

PROMOTION RECOMMENDATION
THE UNIVERSITY OF MICHIGAN
MEDICAL SCHOOL
DEPARTMENT OF HUMAN GENETICS
DEPARTMENT OF COMPUTATIONAL MEDICINE AND BIOINFORMATICS

Jeffrey M. Kidd, Ph.D., assistant professor of human genetics, Department of Human Genetics, and assistant professor of computational medicine and bioinformatics, Department of Computational Medicine and Bioinformatics, Medical School, is recommended for promotion to associate professor of human genetics, with tenure, Department of Human Genetics, and associate professor of computational medicine and bioinformatics, without tenure, Department of Computational Medicine and Bioinformatics, Medical School.

Academic Degrees:

Ph.D.	2010	University of Washington, Seattle, WA
B.S.	2005	Case Western Reserve University

Professional Record:

2012-present	Assistant Professor of Human Genetics, University of Michigan
2012-present	Assistant Professor of Computational Medicine and Bioinformatics, University of Michigan

Summary of Evaluation:

Teaching: Dr. Kidd is a creative designer of novel didactic lectures and curricula, an inspirational leader of educational research seminar courses, and an energetic advocate for increasing the diversity of our trainee population. His most important educational contribution is the development of a new class, Human Genetics 551 “Computational Genomics.” The class is essential for students that wish to pursue modern human population-level genetics research. It is designed to teach students with no prior background in computer programming the skills required to work with the large data sets now routinely produced in biomedical research. Dr. Kidd is both the originator and the director for HG551 and co-teaches with Dr. J. Kitzman. Although ‘big data’ and high-throughput sequencing are now common, many trainees still lack the practical experience required to analyze these types of data. HG551 teaches the basics of Python programming for data analysis and teaches the computational tools for genomic analysis. The course consists of lectures, in-class exercises, and practical programming skills.

Dr. Kidd has taught lectures in the core graduate courses in molecular genetics and human genetics, HG541 and HG544. These are popular courses for graduate students in the Program in Biomedical Sciences (PIBS), as well as students in the School of Public Health, College of Engineering, and College of Literature, Science, and the Arts. He has participated in teaching HG803, which combines lecture and discussion designed to increase critical evaluation of the scientific literature in human genetics and genomics. He has also taught in HG 606 “Introduction to Bicomputing,”

HG632 “Experimental Genetic Systems,” and BIOINF527 “Introduction to Bioinformatics and Computational Biology.” Dr. Kidd has also taken a leadership role as co-organizer for BIOINF 602, Journal Club. Teaching evaluations are available for the HG courses and Dr. Kidd is clearly viewed as an engaged and superior educator.

Dr. Kidd has uniquely bridged the fields of computation and biological sciences. His interdisciplinary focus is on teaching bioinformatics, genomics, and genetics in didactic settings, workshops and public outreach. He is an outstanding communicator. Dr. Kidd will continue to develop advanced courses for geneticists and biologists to improve their ability to integrate computer science and statistics into their research. These interdisciplinary concepts are essential, as biologists and geneticists must deal with enormous amounts of complex data. Clearly, Dr. Kidd will have a powerful impact on the Human Genetics curriculum, and in preparing our trainees for the future of genetics and genomics research. Dr. Kidd is a spectacular research mentor. He invests a great deal of time and effort to nurture and guide the students. He has high standards for productivity and intellectual engagement. He has mentored undergraduate (six), graduate (four Ph.D., two M.S.) and post-doctoral (four) trainees. In addition, he has served on eight Ph.D. thesis committees for other graduate students and mentored eight additional rotation students. He is an active member of the Human Genetics, Computational Medicine and Bioinformatics training programs, as well as the Michigan Pre-doctoral Training Program in Genetics and the interdisciplinary Genome Science Training Program. Evaluations by his current and former trainees are strongly enthusiastic.

Dr. Kidd is actively involved in departmental efforts to recruit underrepresented minorities into the biological sciences. For two summers, Dr. Kidd was a visiting professor at the Mathematical and Theoretical Biology Institute (MTBI; 2013-2014), at Arizona State University. The MTBI is widely-regarded as a unique and powerful program that connects mathematically trained undergraduates to top-level research in the biological and medical sciences. He continues to be involved with local Michigan and PIBS recruitment efforts.

Research: Dr. Kidd’s research work is widely recognized as highly imaginative and original. He has made fundamental contributions to understanding the processes that shape species evolutionary history, in modern and ancient populations. His broad knowledge and skills have stimulated work across multiple disciplines, producing novel strategies and methods for examining the genetic changes that accumulate within the human brain and other tissues, and the impact of genetic changes on health and disease. Dr. Kidd’s research integrates multiple approaches to study the causes and evolutionary consequences of genomic variation, both within species and within the somatic cells of individuals. By combining high-throughput sequencing, bioinformatics, and population genetic models, he endeavors to learn about the history of species and to understand how that history, in combination with mutation, natural selection and genetic drift, alters the observed patterns of variation. His work examines the evolution of genomic structural variation in repetitive and duplicated sequences and studies the effect of mutation on somatic cells within an individual. United by a common computational and analytic tool set, these explorations can be divided into two broad categories of study: (1) modern and ancient population genomics and (2) the discovery and characterization of genomic variation. Population genomics is experiencing a true “golden era.” The availability of high-quality, genome-wide DNA sequence at low cost, combined with technologies to extract DNA from ancient samples has fundamentally transformed

our understanding of species, including our own. The acquisition of DNA sequence is routine, however, only a handful of research groups, such as Dr. Kidd's, are positioned to undertake the computational demands of this analysis. To date, his work has dramatically changed our understanding of: (1) human Y-chromosome evolution and purifying selection, (2) the expansion of human populations out of Africa, (3) the evolution of the great apes, and (4) the natural and artificial selection of dogs and the parallels of dog migration and human migration. Similarly, sequence analysis of genomic variation, at all scales is a broadly applicable strategy. Dr. Kidd has developed expertise that will accelerate his work over the next decade. The research infrastructure of his group is now poised at the leading edge of a powerful wave. New findings show that somatic variation – the DNA differences among the cells within an organism – play an important role in human disease. With collaborators at the University of Michigan and other institutions, his work is using high-depth genome sequencing and single cell amplification approaches to characterize the extent of somatic mutation and the impact of chromatin features on patterns of somatic variation.

In addition to his productivity as an individual investigator, Dr. Kidd has been an exemplary member of interdisciplinary scientific teams involving both University of Michigan and external collaborators. His publication record shows a spectacular range of contributions to international “team science,” including work on: human olfactory genes, great ape evolution, massively-parallel sequencing, African populations, developmental-delay disorders, the 1000-Genomes Project, macular degeneration, human migration, brain genetic mosaicism, and the origins of domesticated dogs. These projects represent the best in modern, international collaborative science. In the field of genetics, it is widely recognized that the projects with the biggest impact are now too large for a single investigator. Only valued collaborators with deep knowledge, effective skills, and proven work-ethic are asked to join leading-edge consortia. Dr. Kidd has an impressive track record of continuous funding. He is currently an investigator or co-investigator on six funded projects. He has obtained funding from the NIH as an investigator or co-investigator at several levels, with three R01s, one U01 (and a U01 supplement), one R33, and an Early Independence Award (DP5). His work also has been recognized by grants from the Pew Charitable Trust and the University of Michigan Reproductive Sciences Program. Dr. Kidd is widely sought as a collaborator, because of his skills in computational genomics research and his ability to move rapidly across disparate fields of biological science. Evidence of broad recognition for Dr. Kidd's work comes from invitations to speak at national and international venues. Most recently, he has been an invited speaker at the University of Virginia, the Hudson Alpha Institute, the University of California – Los Angeles, the Universitat Pompeu Fabra (Barcelona), and at international meetings in Cape Town, South Africa; Iguassu, Brazil; Kyoto, Japan; Beijing, China; Tokyo, Japan; Stanford University; Google Corporation; and the Cold Spring Harbor Laboratories.

Recent and Significant Publications:

Wildschutte JH, Baron A, Diroff NM, Kidd JM: Discovery and characterization of Alu repeat sequences via precise local read assembly. *Nucleic Acids Res* 43:10292-10307, 2015.

Oetjens MT, Shen F, Emery SB, Zou Z, Kidd JM: Y-chromosome structural diversity in the bonobo and chimpanzee lineages. *Genome Biol Evol* 8:2231-2240, 2016.

Wildschutte* JH, Williams* ZH, Montesion M, Subramanian RP, Kidd JM, Coffin JM: Discovery of unfixed endogenous retrovirus insertions in diverse human populations. *Proc Natl Acad Sci U S A* 113:E2326-3234, 2016.

Song S, Sliwerska E, Emery S, Kidd JM: Modeling human population separation history using physically phased genomes. *Genetics* 205:385-395, 2017.

Botigué* LR, Song* S, Scheu* A, Goplan S, Pendleton AL, Oetjens M, Taravella A, Seregély, T, Zeeb-Lanz A, Arbogast RM, Bobo D, Daly K, Unterländer M, Burge J, Kidd JM, Veeramah KR: Ancient European dog genomes reveal continuity since the early Neolithic. *Nature Communications*, 8, 2017. [16082]. DOI: 10.1038/ncomms16082

Service: Dr. Kidd has been an exemplary citizen in the Department of Human Genetics, the Medical School, and the international scientific community. He has served as an invited grant reviewer for over 30 journals and has been an abstract and poster judge at several international meetings. Importantly, Dr. Kidd has recently been appointed to a three-year term as a member of the Program Planning Committee for the premier scientific meeting in the field of human genetics – the American Society of Human Genetics annual conference. He has served as an ad hoc grant reviewer for multiple institutional, national and international organizations including the Netherlands Organization for Scientific Research, the European Science Foundation, the U.S. National Science Foundation, and the NIH Genomics, Computation, and Technology (GCAT) study section. Within the department, Dr. Kidd is a member of the Academic Curriculum Committee, the course director for HG551, the Computing Advisory Committee, and has served on the Doctoral Admissions Committee and the Master's Degree in Genetic Counseling Admissions Committee.

External Reviewers:

Reviewer A: “Through the development of innovative methods to quantify and investigate the biological consequences of genomic variation, Dr. Kidd’s work has had a profound impact in the fast-moving field of human genomics....the type of genomic variation that Dr. Kidd investigates is widespread in nature and the detection/analysis pipelines that he develops are broadly applicable to any organisms for which (substantial) genome sequence data is available. In that sense, Dr. Kidd’s research has the potential to have a huge scientific impact...”

Reviewer B: “Dr. Kidd has also done cutting-edge work on the genetic evolution of domesticated dogs, a project for which he had an NIH R01 grant. He has recently become involved in research on somatic mosaicism, a very timely topic with considerable relevance for human health and disease. Dr. Kidd’s research is outstanding, and he contributes significantly as an independent investigator and as an effective collaborator.”


Reviewer C: “He clearly exceeds the standards expected from world-class institutions for individuals at this career level, interested in advancing human genetics research and its application to medicine.”

Reviewer D: “Dr. Kidd is a highly engaged and productive scholar who is doing excellent research. He has published in leading journals, and I would rank him at the top among his peers. His work at the intersection of population genetics and genomics is exciting and innovative.”

Reviewer E: “...Dr. Kidd has shown the strength of prolonged research, national and international recognition, contribution to the teaching, and service of the School. Further, Dr. Kidd has made significant contributions and membership in numerous high profile and internationally important consortia, providing him with ongoing access to unique data that drives his research and the field.”

Summary of Recommendation:

Dr. Kidd is an internationally-recognized and productive scientist producing high impact, paradigm-shifting work in the fields of population genomics, variation, and evolution. He is an excellent teacher and his track record for training undergraduates, graduate students and postdoctoral fellows is exemplary. I am pleased to recommend Jeffrey M. Kidd, Ph.D. for promotion to associate professor of human genetics, with tenure, Department of Human Genetics, and associate professor of computational medicine and bioinformatics, without tenure, Department of Computational Medicine and Bioinformatics, Medical School.



Marschall S. Runge, M.D., Ph.D.
Executive Vice President for Medical Affairs
Dean, Medical School

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