Something New: Astrobiology in the Real World

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ANNIVERSARIES ARE GOOD times to celebrate progress and consider the path forward. So it is for the field of astrobiology. The coming year marks the 20th anniversary of the NASA Astrobiology Institute (NAI), the beginning of an “institute without walls” that aimed to foster a guided approach to understanding life in the Universe. By deliberately integrating multiple disciplines across the life, Earth, and space science fields, NASA initiated the establishment of a far-flung virtual community and developed an ambitious research roadmap with goals and objectives focused on addressing foundational questions about the origin, diversity, and future of life (Morrison, 2001). In those early years, some naysayers argued that astrobiology wasn’t an area of legitimate scholarship but merely NASA’s attempt to rebrand its aging space research. After all, it was 40 years post-Sputnik, 30 years post-Apollo, and 20 years post-Viking missions—and still there were no significant discoveries that emerged from searches for life beyond Earth, except perhaps that space was a costly and extreme environment to explore. Indeed, many viewed space as mainly a geopolitical realm, not an area where major scientific advances in our basic understanding of life would be made.

Ten years into the astrobiology experiment, the Space Studies Board report (Committee on the Review of the NASA Astrobiology Institute, 2008) concluded that the NAI was noteworthy for promoting interdisciplinary science research, catalyzing collaborative efforts, and establishing a widely recognized field of scholarship that led indirectly to similar interdisciplinary groups worldwide. That success continues today, as we celebrate two decades of cutting-edge progress: actively training the next generation of astrobiologists, encouraging participation in innovative science research and diverse space missions, and communicating widely about the work through academic and public channels.

From the formative years of the Astrobiology Roadmap (Astrobiology Roadmap, 1998, 2003; Des Marais *et al.*, 2008) to the current Astrobiology Strategy (Hays *et al.*, 2014) and the AstRoMap (Horneck *et al.*, 2016), this international community has embraced a list of guiding principles to complement the research plans. Astrobiology continues to assert the importance of multidisciplinary and the need to cooperate between and among disciplines; to encourage planetary stewardship through attention to planetary protection and ethical issues associated with exploration; to recognize the deep societal interests in research about life, here and else-

where; and to address broad interest in our work through educational and public outreach. While the guiding principles may not be as exciting as space missions and science discoveries, they have persisted, touching researchers in astrobiology and other academic fields in scholarly and sometimes provocative ways.

As our field has progressed, questions about life’s place in the Universe, responsibility for space environmental stewardship, and the implications of different cultural, philosophical, or ethical perspectives have raised serious debate about real-world issues. No longer confined to armchair deliberations in the basic sciences, our attention also focuses on real-world issues and questions about human activities and technological advances with practical implications. Some of the concerns may arise beyond particular disciplinary science silos—or at the intersection of fields that previously may not have interacted much with astrobiologists.

Already our advances have raised the very real prospect of direct interaction with “other” life, here and beyond. The associated practical questions, policy concerns, and potential impediments go beyond the boundaries of individual disciplines. Some scientists may think that delving into applied science or societal questions should remain outside the realm of basic sciences, but that doesn’t make the concerns go away. Others may presume that dissenting opinions or opposition emerge mainly from those with nonscientific worldviews, but that is not usually the case either. We need to be proactive in acknowledging these concerns, if for no other reason than they may raise potential impediments to our research and exploration.

We already recognize that environmental, health, safety, and policy questions will arise for future sample return missions and subsequent handling of materials in containment facilities on Earth. If extraterrestrial life is verified as distinctly different from life as we know it, would that curtail future exploration missions in any way? Would a discovery of verified martian life mean that Mars belongs to the microbes, as Carl Sagan suggested long ago? The questions go on... Already, representative debates have arisen within the science community that are illustrative of what may lie ahead.

In a previous issue of *Astrobiology*, Forum Articles by Fairén *et al.* (2017) and Rummel and Conley (2017) discussed future Mars mission implementation, each expressing strong, divergent views about the optimal path forward in life detection. Their arguments about planetary protection

requirements on outbound missions, Special Region policies against cross-contamination, and concerns about the inevitable future transport of human microbial symbionts in the decades ahead undoubtedly reflect the assorted opinions of the community. The pairing of these Forum Articles was intentional; they are exemplary of the types of issues likely to arise in dealing with risks, uncertainties, cultural concerns, costs, and acceptability of ongoing and future exploration activities... whether debated among scientists or others. Moreover, the News and Views paper by Kminek and Fisk (2017) in the same issue urges all scientists to become involved in meaningful ways in international deliberations that have direct implications for future exploration activities.

In 2018, *Astrobiology* will publish a series of short articles highlighting a variety of topics of societal concern, reflecting behind-the-scenes deliberations or activities likely beyond astrobiology's traditional disciplines. In addition to featuring invited perspectives from assorted science and nonscience fields, there will be ample opportunity for community comment as well—in the form of response letters to the section editor (see the *Astrobiology* Manuscript Submission Guidelines for details). If you still have comments on the recent planetary protection forum articles, send a letter to us soon so we can share details with the readership of *Astrobiology* in the new year.

We hope that this new section, *Astrobiology in the Real World*, will encourage thoughtful consideration of how astrobiology progress is interpreted within and beyond the realms of research and space missions. As we strive to understand humankind's place in the Universe—past, present, and future—and extend our exploration and uses of space, it is right to involve diverse stakeholders, consider collective goals, and make decisions based upon up-to-date understanding—regardless of what disciplinary silos or societal perspectives we represent.

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