THE OHIO STATE UNIVERSITY COLLEGE OF MEDICINE
MEDICAL STUDENT RESEARCH SCHOLARSHIP
PHASE II DOCUMENT INSTRUCTIONS

The **RESEARCH PROPOSAL** must be submitted online via the MDSR website and is to be written in your own words and include:

1. **TITLE**: It should be short and informative to the non-expert.

2. **MENTOR'S LETTER:** Outline the **"Research Training Plan"** for the applicant, describe the skills and techniques that the student will learn, and explain how this particular student is suited/prepared for this project.
   a. Evaluate the student's academic record.
   b. What personal qualities, capabilities, and skills does the applicant possess which will enhance success of the project?
   c. What research or laboratory experience do they bring to the project?
   d. What commitment to supervision and lab safety of the fellow will you provide?
   e. If the application is not funded or only partially funded, will you be able to provide supplementary funds?
   f. Have you identified other potential sources of funding for the student?
   g. Please offer assurance of the project's compliance with research regulatory guidelines.
   h. Who will be the immediate daily supervisor (and title) if not you?
   i. Detailed Training Plan including Learning Objectives
   j. If the proposed research is exempt from IRB or IACUC protocol requirements, please provide documentation with your letter of support. Documentation of IRB/IACUC protocol approval of the project is required *in advance* to review the application.

3. **PROJECT SUMMARY/ABSTRACT (not to exceed 150 words)**: Briefly describe what will be done. Describe the proposed *research training plan* for achieving the stated learning goals. This section should be informative and understandable to a scientifically literate reader.

4. **STUDENT PERSONAL STATEMENT:** (Not to exceed 150 words) Use the Personal Statement to explain your motivation to pursue research training. If you have research experience, explain how an additional experience will enhance your career and what you hope to learn from the experience. If you have little or no research experience, explain what led you to the scholarship program and how you hope to benefit from the research experience.

5. **LEARNING OBJECTIVES/TRAINING PLAN:** A description of the skills and techniques that you will learn (including who will provide said training) and explain how you are suited for and will be prepared to complete the project. Learning objectives should articulate the specific, measurable things you will know and be able to do upon completion of the research project.

6. **RESEARCH PLAN (not to exceed 3 pages):**
   a. **Specific Aims:** Identify what hypothesis will be tested by this research project. What specific question(s) will be answered? Attach a list of 1-3 broad, long-term objectives and the goal of the specific research proposed, e.g. to create a novel research model, to develop a new methodology, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, develop new technology etc.

b. **Background Information**: What work has been done by others in the field? Where does your project fit into the "big picture?" What is the project's significance? Is there an unmet need in human health and disease that your project relates to? Critically evaluate existing knowledge and specifically identify the gaps that the project is intended to fill. Discuss the significance of your project to human health.

c. **Preliminary Studies:** Provide a succinct account of published and unpublished results (previous work in the mentor's laboratory, or your work if it relates to the current project) that supports the rationale for this project.

d. **Experimental Design & Methods**: Describe the plan of experiments. Include a description of the conceptual or clinical framework for the research design, procedures, and analyses to be used to accomplish the specific aims of the project. Include how the data will be collected, analyzed, and interpreted. Be specific in what tests will be performed to evaluate your hypothesis. Describe any novel concepts, approaches, tools, or technologies for the proposed studies. Remember, while statisticians can be involved, we want you to learn from this process and not just rely on a statistician to analyze the data.

7. **ENVIRONMENT & RESOURCES (not to exceed 150 words):** Briefly describe what resources and facilities are necessary to accomplish the specific aims you have outlined. Clarify access to the necessary resources (e.g., lab space, database access and training, statistical analyses).

8. **EXPERIMENTAL DUTIES ON THE PROJECT (not to exceed 150 words)**: List duties you will be responsible for on the project. DO NOT submit a proposal in which your role is **primarily clerical, data entry, or technical**. Such projects are not considered valuable research experiences.

9. **TIMETABLE**: Provide an approximate timetable for executing the research project. Short-term summer projects may begin as early as **May 1** and continue through **August** (before classes begin). All **final reports** for short term projects are due roughly **10 days after the first day of classes**. If you wish to perform full-time research over a period of 1 year, you must include approval for a leave of absence by Associate Joanne Lynn as part of the application. Final reports for all year research experiences are due **June 20** the following year.

10. **REFERENCES (not to exceed 1 page)**: Provide an appropriate number of references from the scientific literature. This need not be an exhaustive review.

11. **NIH BIOSKETCH of the Mentor:** Please request a 4-page NIH biographical sketch from your mentor and include with your application. A blank form is on the MDSR website; other formats will not be accepted.

An example research proposal is included below.

Student Application for Medical Student Research Scholarship

PHASE II COVER PAGE

Student Name: ____Brutus Buckeye_____

Mentor Name: __ Your Mentor MD, PhD_____

Project Title: _____ A Sample Research Proposal with Comments_____

PHASE II CHECKLIST	
X	1. COVER PAGE (include Student, mentor name)
X	2. MENTOR LETTER
X	3. STUDENT NIH BIOSKETCH
X	4. ABSTRACT (150 words)
X	5. TRAINEE PERSONAL STATEMENT (150 words)
X	6. TRAINING PLAN/LEARNING OBJECTIVES
X	7. RESEARCH PLAN (3 pages)
X	a. HYPOTHESIS AND SPECIFIC AIMS
X	b. BACKGROUND INFORMATION
X	c. PRELIMINARY STUDIES
X	d. EXPERIMENTAL DESIGN & METHODS
X	8. ENVIRONMENT & RESOURCES (150 words)
X	9. EXPERIMENTAL DUTIES ON PROJECT (150 words)
X	10. TIMETABLE (specific dates, weeks and duties)
X	11. REFERENCES (1 page)
X	12. NIH BIOSKETCH OF MENTOR
X	13.IRB/IACUC PROTOCOL APPROVALS

THE OHIO STATE UNIVERSITY
WEXNER MEDICAL CENTER

Department of Internal Medicine
Division of General Internal Medicine

Martha Morehouse Pavilion
Suite 2335
2050 Kenny Road
Columbus, OH 43221

614-293-4953 Phone
614-293-6890 Fax

Dear MDSR Review Committee,

Mentor Letter = A letter of recommendation in which the mentor assesses your qualities, relevant research experience and capabilities. The mentor should discuss how these characteristics and capabilities prepare you for the proposed project.

Alternatively, the mentor may discuss how the mentee will acquire the necessary training to conduct the research.

The mentor may wish to mention the time needed/available to meet with the mentee, to perform the research and the availability of resources and supervision.

- Should be on department letterhead
- Should include training plan
- Should include IRB/IACUC status

Sincerely,

Your Mentor

SCHOLARSHIP APPLICANT BIOGRAPHICAL SKETCH

DO NOT EXCEED ONE PAGE

NAME OF SCHOLARSHIP APPLICANT Brutus Buckeye	POSITION TITLE (YEAR AND PROGRAM)
OSUMC EMAIL ADDRESS Brutus Buckeye@email.com	Medical Student, Class of 2022

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
The Ohio State University	B.S.	2020	Engineering
The Ohio State University College of Medicine	In Progress		Medicine

A. Positions and Honors

ACTIVITY/ OCCUPATION	BEGINNING DATE (mm/yy)	ENDING DATE (mm/yy)	FIELD	INSTITUTION/COMPANY	SUPERVISOR/ EMPLOYER
Student Research Assistant	08/2017	8/2020	Engineering	The Ohio State University	Dr. Dean

Academic and Professional Honors and Awards (financial and otherwise)

- Ohio State University College of Medicine Distinction Scholarship, Awarded 2020
- Phi Beta Kappa Member, Elected 2018, My University
- Benjamin A. Buckeye International Scholarship Recipient, 2017
- College of Arts and Sciences Executive Dean's List, My University, 2016-2019

B. Publications

-Buckeye, B. Significance of Fusion in the Development of Sarcoma and Prostate Cancer. Poster Presented at: Hutton Honors College Research Symposium and Poster Fair; April 6, 2019; Columbus, Oh.

-Buckeye. B, CoAuthor, M. J., (2017). Teaching Football to Big Ten Champs. Journal of Football and Sports Development, 23(4), 245-259.

C. Research Related Coursework and Activities

SCIENCE			**OTHER**		
YEAR	COURSE TITLE	GRADE	YEAR	COURSE TITLE	GRADE
2016	General Biology,	A	2022	Foundations 1 COM	TBD
2017	Cellular Biology,	A			
2018	Human Comparative Anatomy,	A-			
2019	Cellular Biology,	A			
2020	Stats for Life Science	A+			
2021	Micro Path and Immunology	A			

Title: *A Sample Research Proposal with Comments*

Abstract (150 Words)

Grant Abstracts Provide Answers to These Questions:

- What do you intend to do?
- Why is the work important?
- What has already been done?
- How are you going to do the work?

Student Personal Statement (150 Words)

Introduction yourself to the application reviewer

- Interest in Specific Medical Problems/Issues
- Past Research Experience & Outcomes
- Research Training Needs/Interests
- Career Goals

Questions to ask yourself when writing your personal statement.

- What is distinctive about me?
- What events, people or family history have shaped my interest in medical research and/or medical problems/issues?
- When did I first become interested in the field of research?
- What do I hope to gain from this research training experience?

Learning Objectives/Training Plan

Training or learning objectives are the intended measurable outcome that you will achieve once you've finished the project. They should **detail** the information that will be acquired and what researchers/learners will be able to accomplish through completing the research project. (This should also be covered in the mentor's letter from their perspectives and mention any other individuals that will be part of the training process, statisticians, lab managers, residents, etc.)

Research Plan (Not to exceed 3 pages)

a. Hypothesis and Specific Aims

1. What are the main goals of your project?
    - Test the comparative efficacy of a new assay or method for …. enhancement of diagnosis, prognosis
    - Study a specific biochemical pathway important in pathophysiology of a disease process …. such as acute pancreatitis
    - To assess the comparative efficacy of a drug to treat hypertension…
    - To determine the efficacy of a new technology for diagnosis of myocardial ischemia…
    - To design and compare 2 educational strategies to improve patient compliance with medications
2. What specific question(s) will be answered?
3. How will your project approach the problem?

b. Background information

- What is the main problem that this project will address?
- What work has been done by others in the field?
- What gaps are there in solving this problem?
- What more needs to be known about the problem?
- What is the significance of the problem that you propose to study to human health?

c. Preliminary studies

Describe any previous work in your mentor's laboratory or from the published literature that supports the rationale for this project

d. Experimental Design and Methods

- Describe the plan of experiments and controls
- Number of subjects or animals
- Describe the methods to be used
- Discuss what data/results will be collected
- Discuss how the data will be analyzed
- Discuss the plan for statistical analysis of results
- Address feasibility of what you propose to do
- Identify any novel approaches or methods you will use

*Use Figures, diagrams, photos, histology, paradigm/mechanism, etc., as needed. Reference all figures, surveys, scales, etc.

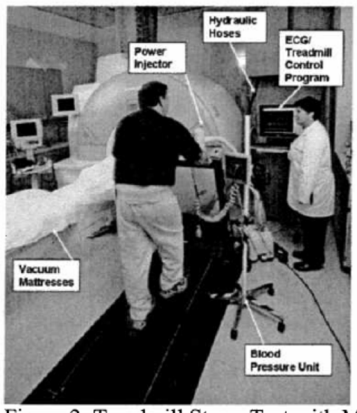

Figure 2: Treadmill Stress Test with MRI

Environment and Resources

- Lab Space
- Access to database
- Equipment
- Experts in the field
- Statistical Analysis
- Personnel in the lab

Experimental responsibilities

- What will you personally do?
- Who else, if anyone, will assist you and what role will they play?

Timetable

- How much time will you devote to the project?
- When do you anticipate completing each milestone, goal or aim?
- Week 1, 2, 3 etc.
- Table of expected accomplishments
- Be very specific
- Include time for analysis and reporting
- ***Your Timeline should be based on a 40 hour/week**

Medical Student Research Scholarship Timeline Outline

Include specific dates and duties to be performed by the Research Trainee during the award period. This timeline is applicable to a 40-hour work week and must be agreed upon by both mentor and mentee. Acknowledging signatures are required.

Week 1 (May 6–May 10)	Learn how to use gene set expression analysis using online tutorial and Dr. Stover's guidance.
Weeks 2–4 (May 13–May 31)	Learn the basics of the R programming language while beginning to apply it to the BrighTNess data.
Weeks 5–6 (June 3–June 14)	Apply GSEA to BrighTNess data set. Use R to perform statistical analysis and calculations of individual gene expression signature scores from the BrighTNess data.
Weeks 7–8 (June 17–June 28)	Combine GSEA and individual gene expression signature scores and cross reference with baseline characteristics (e.g., molecular tumor subtype, immune microenvironment, cell proliferation, and BRCA mutation status) and cancer phenotype (e.g., pCR with/without carboplatin).
Weeks 9–10 (July 1–July 12)	Work with bioinformaticist to apply three modeling approaches (logistic regression, recursive partitioning, random forest).
Weeks 11-13 (July 15–July 26)	Interpret key transcriptomic features in modeling approaches. Complete statistical analyses.
Week 14 (July 29–August 2)	Write up results.

Trainee Signature: _____Digital Signature are suggested _____ Date: _____

Research Mentor Signature: __ Digital Signature are suggested _____ Date: _____

References

Key publications substantiating the significance of the problem, rationale for the project, approach, feasibility, …

1.Reese JM, Bruinsma ES, Nelson AW, et al. ERβ-mediated induction of cystatins results in suppression
of TGFβ signaling and inhibition of triple-negative breast cancer metastasis. Proceedings of the National Academy of Sciences. 2018;115(41):E9580.

2. Minckwitz Gv, Untch M, Blohmer J-U, et al. Definition and Impact of Pathologic Complete Response on
Prognosis After Neoadjuvant Chemotherapy in Various Intrinsic Breast Cancer Subtypes. 2012;30(15):1796-1804.

3. Kassam F, Enright K, Dent R, et al. Survival Outcomes for Patients with Metastatic Triple-Negative
Breast Cancer: Implications for Clinical Practice and Trial Design. Clinical Breast Cancer. 2009;9(1):29-33.

4. Sharma P, Lopez-Tarruella S, Garcia-Saenz JA, et al. Efficacy of Neoadjuvant Carboplatin plus
Docetaxel in Triple-Negative Breast Cancer: Combined Analysis of Two Cohorts. Clinical cancer
research : an official journal of the American Association for Cancer Research. 2017;23(3):649-657.

5. Sikov WM, Berry DA, Perou CM, et al. Impact of the addition of carboplatin and/or bevacizumab to
neoadjuvant once-per-week paclitaxel followed by dose-dense doxorubicin and cyclophosphamide on
pathologic complete response rates in stage II to III triple-negative breast cancer: CALGB 40603 (Alliance). Journal of clinical oncology : official journal of the American Society of Clinical Oncology.
2015;33(1):13-21.

6. Tamura K, Hashimoto J, Tsuda H, et al. Randomized phase II study of weekly paclitaxel with or
without carboplatin followed by cyclophosphamide/epirubicin/5-fluorouracil as neoadjuvant chemotherapy for stage II/IIIA HER2-negative breast cancer. Journal of Clinical Oncology. 2014;32(15_suppl):1017-1017.

7. von Minckwitz G, Schneeweiss A, Loibl S, et al. Neoadjuvant carboplatin in patients with triplenegative
and HER2-positive early breast cancer (GeparSixto; GBG 66): a randomised phase 2 trial. The Lancet Oncology. 2014;15(7):747-756.

8. Ho GY, Woodward N, Coward JIG. Cisplatin versus carboplatin: comparative review of therapeutic
management in solid malignancies. Critical Reviews in Oncology/Hematology. 2016;102:37-46.

BIOGRAPHICAL SKETCH

NAME	**POSITION TITLE**
eRA COMMONS USER NAME (credential, e.g., agency login)	

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	MM/YY	FIELD OF STUDY

Personal Statement Positions and Employment

Other Experience and Professional Memberships

Contribution to Science

Additional Information:

Research Support and/or Scholastic Performance

Ongoing Research Support Completed Research Support

*Most faculty will have an NIH bioskecth.

IRB Requirements for Medical Student Researchers IRB Requirements: All medical students participating in research which requires IRB protocols must be added to the protocol as key personal and receive all the proper training required of all staff. All MDSR COM Scholarship projects are required to supply the MDSR office with documentation that the scholarship recipient has been officially added to any and all relevant IRB protocols. If your research has been determined to be exempt, the MDSR Office needs documentation of the exempt status. http://orrp.osu.edu/irb/

IACUC Requirements for Medical Student Researchers IACUC Requirements: All medical students participating in research which requires IACUC protocols must be added to the protocol as key personal and receive all the proper training required of all staff. All MDSR COM Scholarship projects are required to supply the MDSR office with documentation that the scholarship recipient has been officially added to any and all relevant IACUC protocols. If your research has been determined to be exempt, the MDSR Office needs documentation of the exempt status. http://orrp.osu.edu/iacuc/

*If you have IRB/IACUC approval letters they can be included, they can also be referenced by protocol number in your mentor's letter of recommendation and/or in your research plan.