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Can patents prohibit research? On the social epistemology of patenting and licensing in science

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ABSTRACT

A topic of growing importance within philosophy of science is the epistemic implications of the organization of research. This paper identifies a promising approach to social epistemology—nonideal systems design—and uses it to examine one important aspect of the organization of research, namely the system of patenting and licensing and its role in structuring the production and dissemination of knowledge. The primary justification of patenting in science and technology is consequentialist in nature. Patenting should incentivize research and thereby promote the development of knowledge, which in turn facilitates social progress. Some have disputed this argument, maintaining that patenting actually inhibits knowledge production. In this paper, I make a stronger argument; in some areas of research in the US—in particular, research on GM seeds—patents and patent licenses can be, and are in fact being, used to prohibit some research. I discuss three potential solutions to this problem: voluntary agreements, eliminating patents, and a research exemption. I argue against eliminating patents, and I show that while voluntary agreements and a research exemption could be helpful, they do not sufficiently address the problems of access that are discussed here. More extensive changes in the organization of research are necessary.

1. Introduction

A topic of growing importance within the philosophy of science is the epistemic implications of the social organization of research (e.g., Biddle, 2007, 2012; Goldman, 1999; Kitcher, 1993, 2001, 2011; Kukla, 2012; Longino, 1990, 2002; Reiss, 2010; Wilholt, 2009). By 'social organization of research,' I mean to include such things as the kinds of institutions in which research takes place; how research is funded, and the incentive structures that encourage or discourage research and information sharing. Some ways of organizing research are conducive to the production and dissemination of knowledge, and others are not; the examination of which is which is an important project in social epistemology, especially given the recent changes in how research is structured. Commercial considerations are becoming more influential, and the organization of many areas of research is changing accordingly.[1]

One way in which commercial interests are changing the organization of research concerns patents and patent licenses. Patents provide the legal right to exclude others from making, using, selling, offering to sell, or importing patented inventions[2]; this right is given in exchange for the inventor filing a patent application that is sufficient to show others who are "skilled in the art" how to make and use the invention (the so-called "quid pro quo" of the patent monopoly).[3] Patent licenses are contracts between patent holders and other parties, which give certain rights to those parties (e.g., the right to use the patented invention) under conditions specified by the patent holder. Thus, while patent applications (ideally) provide the knowledge of how to make and use an invention, the legal

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[1] See, for example, Bekelman, Li, & Gross (2003), Krimsky (2003), the Introduction to Mirowski & Sent (2002), Mirowski & van Horn (2005), and Slaughter & Rhoades (1996). On the ideology informing these changes, see Biddle (2011). For an excellent discussion of the effects of patenting and licensing in the biomedical sciences, see Walsh, Cohen, & Cho (2007).

[2] 35 U.S.C. §§ 154, 271(a).

[3] 35 U.S.C. §§ 111, 112.

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right to do so requires a patent license. Since the early 1980s, patenting and licensing activity in science has skyrocketed, especially in the biomedical sciences and biotechnology. Between 1983 and 2003, the number of patents issued to U.S. universities rose from 434 to 3259 (Walsh et al., 2007, p. 1184); patenting in biotechnology has also risen significantly, from 2000 in 1985 to over 13,000 in 2000 (Walsh, Cohen, & Arora, 2003, p. 293). Other countries have witnessed similar trends (American Association for the Advancement of Science, 2007).

While there are a number of potential justifications for patenting in science, including Lockean labor-based justifications and Hegelian personality-based justifications, the most plausible justification is consequentialist in nature (Biddle, in press; Resnik, 2004).[4] On this account, patenting incentivizes research and thereby promotes the development of scientific and technological knowledge, which in turn facilitates social progress. This justification has both an epistemic and an ethical component: patenting is supposed to facilitate knowledge production (the epistemic component) that leads to social benefits (the ethical component). Recently, however, a number of commentators have criticized the consequentialist justification, on the grounds that patenting and licensing activity is actually inhibiting research in many areas of science (Biddle, 2012; Eisenberg, 2008; Heller & Eisenberg, 2006). In this paper, I will make a stronger argument. In some areas of biotechnology, patenting and licensing are not only inhibiting research; they are prohibiting it. In particular, I will argue that patent holders and licensors of genetically modified (GM) seeds can use, and are using, patents and license agreements to prohibit others from doing some types of research on GM seeds. This is the first major goal of the paper. The second is to evaluate three possibilities for improving the situation, so as to better achieve our epistemic aims. An evaluation of these possibilities will demonstrate that a significant reorganization of research will likely be required to solve the problems that are raised here.

The philosophical framework of this paper is a particular strand of social epistemology. Social epistemology covers a variety of different topics, including trust in experts and testimony, reasonable disagreement, and systems design. There are a variety of approaches to each of these; with regard to the latter, one category of approaches might be termed *ideal systems design*, which when applied to science and technology, takes as its primary or exclusive philosophical aim the articulation of an ideal way of organizing research. The question of how we are to achieve that ideal is acknowledged to be important and challenging—but not a matter for philosophers. Philip Kitcher, in *Science, Truth, and Democracy* (2001), takes this approach in his proposal for incorporating public participation into scientific decision making.[5] (In his more recent work (2011), he has begun to move in a somewhat different direction.)

The approach that I adopt is *non-ideal systems design*; instead of beginning by articulating an ideal, I begin with the actual organization of research, in all of its messiness, and attempt to improve how research is organized in a piecemeal, iterative, and empirically-based manner. More specifically, this approach begins with an examination of a specific aspect of the organization of an area of research, and the implications of this form of organization for knowledge production. Of particular importance are those features that impede the production or dissemination of knowledge.[6] One then predicts the effects of modifying particular organizational features, and makes a corresponding proposal. Once the proposal is adopted, the iterative process begins anew. This approach is similar to the strategy of 'adaptive management,' which has been defended by Mitchell (2009) in the context of policy-relevant research and by Reiss (2010) in the context of biomedical research, but it can be traced back at least as far as Dewey (1938). In this paper, I will use this approach to examine one aspect of the organization of biotechnology—namely, the role of patents and licenses in structuring the production and dissemination of knowledge—and to discuss specific ways of redesigning this aspect so that we can better achieve our epistemic aims.

This approach to social epistemology has important connections to recent work on iteration in science. Chang (2004) has introduced the notion of *epistemic iteration*, according to which successive stages of knowledge build upon one another in iterative fashion in order to achieve particular epistemic aims. O'Malley, Elliott, and Burian (2010) has introduced the notion of *methodological iteration*, according to which progress is made by moving iteratively through different "modes" of research practice. Elliott (2012) has distinguished between methodological iteration and epistemic iteration and argued that the former can promote the latter in a number of ways. This paper introduces another type of iteration—*organizational iteration*—and illustrates how it relates to epistemic progress.

Moreover, one of the main conclusions of the paper—that patents and patent licenses can be, and are in fact being, used to prohibit some research on GM seeds—represents an important contribution to the emerging field of agnotology. A diverse array of scholars in history and philosophy of science have recently emphasized the ways in which ignorance can be consciously produced—in many cases by political and/or industrial interests that stand to benefit from such ignorance (e.g., Elliott, 2013; Oreskes & Conway, 2010; Proctor & Schiebinger, 2008). This paper identifies an important set of mechanisms by which this can occur (namely patents and patent licenses), and it highlights some of the difficulties involved in reorganizing research so that ignorance cannot be so easily propagated.

Given the intense controversy surrounding GM seeds, it is perhaps necessary to make one final clarification before proceeding. This paper is not an evaluation of the safety profile or environmental impact of GM crops. My own view is that there is nothing intrinsically wrong with using recombinant DNA technologies to modify the genomes of plants; some particular cases of genetic modification might prove to be problematic for any number of reasons, but under the right circumstances, these techniques can be both safe and environmentally unproblematic. However, there is no doubt that GM crops should be subjected to extensive research; this is especially true given that seeds are self-replicating and can be spread by wind, bees, and other means that are outside of human control. This paper argues that the current system of patenting and licensing allows for the prohibition of some research on GM seeds, and it will suggest potential ways of remedying this epistemic deficiency.

2. Patenting and licensing of GM seeds

GM seeds are seeds that have been modified using recombinant DNA technologies. A target gene in one organism is identified and isolated, and DNA sequences are inserted ahead of the gene (a promoter) and behind it (a terminator) in order to regulate the gene's expression. These are then transferred into another organism via a vector such as a bacterium. While there are, in principle, an almost infinite number of ways in which organisms might be modified through the use of these techniques, almost all of the GM seeds

[4] For a discussion of potential justifications of intellectual property in general, see Hughes (1988).

[5] Brown (2004, pp. 82–83) makes a point similar to this.

[6] This project, which one might call the *critical project in systems design*, has its roots in the work of Marx, Mannheim, and others, and is similar to work in the emerging field of agnotology (see below).