

# Chapter XLIX

## Lessons Learned from the NASA Astrobiology Institute

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### ABSTRACT

*Complex social, economic, political and environmental challenges as well as new research areas that cut across disciplinary, institutional and national boundaries are catalyzing a rapid increase in geographically distributed work groups. At the same time, advanced information technologies designed to facilitate effective communication and collaboration among remote colleagues are having a dramatic impact on social and professional relationships and organizational structures and forms. The practice of science is one of the domains that are undergoing significant change as a result of this trend toward increased collaboration. In this chapter we describe our efforts to promote collaboration among geographically dispersed multidisciplinary science teams in the NASA Astrobiology Institute. The lessons learned regarding the importance of recognizing and addressing the complex and inter-related dimensions of collaboration have implications not only for science but also for many other contemporary domains of activity.*

### INTRODUCTION

Today, around the globe, there are growing numbers of people connected by shared purposes, common goals or strategic interests working in virtual teams and organizations whose effective

operations are dependent upon collaboration across distance and other barriers. In theory, these virtual groups, made possible by advanced information technologies, are well suited to address complex issues and problems by having the capability of drawing on needed expertise and

other resources wherever they may be located. In practice, however, the establishment and maintenance of thriving virtual groups and organizations remains challenging.

Over the last 20 years or so, a significant amount of research has been undertaken with the aim of better understanding the technical and social requirements for, and the best practices associated with productive virtual collaboration (See Duarte & Snyder, 2006; Gignac, 2005; Haywood, 1998; Hinds & Kiesler, 2002; Jones, Oyung, & Pace, 2005; Langhoff, 2006; Lipnack & Stamps, 1997, 2000; York, 2000). The successful implementation of collaboration tools and technologies requires attention to the specific domains and existing organizational cultures into which these new methods of communication and collaboration are being introduced. While some issues are pertinent to a wide range of domains, others are unique to a specific context, for example, business, education, social policy, or science. Our concern here is with the challenges associated with the implementation of electronic collaboration to further scientific research.

This chapter focuses on a recent NASA effort to establish a virtual scientific organization, the NASA Astrobiology Institute, made up of geographically dispersed multidisciplinary teams of scientists supported by electronic communication and collaboration tools and technologies. Our discussion is based on work carried out by Lisa Faithorn and her team during her tenure as Manager of Collaborative Research at NAI from 2000 through mid-2004, with the guidance of NAI Director Baruch Blumberg, and during the year following Blumberg's retirement from NAI. We discuss our findings from these several years of research focused on attempts to catalyze and facilitate electronically supported collaboration within and between 15 multidisciplinary teams involving more than 500 participants from over 100 institutions. Our efforts included not only the implementation of a variety of electronic collaboration tools, but also the promotion of an or-

ganizational culture in which collaboration across distance, across disciplines, across institutions, and even across generations was emphasized, valued, and sought out. We believe the lessons learned from this endeavor are not only important for science but are also relevant to geographically distributed work groups in education, business, social policy and other activities.

## **BACKGROUND: SCIENTIFIC RESEARCH AND THE CHALLENGES OF REMOTE COLLABORATION**

Collaboration among researchers has always been part of the scientific endeavor. Students undergoing their training together, senior and junior scientists in mentoring relationships, or colleagues at the same institutions who then relocate, develop close working relationships maintained across distance and time. Collaborations based on shared research interests also develop through professional societies, conferences, and other meetings. However, most of these formal and informal interconnections among scientists have historically occurred within the same or similar disciplines. What is more recent within the scientific realm is the increasing occurrence of collaboration across a wider array of diverse specialties and disciplines, institutions, and national boundaries.

New information and knowledge is accumulating so quickly and is available so readily that it is necessary for researchers to limit the breadth of their expertise in order to develop necessary depth of understanding. Individual institutions and laboratories can no longer encompass the study of all possible subjects within a discipline, let alone all the disciplines relevant to a complex project. To address many current science and engineering problems, knowledge must be integrated from a variety of different disciplines. This collaboration among scientists of diverse backgrounds,

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