also new high speed network lines linking Lake Nona COM to main campus, thus faculty on the COM campus will be able to easily collaborate with cluster faculty. Therefore, we believe that locating G&B cluster in the biological sciences building first floor space would reduce renovation costs, reduce startup costs because of shared resources and infrastructure plus increase collaboration among core and affiliated UCF students and faculty. Critically, this space plan would ensure that other COM, COS and CECS faculty and graduate students will be interspersed among G&B faculty and graduate students, increasing interaction, collaboration and peer-to-peer education.

Industry Partnerships:
We have communicated with Dr. Perera, Scientific Director, Analytical Genomics and Bioinformatics of Sanford Burnham Institute; he is excited about future collaborations. Dr. Von Kalm, Biology affiliate faculty just finished a collaboration with a Sanford Burnham faculty member, thus these collaborative efforts have already been proven feasible. We plan to invite Dr. Perera to be part of the organizing committee for this cluster so that we complement rather than overlap with Sanford Burnham Institute in capabilities and trajectory. The integration of G&B into our burgeoning industrial microbiology and biodiversity programs will allow new industrial partners to work directly with UCF researchers and also open the door for funding opportunities designed to link on-campus employee training with Florida's workforce. Our goal is to forge a integrative working group that will strengthen the collaborative teams of researchers and industrialists located in Central Florida.

Appendix

Academic Plan

G&B is one of the most inclusive interdisciplinary STEM efforts; requiring expertise in computer programming, mathematics, engineering, chemistry, biochemistry, physics, statistics, and molecular biology. UCF already has a pronounced strength in each of these disciplines because of its balanced campus architecture and well-developed education and research infrastructures. What is needed is a focused impetus to drive these disciplines together into a critical mass to erode a historically segregated academic architecture. A G&B cluster will provide such a force by encouraging students and researchers from different backgrounds to work together in new ways. For example, we would become a leader in education by having our undergraduate and graduate students directly participate in data acquisition and processing using next-generation DNA sequencing machines. Likewise, our strong physics, engineering, mathematics, computer science, statistics, and chemistry students can use such experiences to plan and develop the "next-next generation" sequencing and data analysis platforms. Having a tangible G&B stage will go a long way toward bridging the gap between routine classroom lecturing and an applied STEM effort to advance and discover new technologies. A G&B facility will provide such an academic venue: students in different majors will shake hands, perhaps share computer code or discuss technology, and maybe even have lunch with each other. The strength of this cluster is in the broad net is casts.

Currently, courses in G&B are taught in all three colleges. Additionally Jane Gibson (affiliate faculty) teaches modules in which medical diagnostics using G&B methods are taught to our medical students. Our goal would be to synthesize & integrate all G&B curricula at UCF, making sure courses maximize their educational power so students & faculty do not duplicate effort plus synergize and strategize the content. Many of the current courses are discipline specific, that is when bioinformatics is offered by a computer science faculty they focus on algorithm development which most life science majors do not understand or vice versa computer science majors don't have the background to enroll in up level molecular biology courses. Therefore, new courses would be created, such as computer programing for life science majors or molecular biology for engineers.