**BCM GSBS Instruction in the Responsible Conduct of Research**

Training in the Responsible Conduct of Research (RCR) is required of all graduate students at BCM, and the GSBS has established the for-credit courses **RCR-Year 1**, **RCR-Year 2**, **RCR-Year 3** and **RCR-Year 4**. These courses are taught during each of their first four years in graduate school (*e.g.* 2nd year students are required to take RCR-Year 2). Thus, rather than concentrating Responsible Conduct of Research training into the first year of study, the 17 required hours are distributed over the first four years of training which provides an opportunity to reinforce ethics concepts with students on a yearly basis. Students must attend all sessions in order to graduate. Individual lectures or case studies can be, if necessary, made up by attending the corresponding activity in a subsequent offering. The topics covered in these classes include:

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| **No.** | **Year 1: RCR Lectures** | **Lecturer** |
| 1 | **Data Acquisition and Record Keeping Responsibilities:** Responsibilities for record keeping, challenges in keeping accurate and understandable notebooks, ownership of research materials, reagent/data sharing.  | Nelson, D. |
| 2 | **The Mentor/Mentee Relationship:** Selecting a lab and developing a group of mentors, what to look for in the mentor/mentee relationship, keeping on track toward your degree. | Smith, C. |
| 3 | **Responsible Authorship and Publication:** Giving credit when credit is due, when to cite or not, how to use direct quotes, paraphrasing, plagiarism, copyright and copyright permission. | Smith, C. |
| 4 | **The Funding Structure of Science and Public Policy:** Government organizations, private funding sources, applying for fellowships, structure of a grant, grant review system, consequences of fraud in grant applications, science advocacy | Lee, B. |
| 5 | **Resilience:** Coping with academic challenges | Yang, P. |
| 6 | **Rigor and Reproducibility:** Reproducibility, transparency, authentication of key biological and chemical resources, types of replication, blinding and randomization. | Pautler, R. |
| 7 | **Setting Goals for Your Scientific Development and Coping with Challenges:** Career paths for the professional scientist, career decisions (how and when to make them), what to do in your first year to ensure your success, developing curiosity, coursework (what to expect in grad school), lifelong learning, selecting rotations, where to get help and information, thinking now about the next step. | Smith, C.  |
| 8 | **Case Studies on Data Management/Plagiarism:** Record keeping, ownership of research materials, responsible citation, and plagiarism. | Faculty |

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| **No.** | **Year 2: RCR Lectures** | **Lecturer** |
| 1 | **Ethics of Biomedical Studies with Animals:** When can animals be used ethically in research, avoiding unnecessary pain/suffering and euthanasia, appropriate selection of numbers/types of animals in research, animal use approval. | Pereira, F. |
| 2 | **Research misconduct - (NIH b3) Safe Practices in the Laboratory:** Definitions - Falsification, fabrication, plagiarism – whistleblowers, allegations, investigations, penalties. College policy and mechanisms for handling misconduct allegations, federal policies and procedures. (NIH b3) Safe Practices in the Laboratory. | Nelson, D. |
| 3 | **Conflict Resolution:** Potential causes of conflict during graduate training, approaches to conflict resolution. | Yang, P. |
| 4 | **Mentorship:** Meeting with 2nd year students and their mentors, matching expectations between mentor & student, developing communication channels, picking an appropriate thesis topic, the thesis committee as a resource. | Smith, C. |
| 5 | **Case Studies on Scientific Misconduct/Animals:** Scientific misconduct and experiments with animals (small group discussion format with faculty facilitator). | Faculty |

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| **No.** | **Year 3: RCR Lectures** | **Lecturer** |
| 1 | **Authorship/Peer Review - NIH a) Other Conflicts of Interest:** Organizing your paper, preparing manuscripts, who should be an author, responsibilities of an author, manuscript review systems, responsibilities of a reviewer, dealing with criticism - (NIH a) Other Conflicts of Interest - conflicts of interest in the peer review process, financial and professional conflicts and their management. | Smith, C.  |
| 2 | **Collaborative research including collaborations with industry:** The values/responsibilities of collaboration, establishing collaborative relationships, grants, contracts, intellectual property considerations, impact of industry collaborations on publication, thesis submission. | Zechiedrich, E. |
| 3 | **Advanced Topics - Rigor and Reproducibility:** Continuation of discussions on reproducibility, transparency, authentication of key biological and chemical resources, types of replication, blinding and randomization. | Bertuch, A. |
| 4 | **Mentorship:** Meeting with 3rd year students and their mentors, matching expectations between mentor student, developing communication channels, assessing your progress, risky experiments and backup projects, the thesis committee as a resource. | Smith, C. |
| 5 | **Case Studies on Peer Review/Collaboration:** Peer review of grants and papers, conflicts of interest, collaboration (small group discussion format with faculty facilitator). | Faculty |

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| **No.** | **Year 4: RCR Lectures** | **Lecturer** |
| 1 | **The scientist as a responsible member of society:** Contemporary ethical issues in biomedical research and the environmental and societal impacts of scientific research | Lazaro-Munoz, G. |
| 2 | **Research with Human Subjects:** Definition of research with human subjects, experiments with human material, confidentiality of medical data, experiments involving humans, informed consent. | Berg, S.  |
| 3 | **Steps to Graduation:** Explanation of the benchmarks and deadlines for the completion of academic study beyond the 4th year, including dissertation prep, binding, and other required steps to graduate. | Smith, C. |
| 4 | **Mentorship:** Meeting with 4nd year students and their mentors, matching expectations between mentor student, maintaining communication channels, timeline for graduation, backup projects, the thesis committee as a resource, career decisions, the next steps. | Smith, C. |
| 5 | **Case Studies Human Research/Science and Society:** Research with human subjects, societal impact of research (genetics/genomics, stem cells, neuroethics) (small group discussion format with faculty facilitator.) | Faculty |

Dr. Carolyn Smith, Dean of the Graduate School, led several of these lecture topics in the 2020-21 academic year. Other lecturers include, for example, Dr. David Nelson (Chair of the BCM Committee on Scientific Integrity) and Dr. Gabriel Lazaro-Munoz (Center for Medical Ethics and Health Policy), among others. RCR training at BCM also includes small group discussions of contemporary ethical issues in science each year (*e.g.* conflicts of interest, data management, plagiarism, scientific misconduct, research with animals and human subjects) in the format of case studies held in small groups with a faculty facilitator. As part of their 17 required hours, graduate students are also required to attend progress–to-degree/mentoring session with topics focused by year (*e.g.* year 1 – selecting a lab and developing mentoring relationships, year 2 – mentor-mentee expectations and communication skills; year 3 – assessing progress and mentoring for risky projects, maximizing the thesis committee as a resource; year 4 – finishing the thesis, plans for graduation and next steps); thesis mentors are invited to these sessions which also include discussion of ongoing professional development and use of individual development plans.