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I see the Ames Astrobiology Academy as a great forum to cross-pollinate research and spark new ideas. Research Associates bring unique perspectives from their home institutions, and take back their experience. As my background shows, my focus is on how we can stimulate discovery, collaboration, and cross-disciplinary fusion at NASA.

The origin of life is an ideal case study of the creative process. To date no one has been able to "repeat the experiment" — to recreate life. Nor can we test myriad competing, contradictory hypotheses about the origin of life, either to verify them or to prove them false. Many aspects of the origin of life problem lack the traditional cornerstones of scientific method: a single unknown variable, repeatable experiments, and falsifiable conclusions. I've been writing a book, *Of Microbes and Mind: from the origin of life to artificial life*, which describes how origin of life theorists tackle this ultra hard problem — how they form and debate their contradictory hypotheses.

In my first career as an architect I focused on "design method", research on how we solve complex problems demanding originality and innovation across disciplines. Like astrobiology, architecture resists "disciplinary boxing" and requires collaboration amongst different areas of expertise toward synthesis. While a graduate student at Harvard, I worked with Buckminster Fuller, who coined the term "design science."

My research on tensegrity structures (lightweight, rapidly deployable, discontinuous compression structures) led to a German government research fellowship to develop "Lightweight Structures for Solar Energy Applications" at the Institute for Lightweight Structures (University of Stuttgart, Germany). But I then realized that I was more

interested in research on the processes of discovery and invention, than in this specialized domain. I returned to the U.S. and led two cross-disciplinary R & D teams funded by the Department of Energy and National Science Foundation. Both teams won national awards, convincing me that my research on innovation would pay off. An NEA grant enabled me to further develop my cognitive model and tools to support innovation. This early interest led to research on how evolutionary models underpin creative intelligence and collaborative problem-solving.

To test my method, I prepared a submission to the international competition "Kawasaki: Information City of the 21st Century", sponsored by the Japan Association for Planning Administration and Mainichi Newspapers with cooperation of ten ministries and three agencies of the Japanese government. I proposed a modular structure of linked components, based on an evolutionary model, for a think tank to guide urban revitalization through a self-organizing, collaborative network. My submission tied with Matsushita Corp. for first place and won the Award of the Mayor of Kawasaki.

I aspired to continue my research on the creative process at that most creative of federal agencies, NASA — to apply my method and assess its effectiveness by addressing the challenges of NASA missions. Since one cannot observe an individual creative mind at work, I hypothesized that one might draw a correlation between the individual creative mind and the collaborative "group mind" of a team trying to solve a hard problem. In a group, the process of concept formation is open to view, so it can be observed. Collaborative web environments now enable the researcher to track problem-solving paths, trace threaded discussions, and document the steps toward design synthesis.

From 1998 to 2002 I was a Research Scientist at NASA Ames, studying how CPSEs (computational Collaborative Problem-Solving Environments) can enable distributed creativity and design collaboration for NASA space missions. I developed a proposed new program, which would not only include a think tank to promote innovation across disciplines, but also provide a testbed to pioneer research on how best to support invention, collaboration, and breakthrough discovery in cross-disciplinary teams.

The Ames Astrobiology Academy is at once a co-located team each summer, and a distributed university network of alumni and faculty year round. So it is an anvil on which to forge new forms of learning, collaboration, discovery and innovation for NASA Astrobiology Missions.

Hobbies: Wilderness hiking, dancing (from modern to swing to ballroom), creative writing, visual arts. Cannot sing, so should be debarred from vans where *a cappella* talent is required.