BIOGRAPHIES

The first Biography is in two parts, and was specifically prepared for the Polymath Retreat of the Imagination Institute at the Department of Psychology at the University of Pennsylvania, held July 7-9, 2017. The third Biography was prepared for the Advisory Board of a mathematical physics institute.

May 30, 2017

Harvey M. Friedman was born in Chicago, Illinois on September 23, 1948 to parents in the photo typesetting business with no academic background. The family moved a few years later to Highland Park, Illinois. Friedman displayed early interest and aptitude for mathematics and related logical and philosophical matters. As the oldest child in a nonacademic household, by age seven. Friedman became fixated on his "discovery" that the sum of a grocery bill does not depend on the order in which the numbers are added, and the "worthlessness" of dictionaries because of their obvious circularity. At age nine, Friedman formulated careful existence and uniqueness statements while working through a standard algebra text on his own. At age eleven, Friedman attended summer school at the University of Oklahoma obtaining a perfect score in the final exam for Calculus. He became absorbed in high school with logic and philosophy through reading Bertrand Russell, especially his Introduction to Mathematical Philosophy. Friedman arrived at MIT in 1964 as a freshman, and received his Ph.D. from the MIT mathematics department in 1967 under Gerald Sacks. He was deeply influenced by the renown mathematical philosopher Hillary Putnam, who was at MIT and Harvard at the time. Friedman accepted an Assistant Professorship in the Stanford Philosophy Department in 1967 at the initiation of Solomon Feferman, Georg Kreisel, and Patrick Suppes. Friedman held tenured positions at Stanford Philosophy and UW Madison Mathematics in 1970 before returning to Stanford. He left for a Professorship at the State University of New York at Buffalo mathematics department in 1973, where he remained until accepting a Professorship at The Ohio State University mathematics department in 1977. Friedman retired in 2012 as Distinguished University Professor of Mathematics, Philosophy, and Computer Science Emeritus, at The Ohio State University. Friedman was the recipient of the 1984 Alan T. Waterman Award "For his revitalization of the

foundations of mathematics, his penetrating investigations into the Goedel incompleteness phenomena, and his fundamental contributions to virtually all areas of mathematical logic", an annual award of the National Science Foundation then given to a single US based researcher 35 years or younger, covering all areas of mathematics, science, and engineering. Friedman is most well known for his invention and development of Reverse Mathematics in the late 60's and early 70's, and his longstanding Concrete Mathematical Incompleteness program, which is presently reaching a climactic phase in its 50th year.

Before leaving for MIT in 1964, Friedman took classical piano performance lessons every one or two weeks with Mollie Margolis and Robert McDowell of Roosevelt University, with undistinguished and undisciplined progress, while focusing on seemingly more readily accessible mathematical and philosophical matters. Piano then receded into the background as an unremarkable hobby for several decades. Friedman was always fascinated by just how professional pianists communicate such vivid emotions simply by pressing keys and pedals on a mechanical instrument made primarily of wood and taut strings. So upon arriving at The Ohio State University, Friedman seized a lucky opportunity to purchase a concert grand piano at a steep discount because of superficial damage from a storm. He naturally found that there remained a huge gulf between owning and playing on a professional quality concert grand, and sounding like a professional. Friedman surmised that in his case, the insurmountable gulf was a matter of physical piano technique, and got interested in using rapidly developing electronic piano technology to create performances without relying on fingers. Friedman worked through these ideas for about fifteen years, and with continual advances in technology, including editing software, this culminated around 2008 with his release of twelve recordings which can be heard on his YouTube channel at https://www.youtube.com/channel/UCdRdeExwKiWndBl4YOxBTEQ These have gained professional level credibility from several professional musician sources, some of whom were not all aware of how these recordings were made. Much to his surprise, after making these recordings from mental processes without reliance on fingers, upon returning to his concert grand piano, there was an immediate obvious considerable unexplained increase in piano technique. This increase has been at least steady and often accelerating

during the almost ten years since those mental recordings were made. Friedman is now actively seeking professional feedback concerning the possibility that a profound and useful kind of merging has taken place between his mathematical/philosophical activities and his standard and nonstandard pianistic adventures.

Friedman resides in Columbus, Ohio together with his wife.

July 30, 2017

Friedman is Distinguished University Professor of Mathematics, Philosophy, and Computer Science, Emeritus, at The Ohio State University in Columbus, Ohio, and is most well known for his work in the foundations of mathematics. He founded Reverse Mathematics in the 1970's, and more recently, the more ambitious Strict Reverse Mathematics. Reverse Mathematics has been increasingly active since its inception, and focuses on the derivation of mathematical axioms from mathematical theorems. Friedman has concentrated most heavily on his fifty year Concrete Mathematical Incompleteness project, which has reached major milestones this past year (2017). These involve uncovering new kinds of discrete and finitary Incompleteness from the usual ZFC axioms for mathematics. These include: Basic results in Emulation Theory, involving regularities that can always be found in some maximal emulation of any given finite set of rational vectors. The full enrichability of specific 376 x 376 pixel displays with 382 colors. The counting of the number of 4-ary operations under 7-isomorphism (having the same 7 element restrictions up to isomorphism). Friedman earned his Ph.D. from the Massachusetts Institute of Technology in 1967, was appointed Assistant Professor of Philosophy at Stanford University at the age of 18, and granted tenure three years later. Friedman received the National Science Foundation's Alan T. Waterman Award in 1984 "For his revitalization of the foundations of mathematics, his penetrating investigations into the Goedel incompleteness phenomena, and his fundamental contributions to virtually all areas of mathematical logic". He delivered the Goedel Lectures (ASL) in 2002 and the Alfred Tarski Lectures in 2007 (UCB). Friedman has also been a Professor of Music in recognition of his efforts in electronic performance, and has twelve highly expressive digitally hyper edited classical piano performances available for streaming on his YouTube site. Friedman received the Institutional Honorary Doctorate

(9/4/13) from the University of Ghent. Friedman is also a classical pianist at the semiprofessional level, and has been the subject of a recent article at Nautilus online (2/17). Friedman retired in July 2012 in order to get more work done.