The following article by Ajeet Pai, a student at the University of Virginia School of Law, won the Intellectual Property Section Student Writing Competition. This is the third year of the section's competition.

Written Description of Software Inventions: An Argument for the Status Quo

by Ajeet Pai

As regards the written-description requirement,
"It is not so easy to tell what the law of the Federal Circuit is."[1]

It has long been established that patent claims in the United States must be adequately supported by a written description. This requirement stems from the first paragraph of 35 U.S.C. § 112, which provides that a patent's specification shall contain:

> . . . a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

A line of cases beginning with *In re Ruschig*[2] and continuing through *Vas-Cath v. Mahurkar*[3] confirmed that the written-description requirement would be used as a priority policing tool, applied to bar the improper expansion of a patent through later amendments of the claims or specification. For the decades between 1967 and 1997, this was arguably the only way in which the written-description requirement was applied.[4] In the past 10 years, however, the written-description jurisprudence of the Federal Circuit has undergone a sea change.

In 1997, *Regents of the Univ. of California v. Eli Lilly & Co.*[5] marked the beginning of the rigorous application of a freestanding written-description requirement in the biotechnology context.[6] Rather than using the doctrine solely to regulate improper introduction of new material or unsupported expansion of existing claims, the U.S. Court of Appeals for the Federal Circuit now also applies the doctrine to original, unamended claims as a separate disclosure requirement. After *Eli Lilly*, modern written-description doctrine in the context of biotechnology (but apparently not elsewhere) requires that the disclosure provide "a precise definition, such as by structure, formula, chemical name, or physical properties, not a mere wish or plan for obtaining the claimed chemical invention."[7] This stringent requirement applies to original biotechnology claims—not just to claims which are added or amended after a patent application has already been filed with a given disclosure. It appears that written-description doctrine will be applied stringently to the original claims of each biotechnology patent that is filed.

Courts often state that patent law as written is not technology-specific. While ostensibly true, the same law of written-description in practice is applied differently in different arts. The treatment of biotechnology contrasts with the treatment of software inventions under § 112, paragraph 1. While a functional claim is unlikely to pass muster for a drug or genetic invention, functional claiming appears to be standard practice for computer-based inventions.

Although many of the same policy concerns that underlie the Federal Circuit's biotechnology written-description jurisprudence would seem to be present in the context of the computer arts as well, the court has not chosen to reconcile its disclosure jurisprudence in the two areas.

The written-description requirement applies to software inventions, not just biotechnology.

While the staggering number of articles on the subject might lead one to believe that the written-description requirement rears its head in the biotechnology arts alone, it seems apparent that the requirement is not so narrow. Though in practice it is applied most rigorously to genetic, chemical and DNA-based inventions,[8] the Federal Circuit has begun to apply written-description analysis in a broad range of other fields of invention.[9] These include, for example, reclining sofas,[10] a computerized airline reservation system,[11] oil refining and a resulting petroleum compound,[12] Web browser software,[13] injection-molded plastics[14] and image processing software.[15] The applicability of the doctrine to all fields of invention was made explicit in a 2004 decision.[16] The trend of the court appears to be towards expanding the reach of the requirement. Thus, written description should not be seen as a technology-specific doctrine applied only to bar overly broad biotechnology claims, but rather as an evolving doctrine that impacts all fields of invention, including software.

Software-Based Inventions: a Low Written-Description Bar

In contrast with the stringent disclosure required for an adequate biotechnology written description, the written-description

requirement is more honored in the breach when it comes to software inventions. While courts have applied the written-description requirement to invalidate software patents on priority grounds,[17] no court appears to have invalidated a software patent for lack of disclosure akin to the missing "precise definition" of *Eli Lilly*. The few cases that do address the written-description issue for software suggest a much lower bar exists for disclosures of software-related inventions than for biotechnological inventions.

In re Sherwood and the Beginnings of the Low § 112 Bar for Software

The first major indication that software as an art would require little disclosure came in *In re Sherwood*, a 1980 case before the Court of Customs and Patent Appeals.[18] The patent at issue in *Sherwood* had been rejected for, among other reasons, failure to satisfy § 112's best-mode requirement. The program listing that the inventor had used to carry out the claimed invention was not included in the patent application.[19] While the best mode was disclosed at a general level—using a computer to achieve the desired result—the examiner and the Board of Patent Appeals agreed that the disclosure was not enabling since program flow-charts and algorithms were not included.[20]

The *Sherwood* court disagreed, holding that a detailed program listing was not required to enable (or disclose the best mode) of a computer-related invention.[21] In a famous and oft-quoted passage, the court wrote:

> In general, writing a computer program may be a task requiring the most sublime of the inventive faculty or it may require only the droning use of a clerical skill. The difference between the two extremes lies in the creation of mathematical methodology to bridge the gap between the information one starts with (the "input") and the information that is desired (the "output"). If these bridge-gapping tools are disclosed, there would seem to be no cogent reason to require disclosure of the menial tools known to all who practice this art.[22]

By characterizing programming in this way, the court apparently took the view that programmers are quite skilled and a relatively low disclosure is necessary as long as the "trick" or functional goal is communicated.[23] Translation of this functional goal into a working computer program is assumed to require nothing more than a clerical skill, and the level of required disclosure for § 112 is correspondingly low. In contrast with biotechnology, this disclosure requirement (for best mode, and by analogy, for written description) is remarkably lax.

In re Hayes: An Adequate Written Description of Software Requires Very Little

The major Federal Circuit opinion considering the application of the written-description requirement to software-based inventions, *In re Hayes*, confirmed the low bar for § 112 compliance that *In re Sherwood* suggested.[24] The patent at issue (the '302 patent) in *In re Hayes* concerned the control of a modem.

The specification of the '302 patent disclosed that the "decision making capability" of the modem "preferably reside[d] in a microprocessor,"[25] but details on programming the microprocessor were not included. Ven-Tel (the adverse party) argued that the '302 disclosure failed to satisfy the requirements of § 112, paragraph 1: The "timing means" referenced in the claims was implemented using software executed by the microprocessor, but Hayes failed to include a program listing or otherwise provide the specifics of the program used.[26]

The court rejected this argument. Recognizing that "the specification is directed to one of skill in the art,"[27] the court found that the details of the microprocessor structure would be known to those so skilled. Because the desired function was disclosed, and the use of a microprocessor was suggested, "[o]ne skilled in the art would know how to program a microprocessor to perform the necessary steps described in the specification."[28]

The court disagreed that Hayes was required to disclose the firmware listing itself (i.e., the software code implemented in the microprocessor) in order to satisfy the written description requirement: "[A]ll that was required for one of ordinary skill in the art to understand what the invention was and how to carry it out was the disclosure of a microprocessor having certain capabilities *and the desired functions* it was to perform."[29]

In re Hayes thus stands for the proposition that, in the ordinary case, a listing of the specific program used in a computer-based invention need not be supplied to provide a written description, so long as the functions of that program are disclosed along with a rough description of the hardware required to implement it. The remainder of the work involved—writing software to achieve those functions—is assumed to be well within the capabilities of one skilled in the art. In the court's view, it does not require so much inventive facility that a functional disclosure is "a mere wish or plan." As a result, functional claiming of software has become general practice.[30]

Arguing by Analogy: Best Mode and Enablement Suggest a Low § 112 Bar

Northern Telecom v. Datapoint Corp.[31] and *Fonar Corp. v. Gen. Elec. Co.*,[32] a pair of Federal Circuit cases focusing on the remaining two requirements of § 112 enablement and best mode, respectively, also suggest a low disclosure burden for software.

The earlier of the two cases, *Northern Telecom*, found the patentee challenging the trial court's decision that a software-implemented invention was invalid for lack of enablement. The Federal Circuit reversed.[33] The court held that "[t]he amount of disclosure that will enable practice of an invention that utilizes a computer program may vary according to the nature of the invention, the role of the program in carrying it out, and the complexity of the contemplated program-

ming."[34] Given that the evidence showed that implementing the programming would not be beyond the ordinary skill in the art, the failure to include the specific code or program used did not amount to a lack of an enabling disclosure.[35] As with *In re Sherwood* and *In re Hayes*, this suggests a low bar for § 112 disclosure; absent unusual circumstances, only the intended function of the software need be disclosed to satisfy the patent statute. The court was careful to point out that such unusual cases could certainly exist (such as *White Consolidated Industries Inc. v. Vega Servo-Control Inc.*,[36] where implementing the claimed program took an entirely unreasonable amount of time—almost two programmer-years of work).

Fonar Corp., decided seven years later in 1997, dealt with the best-mode requirement. Like the disclosure in *Northern Telecom*, the disclosure of the invention in *Fonar* did not include a program listing of two software routines necessary to render the invention operable.[37] The Federal Circuit rejected this argument, finding that best mode was satisfied by the disclosure of the functions of the software and the hardware upon which it might run.[38] In justifying the holding that "best mode is satisfied by a disclosure of the functions of the software" (as opposed to structural or code-level disclosure), the court wrote that "normally, writing code for such software is within the skill of the art.... Stating the functions of the best mode software satisfies that description test."[39] The court then went on to further reduce the § 112 disclosure burden for software: "[F]low charts or source code listings are not a requirement for adequately disclosing the functions of software."[40] While *In re Sherwood* and *In re Hayes* established that no source code listing was required, *Fonar* went so far as to suggest that a pure textual description of what the software should achieve, without diagrams or logic flowcharts, also could be sufficient. Taken together, the low bars for enablement and best mode suggest that written description will be equally lax when the invention concerns the art of computer programming.

Divergent § 112 Standards Exist for Software and Biotechnology

The Written-Description Bar Is Low for Software but High for Biotechnology.

A major discrepancy has arisen between the Federal Circuit's treatment of the written description requirement in the context of biotechnology and in software. While biotechnology must be claimed at a detailed level—either a recitation of chemical structure, or a recitation of function with a known correlation between structure and function—software may be claimed with only the thinnest of functional descriptions. This is easily demonstrated simply by substituting the court's language from one discipline into another field of invention.[41] Take, for instance, *Fonar*'s low bar for best mode in the software context. Replacing every instance of "software" in the *Fonar* opinion with "DNA," Professors Burk and Lemley write, results in the following:

> As a general rule, where [DNA] constitutes part of a best mode of carrying out an invention, description of such [DNA] is satisfied by a disclosure of the functions of the [DNA]. This is because, normally, [identifying such DNA] is within the skill of the art, not requiring undue experimentation, once its functions have been disclosed.[42]

Perversely, such a rule would be "exactly antithetical to the actual rule in biotechnology cases, as stated by *Eli Lilly*."[43] Disclosure of the functions of DNA is insufficient: structure or a structure-function correlation must be disclosed.

This seeming technological specificity of § 112 application has not been lost on the judges of the Federal Circuit. As Judge Randal R. Rader (an opponent of the use of the written- description doctrine in non-priority contexts) has noted, biotechnology is held to a more stringent standard, even after *Enzo Biochem* and *Univ. of Rochester*. In an earlier decision, he noted the contrast between the rule for software (as set forth in *Northern Telecom*) and the rule for DNA-based inventions, writing:

> This burdensome disclosure standard is tantamount to requiring disclosure, for a new software invention, of the entire source code, symbol by symbol, including all source code permutations that would not alter the function of the software. Ironically, the Federal Circuit has expressly rejected such a requirement for software inventions [in *Northern Telecom*], but apparently enforces the requirement for biotechnology….[44]

The different treatment of the two technologies is particularly puzzling in light of the policy concerns which underlie applying a strict written-description requirement in the biotechnology context (such as avoiding overreaching, and preventing an inventor from broadly claiming things she suspects exists but has not yet actually invented); these concerns would appear to be equally present in the software context.[45]

Understanding the Rationale for Disparate Treatment

Having established that software and biotechnology are treated differently, it remains to be seen whether satisfactory rationales exist for the difference. This article posits that, as a descriptive matter, two explanations exist: Software and biotechnology are treated differently because of the varying level of predictability between the two arts and functional claiming (and hence less written description) of software makes more sense, given the intangible and multistructured nature of software inventions.

Software Is Currently a More Predictable Art Than Biotechnology

In re Hayes illustrates the maxim that "an applicant's disclosure obligation varies according to the art to which the invention pertains."[46] This varying level of disclosure can be seen as relating directly to the predictability of the art. For less predictable arts, more disclosure is required to place

the public in possession of the invention; for more predictable arts, less disclosure is required, since much is already in the public sphere of knowledge.

Although the state of the science is advancing, biotechnology is currently a less predictable art than many of the traditional fields of invention (and some of the more recent ones, such as software). As one commentator succinctly said:

> The electrical and mechanical arts, in contrast to the chemical and biotechnological arts, are considered "predictable" because once a single embodiment of the invention is enabled, other embodiments can be made without difficulty and their performance characteristics can be predicted by known scientific laws.[47]

While biotechnology patent litigation is replete with examples of unpredictable results, implementation of software appears to be more straightforward. This is because software, though a relatively young science, has developed at an astonishing rate. As indicated by Federal Circuit jurisprudence, one of skill in the art of programming is viewed as an expert; software is therefore predictable in the sense that a programmer is able to implement almost any function given sufficient time and direction.[48]

Written description works in the face of this basic level of unpredictability and acts as a check on the scope of claims. If a person skilled in the art is likely to recognize the full range of embodiments of an invention—in other words, understand the breadth of the invention—then less description is required. This is characteristic of more predictable arts (which this article posits includes software); given a functional claim, a skilled programmer would understand that any number of methods of achieving that function may be claimed. This result does not necessarily obtain with biotechnology; given that functionality may not be clear, even after a given DNA sequence is obtained, a person skilled in the art of genetics could not necessarily visualize (or possess) the entire scope of the invention. In Judge Alan D. Lourie's words, unlike software, "a functional description of DNA does not indicate which DNA has been invented."[49] A stringent written description requirement is therefore applied to narrow the scope of what may be claimed.

For Software, Function Is More Important Than Structure

A second major difference explaining the gap in application of the written-description requirement to software and biotechnology is the usefulness of functional claiming. For biotechnology, having a desired function does not necessarily give any indication of which existing DNA structure might map to that function. Indeed, functional claiming in DNA-based inventions is little more than a treasure hunt; some sequence of DNA encodes for the desired result, and allowing a claim for an unknown sequence would offer little public benefit. As a result, functional claiming (in the absence of a known function-structure correlation) is disallowed.

The opposite is true for software. In the usual case, the logical structures of software are the crux of a software-based invention.[50] While DNA inventions result from finding or creating a physical DNA sequence that achieves a given result, software inventions involve designing a desired functionality, and then creating a software structure to achieve that given result. DNA is an artifact of nature, and as a result exists independently of the inventor; software, in contrast, is a specific implementation of an inventor's logical structures or functional plan. The way in which that implementation occurs (the specific programming routine, the data structure, or the language used) is generally irrelevant to the functionality and usefulness of the invention. Some implementations may be more desirable than others, but the invention can be achieved in multiple ways. Thus, functional claiming makes sense; functionality is what software *is*.

Since software can be adequately disclosed in functional terms, a detailed written description of the structure of the resulting code is unnecessary. So long as the logical structure of the software is apparent, the invention has been described. In contrast, biotechnology cannot currently be described in shorthand with equal ease. As a result, the disclosure burden is higher.

Moving Forward: A Low § 112 Bar for Software Is Appropriate

Given the continued vitality of the modern written-description requirement, the Federal Circuit will eventually be confronted with the divergent treatment of software and biotechnological inventions. It can reconcile these two treatments in one of two main ways: by lowering the bar in biotechnology to match that of software, or by raising the software bar to match that of biotechnology. Several factors suggest that the written-description bar for software should not be made more stringent, and that the better path is to wait for the eventual relaxation of the written-description bar for biotechnology as the field matures.

First, the predictability of biotechnology is improving. The evolving §112 standard for chemical and genetic inventions supports this characterization. *Eli Lilly*, the earliest of the modern written-description biotechnology cases, required the most explicit disclosure. Subsequent cases such as *Enzo Biochem*[51] and *Falkner v. Inglis*[52] backed away from the nucleotide-by-nucleotide disclosure requirement as the art began to mature; once correlations between functions and structures emerged, recitation of known structure was no longer required. Presumably, this trend will continue as the art continues to advance, and biotechnology will once again be on equal footing with the other inventive arts.

Secondly, mechanisms more appropriate than written description exist to police the scope of software patents. The most important of these are the high bars in the software arts for obviousness and anticipation.[53] The high skill level imputed by the courts to programmers is a double-edged sword: While it reduces the disclosure

burden on the patentee, it also makes patents harder to obtain as the field is rich with generously interpreted anticipating references and opportunities to find new inventions obvious over the existing art. Given that obviousness and anticipation are well-established doctrines that are understood by courts and litigants, using those mechanisms instead of the newly minted written-description requirement to police claim scope should reduce cost and confusion.

Finally, the functional claiming typically used for software simply does not fit well into the structural-disclosure role of the modern written description requirement. Artificially emphasizing disclosure of the structure or implementation of software is counterproductive, regardless of how useful similar disclosure may be in the biotechnology context. The important question for software is not what the underling structure is—the written description—but rather whether it is obvious (and hence not patentable) or not new (and hence not patentable). These questions are better answered by other doctrines.

In sum, maintaining the status quo with regard to written description and software is the preferable path; in time, disclosure for biotechnology will become harmonized without introducing yet another disclosure doctrine to software patent litigation.

The written-description requirement has spawned an astonishing level of confusion and debate in its short existence; the result has been uncertainty and increased costs in biotechnology development and patent practice. Extending this confusion to software via a stringent written-description mechanism seems unwarranted. The better route, it seems, is to maintain a low written-description bar coupled with a high bar for anticipation and obviousness. ⚖

Endnotes:

1 *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1560 (Fed. Cir. 1991).

2 *In re Ruschig*, 379 F.2d 990 (C.C.P.A. 1967).

3 *Vas-Cath*, 935 F.2d at 1555.

4 For an exhaustive list of every case applying the written description requirement between *Ruschig* and *Eli Lilly*, see the appendix to *Enzo Biochem, Inc. v. Gen-Probe Inc.*, 323 F.3d 956, 984 (Fed. Cir. 2002) (Rader, J., dissenting). Judge Rader lists some thirty cases and cites language in each that suggests that priority was the issue resolved using written description. But, as Judge Lourie points out in his thoughtful response to Judge Rader's dissent, the language of the statute does not limit written description to priority cases, and the cases that have been decided may simply reflect priority issues because of the arguments counsel chose to put forth. *Id.* at 972 (Lourie, J., concurring).

5 *Regents of the Univ. of California v. Eli Lilly & Co.*, 119 F.3d 1559 (Fed. Cir. 1997).

6 An in-depth analysis of the written description requirement's rise as a stringent disclosure doctrine (particularly in biotechnology) is beyond the scope of this article. The effects of *Eli Lilly* and the rise of the written-description requirement in biotechnology have been more than adequately examined by commentators. Good starting places for further reading would be Margaret Sampson, *The Evolution of the Enablement and Written Description Requirements Under 35 U.S.C. § 112 in the Area of Biotechnology*, 15 Berkeley Tech. L.J. 1233 (2000) and Corrin Nicole Drakulich, *Note: Univ. of Rochester v. G.D. Searle & Co.: In Search of a Written Description Standard*, 21 Berkeley Tech. L.J. 11 (2006).

7 *Eli Lilly*, 119 F.3d at 1566 (internal quotation and citation omitted).

8 *See, e.g., Eli Lilly*, 119 F.3d at 1559; *Enzo Biochem*, 323 F.3d at 956.

9 For additional examples of non-biotechnology applications of written description, see Burk & Lemley, *Is Patent Law Technology-Specific?*, 17 Berkley Tech. L.J. 1165 n.41 (2002).

10 *Gentry Gallery v. Berkline Corp.*, 134 F.3d 1473 (Fed. Cir. 1998).

11 *Lockwood v. Am. Airlines Inc.*, 107 F.3d 1565 (Fed. Cir. 1997).

12 *Union Oil v. Atl. Richfield*, 208 F.3d 989, 996 (Fed. Cir. 2000).

13 *Reiffin v. Microsoft Corp.*, 214 F.3d 1342 (Fed. Cir. 2000).

14 *Koito Mfg. Co. v. Turn-Key-Tech LLC*, 381 F.3d 1142 (Fed. Cir. 2004).

15 *LizardTech v. Earth Res. Mapping*, 424 F.3d 1336, 1345 (Fed. Cir. 2005).

16 *Univ. of Rochester v. Searle & Co.*, 358 F.3d 916, 925 (Fed. Cir. 2004).

17 *See, e.g., Reiffin*, 214 F.3d at 1342; *Symbol Techs. Inc. v. Lemelson Med. Educ. & Research Found. L.P.*, 301 F. Supp. 2d 1147, 1165 (D. Nev. 2004) (recognizing, but not reaching, written-description issue). In addition, at least one case has applied written-description to invalidate an unsupported claim to a software *genus* when only a few species were disclosed. *LizardTech*, 424 F.3d at 1345. This may be another emerging use of the written-description requirement, but does not implicate the stringent disclosure function in the sense of requiring detailed source code or structure.

18 *In re Sherwood*, 613 F.2d 809 (C.C.P.A. 1980).

19 *Id.* at 811–13.

20 *Id.* at 813.

21 Though the court discussed best mode, its logic applies equally well to enablement. Both of these foreshadow the court's treatment of written description: since the requirements are "related and spring[] from the same factual predicates," they usually rise and fall together. *See Crown Operations Int'l LTD v. Solutia Inc.*, 289 F.3d 1367, 1378 (Fed. Cir. 2002).

22 *Sherwood*, 613 F.2d at 816–17.

23 *See Burk & Lemley, supra* n.9 at 1192 ("[T]he court thinks of programmers as people of astonishing skill, capable of implementing any idea in a computer program as a matter of course.")

24 *In re Hayes Microcomputer Prod. Patent Litig.*, 982 F.2d 1527 (Fed. Cir. 1992).

25 *Id.* at 1533.

26 *Id.* at 1533–34.

27 *Id.* at 1533.

28 *Id.* at 1534.

29 *Id.* (emphasis added).

30 It is worth noting that the Patent and Trademark Office has adopted the *In re Hayes* fact pattern as an example of how examiners should apply the written-description requirement to software inventions: where a "claimed invention is supported by conventional hardware structure and because there is a functional description of what the software does to operate the computer, there is sufficient description of the claimed invention." United States Patent and Trademark Office, *Synopsis of Application of Written Description Guidelines* 26 (Example No. 5), *available at* **http://www.uspto.gov/web/menu/written.pdf** (last visited Jan. 10, 2007).

31 *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931 (Fed. Cir. 1990).

32 *Fonar Corp. v. Gen. Elec. Co.*, 107 F.3d 1543 (Fed. Cir. 1997).

33 *Northern Telecom* 908 F.2d at 941.

34 *Id.*

35 *Id.* at 942–43.

36 *White Consol. Indus. Inc. v. Vega Servo-Control Inc.*, 713 F.2d 788,791 (Fed. Cir. 1983) (disclosure not enabling when 1.5–2 programmer-years of

Student Essay *continued on page 59*

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work required to implement non-standard software component).

37 *Fonar*, 107 F.3d at 1548.

38 *Id.*

39 *Id.* at 1549 (citing *In re Hayes*, 982 F.2d at 1537–38; *In re Sherwood*, 613 F.2d at 816–19).

40 *Id.*

41 *Burk & Lemley*, *supra* n.9 at 1183–84.

42 *Id.* at 1184.

43 *Id.*

44 *Moba v. Diamond Automation*, 325 F.3d 1306, 1325–1326 (Fed. Cir. 2003) (Rader, J., dissenting).

45 A casual search of recent news media will return an enormous number of articles arguing that software patent protection is far too broad or otherwise urgently in need of reform. Many of the articles in the past few years focus on either the debate over recognizing software patents in the European Union, *see, e.g.* "Software Patents: Not Here, Thank You," *IT Week*, Feb. 6, 2006, at 28, or on the *BlackBerry NTP v. RIM* decision, *see, e.g.*, Tim Wu, "Weapons of Business Destruction," *Slate Magazine*, Feb. 6, 2006, http://www.slate.com/id/2135559/.

46 *In re Hayes*, 982 F.2d at 1534.

47 Drakulich, *supra* n.6 at 32 n.50 (2006). *See also* Thomas P. Nound, Mark S. Carlson & Paul T. Meikeljohn, *Patent Law Issues Affected by the Predictability of Technology in the Field*, 88 J. Pat. & Trademark Off. Soc'y 603, 637 (2006) ("[A] tension exists between the adequacy of the written description and the scope of the claimed invention in unpredictable fields such as biotechnology.").

48 *See, e.g., In re Sherwood*, 613 F.2d at 816–17; Lance D. Reich, *One of Skill in the Art of Software Engineering: The Rising Tide*, 84 J. Pat. & Trademark Off. Soc'y 269 (2002); Burk & Lemley, *supra* n.9 at 1192 ("[T]he court thinks of programmers as people of astonishing skill, capable of implementing any idea in a computer program as a matter of course."). Note, however, that Professors Burk and Lemley think the Federal Circuit misunderstands the level of technological sophistication of a person having ordinary skill, overestimating it for software and underestimating it for biotechnologists. *See id.*

49 *Enzo Biochem*, 323 F.3d at 974 (Lourie, J., concurring).

50 *See* Robert Plotkin, *Computer Programming and Automation of Invention*, 2003 UCLA J.L. Tech. 7 (2003) (differentiating software from electromechanical inventions and arguing for patent reform allowing software to be claimed entirely functionally as logical constructs).

51 *Enzo Biochem,* 285 F.3d at 1013, *vacated, reh'g granted* 323 F.3d 956 (Fed. Cir. 2002), *reh'g en banc denied* 42 Fed. Appx. 439 (Fed. Cir. 2002).

52 *Falkner v. Inglis*, 448 F.3d 1357 (Fed. Cir. 2006), *reh'g en banc denied*, 2006 U.S. App. LEXIS 22630 (Fed. Cir. Aug. 24, 2006).

53 *See* Amir A. Naini, *Convergent Technologies and Divergent Patent Validity Doctrines: Obviousness and Disclosure Analysis in Software and Biotechnology*, 86 J. Pat. & Trademark Off. Soc'y 541, 555–56 (2004).