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So You Want to Form an Interdisciplinary Team? ...Good Luck!

If your research depends on federal funding agencies, you have probably noticed that requests for proposals

that encourage (or in some cases require) an interdisciplinary team are becoming more common. Interdisciplinary research, by definition, involves two or more disciplines that are usually considered distinct. Therefore, I am not talking about disciplines like mineralogy and petrology, where the overlaps and connections are obvious. Try instead mineralogy and biochemistry, or geochemistry and geophysics, where one can be left scratching one's head looking for shades of grey in between two otherwise disjointed fields. Yet interdisciplinary teams are formed all the time—they are assembled typically to solve real world problems that individual disciplines cannot address by themselves. For example, if one wants to look into the possibility of bioremediation of dense non-aqueous phase liquids (DNAPLs) within a complex soil horizon sequence, it would be nice to have a physical hydrologist, a geochemist, a microbiologist, and a soil scientist on board, at the minimum. Scientific interdisciplinary collaboration is a complicated and tricky undertaking—and if the team members do

not realize it already, they soon will. The probability of a long-term, close-knit, fully cooperative and productive effort is probably much lower than one would ever hope, or even imagine. This is because diversity, although it clearly enhances scientific breadth, which is essential in complex problems, also greatly complicates group communication, hinders cooperation, increases the potential for conflict, and even reduces and erodes cohesion.

Such groups, although they begin with the best of intentions, can and often do fall prey to any number of splintering mechanisms, which reduce or eliminate their effectiveness. How will team members appreciate (or even understand) the technical complexities of several specialties at once? Can the team really speak each other's language? How many months or years will it take to become truly scientifically productive together? How will graduate students cross over into cutting-edge research in fields other than their own? In what journals will team members publish interdisciplinary research? There are even logistical problems that often go unrecognized. With the research team spread all over a campus, or a country, or

the world, how will the team meet conveniently on a consistent basis? Potential questions, concerns, and problems seem endless.

Even if the pitfalls implied above can be overcome, the battle may still be lost. This is because forming an effective interdisciplinary team is often perceived as a matter of mechanically selecting individuals with the specialties required, while also considering practical and/or proposal-enhancing factors such as the accomplishment, status, and availability of potential group members. Recent academic studies centered on the psychology of collaborative scientific endeavors are actually few and far between, but the literature on team performance in general has shown, perhaps not surprisingly, that attributes such as values, attitudes, beliefs, and personality traits are even

more important for group success. Such conclusions are difficult to quantify, but the evidence in this case comes from the peer-reviewed scientific literature by researchers who study the psychology of group dynamics for a living. The problem here is that this literature is generally not easily accessible or even of interest to physical scientists.

Individual investigators, delving deeply into a single discipline, still form the

essential foundation of each field. Such research is more important than ever. But in these days especially, there is more to it. Society continually demands more and more from science. And the fashion of science is changing. The model of complex problems, addressed by interdisciplinary teams, is becoming standard fare, not an oddity. And the success of an interdisciplinary team depends on the constructive interfacing of team members through a complex human interaction dynamic. Clearly, such teams do not automatically work. A functional, productive team requires a great deal of patience, understanding, hard work, persistence, and superb communication skills. Only then will interdisciplinary scientific teams, and individual scientists on those teams, reach their potential and have a chance of solving the next generation of complex problems facing the world.

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