

Expanding ELSI to all areas of innovative science and technology

Dov Greenbaum

New curricula in the study of the ethical, legal and social implications of scientific research aims to further the conversation among all stakeholders in the interactions between science, technology and society.

As a graduate student, I didn't appreciate the importance or relevance of the class on the ethical, legal and social implications (ELSI) of research that I was forced to attend. Many students, and even established researchers, in basic research and medicine see bioethics in general—and the analysis of ethical, legal and social concerns in particular—as merely tangential and perhaps even wholly unimportant to their research^{1–4}.

Early challenges

The growing focus on ELSI and subsequent development of a curriculum dates back to the early days of the Human Genome Project⁵. The US National Human Genome Research Institute's ELSI research program came on the heels of the unprecedented 1975 Asilomar Conference on Recombinant DNA⁶ which aimed, to some degree, to have a responsible public discussion on science policies⁷. ELSI research under the auspices of Human Genome Project, the largest ethics program ever created⁸, nevertheless has had a number of shortcomings⁹.

Some of the problems with ELSI research have been attributed to unprecedented federal funding levels that encouraged speculation of unlikely events and drew researchers in other fields to abandon their less lucrative studies¹⁰. Additionally, some have suggested that ELSI and bioethics research tends to focus more on speculative, future issues rather than the



actual technologies in use today¹¹. Others have suggested that bioethics tends to be weak on the underlying science, relying on fiction to fill in gaps in understanding the relevant technologies¹² and reinforcing already entrenched misunderstandings or, conversely, that those in the ELSI field tend to be scientists with little or no background in social science¹³.

These concerns notwithstanding, the continued growth of ELSI and the longstanding institution of the congressionally mandated and/or presidential commissions on bioethics¹⁴ are indicative of the continued importance of this field. Most would agree that the introduction of ethics and legal and social concerns in science has been a positive influence on research.

A multidisciplinary approach

To promote the idea that the ELSI model should not be limited to genomics¹⁵, but rather that

all areas of science and innovation can benefit from organized introspection and analysis in light of societal concerns¹⁶ and a general sense of duty to society¹⁷ the Zvi Meitar Institute for Legal Implications of Emerging Technologies (<http://portal.idc.ac.il/en/main/research/zmi/pages/default.aspx>) was opened at the Radzyner Law School in the Interdisciplinary Center (IDC) in Herziya, Israel. The institute, which began operating in November 2014, is broadly interested in the ethical, social and legal implications of new and emerging technologies, with a particular focus on disruptive technologies in hitech and biotech. Current and future areas of focus include but are not limited to artificial intelligence, next-generation genomic sequencing, autonomous vehicles and smart transportation systems, emerging assisted reproductive technologies, renewable energy sources, the 'quantified-self' movement, mobile medical applications,

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synthetic biology, personalized medicine, 3D printing, telemedicine, epigenetics, citizen science, personal genomics, cloud computing, human enhancement, cryptocurrencies, the Internet of Things, virtual reality, precision farming and genetically modified organisms.

The IDC in Herzliya is particularly well suited for housing the institute. Founded in 1994, the IDC is a private, nonprofit organization modeled after US Ivy League universities. Its ten schools offer a wide-ranging multidisciplinary education to students from around the world, providing innovative, dynamic undergraduate and graduate programs to educate future business, technology and civic leaders. Its interdisciplinary educational methods are based on the teaching of information technology and global markets and rooted in the twin concepts of individual freedom and social responsibility, emphasizing entrepreneurship, leadership and commitment to community service.

To fill its mandate, the Zvi Meitar Institute has at least four discrete arms. A policy arm aims to help governments, nongovernmental organizations (NGOs) and corporations by providing, for example, short but comprehensive summaries on ethical, legal and social issues associated with particular emerging technologies. The institute will also aim to draft amicus briefs and relevant draft statutes as opportunities arise.

In practice, some of the policy goals will be achieved via roundtables—closed-door sessions where invited experts from varied disciplines interact in an informal environment to discuss current topics. A goal of the roundtables is to create one or more policy and/or academic papers as a result of the discussions, to be submitted to academic journals, relevant governments and/or NGOs. Although the primary objective of these roundtables is to create a general awareness of the issues associated with new and emerging technologies and to develop policy initiatives and guidelines that will be useful as organizations tackle such issues, secondary objectives include familiarizing experts with the aspirations and accomplishments of the institute and developing long-term interdisciplinary relationships in the relevant fields of study.

Second, a public-outreach arm aims to educate the public on issues relating to innovative science and technologies—through publishing in the lay literature, newspaper

opinion pages and social media. This mandate is also fulfilled by programming that includes interacting with local high schools and senior centers.

Another area of interest for the institute is the effect of film on the understanding (or misunderstanding) of science and technology, and how that understanding can be translated into good or bad science policy. In general, films provide shared touchstones for laypeople and professionals to discuss innovation with friends and colleagues; that is, they provide shortcuts that can clue people in to complicated science and technologies and their relevant social concerns. The nature of the science presented in films and television can have real effects on the general understanding of science and, in some instances, the direction of research¹⁸. Furthermore, the effect of film on young minds to encourage the pursuit of research in science in technological fields or to create a desire to actualize the fictional innovations that they see in film has been well documented. Given the influence of films and their pan-generational popularity, they are great outreach tools to raise ELSI issues with the public. As such, the institute holds events for students and senior citizens that include short presentations and follow-up discussions on science and technology in different films.

Third, a pedagogical arm endeavors to engage the 10–15 affiliated student researchers through individual and large-scale projects and, eventually, credited coursework. The institute also hosts regular events featuring local and international experts and journal clubs with the goal of giving small groups of students access to academic researchers and stakeholders. Moreover, at least one journal-club event each semester is set aside so that one or more students can present their own research, further enhancing the learning experience of the institute.

Finally, a vibrant academic arm publishes and presents scholarly papers, books and textbooks. In its first years, the institute will look to four areas of significant change and innovation for the coming century: human biology, globalization, disruptive technology and sustainability.

For example, in its first year, the institute focused on the legal, ethical and social implications of exoskeletons (human biology); Israeli immigration policy and local technological development (globalization); 3D additive printing (disruptive technology) and autonomous vehicles (sustainable technology).

In the following years, the institute will continue to be guided by these four areas of significant change.

In addition to publishing, the institute intends to host multiple symposia over the course of each academic year. The goals of the symposia are to raise awareness of issues of interest, raise the institute's profile and present academic research to the scientific community and general public. The symposia are designed to be compact affairs wherein academic researchers can present and discuss their latest research over a couple of hours at the end of the day.

All current programming is fully funded, but the institute intends to apply for funding to develop a postdoctoral program to enhance its research capabilities, broaden its reach and help researchers interested in these fields become more established. Above all, the institute's goal is to promote responsible innovation without stifling research. In appreciating that there is a broad middle ground between permissionless innovation and over-regulation of research, the institute's principal aim is to further the conversation among relevant stakeholders in the interactions between science, technology and society.

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