

# Melanie Mitchell Introduction (by Kevin Mills)

Good morning. For those of you who don't know me, I am Kevin Mills, a Senior Research Scientist in the Information Technology Lab at NIST. I have the distinct pleasure of introducing today's colloquium speaker, Dr. Melanie Mitchell, who will be talking about her latest book, Complexity A Guided Tour, published in 2009 by Oxford University Press. This is not Melanie's only book, as I know firsthand. In 1996, the MIT Press published another of her books, An Introduction To Genetic Algorithms. I recently implemented a classic genetic algorithm, which entailed a literature search to understand the ins and outs, best common practices and design options for GAs (as genetic algorithms are often known). In my search, I read many papers and books, and I can report that Dr. Mitchell's writing provided me with the clearest and most complete overview of the subject. Further, I was able to base much of my implementation on Chapter 5 ("Implementing a Genetic Algorithm"). Thank you, Melanie.

Dr. Mitchell found her calling as an Artificial Intelligence researcher in the early 1980's after reading Godel, Escher and Bach, a Pulitzer-Prize winning book written by Douglas Hofstadter, then a professor at Indiana University. Perhaps many of you read and enjoyed that book, as I did. For Melanie, however, the book became a call to action, and changed her life. At that time, Melanie, a recent mathematics graduate from Brown University, was teaching high-school math in New York City. Reading Hofstadter's book motivated her to write him a letter expressing her desire to become his graduate student. Melanie got no reply. A year later, she had moved to Boston and begun taking classes in computer science, when one day she happened upon a poster advertising a Hofstadter talk at MIT. Melanie attended the talk and hung out afterward to meet the speaker. After shaking his hand, Melanie again made the request to become one of his graduate students. She learned that Hofstadter was spending a year at the MIT Artificial Intelligence Lab, but, alas, he did not invite her to visit him there. Undeterred, Melanie managed to find Hofstadter's MIT phone number, made several calls, never reaching him, and instead leaving unanswered messages. During one sleepless night, Melanie realized that all her calls had been during normal working hours, but perhaps Hofstadter worked at night. She called at 11 PM, and Hofstadter answered, they chatted and he invited her to his office, where they agreed that Melanie could work to create *CopyCat*, a computer program capable of generating analogies, a most human of skills.

Melanie began work on *CopyCat* at MIT in the summer of 1984. That fall, Doug Hofstadter moved to the University of Michigan, and Melanie enrolled there as a PhD student. In due

course, Melanie finished *CopyCat*, obtained her PhD and wrote her first book, *Analogy-Making as Perception*, published in 1993 by MIT.

In 1989, during Melanie's last year of graduate school, Doug Hofstadter was invited to New Mexico to attend a conference on emergent computation. The conference was organized by the Santa Fe Institute, which was founded in 1984 to foster the study of complex systems. Hofstadter could not attend, and so he sent Melanie, who made such a fine impression that she was invited to spend a summer at the institute. That summer stretched to a year, and the year stretched on for many additional years, as Dr. Mitchell became one of the institute's few resident scholars.

Dr. Mitchell's long-term association with the Santa Fe Institute provides her with some unique perspectives unavailable to most others. She made one particularly salient observation regarding the degree to which complex systems thinking and concepts have penetrated the university curriculum. As she interacted with young graduate students and post-docs at the Santa Fe Institute in the 1990's she found that those researchers were very enthusiastic about the novel ideas, concepts and worldview conveyed at the institute's summer school program. By the early 2000's, however, most of the arriving students had already grasped the concepts of complex systems science, and thus stood prepared to begin work immediately on relevant interdisciplinary problems.

At the end of Dr. Mitchell's appointment at the Santa Fe Institute, she moved to the Oregon Graduate Institute in Portland, which had recently merged with the Oregon Health and Science University, and which subsequently reoriented its mission, resulting in most of the computer science department being moved to Portland State University, where Dr. Mitchell currently serves as a professor.

To this day, Dr. Mitchell maintains her long-standing association with the Santa Fe Institute, where she currently serves among the institute's many outstanding external professors. In fact, the idea for her latest book arose when Dr. Mitchell was invited to give the Ulam Memorial Lectures in Santa Fe. This yearly lecture series, honoring mathematician Stanislaw Ulam, aims to convey the concepts of complex systems to a general audience. Her lectures, entitled "The Past and Future of the Sciences of Complexity", established a basis to begin the book that she is here today to discuss with us.

*Complexity A Guided Tour* has achieved critical acclaim, winning the 2010 Phi Beta Kappa Book Award in Science. The award is offered for outstanding contributions by scientists to the literature of science, and is intended to encourage literate and scholarly interpretations of the physical and biological sciences and mathematics. Despite the prestige of this award, and the associated \$10,000 check, Dr. Mitchell often points out her pride in another review, which

contains an analogy (recall that Melanie's PhD work involved computer-generated analogies). The review in question was written by an editor for *The Magazine of Yoga*. Let me quote from the review: "Mitchell writes about science the way Julia Child writes about deboning a raw chicken all by yourself."

To quote Dr. Mitchell: "Indeed, this analogy pinpoints perfectly what I had hoped to do: give readers the confidence that they, themselves, can really make sense of the science, even though the science can be objectively difficult and daunting."

Please join me in welcoming Dr. Melanie Mitchell.