BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors. Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Newman, Dina L.

eRA COMMONS USER NAME (credential, e.g., agency login): dnewman

POSITION TITLE: Associate Professor

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Cornell University, Ithaca, NY	B.S.	05/1991	Biological Sciences
University of Chicago, Chicago, IL	M.S.	12/1993	Biochemistry & Molecular Biology
University of Chicago, Chicago, IL	Ph.D.	06/1998	Genetics
University of Chicago, Chicago, IL	postdoctoral	12/2000	Human Genetics

A. Personal Statement

I have the background and expertise to act as a research mentor for this project. I have mentored over 75 undergraduate students since I came to RIT in 2003, including over two dozen on educational research projects (the focus of my involvement with students for this proposal). In addition to my personal experience with mentoring, I have been a leader of undergraduate research in my department at RIT, having served as a member and/or chair of the undergraduate research committees in my department and/or college throughout. For over ten years I led a program to increase student participation in long-term research projects and teaching them crucial communication skills, and later developed a course for teaching research students to write and publish manuscripts in collaboration with their mentors. I acted as co-PI on an NSF grant that improved access for and participation of deaf and hard-of-hearing students in mentored undergraduate research, and inspired many of the participants to continue on to graduate programs in biology. I also collaborate on developing and analyzing internal surveys to inform administrators of student interest in, experiences of, access to and barriers to experiential learning opportunities in the College of Science at RIT. Currently I am helping to run an REU program that brings 10 students per year to RIT to learn about DBER and get involved in mentored research projects.

- a. Newman DL, Wright LK, Sweet HC (2010). A structured undergraduate research program that trains and prepares students for post-graduate education and scientific careers. *ICERI2010 Proceedings*, p. 5010-5019. <u>http://library.iated.org/publications/ICERI2010</u>
- b. Wright LK, Zwickl B, **Newman DL** (2015). Getting a Jump-Start on the Summer DBER REU. Society for the Advancement of Biology Education Research, Minneapolis, MN.

B. Positions and Honors

Employment

2001-2003 Research Professional, Department of Human Genetics, University of Chicago, Chicago, IL

2003-2008 Research Assistant Professor, Department of Biological Sciences, Rochester Institute of Technology, Rochester, NY

- Assistant Professor, Thomas H. Gosnell School of Life Sciences, Rochester Institute of 2008-2015 Technology, Rochester, NY
- Associate Professor, Thomas H. Gosnell School of Life Sciences, Rochester Institute of 2015-Technology, Rochester, NY

Other Experience and Professional Memberships

American Society of Human Genetics (ASHG) 1998-

- Member, Undergraduate Education Working Group (2011-present)
- Member, Information and Education Committee (2016-present)
- Member, Association for Research in Otolaryngology (ARO) 2004-2008
- 2005-2008 Member, Sigma Xi
- 2005-2011 Member, Council on Undergraduate Research (CUR)
- Member, Society for the Advancement of Biology Education Research (SABER) 2011-
 - Abstract reviewer (2014-present)
- Member, American Society for Microbiology (ASM) 2011-
- Member, Project Kaleidoscope (PKAL) 2011-
 - Founding member of Upstate NY Regional Network (2012-present)
- Member, American Educational Research Association (AERA) 2013
- 2013-Reviewer, CBE-Life Sciences Education
- Member, Best Practices in Introductory Biology (BPIP) network 2013
- Reviewer, Association of American Colleges & Universities (AAC&U) TIDES Program 2014 grants
- 2014-Founding member, Assessment of Competence in Experimentation in Biology (ACE-Bio) Network
- Reviewer, International Journal of Science Education 2016-
- Grant reviewer, NSF (Directorate for Biological Sciences, Directorate for Education and 2016 Human Resources)

Honors

2012	Bioscience	Education	Network	(BEN)	Scholar

2003-2006 **RIT First-in-Class Program**

C. Contribution to Science

- 1. After acquiring my Ph.D. in genetics, with a dissertation on differential gene regulation in the bacterial colony, I moved to a post-doctoral fellowship in human genetics. There I developed new expertise in complex trait genetics. Over the next 10 years, I contributed to our understanding of several complex diseases, including cardiovascular disease, asthma, atopy, and age-related hearing loss. These diseases are some of the biggest public health issues in the U.S., and it has been difficult to pinpoint genetic factors in them due to the large effects of environment and the heterogeneity of etiology. In each study, I analyzed genetic markers in large human populations, and used cutting-edge statistical genetics techniques to determine that particular genetic variants were associated with development of the disease. I also published more general papers about population structure and variant frequencies that are considered important to our understanding of genetic diseases and gene hunting in general.
 - a. Newman DL, Abney M, Dytch H, Parry R, McPeek MS, Ober C (2003) Major loci influencing serum triglyceride levels on 2g14 and 9p21 localized by homozygosity-by-descent mapping in a large Hutterite pedigree. Hum Mol Genet 12(2):145-153. DOI: 10.1093/hmg/ddg012
 - b. Newman DL, Hoffjan S, Bourgain C, Abney M, Nicolae RI, Profits ET, Grow MA, Walker K, Steiner L, Parry R, Reynolds R, McPeek MS, Cheng S, Ober C (2004). Are common disease susceptibility alleles the same in outbred and founder populations? Eur J Hum Genet 12(7):584-590. doi:10.1038/sj.ejhg.5201191
 - c. Chan A*, Newman DL*, Shon AM, Schneider DH, Kuldanek S, Ober C (2006). Variation in the Type I interferon gene cluster on 9p21 influences susceptibility to asthma and atopy. Genes Immun 7(2):169-178. doi:10.1038/sj.gene.6364287

*These authors contributed equally.

- d. **Newman DL**, Fisher LM, Ohmen J, Parody R, Frisina ST, Mapes F, Eddins DA, Frisina DR, Frisina RD, Friedman RA (2012). *GRM7* variants associated with age-related hearing loss based on auditory perception. *Hear Res* 294:125-132. DOI: 10.1016/j.heares.2012.08.016
- 2. About 6 years ago I changed my primary field of scholarship from complex trait genetics to biology education. I have studied in depth students' conceptions about the process of meiosis, including analyses of student-generated models and language, and brought a new perspective to this problem by considering the cognitive issue of lack of transfer as a reason for the expert/novice divide. More recent work proposes a new framework for thinking about the novice to expert transition: the DNA Triangle. I have also studied in depth student understanding of the central dogma, using qualitative methods to dig into their mental models and identify novel misconceptions. This work led to the development of a rigorous tool for the assessment of student understanding of these concepts, the Central Dogma Concept Inventory (CDCI), which enables instructors design lessons specifically tailored their own students' levels, and to evaluate the effectiveness of their interventions.
 - a. Wright LK, **Newman DL** (2011). An interactive modeling lesson increases students' understanding of ploidy during meiosis. *Biochem Mol Biol Educ*, 39(5): 344-351. DOI: 10.1002/bmb.20523
 - Newman DL, Catavero CM, Wright LK (2012). Students Fail to Transfer Knowledge of Chromosome Structure to Topics Pertaining to Cell Division. *CBE Life Sci Educ*, 11(4): 425-436. DOI: 10.1187/cbe.12-01-0003
 - c. Wright LK, Fisk JN, **Newman DL.** (2014) DNA → RNA: What do students think the arrow means? *CBE-Life Sci Educ.* 13(2):338-348. doi:10.1187/cbe.CBE-13-09-0188
 - d. Newman DL, Snyder CW, Fisk JN, Wright LK. (2016) Development of the Central Dogma Concept Inventory (CDCI) Assessment Tool. CBE Life Sci Educ. 15(2):ar9, 1-14. doi:10.1187/cbe.15-06-0124
 - e. Wright LK*, **Newman DL***, <u>Catavero CM</u> (2017). The DNA Triangle and its Application to Learning Meiosis. Submitted to *CBE-Life Sci Educ*. *In press*. *These authors contributed equally.
- 3. In addition to researching the underlying cognitive issues of novice biologists, I have been involved in designing and testing interventions to improve student learning in the classroom. One of my papers described a new way of teaching meiosis in a student-centered lecture class, which focuses directly on clarifying issues of chromosome structure and ploidy, and was demonstrated to be effective. I later took this one step further to focus on DNA sequence, which I find to be even more effective than the original. This lesson was published in CourseSource. Another paper described a PCR-based laboratory activity that can help resolve student confusion about the Central Dogma. A third paper described the benefits of an online, collaborative reading and annotation tool for generating quality discussions about primary literature. Another paper described the overhaul of our introductory biology course to small, student-centered, leveled classes that emphasize active learning and inquiry-based laboratories. I am currently in the process of developing a set of 15 modules for interactive instruction (MINTs) that include short, interactive video-based tutorials to teach core concepts in biology using live actors and data collection (NSF IUSE grant).
 - a. Wright LK, **Newman DL** (2011). An interactive modeling lesson increases students' understanding of ploidy during meiosis. *Biochem Mol Biol Educ*, 39(5): 344-351. DOI: 10.1002/bmb.20523
 - b. Wright LK, Zyto S, Karger DR, Newman DL (2013). Online Reading Informs Classroom Instruction and Promotes Collaborative Learning. *J Coll Sci Teach.* 43(2):44-53.
 - c. Newman DL, Skuse GR, Carter D, Pough FH, Wright LK (2013) Lessons Learned from the First Year Implementation of a Two-Track, Reformed Introductory Biology Course. 2013 NABT Biology Education Research Symposium Proceedings. http://www.nabt.org/websites/institution/index.php?p=741
 - d. Wright LK, **Newman DL** (2013). Using PCR to target misconceptions about gene expression. *J Microbiol Biol Educ*.14(1):93-100. DOI: 10.1128/jmbe.v14i1.539
 - e. **Newman DL**, Wright LK (2017). Meiosis: A Play in Three Acts Starring DNA Sequence. *CourseSource* Vol 04. DOI: 10.24918/cs.2017.9

D. Research Support

Ongoing Research Support

HHMI Inclusive Excellence Franklin (PI) 09/01/2017-8/31/2022 The goal of this project is to improve inclusivity in the College of Science at RIT, particularly for nontraditional and historically excluded groups of students. The program 1) develops faculty to proactively recruit and mentor targeted students in undergraduate research; 2) creates new course materials to improve reflective and metacognitive strategies proven to enhance student success; and 3) develops a college-wide welcoming faculty/student and student/student community to foster an inclusive environment. Role: co-PI

NSF DUE 1625649 Goudreau (PI)

Collaborative Research: Transforming the Organic Chemistry Lab Experience: Implementation and Evaluation of Reformed Organic Lab Curriculum Across Institutions

This project addresses widespread delivery of a new pedagogy for teaching a studio-style organic chemistry lab that utilizes self-guided modules within a scaffolded curriculum. The modules are being tested at diverse institutions to determine the robustness of implementation. Role: co-PI

NSF DUE 1432286 Teese (PI) 09/01/2014-08/31/2018 Improving Undergraduate STEM Education, Collaborative Research: Development and Assessment of Interactive Video Vignette Modules for Biology Teaching.

The goal of this project is to help instructors incorporate interactive, research-based pedagogies into their biology classrooms by providing them with a set of modules that promote deep learning of core biology concepts. The cornerstone of each module will be a new genre of web-based learning tools called Interactive Video Vignettes (IVVs). Role: co-PI

NSF DUE 1359262 10/01/2014-10/01/2018 Wright (PI) Research Experiences for Undergraduates in Model-based Reasoning in STEM Education at the Rochester Institute of Technology.

This grant supports cohorts of 10 students per year to participate in discipline-based education research focused on studying the core scientific practices of model-based reasoning and representations in science.

Role: co-PI

Completed Research Support

GERP 13-SF1 Newman (PI) 09/01/2013-08/31/2015 American Society of Human Genetics, Genetics Education Research Program Development and Evaluation of an Assessment Tool for Central Dogma Conceptual Understanding. The goal of this grant is to support development and testing of a new instrument for assessing student understanding of the Central Dogma of Molecular Biology. Role: PI

NSF DUE 1239994 Franklin (PI) 09/01/2012-08/31/2014 RIT/NazEd Tech2Teach: Developing Institutional Commitment to STEM Teacher Preparation. The goal of this project was to lay the foundation for a Learning Assistant Program based at RIT, to attract talented STEM undergraduates to careers in secondary education. Role: Senior Personnel

NSF DBI-0829259

Sweet (PI)

01/01/2009-12/31/2013

9/1/2016-8/31/2019

The RIT Undergraduate Research Diversity Initiative: Increasing Participation of Deaf Students in the Research Scholars Program.

This project recruited and supported deaf and hard-of-hearing students (typically underrepresented in science) to participate in mentored undergraduate research. Role: co-PI