Networking necessities in the world of big science

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Our lead article this month debates a topic of great importance for the future of the biomedical research enterprise. And, in a very certain and directed sense, the matter of “BIG” science plays into the hand that has been dealt to reproductive science in the United States. With so many scientific disciplines making progress in the diagnosis, treatment, and long-term management of human disease, for the JARG constituency the future of research is looking bleak at best!

Ten years ago, under the leadership of Dr. Elias Zherouni at the National Institutes of Health, an experiment was launched to encourage the formation of research enterprises geared directly at advancing specific areas of human health through the investment of research dollars in substantial proportions. Referred to as “roadmap” grants, some eight projects were identified after fierce competition, with one of them chosen to address new and pressing needs for preserving the fertility of men and women whose fecundity was compromised by medical treatments such as those imposed on cancer patients seeking a quality-of-life measure we tend to take for granted—the ability to reproduce! The story behind this is offered to our readership this month by Dr. Teresa Woodruff, the founder and leader of the Oncofertility Consortium based at Northwestern University. The take-home message, while subject to interpretation and a much-needed reality check in today's economically challenging climate, is clear as the results of this effort have constructed a network of interactions between oncologists and reproductive medicine

specialists that maps out realistic options for patients requiring fertility preservation.

Fertility preservation has become a focus within the discipline of reproductive medicine, and a subject JARG has treated and emphasized over the past 4 years. We continue to do so in this issue and encourage our readers to explore topics as far-reaching as treatment options for cancer patients in the article from Nicole Noyes to the engineering of artificial matrices within with to recapitulate the process of ovarian follicle development, as shown in the paper from Ronit Abir's group in Israel. These studies, and those going on around the world, are providing building blocks that should shape the face of reproductive medicine in the future. But will they? The experiment launched by the NIH nearly 10 years ago is paying dividends to patients. But what will it take to sustain such an effort when borderline procedures enter the realm of human ARTs, with no way to ensure that the basic science required to validate our new technologies for safety and efficiency has taken place?

Just as networking retains the buzz word persona inherited at the dawning of the Internet, so too has the notion of the “interactome” crept into our omics vernacular as just another tool for bioinformaticists to invoke in a data-monging era of “BIG” science. Have a look at our cover this month. In glorious display is the interactome depiction. The graphic, taken from the aforementioned article by Woodruff, illustrates the growth and magnitude of the interactions fostered in the oncofertility field over a 12-year span. There are two impressive qualities that emerge. First, in good quantitative style (and adherent to the much-trusted axiom that more is better!) the sheer growth of the field is notable between 2000 and 2010 in terms of number of participants and centers. Second, the confluence of many islands is the most distinguishing difference between 2010 and 2012, reflecting the assembly of an interactome that could easily double as a cell phone network populating North America. The necessity for networking and its impact on many

Capsule The Oncofertility Consortium at Northwestern University is drawn upon as an illustrative example of “BIG” science maximizing networking for the improvement of human health. Will it work today and at what cost for “small” science?

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aspects of world order is the most visible manifestation of communication between peoples and disciplines, for better or worse. And this conclusion—and possible consequences—finds its’ origins in the not-so-distant past. Let me indulge in editorial prerogative for just a moment.

Growing up in a blue-collar family in the 1950s and early 60s allowed me to witness a transformative matter of enormous proportions for the continental United States. Conceived and implemented under the Eisenhower administration, and sustained at great cost to this day, the Interstate Highway system became a reality that has forever linked 48 separate states and hence underwritten the realization of dreams for this country of opportunity: the roadmap network of highways gave every American car owner the right and privilege to travel for business or pleasure. Moving resources, transpositioning people and their acquired knowledge and experience, became the *raison d’être* of opportunity previously accorded to the few that could afford travel by air. The investment made in the highway system was a huge economic boost potentiating employment, production, commerce, and educational progress for Americans. Cities and states were brought into a truly interactive and synergizing configuration that could not have been achieved without such an investment in infrastructure. In some sense, this was the North American equivalent of the industrial revolution in Europe fostered by the railroad industry and underscoring that continent’s integration to this day. Just a century later!

The next great networking event of the 20th century took place in the 1990s when the Internet matured into the vehicle it

has become for advancement of the scientific enterprise. Again, using the baby boomer generation as a reference point familiar to some of our readers, trips to the library or post office (anyone remember reprint request postcards?) used to be commonplace and requisite for reading and archiving the literature most pertinent to our chosen field of study. And superimposing the electronic media capabilities on top of this has made the sharing of information, of the fertile and sterile variety, both facile and dominant. Have the necessities of networking been fully exploited through the traditional R01 reductionist “small” science approach, or is it time to adopt and fully engage “BIG” science?

“Small” science worked when technology advanced at a snail’s pace relative to today. It fostered the evolution of islands of expertise and knowledge factories that were allowed to synergize in the traditional formats of meetings, peer review, and publishing. It fed many institutional “mouths” with generous subsidies (also known as indirect costs). But is it practical with the globalization of the world economy, and the dependence dictated by interdependencies in the quest for new knowledge? The costs for “BIG” science alone reveals that there are no simple answers. But playing well together will remain an essential element no matter what paradigm emerges as our path to a knowledge-based economy and the improvement of the human condition. Even more important will be the choice of leaders who perceive the greater good as a target. As so aptly stated by Helen Keller, “...sad is the person who has sight but no vision.”