Graduate Student Reflections of the ASU- Workshop of Research Agendas in the Societal Aspects of Synthetic Biology

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As the 'new kids on the block', graduate students who attended the ASU Workshop on *Research Agendas in the Societal Aspects of Synthetic Biology* were asked to provide reflections of our experiences. As a group, we considered what we learned, what the emerging research needs in the field are, how our views of research needs were shaped by the workshop, and whether the workshop was successful in setting a research agenda.

We learned that the scope of what constitutes synthetic biology is much larger and more diverse than what may be expected in other fields of study. This complexity within the field is potentially what justifies the investment of resources, since the benefits can apply across multiple disciplines. We also noted several key research needs within the field- interdisciplinarity, interdisciplinarity, and interdisciplinarity! There were clear disciplinary cultural boundaries that emerged in conversations during the plenaries and break-out sessions that illustrated this need.

One analogy from the workshop opening session that underscored this idea was the suggestion that social scientists and natural scientists see themselves as tied to each other in a marriage - not of the 21st century, but of the 19th century- when "divorce was not an option." At first, this analogy simply seemed problematic; were we really being called to model ourselves on a relationship of institutionalized grossly uneven power dynamics? As various social scientists spoke of the challenges of being embedded in programs with synthetic biologists, the American institution of marriage in the 1800s began to sound like an accurate description of some 'interdisciplinary' projects.

Some natural scientists (and funding agencies) seem to assume that social scientists are there to aid in the goals of synthetic biology, much as wives were once assumed to exist to support the work of their husbands. American women gave up civil and property rights upon marriage, and in return their husbands were legally obliged to support them - perhaps an uneasy parallel with the restrictions that some social scientists have felt are the price of being affiliated with well-funded projects.

As graduate students, we are defining ourselves as scholars in our respective fields. There are risks in engaging in interdisciplinarity research at this stage in our careers. Nonetheless, we each came away from this workshop believing that work on synthetic biology encourages and perhaps

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requires interdisciplinary approaches to research and communication. We also, however, saw the need to ask: Interdisciplinarity to what end, and how?

If our model is the 19th century American institution of marriage, we might understand the call for interdisciplinarity as primarily urging social scientists to better understand the underlying science of synthetic biology. With a bit of flexibility, this might be broadened to requiring natural scientists and engineers to include social scientists in grant applications, even to provide certain kinds of access and information to those social scientists in the interest of allowing them to do their job.

Luckily, we are not restricted to that model for research concerning synthetic biology. A better model might be symbiosis: the mutually beneficial, close interaction of different organisms. There are many different kinds of symbiosis, with differing degrees of dominance, mutual reliance, and distance between organisms. Thus, in some cases, symbiosis is required for survival, while in others, it is a desired convenience. This analogy might enable us to recognize the importance of multiple approaches to knowledge production, while also recognizing that this does not always mean social scientists embedded in synthetic biology labs.

The point is, there are lots of different ways to 'do' interdisciplinarity. This workshop demonstrated the incredibly broad range of research projects and approaches by social scientists (and those in the humanities and law) on synthetic biology. We are excited to engage in projects that draw from this broad spectrum, as well as the wide range of work by engineers and natural scientists on synthetic biology. Certainly there is no 'one-size-fits-all' approach to structuring these projects. We doubt that the speaker meant to imply all of the inequities in power distribution that came with 19th century marriages, but likely was alluding to the permanence of the arrangement. Nonetheless, if a 19th century marriage seems like a fitting analogy for the power dynamics within a project that may be a useful indicator of the need for change.

Overall we were encouraged to see such a great selection of participants. The diverse backgrounds and research interests of the invitees contributed greatly to the conversation. We recommend further workshops to continue the discussion and perhaps the establishment of a website or other forum to facilitate communication. As far as setting a research agenda for societal aspects of synthetic biology is concerned- we see this experience as providing a foundation for conversations and future research partnerships, marriages, or whatever works for the parties involved.