



# NASA ASTROBIOLOGY INSTITUTE ANNUAL REPORT YEAR [July 2002 - June 2003]



## Introduction: Letter from the Director



An Open letter from the Deputy (previously Acting) Director  
Rosalind Grymes

The year just concluded, the Institute's fifth, has been a year of milestones and accomplishments. The achievements, as in the past, are focused on both individual and collective efforts from our member researchers; their work, their publications, their contributions to the landscape of science.

And, once again, in their participation with initiatives either conceived by them and supported by NAI Central, or vice versa. The partnership between our distributed Teams and the centralized administrative directorate persists, and continues to generate productive results in a variety of endeavors that define and nurture the astrobiology community. I will mention some of these here, and rely on the body of this Annual Report to detail the substantial scientific accomplishments and other results of Institute activities. Personally, however, this fifth year—during which I stewarded the Institute as Acting Director—is memorable for the incessant rush of institutional milestones. One by one, or in groups, these appeared on the horizon and then sped by breathtakingly fast.

These milestones represent maturation stages in the development of the NAI rather than individual annual achievements. They are close to my perspective not only because many proceeded from NAI Central, but because they intrinsically tested, and demonstrated, the continuum of the NAI as an entity that is 'more than the sum of its parts.' We have experienced a second change in leadership, the validation and formalization of the Institute's Executive Council, and a re-orientation of the NAI's research suite. Were there comparable shifts in the preceding four years, since the NAI's inception? In 1999, we saw the hand-over from the NAI's first director and interim manager, G. Scott Hubbard, to the stewardship of the second director, Dr. Baruch Blumberg. In 2001, the Institute felt an expansion in its membership with the selection of four additional Teams. These events were substantial milestones in the Institute's lifetime, certainly. However, the timing of these previous experiences, at two year intervals, highlights the unique circumstance of the simultaneous occurrence of three comparable defining alterations in one year.

As alluded to above, Dr. Blumberg retired from his NAI role late in 2002 (although remaining active with aspects of the NAI and with other scientific organizations at NASA), after having announced his intention to do so in December of 2001. We, as a group, experienced an unexpectedly long lag

between his leave-taking and the appointment of the third Director, Dr. Bruce Runnegar. Weathering a change in leadership is a classic challenge to any organization, and this one was more protracted than most. It was, even, two changes at once, as I stepped in to become Acting Director in October of 2002. I am deeply grateful to my colleagues in all fifteen of the NAI Teams for their cooperative and supportive input last year. Two different considerations permeated my time as NAI caretaker. One, that the business of the Institute and the maturation of science initiatives continue, seamlessly and with clear purpose. Two, that issues relating to strategic future directions and policy or precedent be handled gently, so as to provide ample room for the perspective of the new Director, and for the perspective of the Institute's Executive Council. To the extent that these competing views mingled successfully, I credit the professionalism and commitment of the NAI Central team and the good-will of the NAI members.

The Executive Council, this year, also experienced dramatic change. Crystallizing informal procedures, the Council was provided with a Charter (drafted in Year 5 and signed in November, 2003) defining its operational scope as the primary advisory body of the NAI. Among the specified functions of the Council is a new responsibility related to the use of the Institute Strategic Fund (ISF). The Council prioritizes the use of this fund and the NAI overall benefits from the relevant and knowledgeable advice of leading astrobiology experts—the PIs. In addition, through the ISF, the Institute maintains operational flexibility and responsiveness that are critical to research and technology innovation. Simultaneous with this change, however, the Executive Council itself was re-arranged. The change in Council membership did not occur until November 1, 2003, but the stage was set by the announcement, in June, of the selection results from the third Cooperative Agreement Notice. Like the challenge associated with the directorship, this substantial change to the operation and membership of the Executive Council relied on the underlying continuity of the Institute infrastructure.

The third Cooperative Agreement Notice (CAN) proposal cycle had far-reaching effects beyond its impact on the membership of the Executive Council, of course. The first Team selections, in CAN-1, established the founding Teams of the NAI. The second round, CAN-2, provided additional research elements, through the selection of four new Teams that joined the initial eleven. For the first time, in CAN-3, the NAI experienced a revision of its content, rather than an additive expansion. The process of CAN-3 and its outcome, and the perception of both these elements by the Institute's membership, the NAI's funding sponsors, and the astrobiology community at-large, were critical features of the Institute's maturation. Thoughtful, deliberate planning went into every aspect of CAN-3, for exactly these reasons. The experience of concluding the founding Team awards, at the five+ year mark (each CAN-1 Team was provided a four-month fully funded extension to the original five year period of performance, for transition purposes) was painful, but essential. Institute membership has become a sought-after, high profile recognition of excellence across the disciplines of astrobiology. This circumstance is due, quite directly, to the achievements of the scientists involved in the NAI during its first five years. At the same time, the NAI remains, not only nationally but internationally, a unique opportunity

for large-scale support of astrobiology research, a dynamic interdisciplinary endeavor. Both these features of the NAI, prestige and singularity, contribute to an intensely competitive selection environment.

The last five years of NAI activities, and the result of the CAN-3 selections in this year, highlight another challenging aspect to the Institute's collaborative community. The proposal evaluation process pointed out the dichotomy between the inter-Team competition that is intrinsic to peer-review processes and the inter-Team cooperation that is intrinsic to Institute membership. The solution, if there is one, to these apparently opposing interests lies in the advantages, project by project and researcher by researcher, that collaboration provides. We continue to observe dynamic interactions between NAI members, whose individual and Team activities benefit from collegial exchanges. One specific outcome of the competition/collaboration dipole is the Astrobiology Drilling Program (ADP). This initiative for the acquisition of Early Earth geological samples officially began in the summer of 2002. It is ongoing, and provides an umbrella organization to individual, even potentially competitive, projects. The ADP articulates, and manages through its Steering Committee, policies on research conduct, field investigation protocols, international cooperation, and sample curation/distribution. The program arose through initial dialogues with groups representing potentially competitive inter-Team interests. Facilitation of outside-the-box solutions to collaborative science is a key feature, and key success, of the NAI.

It is difficult to say whether these organizational developments occurred against the continuing backdrop of other events and annual accomplishments, or vice versa. Whichever attitude you prefer, the accustomed suite of repeat successes and innovations went forward in Year 5, as it always does. The NAI held its third Institute-wide meeting, maintained its visibility with international partners, interacted with several review, oversight, and advisory committees, and moved forward with ambitious Education and Public Outreach offerings while maturing as a 'virtual,' electronically-enabled, Institute.

The Third General Members' Meeting, held at Lead Team Arizona State University hosted by PI Dr. Jack Farmer and his associates, was notable for many reasons. The ASU administration offered us an extraordinary welcome, and many members of Jack's Team contributed long hours to planning and implementing this meeting. The NAI demonstrates its true nature as a working collaborative when research sites support Institute-wide activities of this scale, lending a warm and collegial atmosphere to a broad and inclusive undertaking. The meeting was filled with up-to-the-minute presentations of new information balanced with interdisciplinary reviews of current astrobiology science issues. A Town Hall Meeting broadcast to distant sites and a PDA-based alternative to either CD or hard-copy program books contributed a forward-looking use of technology to the meeting. The single highlight, though, must be the morning we spent interacting in open-ended, unstructured discussion groups as we waited for ASU security and local law enforcement officials to determine that the conference site was suitable for our use following a bomb-scare. This meeting, like most, had overtime sessions and speakers overly optimistic about their effective content delivery rates. However, our unexpectedly disrupted day concluded with only a deliberate 30

minute adjustment, and no loss of content. The cooperation of the re-scheduled plenary speakers, Drs. Steven Benner and David Deamer, and of the entire day's roster of presenters, enabled that outcome. The sangfroid of the combined ASU and NAI Central logistics teams, on this occasion, matched our previous high (with our hosts at the NAI Team Carnegie Institution of Washington) during the kitchen fire at the NAI Second General Members' Meeting in Washington, D.C. (you didn't know...?)

In a marginally less explosive development, the National Research Council's Committee on the Origin and Evolution of Life (COEL) last year produced a report on astrobiology, nationally and internationally, which included special comment on the NASA Astrobiology Institute. The COEL included positive and complimentary material on the accomplishments of the NAI. The committee also thoughtfully articulated its advice relative to ongoing challenges of balance among the NASA Astrobiology Program elements (individual grants for both research and technology efforts, the NASA Specialized Centers of Research and Training focused in the Origin of Life, and the NAI) and the inclusion of additional astrophysics and astronomy research in the astrobiology repertoire. The group also recommended, presciently, several initiatives that were already underway at NAI by the time the report was published and distributed, notably the formation of an Astronomy Focus Group. In their analysis of the international astrobiology science scene, COEL accurately pinpointed the positive effect of the Institute's program of Associate and Affiliate partnerships. This area, too, saw important developments this year, with the formation of the International Astrobiology Circle (IAC). The IAC's founding members include the NAI and each of the Institute's Associates (Centro de Astrobiología and Australian Centre for Astrobiology—which became an Associate following Affiliate status this past year) and Affiliates (Astrobiology Society of Britain, Groupe de Recherche en Exobiologie, and European Exo/Astrobiology Network Associate—a twelve member European conglomerate). These six groups were soon joined by the Swedish Astrobiology Network. Together, the IAC's members will focus on providing opportunities for young scientists, across the globe, and ensuring that workshops, conferences, and symposia include both student participants and appropriately diverse international contributors.

Two accomplishments come to mind for special acknowledgement in the arena of education, outreach, and training. One is a specific initiative aimed at the professional science community, the other a general recognition of the continued importance of using many and varied approaches targeted to multiple different audiences. In the first, a suggestion from Drs. Bruce Jakosky and Carl Pilcher led to the inception of the NAI Insight Courses. The concept behind the Insight Courses is simple; each is a full-featured 5-day introduction, presented by experts, to a domain of scientific inquiry. Each course includes some laboratory or field investigation elements, as appropriate, and each is designed specifically to accommodate participants with an advanced background in science, but one obtained in a different discipline than that addressed by the course. For example, this year, we presented Planetary Science for non-Planetary Scientists (led by Dr. Bruce Jakosky with a field component in the area surrounding Flagstaff, AZ) and Microbiology for non-Microbiologists (led by Dr. Ken Nealson with a field and

laboratory component at the Wrigley Marine Science Center, Catalina Island, CA). Registration in these courses is open to the entire community. A more general approach to the scientific, academic, and general public communities was articulated in one of the evaluative elements specified by CAN-3. The most recent selection opportunity for NAI Teams required each submission to detail the various ways in which the Team planned to 'strengthen the astrobiology community'—one of the encompassing goals of the NAI. Possible areas of emphasis included the pre-college education audience, the science-interested public, traditionally underrepresented communities, and the professional research community. NAI recognizes that informing and engaging each of these sectors is important, and that the most successful projects will leverage talented, creative partners experienced in a variety of media with scientists engaged directly in astrobiology research programs.

The virtual Institute has matured, year by year, over the preceding five. Throughout, we have endeavored to explore both synchronous and asynchronous technologies that enable effective, distributed interactions between the Teams and NAI Central, between the Teams themselves, and between the members individually. In addition to piloting the use of hardware and software tools, we have learned that the inclusion of 'users' in the process that identifies needs and solutions is critical, as is remaining in the loop following deployment and training to observe and measure how the tools are used. Following an extensive survey of NAI members regarding the needs and priorities they perceived for electronic resources, we discontinued our support for the *Postdoc* knowledge management software and performed a market survey of other tools. The primary videoconference solution originally acquired has stood the test of time, and has been upgraded constantly. It has been joined, now, by a desktop videoconferencing system that expands the ability of members across the NAI to participate in video-seminars and journal clubs as well as special interest meetings. Other asynchronous facilities have been piloted and distributed, and this approach will continue. The NAI is unique in the institutional breadth of its 'virtual' undertaking, in the complexity of its connectivity issues (multiple supported platforms, for example, and mixed user motivations), and in the highly technical nature of many of its supported collaborative dialogues. We demonstrate a broad natural laboratory of user interface issues.

Another of the critical interfaces in astrobiology arises from the diversity of disciplines represented within the astrobiology community. We continue together to face the ceaseless challenge of facilitating informed exchanges at the edges of our disciplines. In addition to this communication issue, we must continually address the dynamic balance between competition and collaboration. NAI members are diverse; they compete; they collaborate. Diversity, competition, exchange. This strategy has served well throughout the evolutionary history of life on Earth. It seems robust and dynamic enough to succeed. In fact, the NAI is counting on it.

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