

# Center for Interdisciplinary Biomolecular Studies (CIBS)

## A proposal from my experience in the Ignatian Mentoring Program

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The Center for Interdisciplinary Biomolecular Studies (CIBS) is a collaborative effort by Xavier University faculty who study biologically related phenomena from a molecular perspective. By combining our individual expertise, we gain new insights how nature works. We invite students to join us in our studies so they can see the value of cross-disciplinary and interdisciplinary approaches to important scientific questions. We take advantage of our Jesuit heritage to think carefully about the ethical and moral implications of our studies for each of us individually, and for our society.

CIBS will formalize ongoing cross-departmental interactions between faculty in Biology, Chemistry, and Physics. CIBS will also be open to members of other departments with interests in studying biological problems at a molecular level, broadly defined. Formalizing these interactions into a Center will provide a focal point for prospective students, donors, and funding agencies. This Center will also emphasize to our students the interdisciplinary nature of current scientific research and the benefits of cross-departmental collaborations. Having this Center will provide a more formal structure for interactions and collaborations between the faculty in the associated departments.

Membership in the Center will include faculty members from traditional departments, such as Biology, Chemistry, and Physics whose research interests cross traditional departmental lines. Members of other departments will also be welcome if their interests align with the Center, broadly speaking.

The Center will be largely virtual in nature, however, shared space in Logan 6, 7, 102 and Lindner 2 will provide a visual presence and a place for shared equipment and interactions between students and faculty within the Center. A future building would provide additional research space and opportunities for further collaboration.

As part of the Center, and in support of the Jesuit Catholic nature of Xavier University, we will develop a training program in research ethics for students associated with CIBS. This training will include a seminar course focused on the ethical conduct of research. This course will teach students about the proper conduct of research, consistent with training guidelines specified by the National Science Foundation (NSF), as well as the ethics of the types of research that can be conducted and the methods used for those studies. Students in this training program will include a chapter in their thesis or senior project dedicated to the ethical conduct of research. Upon successful completion of the training program, students will have completed the Responsible Conduct of Research (RCR) training required by federal funding agencies, such as NSF, and may be granted a certificate of training in research ethics.

### **Faculty Involvement**

All faculty members at Xavier University are welcome to be a part of CIBS if they have interests that broadly involve the study of biological questions at the molecular level. These interests could range from direct experimental study of these questions to a study of the ethical, moral or societal

implications of biomolecular research. It is expected that the majority of the faculty in CIBS would be from Biology, Chemistry and Physics, but faculty from other departments would also be welcome. As members of the Center, faculty would be asked to contribute to the training of students through mentored research projects, as thesis advisors for students and through courses offered within the Center. Additionally, faculty would be expected to interact and collaborate with each other (formally and informally) to enhance the interdisciplinary aspect of the Center.

### **Student Involvement**

Students from all majors would be welcome to be involved with CIBS, however the majority of the students would likely have majors associated with the departments of Biology, Chemistry or Physics. In the Spring of their Sophomore year, students will be invited to apply to join CIBS. Their application will include:

1. A 1-page essay of what interests them about the center and what they hope to get out of being a part of this center,
2. Their academic transcripts,
3. The name of a CIBS faculty member who will support their joining the Center.

In their Junior year, as members of CIBS, students will take a 1-unit seminar course on research ethics (described below). In addition, students will conduct mentored research with a faculty member who is part of CIBS. Students will submit a thesis based on their research to their home department. This thesis will include a chapter in which the students reflect on the ethical and moral aspects of their research project.

### **Alignment with the Gifts of our Ignatian Heritage**

As suggested by Self-Evaluation Instrument for Jesuit Colleges and Universities published by the Association of Jesuit Colleges and Universities, Centers at Xavier University should have a focus on the Jesuit, Catholic values of the Society of Jesus. CIBS aligns very well with Ignatian values and the Gifts of our Ignatian Heritage, as described by the Center for Mission and Integrity.

### **Finding God in All Things**

One of the main goals of CIBS is to provide a space where the fields of Physics, Chemistry and Biology, as well as other related fields, can work together to understand and discover the beauty and majesty of God's created world. By studying our physical world, we uncover God's design in the World, which leads us to Reverence and Devotion.

### **Cura Personalis**

The idea of Cura Personalis asks us to care for the whole student, rather than focusing solely on that student's academic training. The integrated approach to science and the emphasis on ethical research provide students with an education for their heart and soul, as well as their mind. Additionally, a Center that integrates different scientific disciplines encourages us to look at scientific questions from different angles. A particular question may be addressable using techniques of Chemistry alone, but may be answered more completely using approaches from Biology and Physics as well.

## **Magis**

The concept of Magis invites us to do everything with excellence for God's greater glory. Following that idea, our research should be carried out with excellence, in an ethical manner, and taking into account the impact of our research on society. The ethical training within CIBS will teach students proper research practices and instill in them strong research ethics.

## **Service Rooted in Justice and Love**

This gift of our Ignatian Heritage asks us to keep the well-being of our neighbors in mind as we live our lives. An aspect of the ethical training within CIBS will guide students to keep the greater society in mind while carrying out their research. Faculty within CIBS will model this as they plan research projects. This aspect of Ignatian Heritage will impact the types of research project undertaken, as well as the way they are carried out.

## **Women and Men for Others/Whole persons of Solidarity for the Real World**

Cross-disciplinary research and collaborative research invites students and faculty to learn from each other. By having Chemists, Biologists and Physicists working side-by-side, each will learn from the other's specialty. Additionally, our students will be able to see more clearly how concepts and ideas from one discipline overlap with concepts and ideas in the other disciplines. This insight will help our students better integrate information from different disciplines.

## **Discernment and Reflection**

The processes of Discernment and Reflection will help the members of CIBS (students and faculty) to evaluate how our teaching and research impacts our students, our society and our world. Having the disciplines of Reflection and Discernment readily available keeps the other Ignatian Gifts in mind. When ethical questions about areas of research arise, these Gifts provide a way to evaluate best courses of action.

## **Research Ethics Seminar**

### *Course Description*

This course will be a Junior level course for students associated with the Center for Interdisciplinary Biomolecular Studies (CIBS). The goal of this course is to provide students with an ethical foundation for conducting research. The course will be broken up into 3 modules. The first module will cover the Responsible Conduct of Research (RCR) training as required by the National Science Foundation (NSF). The second module will be a reflection on Ignatian principles that further inform ethical conduct of research. The final module will examine specific case studies to which the principles of the previous modules can be applied. As the students go through each module, we will spend significant class time reflecting on specific examples and situations where ethical conduct may not be obvious. We will use Ignatian principles to justify and emphasize responsible and ethical research practices. As we discuss specific case studies, students will see how the guidelines and principles of the previous modules play out in practice. These case studies will include biomedical-types of ethical questions as well as situations where social justice and care for the environment should be considered.

This course will be lead by an instructor associated with CIBS but supplemented by guest speakers with expertise in specific topics, such as Ignatian ethics or specific scientific studies. These guest speakers may come from within the Xavier community or from outside.

Students will complete the NSF RCR online training programs provided by CITI program at the University of Miami for:

- 1) Physical Science or Biomedical research (depending on their specific interests),
- 2) Human Subjects training for research with data or lab specimens only,
- 3) Conflicts of Interest

While taking this course, students will also write three reflection papers relating to each module. The first reflection paper will discuss the NSF RCR guidelines. The second paper will reflect on Ignatian principles, in general. For the final paper, students will choose their own case study and apply the guidelines and principles discussed earlier to their specific example.

A final aspect of the course, in the context of CIBS, will be for each student to include a chapter in their senior thesis or project that has a discussion of the ethical and moral aspects of their senior research. This discussion could be anything from a discussion of the greater societal implications of their research, to how they minimized the environmental impact of their research by applying principles of green chemistry to their experiments. The scope of this discussion will be decided between the student and their research advisor.

### **Ignatian Pedagogy**

This research ethics course uses many aspects of Ignatian pedagogy in its design. The course has specific, structured materials that teach students the basics of Responsible Conduct of Research and Ignatian Values. At the same time, this course is flexible and adaptable to the needs and interests of the students with respect to the specific topics addressed in the last part of the course. Individual instructors will choose specific case studies suited to their expertise and the interests of the particular students in that section of the course.

Class schedule for Research Ethics Seminar

Week	Discussion Topic	Do before class	Assignments due
1	Introduction and Course overview		
2	RCR Discussion: Data Management, Authorship, Conflicts of Interest	Complete CITI modules on Data Management, Authorship and Conflicts of Interest	CITI Modules
3	RCR Discussion: Research Misconduct	Complete CITI module on Research Misconduct, Read assigned papers	CITI Modules
4	RCR Discussion: Mentoring, Peer Review, Collaborative Research	Complete CITI modules on Mentoring, Peer Review and Collaborative Research	CITI Modules
5	RCR Discussion: Animal Subjects and Human Subjects	Complete CITI modules on Animal and Human subjects, Belmont Report and IRB Process	CITI Modules
6	Discussion of Ignatian Ethical Principles – Solidarity and Promotion of Justice	Complete assigned readings	Reflection Paper: Responsible conduct of Research
7	Ignatian Ethical Principles – Magis, Finding God in All things, Cura Personalis	Complete assigned readings	
8	Ignatian Ethical Principles – Reflection, Discernment, Mission	Complete assigned readings	
9	Topics: CRISPR/Cas 9 overview	Assigned readings	
10	CRISPR/Cas 9 discussion	Assigned readings	Reflection Paper: Ignatian Ethical Principles
11	Topics: BioFuels/Global Warming overview	Assigned readings	
12	BioFuels/Global Warming discussion	Assigned readings	
13	Topics: Genetically Modified Organisms Overview	Assigned readings	
14	Genetically Modified Organisms Discussion	Assigned readings	
15	Topics: Dual Use Technologies Overview	Assigned readings	
16	Wrap up and Summary	Complete course evaluations	Final reflection paper