Rochester Institute of Technology

College of Science
Strategic Plan

2012-2017

COLLEGE OF SCIENCE STRATEGIC PLAN 2012 - 2017

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INTRODUCTION

The College of Science (COS) has been instrumental in helping RIT realize its broader vision. The College is known for its innovative teaching, scholarly research, and the high quality education it provides to all students. The strategic plan articulated in this document refreshes the vision and mission of the College. In addition, the document provides a roadmap for the development of strategic goals, recommendations pertaining to priority areas, the establishment of key measures and action plans that are in alignment with the strategic plan of the Institute. This strategic plan will be used to provide a focused direction and to identify our collective opportunities and possibilities for the next five years. The plan will also be used to inform our budget and decision making process, identify action items, responsibilities, target dates, and key performance indicators. This plan will be the basis to further improve our practices regarding the overarching operation of the COS.

METHODOLOGY

The process used to develop this strategic plan was inclusive of every stake holder in the COS. This participation and engagement made this process the most inclusive to date. The entire College was engaged in conversations through a summer retreat of all COS faculty and staff, various focused group discussions, electronic questionnaires, and faculty and staff meetings at the school and college level. This is the first time we attempted to draft a strategic plan together, and we found this journey rewarding and fun and a benefit to each other's perspective, experience, imagination, and wisdom.

A Strategic Planning Steering Core Committee was formed to lead the effort. The Committee held focused group discussions and open sessions and invited faculty, staff and students to provide input and ideas that were used to define our vision, goals, objectives, and strategic direction. An analysis was performed that helped us:

- to assess where we are;
- to identify where we need to go to reach our vision; and
- to develop corresponding goals, objectives, and strategies.

Three COS Strategic Plan Focused Group discussions were held that focused on the following three mutually supporting areas:

i. The development and support of academic programs that meet the challenge of declining US competitiveness in STEM education while preparing graduates for careers in a rapidly changing global marketplace.

ii. The development and support of active, cross-disciplinary research clusters that attract excellent scientists to RIT, provide rich learning environments for our students and are supported by grants, foundations and industrial sponsorship.

iii. The development and support of infrastructure, policies and a collegiate culture that facilitates career advancement and job satisfaction for all members of the College.

The input from the focused group discussions was shared and discussed at faculty and staff meetings of each academic unit.

THE COLLEGE OF SCIENCE STRATEGIC PLAN 2012-2017

VISION

The College of Science will be known for the high quality education it provides for its students, its world-class research and expertise in target areas, and its innovative approaches to teaching and learning. College of Science graduates will be equipped with cutting edge knowledge and will be prepared, through experiential learning, to succeed in their chosen careers. The College of Science will be a vibrant environment for diverse faculty, staff, and students in an organization that fosters professional and personal growth.

MISSION

The natural sciences and mathematics play a significant and fundamental role in all of higher education, especially at an institute of technology, as the required foundational knowledge and skills for the professions. The College of Science will prepare graduates for careers in the physical, life, and mathematical sciences through the granting of degrees in these areas and will provide mathematical and scientific foundations for all RIT students by:

- Developing and supporting academic programs that meet the challenges of US competitiveness in STEM (Science, Technology, Engineering, Mathematics) education while preparing graduates for careers in a rapidly changing global marketplace.

- Developing and supporting active and cross-disciplinary research programs and clusters that attract excellent scientists to RIT, provide rich learning environments for our students, and are supported by government agencies, foundations, and industry.

- Developing and supporting infrastructure, policies, and a collegiate culture that facilitates career advancement and job satisfaction for all members of the College.

The College of Science will serve the global society by expanding fundamental scientific knowledge and developing new technologies.

GUIDING PRINCIPLES

Student Success

- Provide an environment to facilitate learning and success for all students of mathematical, physical, and life sciences. This will motivate everything our faculty, staff, and administrators do.
- Provide a learning environment that will attract and retain a successful student body.
- Help students develop critical thinking skills and an appreciation for the role of mathematics, science, and scientific inquiry in our technologically-driven society.

Academic Excellence

- Educate our students for successful lifetime careers in the physical, natural and life sciences.
- Provide fundamental education in science and mathematics across the Institute and develop the scientific and mathematical literacy required in our contemporary technological society.

- Develop and maintain active disciplinary and cross-disciplinary research programs that will attract and retain first-rate scientists and students to RIT and will provide rich experiential learning environments.
- Expose students to current methodologies and provide firsthand experience applying this knowledge to solve real-world problems as members of interdisciplinary teams.

Faculty and Staff Success

- Provide an environment of support and mentorship to encourage faculty and staff professional growth.
- Recruit and retain outstanding and diverse faculty, staff, and administrators.

Environment and Infrastructure

- Design, acquire, maintain, and effectively utilize the space and facilities required to meet the evolving instructional and research needs of the College.
- Foster an environment of transparency, honesty, inclusion, collegiality, openness, and student-centeredness.

Synergy and Outreach

- The College will support its goals and the Institute's goals by working with individuals, groups, and organizations within the RIT community and beyond.
- Develop and strengthen relationships between the College, its alumni, internal and external partners, and global education programs.

Academic Operations

- The College will manage its budget with fiscal responsibility in line with the budget provided by the RIT administration and will ensure that funds are appropriately allocated to support its mission.
- The College will be structured to best deliver, develop, and promote its academic and research programs.

OVERARCHING GOALS AND OBJECTIVES

I. Robust and Signature Programs

Provide excellent mathematics and science foundation courses for all RIT students and develop and support academic programs that will meet the challenge of declining competitiveness in science and math education, will instill interdisciplinary inquiry and intellectual growth, and will prepare our graduates for careers in a rapidly changing global marketplace.

- Maintain rigorous academic programs that offer a balance between fundamental skills, advanced theoretical work, and experiential learning opportunities that expose students to open-ended problems and real-life applications and prepare them for graduate studies and successful careers in the global marketplace.
- Explore ways to enrich current curricula by broadening inclusion of undergraduate research, experiential learning or capstone experience for all majors within COS, and co-op experience.
- Promote global literacy and cultural awareness.
- Assess potential changes to current programs in response to needs in the current workforce environment, current trends in graduate program admissions, current alumni placements, student needs for current and up to date curriculum that includes new developments in the field, and needs in support of the research initiatives of the College.
- Develop Interdisciplinary Science programs that:
  - will cut across disciplines and will immerse students on the front lines of interdisciplinary, team-based, world-class level research that has practical relevance in the world of careers beyond academia;
  - will provide focus with concentration in at least one science field, and
  - will provide graduates with a well-rounded appreciation of science and its place in society.
- Develop a novel new Ph.D. program in Modeling and Computation that will be cross-cutting and multidisciplinary in nature, will merge and creatively synthesize many disciplines, and it will be complementary and synergistic to other RIT Ph.D. programs.

II. Growth of Research Programs

Build on our successes and develop and support active, world-class, cross-disciplinary research and centers of excellence that will attract first-rate scientist to RIT, will provide rich learning environments for our students, and will be supported by grants, foundations, and industrial sponsorship**.**

- Establish a national and international College presence for RIT through investment in strategic areas where we can be successful. We will invest in:

Established Strong Areas

- Imaging Science
  - Detectors
  - Remote Sensing
  - Vision
- Color Science
- Astrophysical Sciences

Emerging Areas

- Computational Modeling (Scientific computing, State-of-the-art, high-performance computational solutions of scientific problems)
- Comprehensive plan for Optics (Classical/Quantum Optics, Color, Instrumentation)
- STEM Education - Continue to develop and expand the Science and Mathematics Education Research Collaborative (SMERC) that will study issues involving postsecondary student achievement within a scientific discipline.
- Undergraduate Research - Expand opportunities for undergraduates (e.g. more REU programs and internal programs)

Opportunities and Initiatives

- Invigorate Materials Science
- Environmental Sciences
- Earth Sciences
- Invigorate the Biotechnology Program

- Define and develop a coherent "Bio-X" initiative within COS by exploring opportunities to develop interdisciplinary programs such as:
  - *Bioimaging*
  - *Computational Biology and modeling of bio phenomena*
  - *Biophysics*
  - *Bioinformatics*
  - *Mathematical Biology*
  - *Biochemistry*
  - *Biostatistics*

❖ Prioritize hiring to assure the population of research-active faculty is adequate, to take into account research potential, and to support target strategic research areas.

III. Faculty and Staff Professional Growth

Promote, support, and enhance a vigorous and rich academic environment that foster faculty and staff professional growth and job satisfaction for all members of the College.

❖ Provide an environment of support, mentorship, and collegiality to encourage faculty and staff professional growth.

❖ Ensure that faculty and staff productivity and notable achievements are appropriately recognized and rewarded.

IV. Outreach, Internal, and External Partnerships

Develop collaborations between the College, internal and external partners, global education programs, K-12 community, and alumni in support of the goals of the college and institute.

❖ Cultivate interactions with business, industry, and government to develop and implement collaborative programs in mathematics and the sciences.

❖ Create and implement a strategy for improved technology transfer and industrial support of COS research in conjunction with the COS Advisory Board.

- Establish and maintain collaborations with K-12 community in response to needs for additional knowledge and skills in science and mathematics and to help prepare the next generation of STEM educators; develop and support internship programs that will attract high school students to work with our faculty and gain hands on experience in our laboratories during the summer.
- Cultivate new and existing collaborations with international organizations and educational institutions and develop and implement targeted programs for international student exchanges, faculty exchanges, course sharing, and other international exchange programs.
- Outreach and attract female and minority student in science and mathematics disciplines and increase overall diversity in all levels of science and mathematics education.

V. State of the Art Facilities and Infrastructure for Excellence in Math and Science

The College of Science will be housed in State of the Art Facilities and will provide infrastructure that will enable excellence in math and science education and research.

- Develop a plan to renovate the Gosnell building and consolidate college academic units in fewer buildings through the construction of a new cross-disciplinary Science and Math Center that will support our teaching and research mission and will foster collaborations and cross-disciplinary interactions.
- Create an effective structure for the College operations that will support the administration of various academic units, multidisciplinary and disciplinary programs, and research centers and laboratories.
- Improve infrastructure that supports our teaching and research mission and facilitates career advancement and job satisfaction for all members of the College.

OBJECTIVES, ACTION ITEMS AND STRATEGIES

The College of Science will pursue its vision to be known for the high quality education it provides for its students, its world-class research and expertise in target areas, its innovative approaches to teaching and learning, its graduates who will be equipped with cutting edge knowledge and will be prepared, through experiential learning, to succeed in their chosen careers, and for its vibrant environment that fosters professional and personal growth for its diverse faculty, staff, and students through the following goals, objectives and strategies:

I. Robust and Signature Programs

GOAL - 1: Provide excellent mathematics and science foundation courses for all RIT students and develop and support academic programs that will meet the challenge of declining competitiveness in science and math education, will instill interdisciplinary inquiry and intellectual growth, and will prepare our graduates for careers in a rapidly changing global marketplace.

OBJECTIVES	ACTION ITEMS AND STRATEGIES
Objective 1: Maintain rigorous academic programs that offer a balance between fundamental skills, advanced theoretical work, and experiential learning opportunities that expose students to open-ended problems and real-life applications and prepare them for graduate studies and successful careers in the global marketplace.	**Action Item 1:** Explore ways to enrich current curricula by broadening inclusion of undergraduate research, experiential learning, and co-op experience. **Action Item 2:** Develop and implement a capstone experience for all majors within COS. **Action Item 3:** Maintain multiple math and science course sequences that will help students to acquire the level of mathematical knowledge relevant to their major and their future careers.

	Action Item 4: Assess potential changes to current programs in response to: o needs in the current workforce environment; o current trends in graduate program admissions; o recent alumni placements; o student needs; o needs for current and up to date curriculum that includes new developments in the field; and o needs in support of the research initiatives of the COS. **Action Item 5:** Provide strong and effective academic and career advising and other relevant support. **Action Item 6:** Establish a formalized 2nd-year career/curriculum review as a way of guiding students toward their career goals. **Action Item 7:** Support innovative pedagogy and rewards for effective and innovative teaching.
Objective 2: Develop Interdisciplinary Science programs that: o will cut across disciplines and will immerse students on the front lines of interdisciplinary, team-based, world-class level research that has practical relevance in the world of careers beyond academia; o will provide focus with concentration in a single science field, and o will provide graduates with a well-rounded appreciation of science and its place in society.	**Action Item 1:** Assess potential discipline areas by collecting data from current faculty, employment sources, and federal employment databases. **Action Item 2:** Introduce a common first year curriculum for all undergraduate students in the College of Science. **Action Item 3:** Design curricula that will address the needs of students who wish to earn a degree in a field that bridges the subject matter of two or more disciplines and provide enough flexibility in our curricula to encourage COS students graduate with a double major degree or more than one minor.

	Action Item 4: Explore ***specific and targeted*** inter-/multi-disciplinary areas of studies by focusing on possible collaborations between COS programs and other colleges at RIT and consider offering more dual BS/MS programs that span more than one discipline. **Action Item 5:** Develop a curriculum for the COS Science Exploration program to include interdisciplinary projects that will allow our Science Exploration students to focus on important scientific problems and be exposed to all of the COS disciplines.
Objective 3: Develop a novel new Ph.D. program in Modeling and Computation.	**Action Item:** Develop a proposal for a Ph.D. in Modeling and Computation that will: o be cross cutting multidisciplinary in nature; o merge and creatively synthesize many disciplines, and o be complementary and synergistic to other RIT programs.
Objective 4: Enhance and expand the science and mathematics student population and the profile of the College of Science student body.	**Action Item 1:** Actively recruit outstanding students. **Action Item 2:** Develop and maintain strategies to retain qualified students.
Objective 5: Promote global literacy and cultural awareness.	**Action Item:** Increase faculty and student participation in the study abroad and exchange programs.
Objective 6: Offer rigorous courses in the sciences and mathematics at the appropriate level for students in other RIT colleges.	**Action Item 1:** Develop an effective system through tracked science and math course sequences that will deal with the variation in pre-college math preparation of students entering STEM majors and will offer various levels of mathematical training based on the demands of different majors.

	Action Item 2: Use technology, when appropriate and with care, to improve student engagement and learning.

II. Growth of Research Programs

GOAL- 2: Build on our successes and develop and support active, world-class, cross-disciplinary research and centers of excellence that will attract first-rate scientists to RIT, will provide rich learning environments for our students, and will be supported by grants, foundations, and industrial sponsorship.	
OBJECTIVES	**ACTION ITEMS AND STRATEGIES**
Objective 1: Establish a national and international College of Science presence for RIT through investment in strategic areas where we can be successful.	**Action Item 1:** We will invest in: o Established Strong Areas ▪ Imaging Science o Detectors o Remote Sensing o Vision ▪ Color Science ▪ Astrophysical Sciences o Emerging Areas ▪ Computational Modeling (Scientific computing, State-of-the-art, high-performance computational solutions of scientific problems) ▪ Develop a comprehensive plan for optics

(Classical/Quantum optics, Color, Instrumentation)
- STEM Education - Continue to develop/expand the Science/Math Education Research Collaborative (SMERC) that will study issues involving postsecondary student performance within a scientific discipline.
- Undergraduate Research - Expand opportunities for undergraduates (e.g. more REU programs and internal programs)

- Opportunities and Initiatives
  - Invigorate Materials Science
  - Environmental Sciences
  - Develop and Proposed a program in Earth Sciences
  - Invigorate the Biotechnology Program
  - Define and develop a coherent "Bio-X" initiative within COS by exploring opportunities to develop interdisciplinary programs such as:
    - *Bioimaging*
    - *Computational Biology and modeling of bio phenomena*
    - *Biophysics*
    - *Bioinformatics*
    - *Mathematical Biology*
    - *Biochemistry*
    - *Biostatistics*

Action Item 2: Establish a Research Advisory Council, convened by the Associate Dean for Research, to include representation from Graduate Programs, Research Centers, other research active

	faculty, and external members with appropriate experience and expertise. The main function of this Council will be to facilitate the growth of research within the college and in particular, make recommendations as to priorities in terms of supporting existing areas and developing new ones. **Action Item 3:** Prioritize hiring to assure the population of research-active faculty is adequate, to take into account research potential, and to support target strategic research areas. **Action Item 4:** Establish a distinguished visiting scholar program to promote faculty exchange visits and allow for distinguished scholars in selected areas to visit for an extended period (~1 month), to deliver guest lectures, interact with grad/undergrad students, faculty and research groups. **Action Item 5:** Establish a program for long term distinguished visitors (~ 1 year), such as Scholar in Residence or a Visiting Research Professorship.
Objective 2: Encourage and support the scholarship of discovery, pedagogy, integration, and application by faculty and students.	**Action Item 1:** Identify key individuals (existing tenure-track faculty, new hires or outstanding tenured faculty) as "future research leaders" who will have reduced teaching and service loads, but will be expected to secure grant funding, publish regularly, establish research groups or lead new research initiatives. **Action Item 2:** Staff committees that impact research (e.g., Undergraduate Research Council, FEAD, etc.) with research active faculty.

	Action Item 3: Explore developing collaborative research and graduate programs across schools (colleges). **Action Item 4:** Establish an environment that can identify and encourage faculty to establish successful research groups and support continued growth. Connect promising new faculty with successful research groups. **Action Item 5:** Identify faculty with early success and high potential and properly mentor and incentivize them to grow research further. **Action Item 6:** Create and encourage regular journal club-like and/or un-themed coffee-hour meetings for faculty and research staff.

III. Faculty and Staff Professional Growth

GOAL- 3: Promote, support, and enhance a vigorous and rich academic environment that fosters faculty and staff professional growth and job satisfaction for all members of the College.	
OBJECTIVES	**ACTION ITEMS AND STRATEGIES**
Objective: Provide an environment of support, mentorship, and collegiality to encourage faculty and staff professional growth.	**Action Item 1:** Strive to manage workloads so as to allow sufficient time for creativity and innovation (in teaching and research) and to be commensurate with service and scholarship expectations.

	Action Item 2: Implement the COS mentoring program that was developed in 2010 to assist faculty through tenure and promotion. **Action Item 3:** Introduce flexible work schedules for staff to attend professional development training courses, RIT academic courses, and to work on special projects. **Action Item 4:** Put in place a training program to assist new faculty, lecturers and teaching assistants in effective teaching practices. **Action Item 5:** COS support staff will have opportunities to enhance their professional mobility. **Action Item 6:** Encourage and support mini-sabbaticals for faculty and staff. **Action Item 7:** Establish regular visiting speaker programs, if these do not already exist. Speaker programs should be coordinated to accommodate occasional (~monthly) college-wide seminars on general interest or interdisciplinary topics. **Action Item 8:** Ensure that faculty and staff productivity and notable achievements are appropriately recognized and rewarded.

IV. Outreach, Internal, and External Partnerships

GOAL- 4: Develop collaborations between the College, internal and external partners, global education programs, K-12 community, and alumni in support of the goals of the college and institute.	
OBJECTIVES	**ACTION ITEMS AND STRATEGIES**
Objective 1: Cultivate interactions with business, industry, and government to develop and implement collaborative programs in mathematics and the sciences.	**Action Item 1:** Evaluate existing advisory boards at the school level and create new ones or reformulate existing ones as appropriate. **Action Item 2**: Develop and implement a plan to best utilize the recently-formed COS Advisory Board. **Action Item 3:** Create and implement a strategy for improved technology transfer and industrial support of COS research in conjunction with the COS Advisory Board. **Action Item 4:** Develop a COS brand, marketing techniques, and strategies (e.g. Twitter presence, documentary on COS, COS apparel, etc.) and consider hiring a Communications Officer for the College to mark our brand. **Action Item 5:** Develop specific activities aimed at expanding the geographical scope of outreach to alumni and potential students.
Objective 2: Establish and maintain collaborations with K-12 community in response to needs for additional knowledge and	**Action Item 1:** Extend our articulation agreements with Schools of Education – Nazareth, Geneseo to streamline the process of

skills in science and mathematics and to help prepare the next generation of STEM educators.	teacher certification in math and science disciplines. **Action Item 2:** Establish agreements with local schools for RIT students to shadow science/math teachers. **Action Item 3:** Develop and support internship programs that will attract high school students to work with our faculty and gain hands on experience in our laboratories during the summer months. **Action Item 4:** Develop a STEM educators learning community to encourage extra-curricular discussions. **Action Item 5:** Develop and implement COS-based activities, competitions, and events at ImagineRIT and other similar events. **Action Item 6:** Coordinate and publicize the various K-12 activities already taking place in COS and develop additional coordinated programs as needed.
Objective 3: Outreach and attract female and minority student in science and mathematics disciplines and increase overall diversity in all levels of science and mathematics education.	**Action Item 1:** Support and grow the newly formed WISe (Women in Science) program that promotes female participation in science and math disciplines. **Action Item 2:** Develop and support projects that encourage the participation of minority students in science and mathematics.
Objective 4: Cultivate new and existing collaborations with international organizations and educational institutions.	**Action Item:** Develop and implement targeted programs for international student exchanges, faculty exchanges, course sharing, and other international exchange programs.

V. State of the Art Facilities and Infrastructure for Excellence in Math and Science

GOAL- 5: The College of Science will be housed in State of the Art Facilities and will provide infrastructure that will enable excellence in math and science education and research.	
OBJECTIVES	**ACTION ITEMS AND STRATEGIES**
Objective 1: Develop a plan to renovate the Gosnell building and consolidate college academic units in fewer buildings through the construction of a new cross-disciplinary Science and Math Complex that will support our teaching and research mission and will foster collaborations and cross-disciplinary interactions.	**Action Item 1:** Develop a specific plan for a new Science and Math Complex and embark on a "capital campaign" to obtain the necessary funding to begin construction. **Action Item 2:** Create and implement a plan that will be used as a guide to best utilize existing laboratories, for both teaching and research, and to share research infrastructure in order to most efficiently use current and potential future space. **Action Item 3:** Create more collaborative space for research interactions and for student and faculty to gather within existing space and within any new construction.
Objective 2: Create an effective structure for the College operations that will support the administration of various academic units, multidisciplinary and disciplinary programs, and research centers and laboratories.	**Action Item:** Structure the COS into schools (see Appendix B) and research Centers and Laboratories (see Appendix C)
Objective 3: Improve infrastructure that supports our teaching and research mission and facilitates career advancement and job satisfaction for all members of the College.	**Action Item 1:** Campaign for resources to set up a college-wide Core Laboratory Facility that will be aimed primarily at supporting funded, publishable research, or preliminary work to support funding proposals.

	Action Item 2: Devise a plan that will be used to allocate research space efficiently based on external funding and significant outcomes (i.e. publications, patents, and other deliverables). To this end, results of the COS current space audit should be vigorously acted upon. **Action Item 3:** Develop plans for shared research space across schools, especially core facilities, and designate appropriate office space for visitors (visiting speakers and visiting researchers). **Action Item 4:** Review and continue to upgrade the web presence of the COS undergraduate, graduate, and research programs and engage a dedicated support person with significant web design/maintenance experience to oversee future developments and to provide central support to the schools and research centers and laboratories. **Action Item 5:** Campaign for funds to provide new faculty with appropriate and sufficient startup packages (e.g., equipment, graduate student stipends, salary for post-docs or technicians).

APPENDICES

APPENDIX A: OPPORTUNITIES AND INITIATIVES

RIT's maturation to a highly respected university with international reach means we must build stronger science programs to stand the test of quality in their own right. RIT students and alumni are entering science fields at a greater rate, and the university must provide

the highest level of education to these scholars. We are focusing on establishing a national presence through the development of academic and research programs that will prepare the next generation of scientists and mathematicians for careers in a rapidly changing global market place. The need, therefore, to invest heavily in our foundational science programs is greater than ever. To build RIT's core science programs, a substantial investment is necessary. One great advantage to this investment is that the benefits are reaped by students across the university. A dollar invested in the core sciences has impact in degree programs, research initiatives, and outreach opportunities in multiple colleges.

The College of Science will embark on a campaign to fund a number of initiatives. In addition to our prominent and world-known academic and research programs in imaging and astrophysical sciences, we plan to bring a number of our core science and mathematics programs to national prominence and to increase the reputation of the sciences and mathematics at RIT. To realize this, we plan to focus on the following initiatives:

Pre-freshmen Research Initiative: RIT was the first university to implement a research program in the College of Science that invited incoming freshmen - pre-freshman - before the traditional academic year began. Our ability to continue to offer this program will contribute to one of RIT's most unique educational components and will offer prospective students a summer undergraduate research experience that will enrich their educational experience, will connect them to faculty mentors and student peers, and will help them bond with the RIT community. Such a program will also increase the yield of talented mathematics and science freshmen accepting RIT's offer of admission and the number of students interested in research in mathematics and sciences.

Undergraduate Research and Experiential Learning: The College of Science students do more than learn. They learn to apply the knowledge and skills acquired in their courses through experiential education. Working closely with faculty on their nationally funded scholarly research, students have been engaged in publishable research initiatives and have presented their work at national and international conferences. The College of Science seeks to increase the opportunities it provides for its undergraduate students who are interested in participating in Undergraduate Research (innovation and creativity). Such a program will attract and retain students in STEM fields which is crucial to the country's ability to innovate and remain competitive globally, and it will engage them in research that will reshape their educational experience. Undergraduate research has the potential to radically change the understanding of important science and mathematics concepts and to add new knowledge to the field. There is a strong correlation between undergraduate research opportunities and persistence in science-related programs of study and related careers. Those

undergraduate students who are working with faculty on research are more likely to advance in their studies. To be able to provide meaningful research opportunities to undergraduate students during the summer months, through undergraduate research fellowships, is a fundamental differentiating element of RIT's College of Science programs. This research-intensive experience changes the learning environment from one of classroom lecture to real experience, and it prepares students for the rigor of graduate study and to work in industry and government.

Science Exploration: The success of an interdisciplinary effort in the STEM disciplines depends critically on how well the members of the team interact and work together towards a common goal. This complex set of skills demands teamwork, flexibility, organizational talent, and technical depth. These are best acquired through personal experience rather than through the classic instructional paradigm. A successful example of such a program has been implemented within the College of Science in the Center for Imaging Science's Innovative Freshman Experience. In this program, students from within the discipline are immersed into an interdisciplinary, goal-oriented effort in order to design and build a specific imaging device. The program is hands on and gives students ownership of the organizational structure, project goals, milestones, peer evaluation, the selection of approaches, and the final implementation. The course receives strong endorsements from the students each term. Moreover, our experience within COS demonstrates that there is persistent value in implementing such a program at the onset of the student's freshman year. The students develop a sense of accomplishment, teamwork and ownership early in their academic career. As evidence of this continued commitment, students within the CIS program often continue to work on the project during the summer after the course has finished, and often request to participate in the subsequent year's project.

The extension of this model to the COS requires two additional elements not required for the Imaging Science program: a group of students with diverse interests and backgrounds in the various STEM disciplines, and a project that spans all of the disciplines within COS. The COS Science Exploration Program offers students a promising new way to explore various disciplines in a frequent and personal fashion throughout their first year at RIT. Project concepts are currently being collected and will be reviewed by the COS department heads for final selection. This program will act as a template for all of the COS disciplines, as we plan to implement the interdisciplinary approach broadly throughout COS in subsequent years.

Interdisciplinary Science: The knowledge and training the College of Science offers to all of its students should strive to remain a step ahead of the current technological needs of today's dynamic job market that is looking for high-skilled workers. The

last several decades of the 20th century were marked by remarkable progress in the life sciences with gains that were previously unimaginable; the discovery of the double helix structure of DNA in 1952 following by the first sequencing of a strand of DNA in 1977, and culminating in the complete mapping if the human genome in 2003. This rapid progress reflects the enormous power that results from an interdisciplinary and multidisciplinary approach to science, with mathematics, physics, engineering, imaging, computing, and biology applied to understanding of life at the macroscopic, cellular, molecular, and atomic level. It has become apparent that solutions to many complex problems in the 21st Century require the partnership of many science disciplines. Such partnerships are becoming a necessity and not a choice. We cannot make the mistake of being seduced into believing that interdisciplinary research by definition eliminates the need for research in the traditional disciplines. Mathematics shows, perhaps more than any subject the necessity to use the classic building blocks to foster a wide raft of interdisciplinary research. Developing an integrated science degree program with curricula, which cut across disciplines and boundaries, and finding ways that will address intellectual property in order to bring discoveries to market will prepare graduates to become vital members of interdisciplinary teams that will solve real-world problems from a wide range of fields. In addition to the single subject programs, RIT must focus on promoting graduates as part of a STEM blend.

A New Ph.D. Program Modeling and Computation: Current problems in science and technology are of such size and complexity that their solution requires sophisticated techniques drawn from computational and applied mathematics. Modeling and Computation deal with the formulation of mathematical models that describe real world systems and the analysis of such models using analytical and computational techniques. In our modern era of deep specialization and rapid advancement in science, technology, and engineering, the interactions between diverse scientific disciplines has elevated modeling and computational to a critical role. Mathematics used together with high performance computing can help model and simulate very complex real systems and solve and interpret difficult equations that govern complex mechanisms inherent in many fields, such as defense and homeland security, the biological sciences, neuroscience, medical sciences, materials, computational physics and astrophysics, social sciences, economics and finance. Mathematical research and development of new theories and analytical techniques are essential in advancing science, engineering, and technology. The development of mathematical models of cancer growth is a modern example of the scientific method being accomplished by applied and computational mathematicians working closely with biologists and medical professionals. Problems are encountered at the boundaries of disciplines, and they are increasingly complex, as we come to learn more about each discipline and how disciplines interconnect. There is demand in defense and corporate research and development laboratories for scientists who have a deep and broad understanding of how to solve complex problems and how to interpret massively produced data

sets and how to develop secure data transmission systems. Such interpretations are critical in crafting value propositions for new products and services and for policy decisions writers and senior level management.

The proposed Ph.D. program will be a program with its own merit. It will be interdisciplinary and multidisciplinary in nature encompassing the physical, life, medical, computational, social, and management sciences. Graduates of this program will become vital members of interdisciplinary teams that will model and simulate complex systems and solve real-world problems from a wide range of fields. While other scientific programs are already training researchers about the problems that need to be solved, it is the applied and computational mathematicians who have the opportunity to educate graduates about the world of possible tools that can solve classes of problems.

Biological and Environmental Sciences: We live in an era where the greatest advances in science are occurring in the life sciences at the interface between mathematics, physics, chemistry, computer science, imaging science, engineering, and biology. It is imperative, therefore, that we invest in our life sciences programs. The School of Life Sciences in the College of Science is at the forefront of dealing with the increasingly complex issues facing our country and our planet. In this 21st Century, our understanding of the fundamental nature of life, biological processes, and their relationship to health and disease is growing at a very fast rate. By educating our students to become science-literate professionals, leaders, and excellent scientists the COS will prepare its graduates to take up the challenges of the future in environmental, biological, biotechnology, and life science-related fields. In addition to the core science coursework that is the heart of the academic environment, the College will maintain close collaborative connections with many non-science programs such as the Environmental Studies concentration in the Bachelor of Science in Public Policy degree and the Golisano Institute of Sustainability. By merging the knowledge of faculty in these programs, the College of Science will be able to prepare students for highly relevant fields, whether they choose a career-preparation path or advanced study.

Materials Science: RIT and the College of Science will invest in invigorating its materials science academic and research programs. By investing in its materials science programs, RIT can be part of the 21st century advances in materials science that might make our era the Biomaterials, Nanomaterials, and Optical Materials Age; an Age that will be the result of the many advances in materials science, similar to the ones that have contributed to the evolution of the Stone Age to the Bronze Age, of the Bronze Age to the Iron Age, and to the development of the semiconductor that produced the modern era of information technology often called the Silicon Age. Almost everything we come into contact in a modern setting is a manufactured object, from our clothes to our cell phone

to our vehicle, all appliances and equipment at home and at work, our computer, the CDs we listen, the processing chips used in PCs, medical devices that keep us alive, and many other objects that have become necessary in our lives. All these objects are made from materials such as ceramics, metals, polymers, semiconductors and composites. Materials science is the study of materials structures, properties of materials, effect of structure and chemistry on properties of materials, and the understanding of how materials are put together, how they can be used, how they can be changed and made better to create completely new kinds of materials. Materials science is an interdisciplinary field that encompasses various areas of science and engineering and investigates the relationship between the structure of materials and their microscopic properties at the atomic or molecular levels. Through the many technological advances over the last several decades materials science has evolved rapidly enabling scientists and engineers to improve products and to develop technologies that will enhance every aspect of our lives. Materials science has become a recognized key discipline necessary in the competitive global economy and as one of the technical disciplines with exciting career opportunities. Materials scientists can drive the creation of new products or new industries and improve currently used materials. Materials scientists are on the forefront of materials design, nanoscience and nanotechnology, cost-benefit tradeoffs in industrial production of materials, processing techniques (such as glassblowing, crystal growth, casting, etc.), characterization techniques, (such as x-ray diffraction, small-angle x-ray scattering, electron microscopy, etc.), and of the revolution in biotechnology by developing materials for the components of heart valves, artificial joints, and other replacement body parts. Materials scientists are also on the forefront of the so called *smart materials.* These are materials that are designed to have properties that can change when external stimuli, such as temperature, moisture, electric field, etc., are applied to them. There are a number of types of smart materials that show a tremendous potential especially in medical and dental applications, such as shape-memory alloys to correct misplaced teeth or compressible stents that reform to their intended shape upon contact with body heat once inserted into an artery.

STEM Education Center: The COS Science and Mathematics Education Research Collaborative (SMERC) will evolve into an Institute-wide center, promoting innovation in STEM education through discipline-based education research, student-centered curricular reform, rigorous assessment, and focused professional development. The Center will have an active critical mass of faculty in physics, biology, chemistry, mathematics, and other STEM education research areas, working together in an interdisciplinary collaboration that support efforts in multiple Colleges. The new Center will facilitate change in secondary (K-12) and post-secondary STEM education by:

- Conducting rigorous discipline-based education research, involving undergraduate and graduate students, which will study issues involving postsecondary student performance within a scientific discipline.
- Taking an active role in preparing the next generation of STEM teachers through undergraduate and graduate student education, including targeted programs (e.g. in collaboration with Nazareth College) to attract STEM majors to careers in secondary education and to streamline the process of teacher certification in mathematics and scientific disciplines.
- Encouraging and supporting faculty efforts on pedagogical scholarship, assisting with evaluation and assessment efforts, and providing resources in an environment supportive of innovation in the classroom.

Modern Optics: The field of *Modern Optics*, in a broad sense, permeates virtually every sub-discipline of science, technology, and engineering. The roots of this field at a fundamental level, along with the most innovative developments that arise in the field, are entrenched in physics, mathematics, and imaging science, with cross-disciplinary impact into the arenas of the astronomical, materials, biological, chemical, and color sciences. Research endeavors in modern optics (and photonics) seek to extend our understanding of the wave and quantum properties of light, and to fully leverage these properties to technological advantage. On a traditional level, one ordinarily thinks of *optics* in the context of the visible, infrared, and ultraviolet regimes of the electromagnetic spectrum. However, that is unnecessarily restrictive. For example, the field also extends into such important areas as *x-ray optics* and *neutron optics*.

There currently exist a number of pockets of impressive optics and photonics work being done within a number of colleges at RIT. In addition to the optics activity currently housed within COS, there are key faculty within our college who contribute in a major way to optics-related activity in connection with the Microsystems Engineering Program, the Materials Science and Engineering Program, the Astrophysical Sciences and Technology Program, and the Golisano Institute for Sustainability. Future targeted hiring in COS to support such activity within the college, as well as to develop fruitful cross-college optics collaborations, will ultimately be the biggest determining factor in driving *Modern Optics* as one of the signature components of the research and academic portfolios associated with the STEM disciplines at RIT.

Summer Math Institute (SMI): Our Summer Math Institute features programs such as *a Summer Teachers' Workshops* and *Girls Math and Science Workshops:*

Summer Teachers' Workshops*:* The idea of the SMI Teachers' Workshop is simple and powerful: High school mathematics teachers should keep abreast of how the mathematics they teach is used by professionals, and of how college curricula build on high school mathematics. This idea came out of high school mathematics teachers who we consulted four years ago when we designed the SMI Teachers' Workshop. Since we are academic mathematicians and college teachers, we decided that the best contribution we could make would be to ask high school teachers what sort of program we could develop that would best help them. We asked teachers and administrators throughout Monroe County for their advice on this matter before our first workshop, and we periodically meet with them for more advice. They have told us that we could best help by running workshops that answer these questions: What mathematics should high school graduates know to succeed in college? What mathematics should college graduates know to succeed professionally? How can high school teachers help their students better learn this mathematics? Our Teachers' Workshops answer these questions.

The annual workshop runs for a week at the end of June at RIT. Every year 50 high school math teachers attend. Most of them are from Monroe County, but each year a greater percentage comes from elsewhere; now, about 20% of the teachers are from outside the Rochester area. We've had participants from Florida, Pennsylvania, Ohio, Virginia, South Carolina, and from across New York State, from Buffalo to New York City. The workshop features four types of sessions:

- Experienced professionals speaking on mathematics in their professions
- Recent graduates or co-op students speaking of their experiences as math professionals
- College professors discussing the mathematical foundations of curricula in their fields
- Panels and other discussions of educational, cultural, and technical issues

We are particularly proud that among the experienced professionals we always feature an artist.

Girls Math Workshop: This summer workshop is designed to provide middle school girls with a variety of engaging science and mathematics experiences that will help them gain appreciation and understanding of the importance of science and mathematics in informing every aspect of daily lives. The workshop will feature sessions that will focus on helping middle school girls to:

- build their confidence and to be mentored by successful professionals in the sciences and mathematics disciplines;
- see the beauty of science and mathematics - subjects that are often portrayed as not appropriate for girls;
- see a variety of applications and career opportunities in the STEM disciplines where science and mathematics play a key role.

We believe we need to play a role in helping to build knowledge and confidence in science and mathematics ability in girls early in their education path. This is important as studies have shown that girls' interest in science and mathematics drops as they grow older. It is also important to help girls understand that mathematics and science are at the heart of many of the careers they might choose.

Women in Science (WISe) Program: The College of Science is at the forefront of research and outreach initiatives designed to enhance female participation in science and mathematical sciences disciplines and to increase overall diversity in all levels of science and mathematics education. The systemic underrepresentation of women and minorities in numerous STEM disciplines in the U.S. hinders our ability to develop new ideas and new ways of addressing scientific and technological problems. Diversity in the STEM workforce and its impact on society is an increasingly important issue for educators, business leaders and policy makers, particularly as the U.S. faces increasing pressure from our international competitors. According to the U.S. Department of Commerce, women hold only 24 percent of the Science, Technology, Engineering and Mathematics (STEM) jobs in the United States despite the fact that 48 percent of all jobs are held by women. Similarly, women receive only 20 percent of bachelor's degrees in physics, engineering and computer science awarded by U.S. universities. The College of Science WISe program seeks to engage women in the sciences and mathematics by offering information, equity and collaboration opportunities. The goals of the WISe program are to:

- Increase the knowledge of possibilities for woman in all areas of Science and Mathematical Sciences.
- Increase female student enrollments in our Sciences and Mathematical Sciences programs through recruitment, retention and alumni efforts.
- Create networking opportunities for woman in the College of Science.
- Increase female participation in Science and Mathematical Sciences at all levels.
- Increase awareness of issues that impede female students and faculty to achieve their full potential.

APPENDIX – B: THE COLLEGE OF SCIENCE STRUCTURE

Preamble

The College of Science is comprised of five academic units and ten research centers and laboratories. The academic units house disciplinary and multidisciplinary academic programs. The research centers and laboratories house multi-faculty interdisciplinary and multidisciplinary collaborative research groups.

The purpose of this document is to outline the College of Science structure, its organization, and how the various academic units and research centers and laboratories will be administered.

Definition

A School in the College of Science is an academic unit that offers multiple undergraduate and/or graduate programs that span more than one discipline and sub discipline. The College of Science is one of RIT's nine colleges and it is comprised of four Schools and the Chester F. Carlson Center for Imaging Science which functions as a school. In particular, whenever a school is referenced in this document, such a reference shall implicitly include the Chester F. Carlson Center for Imaging Science.

Mission

The mission of each School is to contribute to the overall mission of the College of Science by effectively delivering curricula to undergraduate and graduate students who major in science and mathematics, by recruiting and retaining our majors, by delivering the required scientific and mathematical underpinnings for most of the programs offered at RIT, by recommending candidates for degrees, and by supporting or providing nationally and internationally recognized innovative research programs. All Schools are accountable for contributing to and executing the mission of the College of Science.

Goals and Objectives

The Goals and Objectives of each School will be determined annually and should be aligned with the Goals and Objectives of the College. Each School will be evaluated on its achievement of these Goals and Objectives annually.

The Structure

The College of Science is comprised of the following Schools, Academic Units, programs, and research centers and laboratories:

A. **Schools and Programs:**

- The Thomas H. Gosnell School of Life Sciences
  - Biology (BS)
  - Bioinformatics (BS, BS/MS, MS)
  - Biotechnology and Molecular Bioscience (BS)
  - Biotechnology and Molecular Bioscience (BS) with Bioinformatics Option
  - Environmental Science (BS, BS/MS, MS)
  - Biology with MBA
  - Biotechnology with MBA

- The School of Mathematical Sciences (SMS)
  - Applied Mathematics (BS, BS/MS)
  - Applied Statistics (BS, BS/MS)
  - Computational Mathematics (BS, BS/MS)
  - Applied and Computational Mathematics (MS)
  - BS in Computational Mathematics/MS in Computer Science
  - BS in Applied Mathematics with MBA
  - BS in Applied Statistics with MBA
  - BS in Applied Statistics/MS in Applied Statistics

- The School of Physics and Astronomy (SoPA)
  - Physics (BS)
  - Astrophysical Sciences and Technology (MS, Ph.D.)

- BS Physics/MS Materials Science and Engineering

❖ The School of Chemistry and Materials Sciences (SCMS)

- Biochemistry (BS)
- Chemistry (BS, MS)
- BS Chemistry/MS Materials Science and Engineering
- MS Materials Science and Engineering

❖ The Chester F. Carlson Center for Imaging Science (CIS)**

- Imaging Science (BS, MS, Ph.D.)
- Color Science (MS, Ph.D.)

❖ Science Exploration Program
This is a program that is housed in the College of Science and not in a particular School. Students in the freshmen year can use this program to help them discover what science and/or mathematics major to choose. The students can take up to a year to explore all our science and mathematics programs while making full progress toward their degree.

** The Chester F. Carlson Center for Imaging Science (CIS) is an academic unit that functions like a school and will be governed by the same principles, which are described below.

B. Current Research Centers and Laboratories:

❖ CACM: Center for Applied and Computational Mathematics
❖ CCRG: Center for Computational Relativity and Gravitation
❖ Center for Materials Science and Engineering. This is a joint center between the College of Science and the Kate Gleason College of Engineering.

- CfD: Center for Detectors
- DIRS: Digital Imaging and Remote Sensing Laboratory
- Insight Lab: Science Education and Outreach
- MCSL: Munsell Color Science Laboratory
- MVRL: Multidisciplinary Vision Research Laboratory
- LAMA: Laboratory for Multiwavelength Astrophysics
- SMERC: Science/Math Educational Research Collaborative

These research centers and laboratories will be governed by the *College of Science Guidelines for Collaborative Research Laboratories, Centers, and Clusters* (http://www.rit.edu/cos/policiesmanual/Section17.pdf) which outline college-wide recommendations for the organization and administration of collaborative research groups.

Overarching Principles

The Schools in the College of Science are governed by the following principles:

- Each School is led by a Head who is appointed by the Dean of the College in consultation with the faculty of the School. The School Head is the chief academic and financial officer of the School and has the responsibility to advocate for the School, to facilitate ongoing success of the School's academic and research programs as well as collaborative programs with other Schools and colleges at RIT, and to manage and balance the School's budget.

- Each School consists of more than one degree programs at the undergraduate and/or graduate level; these programs span more than one discipline and sub discipline.

- The faculty of each School, with the support of the School staff, is responsible for the delivery of the curricula of the School's programs.

- The COS Ph.D. programs retain their autonomy and identity within the school in which they are housed.

- A Graduate Program Director is appointed by the Head of the School with the recommendation of the faculty engaged in the program and must have the credentials to direct the graduate program.

- A Ph.D. Program Director is selected from the faculty engaged in that program. According to the September 28, 2008 Memorandum issued by the Provost (https://www.rit.edu/~w-drupal/sites/rit.edu.provost/files/faculty_and_director_hiring_expectations.pdf), the Provost in consultation with appropriate deans makes the final selection for endowed professorships and directorships of Ph.D. programs. It is expected that an unranked list of at least two names will be submitted to the provost for consideration in these cases. The Ph.D. program directors oversee the budget of the program they direct, if such budget exists.

Faculty Appointments

All faculty members in the College of Science hold academic appointments within one or more of the Schools of the College of Science. Tenured faculty members are tenured in the College. Academic programs and research centers often involve faculty from multiple Schools and, in many cases, multiple RIT colleges. College of Science faculty can participate in more than one academic and research program when possible and appropriate either as *Joint, Program Faculty, or Program Allied Faculty*.

School Faculty

School faculty is a faculty member with primary appointment to a School. School faculty will contribute to at least one of the programs in the School and will vote on all school-wide matters (such as: tenure, promotion, policies and procedures) according to the COS policy on voting.

Joint Appointments

Joint appointments exist in the College of Science where faculty members have academic appointments shared across two or more Schools. Joint appointment faculty are School faculty in the Schools to which they are jointly appointed as defined in their appointment letter. Joint appointment faculty can be also appointed to program faculty as appropriate. Administratively, faculty members with joint appointments report to the Heads of those Schools.

Program Faculty Appointments

Program faculty appointments exist in the College of Science where a school faculty member has an appointment in one or more Schools, and has responsibilities involving one or more academic and research programs that are in another School. *Program faculty* might hold primary appointments in other College of Science Schools or other colleges at RIT. Administratively, *program faculty* report to the Head of the School in which their primary appointment resides.

Program Allied Faculty Appointments
Those faculty members whose primary responsibilities are:

- Advising and supporting MS and Ph.D. students on research grants
- Serving on thesis/dissertation committees

will be referred to as *Program Allied Faculty*.

Research Faculty: Research faculty are faculty who are affiliated with one or more programs. Because research is the primary responsibility of these faculty and they often have little or no service or teaching role their primary involvement with a program may be in supervising student research. Research faculty are not program faculty but may become so if their activities warrant it. Thus, research faculty and program allied faculty can serve on student committees as members or primary advisors and have full voting rights on these thesis and dissertation committees and a responsibility to be familiar with and compliant with all procedures related to students' progress towards degree certification

School faculty, program faculty, program allied faculty, research faculty, and joint appointment faculty are committed to the mission of the Schools, they actively participate in the activities of the Schools, and they share responsibility for the success of the programs in which they participate.

Granting *Program Faculty and Program Allied Faculty* Status

Program Faculty: Faculty members who wish to become *Program Faculty* of a particular program within a School apply to the Head of the School. The Head, with the recommendation of the program faculty, accepts or rejects the application. Faculty who are already *program faculty* do not have to apply. A formal offer letter that states the terms of the appointment is issued to those faculty members

who have been accepted. The letter identifies the scope of the appointment, that is, the program or programs that the faculty member will support. The terms for the *program faculty* include:

- Advising and supporting of MS and Ph.D. students on research grants
- Teaching courses in the programs, when appropriate
- Serving on thesis/dissertation committees
- Serving on committees that are related to graduate student recruiting and admission, retention, curriculum development and delivery, and faculty recruitment for the School programs in which they participate
- Contributing to research programs, and/or offering undergraduate research experiences
- Voting rights. The program faculty will vote on curricular and hiring issues of their program.

Program Allied Faculty: Faculty members who wish to become *Program Allied Faculty* of a particular program within a School apply to the Head of the School. The Head, with the recommendation of the program faculty, accepts or rejects the application. Faculty who are already *Program Allied Faculty* do not have to apply. A formal offer letter that states the terms of the appointment is issued to those faculty members who have been accepted. The letter identifies the scope of the appointment, that is, the program or programs that the faculty member will support. The terms for the *Program Allied Faculty* include:

- Advising and supporting MS and Ph.D. students on research grants
- Serving on thesis/dissertation committees

Program Allied Faculty will have no voting rights.

Program Faculty and Program Allied Faculty appointments will be reviewed every three years by the program faculty who will make recommendation to the Head of the School for continuance of the appointment.

Governing Principles

Joint Appointment Faculty: The following principles govern the *joint appointment faculty:*

- Each joint appointment faculty member meets with the heads of the Schools, that house the academic and research programs in which the faculty is participating, to discuss and negotiate their annual plan of work. For graduate programs, especially the Ph.D. programs, the directors of the programs who are responsible for staffing courses, student advising, and committees

related to the graduate program, should be consulted for input. The plan of work is signed by the heads and the faculty member.

- The heads of the Schools, that house the academic and research programs in which the faculty member is participating, write the faculty member's performance appraisal in collaboration with each other. The performance appraisal is shared and discussed with the faculty member and the heads at a meeting where all parties are present. For the graduate programs, especially the Ph.D. programs, the directors of the programs should be consulted for input when the heads are preparing the performance appraisal. The performance appraisal is signed by the heads and the faculty member.

- Joint appointment faculty members have voting rights on all matters related to the Schools to which they are contributing, as defined in their appointment letter.

- For issues involving College of Science faculty across various schools, oversight rests with the College of Science Dean's Office. The Dean's Office works with the appropriate School heads to resolve problems in a manner that promotes the Schools' and College of Science missions while being fair and equitable to all of the faculty and Schools involved.

Program Faculty and Program Allied Faculty: The following principles govern these faculty*:*

- Each faculty member meets with the Head of the School in which their academic appointment resides to discuss and negotiate their annual plan of work. This should include consideration of work to be done in the School in which the faculty member is a *program faculty or a program allied faculty*. For graduate program faculty, especially the Ph.D. programs, the directors of the programs who are responsible for staffing courses, student advising, and committees related to the graduate program, should be consulted for input. The plan of work is signed by the faculty member and the School Head.

- The Head of the School in which their academic appointment resides writes the faculty member's performance appraisal with full consideration of and input from all academic and research programs in which the faculty member is participating. The performance appraisal is signed by the Head and the faculty member.

- For issues involving College of Science faculty across various Schools, oversight rests with the College of Science Dean's Office. The Dean's Office works with the appropriate School heads to resolve problems in a manner that promotes the Schools' and College of Science missions while being fair and equitable to all of the faculty and schools involved.

- *Program faculty* members have voting rights, as defined in their appointment letter, on matters related to the academic and research programs to which they are contributing. Such matters are:

  - Curriculum development and delivery of courses in the programs to which they are contributing
  - Thesis and dissertation
  - Student recruiting and retention
  - Graduate Student admission and recruiting
  - Faculty recruitment for the School programs in which they participate
  - Advising and supporting of MS and Ph.D. students on research grants

Hiring of Program Faculty

Program faculty will participate in the hiring process, as the School faculty, for hires that will be targeted to contribute to the program to which they are appointed. The creation and hiring of program faculty positions within a School are governed by the following principles:

- The School Head seeks the Dean's permission to fill a position. The approval depends on the availability of funds and space and on the fit of the potential hire to the strategic targeted research areas and teaching needs of the College.
- The hiring process is administered through the associated Schools and follows the normal RIT hiring policies and procedures. The Dean will approve job advertisements, lists of finalists, search criteria, final selection, and offer letters.
- The direct supervisor for each position is determined through the hiring process and will be approved by the Dean.
- Faculty appointments are typically made to schools. The school faculty, therefore, have voting rights for faculty positions in the school. In parallel, the program faculty have voting rights for school faculty who will initially be assigned to their programs. Faculty with *program faculty* appointments are eligible to serve as voting members on faculty search committees of the School and to participate as voting faculty members in the faculty hiring process of the School programs to which they are

appointed. The input from the school and the program faculty go to the Head of the School who makes recommendations on hiring to the Dean.

Annual Report

Each School prepares and publishes an annual report; the School annual reports are used to draft the annual report of the College of Science. These annual reports are due at the end of the summer of each calendar year and are submitted to the Dean's office. Each School report states the mission of the School and provides a summary of the School's accomplishments towards meeting the Goals and Objectives of the School and the College and highlights faculty, staff, and student successes.

External Advisory Board

The College of Science Schools are not required, but are encouraged, to have an external advisory board. The College of Science Advisory Board, which is made up of academics, scientists, successful alumni, and industrial/governmental partners, provides advice and guidance to assure that the College's undergraduate and graduate programs remain relevant and timely and advises and assists the College and its Schools in promoting excellence in science and mathematics education, in enhancing the reputation of the College and in building relationships with the larger community.

APPENDIX – C: GUIDELINES FOR COLLABORATIVE RESEARCH LABORATORIES, CENTERS, AND CLUSTERS

Overview

The College of Science (COS) strongly supports existing collaborative research laboratories and the evolution and development of new laboratories, centers, and research clusters. The purpose of this document is to outline college-wide recommendations for the organization and administration of multi-faculty collaborative research groups. This document supplements existing RIT and COS policies and procedures and does not supersede them. While these recommendations do not specifically apply to individual-faculty research labs, they might be helpful for individuals in planning future research activities and facilities.

Definition

Various names are used for multi-faculty collaborative research activities. For example, COS groups use the designations "Laboratory", "Center", "Group", and "Collaborative." There is no intention to require any existing research group to change their name. For new research groups within COS, the term "Laboratory" might be the preferred designation, but other names can be used with careful consideration.

Collaborative research laboratories within COS consist of multiple faculty, often across multiple schools or colleges, working actively together with a common research mission. Examples of COS research laboratories include:

CACM: *Center for Applied and Computational Mathematics*
CCRG: *Center for Computational Relativity and Gravitation*
CfD: *Center for Detectors*
DIRS: *Digital Imaging and Remote Sensing Laboratory*
Insight Lab: *Science Education and Outreach*
LAMA: *Laboratory for Multiwavelength Astrophysics*
MCSL: *Munsell Color Science Laboratory*
MVRL: *Multidisciplinary Vision Research Laboratory*
SMERC: *Science/Math Educational Research Collaborative.*

The designation "Center" has many disparate meanings across the RIT campus and the Provost has developed a separate policy for the creation of Academic Centers at RIT (*Protocols for Academic Centers*, RIT Policy No. D1.2). Such Centers are designated by the Provost. While it is possible for a research laboratory within COS to also seek designation as an RIT Academic Center, such a designation is not necessary, or desirable, in many cases.

The Office of the Vice President for Research (OVPR) currently has a separate designation for "F&A Return Designated Research Centers/Laboratories" that is presently based on annual expenditures on external grants and contracts. This OVPR designation exists to provide additional F&A return to large research groups to assist with administrative and other joint costs beyond those that can be covered by the home school. COS research laboratories are not required to have this OVPR designation, but those who meet the qualifications should explore the designation to obtain additional F&A return to the laboratory.

Mission

Each research laboratory/center shall have a clearly defined, and published, mission to guide its activities. Laboratories are also encouraged to develop strategic plans to assure that all associated faculty are working toward common goals and objectives. Such plans need not be lengthy or formal.

Membership

Each research laboratory shall come to a consensus on a procedure by which faculty become "members" of the laboratory group. Faculty participation should be as inclusive as possible. However, all faculty involved with a laboratory should be committed to the mission of the laboratory, actively participate in the day-to-day activities of the laboratory, and share responsibility for the success of the laboratory. Faculty wishing to become actively involved with an existing laboratory should consult with the current laboratory/center director and appropriate school head(s) to determine the best path to follow. No formal voting procedures, limited membership durations, or other requirements are necessary. Laboratories are encouraged to work by consensus of the active faculty to the degree possible.

Faculty can be "members" of more than one research laboratory within the college, or across RIT, as appropriate and as time allows them to fully participate in the activities of all the laboratories.

Any professional or administrative staff, post-doctoral researchers, or students who are funded by an associated faculty member's external grants and contracts (or are otherwise supervised by an associated faculty member) are automatically considered "members" of the same laboratory and should not be subjected to any additional membership evaluation or requirements.

Oversight

All COS faculty hold academic appointments within one of the COS schools. (Some joint appointments exist in which faculty are appointed to two schools.) Research laboratories and centers often involve faculty from multiple schools and, in many cases, multiple RIT colleges. Administratively, COS faculty report to the COS school heads who endeavor to resolve issues and provide resources for their faculty while valuing the research collaborations and activities with other faculty outside their school.

For issues involving multiple COS faculty across various schools, oversight rests with the COS Dean's Office through the Associate Dean of Research and Graduate Education. The Dean's Office will work with the appropriate school heads to resolve problems in a manner that promotes the laboratory's research mission while being fair and equitable to all of the faculty and schools involved. While the laboratory faculty and directors do not directly report to the COS Dean's Office, they are accountable to the COS Dean's Office in that they are often responsible for activities, personnel, and resources that cross school boundaries.
In some cases, issues involving research laboratories impact multiple colleges. In such situations the COS Dean will work with other Deans (and the Vice President for Research and/or Provost as appropriate) to create solutions supportive of continuing and expanding research activities.

Leadership

The active faculty within a research laboratory/center shall determine a procedure to select a director and define a term of service for the director. This procedure should function via consensus of the associated faculty to the degree possible. Every research laboratory/center must have an identifiable director to facilitate administration, publicity, joint funding, and other group issues.

Since the laboratory/center director must work closely and collaboratively with the associated school head(s), any changes in procedures for selection of the director, as well as any desired changes in the laboratory directorship should be reviewed with the school head(s).

In some cases a laboratory might be best served by sharing leadership responsibilities among more than one faculty member. If a group feels this is the best approach for their particular circumstances, then they might consider it in consultation with their school head(s).

The COS Associate Dean of Research and Graduate Education also provides guidance, as needed, on any issues related to the definition and selection of laboratory/center leadership.

COS Advocacy

It is the responsibility of the COS Associate Dean of Research and Graduate Education to facilitate the creation and growth of new research laboratories within the college as well as to assist with the perpetuation and ongoing success of established laboratories. As

such, the Associate Dean of Research and Graduate Education will provide mentoring and other requested guidance to faculty wishing to establish or enhance a laboratory and will meet occasionally with lab directors to discuss common issues and facilitate exchange of ideas. The Associate Dean of Research and Graduate Education will organize an annual research symposium for COS faculty and staff at which each laboratory will present an update of accomplishments over the preceding year. In addition, the Associate Dean of Research and Graduate Education will assure that each laboratory is promoted appropriately on the COS website and in other COS publications.

COS Administrative Advisory Board

In the case that conflicts, or other issues, arise that cannot be resolved by consensus of the participating faculty, the laboratory/center director should first consult with the associated school heads to seek a solution to the problem. If the laboratory/center director and school heads cannot reach resolution, they should next consult with the Dean's Office through the Associate Dean of Research and Graduate Education.

In the event that the issue cannot be resolved through guidance of the Dean's Office, then a COS Administrative Advisory Board for the laboratory will be convened to determine a resolution. The COS Administrative Advisory Board will be made up of the Dean, the Associate Dean of Research and Graduate Education, the Associate Dean for Undergraduate Education, School Heads associated with the research laboratory, and others with appropriate insight at the request of the Dean. The laboratory's COS Administrative Advisory Board, will meet as needed to determine a solution and the decision will be communicated to the laboratory's director and academic unit head by the Dean.

Any issues that cross college boundaries will be addressed by the appropriate Deans in conjunction with the Provost and/or Vice President for Research.

Funding

Research laboratories do not directly receive operating funds through the RIT budget (beyond any space, support, and faculty salaries provided by the schools and college). The laboratory's research activities are funded by the external grants, contracts, and gifts obtained by the faculty associated with the laboratory. Generally these funds are administered using the same procedures as any other grants, contracts, or gifts to individual faculty members.

It is often the case that a laboratory will have additional joint funding. Such funds might come from group grants or contracts, gifts, or donations to the laboratory as a whole (cash and in kind), endowments, or other sources. Such joint laboratory funds are administered by the laboratory director or their designee.

OVPR F&A Return

Some research laboratories might qualify for additional group F&A return from the OVPR. This question is independent from the establishment and continuation of a COS research laboratory. Laboratory directors are encouraged to explore this possibility with the OVPR. See <*http://www.rit.edu/research/srs/grantsmgmt/Recovered_FA_Return.htm*> for details.

Hiring

The creation and filling of soft-money staff positions within a laboratory are normally administered through the associated schools and should follow the normal policies and procedures for that school (including the determination that sufficient funds and space are available). The direct supervisor for each position is also determined through this process. In some cases the supervisor will be an associated faculty member, while in other cases it might be the laboratory director or school head.

Space

The allocation and re-allocation of space to and within a research laboratory is made using the normal COS and RIT policies and procedures. Laboratory directors and associated faculty should work with their school heads and the COS Space Committee (as necessary) to identify appropriate and available space for the laboratory's activities.

All COS space is administered by the Dean with guidance from the COS Space Committee. To the degree possible, all reasonable efforts will be made to consolidate research laboratories and their associated faculty and staff into contiguous space as desired. Any costs for relocation or renovation of assigned space are the responsibility of the research laboratory and/or the school.

Space questions that cross college boundaries are addressed by the COS Dean in conjunction with other appropriate Deans and others as necessary.

Annual Report

Each COS research laboratory should prepare and publish an annual report. The timing of the annual report each year is at the discretion of the laboratory (Some prefer reports at the end of the academic year, while others find it easier to publish on a calendar year basis.). The annual report should, as a minimum, state the mission of the laboratory and provide a summary of faculty, staff, and student activities, an overview of research projects, and a list of publications and presentations. The report should be published on line at the laboratory's website. Creation and distribution of printed copies is at the discretion of the laboratory and subject to available laboratory funding. New reports should be circulated (or announced) to the school head, Dean and Associate Deans, Provost, President, laboratory sponsors, and alumni and other friends of the laboratory. The scope and magnitude of the annual report is determined by the laboratory director and associated faculty.

Web Page

All laboratories should have a distinct internet presence that can be directly associated with the laboratory and linked to through school and college web pages. These websites should include, as a minimum, a statement of the laboratory's mission, a listing of associated faculty, staff, and students, a listing of laboratory publications, links to associated academic programs, and the laboratory's annual reports.

External Advisory Board

COS research laboratories are not required to have an external advisory board. However such boards, made up of academics and industrial/governmental partners interested in the activities of the laboratory have proven valuable for advice on research directions, input on topics for student research projects, financial support of the laboratory's activities, support on proposals, placement of graduates, assistance in staff and student recruiting, and other general guidance. Research laboratories are encouraged to consider the formation of an external advisory board as appropriate.