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Biotechnology and the Law: A Consideration of Intellectual Property Rights and Related Social Issues

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I. INTRODUCTION

Recent advances in biotechnology are expected by many to improve crop yield, reduce reliance on agricultural inputs like pesticides and herbicides, alleviate world hunger, improve the safety and effectiveness of pharmaceuticals, assist in the discovery of genes that trigger diseases like cancer, and make more efficient our legal institutions through DNA testing. Clearly, innovations in biotechnology are a powerful force for social change, and they pose unique challenges and opportunities for legal scholars and institutions. This section of the *Pierce Law Review* focuses on the interface between law and technology by examining how innovations in biotechnology accelerate debates about social justice (on a global scale), the role of science, and the patenting of intellectual property.

Since biotechnology, and the actors involved in the debates over intellectual property rights, are involved in a form of “high drama” that plays itself out in the social world, it is necessary to understand that technology does not exist in a vacuum. All technologies generate social change and affect, in varying degrees individuals, groups, institutions, etc. For example, the introduction of the pen changed how information is recorded. A pen is portable, relatively inexpensive and creates semi-permanent markings. The pen, however, represented a shift away from orality, created a note-taking culture and lessened our reliance on short-term memory. The pen also helped consolidate the power of bureaucracies where a reliance on efficiency and order was paramount. Legal documents are generally signed in ink. The pen plays a prominent role in our society and can be found in almost all institutions, including those where information/communication technology dominate. If these transformations can occur when a relatively simple technology is introduced, what can be said about the introduction of innovations arising from the science of biotechnology?

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II. ON THE QUESTION OF TECHNOLOGICAL PROGRESS

Developments in science are assumed automatically to have generalized benefits to society. Scientific discoveries are judged as more or less valuable based on how readily they can be converted into innovations that produce wealth and subsequently enhance economic competitiveness. It is worth noting that not everyone agrees with this assessment. In 1811, a group in England known as the Luddites smashed mechanical weaving equipment in textile factories. The Luddites were not against technology *per se*, but were against losing their jobs and against having their art form de-humanized. Even two hundred years ago, people were aware of the transformative power of technology.

The term “neo-Luddite” is used nowadays disparagingly to refer to individuals who express negative opinions or concerns about technological innovations. The new Luddite is characterized as anti-progress, ignorant, phobic and perhaps even conspiracy-minded. They are assumed to be against progress because they question the need for particular innovations. Neo-Luddites are often characterized as ignorant since anyone who understands science cannot possibly have concerns about it. Their fear is assumed to flow from this ignorance and is deemed irrational and phobic. Lastly, neo-Luddites are considered more prone to so-called “conspiracy theories” because they search for explanations that reveal how the production of scientific knowledge and the creation of scientific innovations are complex and interconnected. The neo-Luddite is considered by many as an aberration at best, or a social virus at worst. Anyone who questions scientific progress in our society is looked upon with suspicion and derision. Anyone who raises concerns about the risks associated with any “economically important” technology like biotechnology is also subject to scrutiny. Similarly, anyone who questions the fairness or appropriateness of current conceptions of intellectual property rights is deemed anti-progressive.

III. THE PRODUCTION OF SCIENTIFIC KNOWLEDGE AND THE CREATION OF AN “OPEN SYSTEM”

The questions and approaches that a scientific discipline can entertain are constrained by the dominant paradigm under which it operates. Science is funded by government, industry and academe to meet certain proscribed societal objectives. The peer review process reinforces work done under the dominant paradigm and punishes scientific work that deviates too widely from accepted points of view. Science is a powerful tool for producing knowledge, generating innovation and creating consensus. In other words, science is a mechanism for directing and promoting a particular

vision of society. As such, science is eminently an exercise in organizing society to take advantage of certain kinds of social capital and natural resources. The artificial split that many make between expert and non-expert, and science and non-science, fails to consider that scientific innovations (and the risks and benefits they generate) operate in an open system. An open system is a desirable and necessary state of affairs since it allows science and technology to develop in the most socially acceptable way possible, and also because it allows laws that protect the creation and dissemination of intellectual property to be in the interest of a wider set of social actors.

Due to the tremendous amount of uncertainty, complexity and contradiction arising from advances in biotechnology, an open system approach is necessary. An open system approach recognizes that innovations arising from research in biotechnology must deal with scientific and social uncertainty simultaneously. Scientific uncertainty comes directly from the limitations inherent in the scientific method itself. It arises from the variables that scientists chose to examine (compared to unexamined variables), how measurements are made and samples drawn, models used for creating and testing hypotheses, and the degree to which bias, randomness and true variability are understood. For instance, many of the scientific controversies on the safety of genetically modified foods emerge over the methods used for assessing causal relationships and addressing uncertainty.

By contrast, social uncertainty results from a breakdown in trust.² Social uncertainty about biotechnology is greatest when trust in science is at its lowest point. Why would such a promising technology as biotechnology generate so much social uncertainty? Notable food safety concerns (e.g., "mad cow disease") have left many anxious about the dangers associated with living in a world dominated by the technical control over nature. Some express concerns about the ability of modern forms of governance to adequately regulate technologies that generate risks that transcend both time and space,³ whereas some see a world becoming increasingly concerned about managing the risks ushered in by industrial modernity.⁴ Others are concerned that developments in genetic engineering, especially as applied to reproductive technology, have crossed a line demarcating morally acceptable from unacceptable uses of technology.⁵ Lastly, consumers

2. See Francis Fukuyama, *Trust: The Social Virtues and the Creation of Prosperity* (Simon & Schuster, 1995)

3. See Michael D. Mehta, *Risk Assessment and Sustainable Development: Towards a Concept of Sustainable Risk*, 8 *Risk: Health, Safety and Environment* 133 (1997).

4. See Ulrich Beck, *Ecological Politics in an Age of Risk* (Polity Press, 1995).

5. See Michael D. Mehta, *Public Perceptions of Genetically Engineered Foods: Playing God or Trusting Science*, 12 *Risk: Health, Safety and Environment* 205 (2001).

have little incentive to accept some innovations in biotechnology since few benefits (e.g., herbicide tolerance) are realized by them. Since few genetically modified foods are labelled in North America, consumers have little choice but to consume these foods. Given the above listed issues, it should not be too surprising to hear that biotechnology is an exemplar of a technology that generates tremendous social uncertainty.

IV. MODELS OF TECHNO-SOCIAL CHANGE

When scientific and social uncertainty is high, a technology (or suite of technologies) becomes subject to enhanced scrutiny, irrespective of purported benefits. Two models explain how scientific and social uncertainty operates in tandem. The first model, I call a technology ladder, explains how a technology changes and diffuses throughout a society (see figure 1).

“Technology ladder”

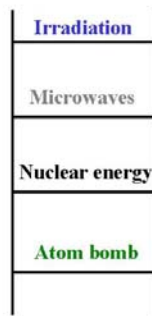


Figure 1: Example of the technology ladder model using nuclear physics.

An analysis of nuclear energy shows how the first large-scale use of technology derived from nuclear physics research involved the production of weapons like the atom bomb. Within a decade, research in this field shifted into the production of energy in the form of civilian nuclear reactors. Although weapons programs were tightly coupled to civilian reactors for the production of radioisotopes like plutonium, the technology ladder model shows us how a technology can diffuse and change into something different. It took at least two decades before organized opposition to nu-

clear reactors became a concern for the nuclear industry. In the 1970s, the general public became aware of microwaves. Microwave ovens were selling well and some people became concerned about possible health effects associated with exposure to this form of energy. The technology ladder model suggests that as nuclear technology progressed from the atom bomb to microwave ovens, a certain degree of transference occurred. General concerns about nuclear technology could be translated into specific concerns about microwave ovens. The debate over the safety of consuming irradiated foods brings us to the top rung of our example ladder. In this case, concerns about radiation stemming from the atom bomb, nuclear power plants, and microwave ovens become even more individualized with food that has been treated by ionizing radiation. The technology ladder shows us how technologies derived from advances in a particular science can build ever-increasing levels of social uncertainty as the risks are perceived in a more personalized fashion. Although rungs in the technology ladder are constructed sequentially, a rung can be removed without toppling the entire structure.

The second model of technology I call a technology cascade (see figure 2).

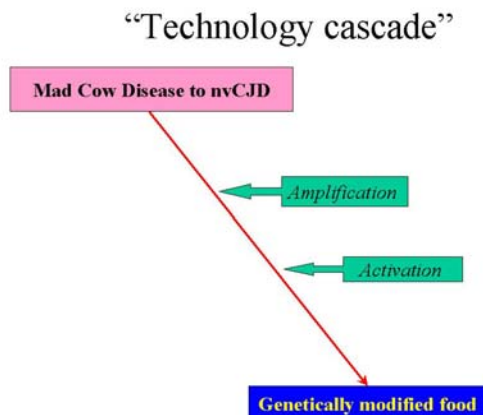


Figure 2: Example of the technology cascade model using genetically modified food and Mad Cow Disease.

In a technology cascade, unrelated technologies or events are perceived as connected. In the above example, public concerns about the safety of BSE-contaminated meat (“mad cow disease”) have cascaded over to concerns about the safety of genetically modified foods. Although not related

issues in a scientific sense, this cascade has occurred due to two phenomena: amplification and activation.

Amplification is a process whereby risks are perceived as larger than the scientific evidence warrants. For example, the terrorist attacks of 11 September 2001 amplified concerns over the safety of air travel to a level that exceeded the so-called "real" risk. With genetically modified foods, amplification exists because many people connect the outbreak of new variant CJD (a human form of the disease BSE) with "unnatural" practices. Ruminants like cows are fed high-protein diets made from offal (animal tissues). Many people were unaware of this practice until very recently, and scientists were unaware of the possibility that prions (proteinaceous infectious particles) could cross the species barrier and infect humans. The introduction of genetically modified foods to the marketplace coincides fairly closely with heightened public concern over Mad Cow Disease.

Amplification also occurs when trust is low. The perceived inability of regulators to protect the public from the hazards associated with consuming BSE-contaminated meat has weakened public trust in government, industry, and science. By association, concern over the safety of genetically modified food is amplified. Lastly, the problem of amplification is not unique to the technology cascade. For example, proponents of nuclear power plants have claimed that amplification of risk is responsible for poor social acceptance of this technology.

Unlike amplification, activation is more complex. Activation is a process whereby a broad set of social issues are illuminated and mobilized. Instead of being the product of a linear unfolding of technology, as in the technology ladder, activation brings together a wide range of individuals and interest groups in a quasi-synchronized way. Activation is made possible by advances in information and communication technology and by the emergence of globalized activist networks. Ironically, the same forces that are responsible for consolidating global capital and stimulating the ascendancy of truly powerful transnational corporations are also partly responsible for the emergence of new transnational political actors.

A technology cascade connects unrelated "hot button" issues by introducing a set of concerns that previously were excluded from consideration, and by globalizing these concerns. For instance, in the early years of civilian nuclear power the activation of concerns over such issues as intergenerational equity (e.g., long term waste disposal) did not occur. Nuclear safety issues were primarily localized, and issue-specific NIMBY ("not in my backyard") responses. With biotechnology, however, a wide range of such concerns have been both activated and amplified on a global basis. Biotechnology represents a new relationship between science and society where complex social issues are likely to be brought together as scientific

cally unconnected issues and technologies cascade together. What makes this particularly startling is the rate at which opposition to biotechnology has developed.

To reverse the tendency to generate cascades, an open system is required. As indicated earlier in this introduction, an open system better accommodates the convergence that exists between scientific and social uncertainty. When these two kinds of uncertainty combine, a technology cascade is likely. An open system minimizes this risk by creating a dynamic that is dialectical in nature. Additionally, an open system fosters trust by creating opportunities and mechanisms for dialogue. It does this by activating and promoting the value of different kinds of knowledge (e.g., indigenous), expanding the role of the public in debates over the social acceptability of particular innovations, and by recognizing that technology does not exist in a vacuum. An open system requires a truly functional public sphere that maximizes inclusion, increases social cohesion, nurtures social capital and creates the conditions for economic security and the equitable distribution of wealth and power.

V. CONCLUSION

In closing, this section of the Pierce Law Review explores how innovations in biotechnology create challenges and opportunities for achieving social justice given the current environment for intellectual property rights. The paper by Chika Onwuekwe moves beyond the traditional, Western approach to the topic of intellectual property rights and biotechnology by situating the debate within a global framework. By invoking the concept of the “commons,” Mr. Onwuekwe explores plant genetic resources and the status of traditional knowledge, and concludes that the needs of the developing world should be considered when assessing the legal rights to ownership and control of what could be considered “public goods.” In closing, biotechnology is a promising technology with the potential to provide tremendous benefits to society. It is hoped that this section of the Pierce Law Review will provide some insights into how biotechnology is transforming our society, and on how some kinds of technological innovations require profound changes in the relationships between science and technology, and new relationships between government, industry and universities, and the law.