Washington University Law Review

Volume 81 | Issue 4

January 2003

Patentability of Chemical and Biotechnology Inventions: A Discrepancy in Standards

Natalie A. Lissy
Washington University School of Law

PATENTABILITY OF CHEMICAL AND BIOTECHNOLOGY INVENTIONS: A DISCREPANCY IN STANDARDS

INTRODUCTION

The United States Constitution sets forth provisions that promote the progress of science and useful arts.[1] Industrious parties heed the call to create and to have their inventions patented. Once an invention is patented, the inventor alone reaps the benefits of his creation and has the right to exclude others from using his invention.[2] In return for this period of exclusive use, the inventor fully discloses his invention to the public.[3]

Today, obtaining patent rights is essential to the viability of corporate America,[4] and arguably, of the national economy.[5] This is especially true for the pharmaceutical industry, where companies invest hundreds of

1. U.S. CONST. art. I, § 8, cl. 8. Congress has the power "to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." *Id.*

2. DONALD CHISUM ET AL., PRINCIPLES OF PATENT LAW 3 (2d ed. 2001). "A patent gives an inventor the *right to exclude*. A patent does *not* give the inventor the positive right to make, use, or sell the invention. This is a common misunderstanding of the modern patent grant. . . ." *Id.* The patent owner can exclude others from using his invention without his permission. *Id.* Thus, if a competitor desires to use the patented invention, the competitor must obtain permission or a license from the patent holder to do so. *Id.*

3. *Id*. at ch.2. Several reasons exist for requiring full disclosure, including preventing duplication of work and effort, advancing technology by allowing others to see the invention so that they may make improvements, and making the inventor clarify the limits of his rights so that others know exactly what they can practice without risk of infringement. *Id.* If the bounds of the inventor's rights are not clear, others may decide not to risk practicing in a related area for fear of infringement. *Id.* This would artificially expand the patent holder's rights since it would prevent others from practicing the patented invention and related inventions. *Id*. By making the boundaries of the invention clear, full disclosure serves society by allowing unhindered development in fields related, but not identical, to the patented invention and by allowing improvements to be made on the invention. *Id.*

4. *Id.* at 58-76. Intellectual property ("IP"), specifically patents, is crucial to the growth of the national economy and to business success. *Id.* Many see IP law as a policy tool for industrial growth. *Id.* Companies invest large sums of money to protect their IP rights, as evidenced by "billion-dollar licenses, infringement verdicts, and sales." *Id.* at 59.

5. Wesley Cohen, *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (Or Not)*, NBER Working Paper 7552 (Feb. 2000), *available at* http://papers.nber.org/NBER Working Paper No.w7552. The report discloses that between 1983 and 1995, the total number of U.S. patents issued to U.S. companies increased 72%. *Id.* at 16. The reasons cited for seeking patent protection for product innovations include (in decreasing order of importance): prevent copying, blocking (prevent others from obtaining a patent on the invention), prevent suits, enhance reputation, use in negotiations, licensing revenue, and measure performance. *Id*. at 47, fig. 7. The reasons cited for seeking patent protection for process innovations included the same reasons as product innovations, except that "use in negotiations" was cited as a more important reason than "enhance reputation." *Id.* at 48, fig. 8.

millions of dollars in drug discovery.[6] In order to ensure a return on their investments in drug discovery and development, pharmaceutical companies guard their patent rights for the full duration of the patent's life and often seek extensions on that life.[7] The pharmaceutical-company patentees dread the expiration of a patent term, which can, and often does, adversely affect Wall Street's valuation of the company.[8]

Pharmaceutical companies have patented a large number of therapeutic chemical and biological compounds.[9] Statutory patentability requirements must be satisfied in order for a patent to issue, and these requirements apply to all utility patents in every field of invention.[10] However, over the last century the area of chemical practice has developed, resulting in a set of patentability standards and requirements that are unique to chemical inventions.[11] These standards surpass the level of review prescribed by statute and result in higher scrutiny by the United States Patent and Trademark Office ("PTO") and the courts for these types of inventions.[12]

---

6. Steven C. Tighle et al., *Comment: U.S. Major Pharmaceuticals, Patents and Cost Effective Research Spending*, Merril Lynch Report, 4 (Mar. 27, 2002). It is estimated that in 1990, the average cost to bring a pharmaceutical product to market was $500 million. *Id.* Today, the cost is believed to be $800 million. *Id.* "Since a pharmaceutical company's products all eventually go off patent, production of new, innovative drugs and therefore new patents is essential in order for the company to continue growing." *Id.* at 2.

7. *See* CHISUM *supra* note 2 at 833. Three reasons exist to seek an extension of a patent's duration: delayed responses from the PTO, greater than three year pendency, and interferences, secrecy orders, and appeals. *Id.* However, of significance to pharmaceutical companies, the Hatch-Waxman Act allows patent term extensions in certain circumstances caused by regulatory delays in drug approval by the Food and Drug Administration. *Id.* at 1210.

8. *See* Tighle, *supra* note 6, at 2. "[T]he number of granted patents indicates the level of innovation taking place in the company, and can be considered one potential indicator of the company's success in developing new drugs." *Id.* at 2.

9. M.E. Mogee & R.G. Kolar, *Patent Citation Analysis of New Chemical Entities Claimed as Pharmaceuticals, in* 8(3) EXPERT OPINION ON THERAPEUTIC PATENTS, 213-22 (1998).

> Patent references are of particular interest for technology analysis because they offer a measure of patent importance and a method of identifying links among patents. Citation analysis was performed on the set of all U.S. patents that cover new chemical entities (NCEs) claimed as pharmaceuticals and issued during the years 1993 through late 1997. Merck & Co. heads the list, with 577 patents or almost 5% of the total. Hoechst Marion Roussel is second with 499 patents or about 4% of the total. Eli Lilly is third with 337 patents or about 3% of all patents.

Id.

10. 35 U.S.C. §§ 101, 102, 103, 112 (2001). For a discussion of these requirements, see ROBERT P. MERGES ET AL., INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE ch. 3 (2d ed. 2000).

11. For a detailed analysis of chemical practice, see JEROME ROSENSTOCK, THE LAW OF CHEMICAL AND PHARMACEUTICAL INVENTION, PATENT AND NONPATENT PROTECTION (2d ed. 2002).

12. CHISUM, *supra* note 2, at ch. 2. Before a patent can be granted, patent applications are submitted to the PTO for review to determine if the statutory patentability requirements have been satisfied. *Id.* Patent law is governed exclusively by federal law. *Id.* The Court of Appeals for the Federal Circuit ("Federal Circuit") has federal question jurisdiction over matters concerning patents. *Id.* Decisions made by the PTO can be appealed directly to the Federal Circuit. *Id.* Teachings in patent

In contrast to the field of chemical practice, the development of therapeutic biological compounds in the pharmaceutical industry, termed biotechnology, is fairly young.[13] As a result, the Court of Appeals for the Federal Circuit ("Federal Circuit") and the United States Supreme Court have heard few cases interpreting the patentability requirements for biotechnology inventions.[14]

Within the area of biotechnology, a number of patents pertain to deoxyribonucleic acid ("DNA")[15] and protein sequences.[16] Scholars and scientists who fear ethical repercussions resulting from the patenting of genetic material that exists in living beings assail these patents and find then to be controversial.[17]

Technically, DNA and protein sequences[18] are complex chemical molecules.[19] Thus, for patentability, these sequences should fall within the higher scrutiny standards that apply to chemical compound inventions.[20] However, an examination of issued patents suggests that the PTO is not holding patents on DNA and protein sequences to the same rigorous standards as chemical compound claims.[21] The Federal Circuit rulings also display an inconsistency with chemical practice.[22] One concern that arises

---

law come from the Federal Circuit and the United States Supreme Court. *Id.* For a discussion on the history leading to the formation of the Federal Circuit, see KENNETH BURCHFIEL, BIOTECHNOLOGY AND THE FEDERAL CIRCUIT 5-16 (1995).

13. The seminal case that gave birth to the field of biotechnology patent law was *Diamond v. Chakrabarty*, 447 U.S. 303 (1980). In this case, the United States Supreme Court held that Congress meant for "anything under the sun" to be patented as long as it was useful. *Id.* at 309. Specifically, the case held that a man-made strain of bacteria was patentable subject matter. *Id.* at 310.

14. CHISUM, *supra* note 2, at 279 n.3.

15. A basic review of molecular biology and biotechnology can be found in *In re O'Farrell*, 853 F.2d 894 (Fed. Cir. 1988). *See* BRUCE ALBERTS ET AL., MOLECULAR BIOLOGY OF THE CELL ch. 2 and 3 (3d ed. 1994).

16. ALBERTS, *supra* note 15, ch. 3.

17. Daniel Kevles & Ari Berkowitz, *The Gene Patenting Controversy: A Convergence of Law, Economic Interests, and Ethics*, 67 BROOK. L. REV. 233, 248 (Fall 2001). "Given that the human genome is widely regarded as a common birthright of people everywhere, governments may feel increasing pressure to limit the property rights sought in DNA sequences." *Id.* For a discussion of the ethical arguments for and against the patenting of human genes and one answer to the question of "Do DNA patents threaten human dignity?," see David Resnik, *DNA Patents and Human Dignity*, 29 J.L. MED. & ETHICS 152 (Summer 2001).

18. DNA and proteins are complex chemical compounds, but chemical compounds nonetheless, see generally ALBERTS, *supra* note 15, ch. 2 and 3. DNA is a double-stranded chain of chemical subunits called nucleotides. *Id.* Proteins are composed of chains of chemical subunits called amino acids. *Id.* Amino acids are organic compounds containing both an amino group and a carboxylic acid. *Id.*

19. Amgen Inc. v. Chugai Pharmaceutical Co. Ltd., 927 F.2d 1200, 1206 (Fed. Cir. 1991). "A gene is a chemical compound, albeit a complex one . . . ." *Id.* at 1206.

20. *See supra* note 11.

21. *See infra* notes 33-58, 68-77.

22. *See infra* notes 113-21, 131-46.

is that while the PTO is issuing patents for DNA and protein sequence claims, it is not clear whether these patents will survive judicial scrutiny.[23] If the patents are not invalidated, a discrepancy will result between chemical practice and biotechnology practice at the PTO and in the courts.[24] If the patents are invalidated, a discrepancy will exist between PTO practice and the standards followed by the court.[25] Neither result is desirable.

The Overview section of this Note will present the standards of review that exist for chemical patents and biotechnology patents, and will highlight perceived differences between the two standards. The Analysis section will discuss the implications of these disparities, the questions that the Federal Circuit has yet to address, and the unresolved concerns in the present patent system.

Finally, this Note proposes that biotechnology practice, a subset of chemical practice, should be held to the same standards as chemical practice. Otherwise, the United States patent system will suffer, becoming the subject of increased litigation. The discrepancies in patentability between biotechnology and chemical inventions need to be corrected and avoided to lend credibility and predictability to this subset of chemical practice. Failure to correct these problems will negatively impact pharmaceutical research and development as well as technological advancement.

I. OVERVIEW

Among the statutory requirements that must be satisfied in order for a patent to issue, four provisions are key: utility,[26] novelty,[27] nonobviousness,[28] and written description.[29] These provisions are the subject of dispute in both the PTO and the courts.

---

23. *See infra* notes 33-58, 66-77.
24. *Compare* notes 113-21 with 131-46.
25. *Compare* notes 33-58 with 66-77.
26. 35 U.S.C. § 101 (2001).
27. 35 U.S.C. § 102. The statutory requirement of novelty will not be discussed in this Note.
28. 35 U.S.C. § 103 (2001).
29. 35 U.S.C. § 112 (2001).

II. UTILITY[30]

A. Chemical Practice[31]

Although the requirements for patentability are applicable to all areas of utility patents, the field of chemical practice has developed distinct standards.[32] In *Brenner v. Manson*, the Supreme Court addressed the issue of chemical invention utility and was required to determine whether or not the patent applicant had demonstrated that his invention was useful.[33] The Court stated that, in contrast to utility patents in other fields of technology, "it is not remarkable that differences arise as to how the test of usefulness is to be applied to chemical processes."[34] Thus, distinct utility requirements developed for chemical practice.[35]

Prior to the *Brenner* case, the trend in chemical patent jurisprudence was that the PTO rejected patent applications unless the specification clearly established the utility of the claimed invention.[36] In contrast, the Court of Customs and Patent Appeals ("CCPA")[37] took the position that

---

30. 35 U.S.C. § 101 reads: Inventions patentable: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title." 35 U.S.C. § 101 (2001).

31. This Note focuses on chemical practice in the sense of chemical compounds that are used for pharmaceutical purposes only. Different requirements have been established as to the patentability requirements for pharmaceutical and non-pharmaceutical chemical compounds. ROSENSTOCK, *supra* note 11, at 2-20.3 to 2-21. The focus of this Note is the comparison of chemical claims to DNA and protein sequence claims in the context of pharmaceuticals.

32. *See supra* note 11.

33. Brenner v. Manson, 383 U.S. 519 (1966). In this case, applicant had filed for a patent for a steroidal compound. *Id*. at 520. The examiner rejected the application because it failed to disclose utility. *Id*. at 521. The examiner did not accept applicant's argument that the compound in question had utility based on the fact that it was similar to a compound that was being tested for anti-tumor effects. *Id*. at 521-22. The Patent Board of Appeals affirmed the rejection, stating, "it is our view that the statutory requirement of usefulness of a product cannot be presumed merely because it happens to be closely related to another compound which is known to be useful." *Id.* at 522.

34. *Id.* at 530.

35. *Id.* at 534.

> Whatever weight is attached to the value of encouraging disclosure and of inhibiting secrecy, we believe a more compelling consideration is that a process patent in the chemical field, which has not been developed and pointed to the degree of specific utility, creates a monopoly of knowledge which should be granted only if clearly commanded by the statute. Until the process claim has been reduced to production of a product shown to be useful, the metes and bounds of that monopoly are not capable of precise delineation.

Id.

36. *Id.* at 529-30.

37. CHISUM, *supra* note 2, at 25 n.94. The CCPA was the predecessor of the Federal Circuit that exists today. *Id.* The Federal Circuit has subject-matter jurisdiction over matters pertaining to patents. 28 U.S.C. § 1295 (2001).

the utility requirement is satisfied if it is "sufficient that a process produces the result intended and is not 'detrimental to the public interest.'"[38] According to the approach taken by the CCPA, almost every patent application would satisfy the utility requirement.[39]

In *Brenner*, the Supreme Court held that to satisfy the utility requirement, the inventor must have in his possession knowledge of the boundaries of the utility of the invention.[40] According to the Court, the reason for requiring this level of definitiveness in the utility of the invention is that otherwise, patentees would be granted the right to exclude others from using the claimed invention even in areas that are not of legitimate use or exclusive to the patentee.[41]

In the patent process, an inventor receives the right to exclude others from practicing the patented invention.[42] In return for this right, the patentee must fully disclose his invention so that the public can benefit from it.[43] If the patentee does not specify the precise utility of his invention and is nonetheless granted a patent, the patent would preclude others from developing applications and uses for the invention in other fields.[44] This result ultimately is detrimental to society because science and the arts would not be developed to their fullest extents.[45] The Supreme Court sought to prevent this potential chilling effect on the advancement of the inventive process.[46] In addition, the Court set forth the standard that chemical compounds must satisfy for the utility requirement and the rationale underlying this requirement.[47]

---

38. *Brenner*, 383 U.S. at 529-30.

39. *Id.* at 530. The CCPA would find the utility requirement satisfied for any process that produces an intended result and "is not 'detrimental to the public interst.'" *Id.*

40. *Id.* at 534.

41. *Id.* at 534.

42. *Id.*

43. *Id.*

44. *Id.*

45. *Id.*

46. *Id.* at 533-34.

47. *Id.* at 534-35. "Unless and until a process is refined and developed to this point—where specific benefit exists in currently available form—there is insufficient justification for permitting an applicant to engross what may prove to be a broad field." *Id.* Today, the utility requirement is not often the focus of review at the PTO or in the courts. *In re Brana*, 51 F.3d 1560, 1564 (Fed. Cir. 1995). As exemplified in *In re Brana*, the court typically analyzes the utility of the invention of a patent application as part of a 35 U.S.C. § 112 ¶ 1 analysis:

> The requirement that an invention have utility is found in 35 U.S.C. § 101: "Whoever invents . . . any new and *useful* . . . composition of matter . . . may obtain a patent therefor . . ." (emphasis added). It is also implicit in § 112 ¶ 1, which reads: The 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

In the case *In re Kirk*, the CCPA further described how to satisfy the utility requirement.[48] First, the court made it clear that the assertion of utility in a patent application required more than a broad statement that the invention is useful.[49] Also, reemphasizing the holding in *Brenner*,[50] the court held that a specific attribute or utility of the invention must be shown, and that it is not up to the court or public to attempt to ascertain that usefulness.[51] Next, the court held that the utility requirement cannot be satisfied if the invention is useful as an intermediate for making a final product with an unknown utility.[52] Finally, the court clearly stated that a chemical compound cannot acquire utility based solely on its structural

---

forth the best mode contemplated by the inventor of carrying out his invention.

Id. Also, because § 112 addresses whether or not an invention has been enabled, utility is inherent in the analysis of enablement since an applicant cannot teach how to use something that is useless. *In re Fouche*, 439 F.2d 1237, 1243 (C.C.P.A. 1971). As stated in *In re Fouche*, "if such compositions are in fact useless, appellant's specification cannot have taught how to use them." *Id.* However, this is not to say that utility is never at issue in a case. For example, see *Cross v. Iizuka*, 753 F.2d 1040 (Fed. Cir. 1985).

48. 376 F.2d 936 (C.C.P.A. 1967).

49. *Id.* at 941 ("It seems to us that the nebulous expressions 'biological activity' or 'biological properties' appearing in the specification convey no more explicit indication of the usefulness of the compounds and how to use them than did the equally obscure expression 'useful for "technical and pharmaceutical purposes . . . ."'").

50. *See supra* notes 35, 40.

51. *In re* Kirk, 376 F.2d at 942.

> We do not believe that it was the intention of the statutes to require the Patent Office, the courts, or the public to play the sort of guessing game that might be involved if an applicant could satisfy the requirements of the statutes by indicating the usefulness of a claimed compound in terms of possible use so general as to be meaningless and then, after his research or that of his competitors has definitely ascertained an actual use for the compound, adducing evidence intended to show that a particular specific use would have been obvious to men skilled in the particular art to which this use relates.

Id. (quoting *In re* Diedrich, 318 F.2d 946, 949 (1963)).

52. *Id.* at 945.

> We find absolutely no warrant for the proposition that although Congress intended that no patent be granted on a chemical compound whose sole "utility" consists of its potential role as an object of use-testing, a different set of rules was meant to apply to the process which yielded the unpatentable product. That proposition seems to us little more than an attempt to evade the impact of the rules which concededly govern patentability of the product itself.

(quoting Brenner v. Manson, 383 U.S. 519, 535 (1966)) (emphasis omitted).

> [T]he practical utility of the compound, or compounds, produced from a chemical "intermediate", the "starting material" in such a process, is an essential element in establishing patentability of that intermediate. It seems clear that, if a process for producing a product of only conjectural use is not itself "useful" within 101, it cannot be said that the starting materials for such a process—i.e., the presently claimed intermediates- are "useful." It is not enough that the specification disclose that the intermediate exists and that it "works," reacts, or can be used to produce some intended product of no known use.

Id.

similarity to a compound or class of compounds that has a known utility.[53] Often, a chemical that structurally resembles a compound of known utility fails to share the same function as the known compound.[54] Thus, a patent application must specifically describe the utility of the chemical invention.[55] Utility cannot be inferred from vague statements of "utility",[56] the compound's use as an intermediate to produce a final product with unknown function,[57] or from structural similarity to a compound of unknown function.[58]

B. Biotechnology Practice

In contrast to chemical practice, the field of biotechnology is a more recent development.[59] The United States Supreme Court essentially created the field in 1980 with *Diamond v. Chakrabarty*.[60] The Court concluded that Congress' intent when it recodifed the Patent Act in 1952 was for "statutory subject matter to 'include anything under the sun that is made by man.'"[61] The Court made clear that non-naturally occurring discoveries and inventions are patentable, while previously unknown but *natural* compositions of matter that are discovered are not patentable.[62]

Following the reasoning set forth by the Court, a DNA sequence or gene taken out of its natural context in a living cell could be patentable subject matter because it is not in its naturally occurring state,[63] provided

---

53. *Id.* at 942. "It cannot be presumed that a *steroid* chemical compound is 'useful' under 101, or that one of skill in the art will know 'how to use' it, simply because the compound is closely related only in a structural sense to other steroid compounds known to be useful." *Id.*

54. *Id.* ("Appellants' arguments fail to recognize that many steroid compounds may possess no activity whatsoever.").

55. *Id.*

56. *Id.* at 941-42.

57. *Id.* at 945.

58. *Id.* at 945-46.

59. *See supra* note 13.

60. 447 U.S. 303.

61. *Id.* at 309 (citing S. Rep. No. 1979, at 5 (1954)). The Court also reiterated that "[t]he laws of nature, physical phenomena, and abstract ideas have been held not patentable." *Id.*

62. *Id.* at 309-10

> [R]espondent's micro-organism plainly qualifies as patentable subject matter. His claim is not to a hitherto unknown natural phenomenon, but to a nonnaturally occurring manufacture or composition of matter- a product of human ingenuity 'having a distinctive name, character and use' . . . [T]he patentee has produced a new bacterium with markedly different characteristics from any found in nature and one having the potential for significant utility. His discovery is not nature's handiwork, but his own; accordingly it is patentable subject matter under § 101.").

Id. (citations omitted).

63. *Id.* The DNA is in a state made by man, outside of its natural context. *Id.*

that the other statutory patentability requirements are satisfied.[64] However, this simple application of the *Chakraberty* ruling[65] to DNA sequences and genes is only the beginning of the analysis: Although DNA exists in biological organisms, it is technically a chemical compound[66] and thus, should be subject to the patentability requirements that exist for chemical practice.[67]

In 2001, the PTO set forth new examination procedure guidelines for patent applications for inventions involving DNA sequences and isolated genes.[68] The guidelines state that the utility requirement of 35 U.S.C. § 101 is satisfied when a specific, substantial, and credible utility is disclosed.[69]

In certain respects, the guidelines appear to concede that DNA is a chemical compound and should be evaluated as such.[70] However, the guidelines contradict chemical practice in several ways. First, the guidelines state:

> [W]hen a patent application claiming a nucleic acid asserts a specific, substantial, and credible utility, *and bases the assertion upon homology to existing nucleic acids or proteins having an accepted established utility*, the asserted utility must be accepted by

---

64. *See* MERGES, *supra* note 10.

65. *See supra* note 13.

66. *See supra* notes 18-19.

67. *See supra* notes 33-58 and accompanying text.

68. Utility Examination Guidelines, 66 Fed. Reg. 1092 (Jan. 5, 2001).

69. *Id.* at 1094. The guidelines also make clear that, "[i]f a patent application discloses only nucleic acid molecular structure for a newly discovered gene . . . the claimed invention is not patentable. But when the inventor also discloses how to use the purified gene isolated from its natural state, the application satisfies the 'utility' requirement." *Id.* at 1093. Nucleic acid is the chemical building blocks of which DNA is composed. *See generally* ALBERTS, *supra* note 15, ch. 2.

70. Utility Examination Guidelines, 66 Fed. Reg. at 1094.

> When patents for genes are treated the same as for other chemicals, progress is promoted because the original inventor has the possibility to recoup research costs, because others are motivated to invent around the original patent, and because a new chemical is made available as a basis for future research. Other inventors who develop new and nonobvious methods of using the patented compound have the opportunity to patent those methods.

Id.

> A DNA sequence—*i.e.*, the sequence of the base pairs making up a DNA molecule- is simply one of the properties of a DNA molecule. Like any descriptive property, a DNA sequence itself is not patentable . . . [A]n isolated and purified DNA molecule may meet the statutory utility requirement if, *e.g.*, it can be used to produce a useful protein or it hybridizes near and serves as a marker for a disease gene. Therefore, a DNA molecule is not *per se* unpatentable for lack of utilit[y]."

Id. "A DNA sequence is not patentable because a sequence is merely descriptive information about a molecule." *Id.* at 1095.

> the examiner unless the Office has sufficient evidence or sound scientific reasoning to rebut such an assertion.[71] (emphasis added).

This statement directly contradicts chemical practice, which holds that because even structurally-similar chemical compounds can have unpredictably-different properties, no utility can be claimed on the basis of similarity to a compound of known function.[72] Indeed, there are numerous examples of DNA sequences that display a high degree of homology and even identity in certain regions or domains of the gene; however, the highly similar proteins encoded by these DNA sequences in fact exert opposite or varied effects on the cells in which they are present.[73]

Next, the guidelines contradictorily state, "[w]hen a class of proteins is defined such that the members share a specific, substantial, and credible utility, the reasonable assignment of a new protein to the class of sufficiently conserved proteins would impute the same specific, substantial, and credible utility to the assigned protein."[74] As already stated, numerous examples exist of proteins and their encoding DNA sequences that share a high degree of homology yet serve different functions.[75] Allowing a patent to issue on a DNA or protein sequence where the only utility is based upon homology to known sequences runs the hazard of ascribing a function to a protein that is in fact opposite to its true function.[76] Also, it runs the hazard of contradicting the rules and precedent that have been established for chemical practice.[77]

---

71. *Id.* at 1096. Loosely, homology means similarity.

72. *See supra* notes 33, 53.

73. B. Matiba et al., *The CD95 System and the Death of a Lymphocyte*, 9(1) SEMINARS IN IMMUNOLOGY 59-68 (Feb. 1997). For example, a naturally-occurring mutation (change) in the CD95 protein's DNA sequence causes the protein to have a completely opposite effect on the cell from the effect the normal CD95 has. *Id.* As another example, the proteins involved in controlling programmed cell death include a number of proteins that are nearly identical for most of the proteins' regions yet vary in other regions, resulting in proteins that exert opposite effects on the cell. Q.L. Deveraux & J.C. Reed, *IAP Family Proteins- Suppressors of Apoptosis*, 13 GENES AND DEVELOPMENT 239-52 (1999).

74. Utility Examination Guidelines, 66 Fed. Reg. at 1096.

75. *See supra* note 73.

76. *Id.*

77. *See supra* notes 33-58 and accompanying text. The guidelines contradict established chemical practice. *Id.*

III. NONOBVIOUSNESS[78]

A. Chemical Practice

A frequent issue of patent litigation is whether or not the invention disclosed in a patent application is "obvious"[79]: If the claimed invention would have been evident to someone with ordinary skill in the art or if the

---

78. 35 U.S.C. § 103 reads: Conditions for patentability; non-obvious subject matter:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

(b)(1) Notwithstanding subsection (a), and upon timely election by the applicant for patent to proceed under this subsection, a biotechnological process using or resulting in a composition of matter that is novel under section 102 and nonobvious under subsection (a) of this section shall be considered nonobvious if—

(A) claims to the process and the composition of matter are contained in either the same application for patent or in separate applications having the same effective filing date; and

(B) the composition of matter, and the process at the time it was invented, were owned by the same person or subject to an obligation of assignment to the same person.

(2) A patent issued on a process under paragraph (1)—

(A) shall also contain the claims to the composition of matter used in or made by that process, or

(B) shall, if such composition of matter is claimed in another patent, be set to expire on the same date as such other patent, notwithstanding section 154.

(3) For purposes of paragraph (1), the term "biotechnological process" means—

(A) a process of genetically altering or otherwise inducing a single- or multi- celled organism to—

(i) express an exogenous nucleotide sequence,

(ii) inhibit, eliminate, augment, or alter expression of an endogenous nucleotide sequence, or

(iii) express a specific physiological characteristic not naturally associated with said organism;

(B) cell fusion procedures yielding a cell line that expresses a specific protein, such as a monoclonal antibody; and

(C) a method of using a product produced by a process defined by subparagraph (A) or (B), or a combination of subparagraphs (A) and (B).

(c) Subject matter developed by another person, which qualifies as prior art only under one or more of subsections (e), (f), and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

35 U.S.C. § 103 (2001).

79. *See* CHISUM, *supra* note 2, ch. 5. Obviousness is frequently the largest hurdle to overcome in attaining a patent. *Id.* In addition, when a patent is asserted against an alleged infringer in court, the infringer invariably challenges the validity of the patent, often as being obvious. *Id.*

state of the field at the time of invention were such as to motivate one to attempt the invention, the nonobvious requirement has not been satisfied.[80]

The key consideration taken into account in chemical practice is the amount of structural similarity between the claimed and prior art compounds.[81] As set forth in *In re Dillon*, a showing of such similarity, in combination with motivation from the art to make the compound, gives rise to a *prima facie* case of obviousness that the applicant must rebut.[82] Several cases have suggested that structural similarity alone may give rise to a *prima facie* case, such as when the state of knowledge in the field provides motivation for making the modification of the prior art to create the invention.[83] However, this result can only be consistent with *Dillon* if

---

80. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). All obviousness analyses begin with an evaluation of three factors that were set forth in *Graham v. John Deere Co.*:

> [T]he scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined.

Id. In addition to these three factors, the court also reviews secondary considerations. *Graham*, 383 U.S. at 17-18 and ROSENSTOCK, *supra* note 11, at 8-7 to 8-8. The secondary considerations, not limited to chemical practice, that may overcome a *prima facie* case of obviousness include: long felt need for the invention, commercial success of the invention, initial expressions of disbelief by experts, copying by an infringer, near simultaneous invention by others, initial skepticism by experts, initial praise by experts, prior failure by others. *Id.*

81. *In re* Jones, 958 F.2d 347, 349 (Fed. Cir. 1992). "The question of 'structural similarity' in chemical patent cases has generated a body of patent law unto itself." *Id.* (citation ommitted).

82. *In re* Dillon, 919 F.2d 688, 692 (Fed. Cir. 1990).

> [S]tructural similarity between claimed and prior art subject matter, proved by combining references or otherwise, where the prior art gives reason or motivation to make the claimed compositions, creates a *prima facie* case of obviousness, and that the burden (and opportunity) then falls on an applicant to rebut that *prima facie* case.

Id. In *In re Papesch*, the court stated a reminder that the structure of the compound is only one characteristic of the compound and although this characteristic must be taken into account, it is not the exclusive consideration in the matter of obviousness. 315 F.2d 381, 391 (C.C.P.A. 1963).

> [A] formula is not a compound and while it may serve in a claim to *identify* what is being patented, as the metes and bounds of a deed identify a plot of land, the *thing* that is patented is not the formula but the compound identified by it. And the patentability of the thing does not depend on the similarity of its formula to that of another compound but of the similarity if the former compound to the latter.

Id.

83. *See, e.g.*, *In re Merck & Co.*, 800 F.2d 1091, 1096 (Fed. Cir. 1986) (discussing the theory of bioisosterism, "where the substitution of one atom or group of atoms for another atom or group of atoms having a similar size, shape and electron density provides molecules having the same biological activity."). The court in *Merck* also quoted the *Payne* decision, stating, "structural similarity, alone, may be sufficient to give rise to an expectation that compounds similar in structure will have similar properties." *Id.* at 1096 (citing *In re* Payne, 606 F.2d 303, 313 (C.C.P.A. 1979). This holding is consistent with *Merck* since bioisosterism was also a consideration in *Payne*.

the state of knowledge in the field does in fact provide the motivation of likelihood of success that, in addition to the structural similarity, satisfies the *Dillon* requirements for *prima facie* obviousness.[84]

The *prima facie* case of obviousness can be overcome in several ways, including demonstration of unobvious[85] or unexpected properties.[86] For example, in *In re Lambooy*, the Board of Appeals of the PTO held the applicant's invention to be obvious in light of the prior art since, *inter alia*, the chemical structure of the applicant's compound was highly related to that of a known compound.[87] However, the Federal Circuit reversed the board's decision, holding that the biological effect of the small difference in structure was a compound with an effect opposite of that of than the compound known in the art.[88] The court found this difference to be a prime example of how to overcome *prima facie* obviousness.[89]

Another consideration taken into account when determining if a claimed compound is *prima facie* obvious is how generic or specific the

---

84. *See In re* Dillon, *supra* note 82, at 692.

85. *In re* Papesch, 315 F.2d at 386-87. "If that which appears, at first blush, to be obvious though new is shown by evidence *not* to be obvious, then the evidence prevails over surmise or unsupported contention and a rejection based on obviousness must fall." *Id.*

86. *In re* Albrecht, 514 F.2d 1389, 1396 (C.C.P.A. 1975).

> Appellants' affidavit evidence, we note, shows that the additional advantageous activity disclosed for the claimed compounds, namely antiviral activity, is not in fact possessed by the prior art analog. That a claimed novel compound possesses a certain advantageous activity which is not in fact possessed by a prior art compound is itself evidence of the nonobviousness of the subject matter as a whole . . . . [A] newly discovered activity of a claimed novel compound which bears no material relationship to the activity disclosed for the prior art analogs is further evidence, not to be ignored, of the nonobviousness of the claimed invention.

Id.

87. *In re* Lambooy, 300 F.2d 950, 954 (C.C.P.A. 1962). The chemical structure of applicant's compound contained two ethyl side groups where the compound known in the art, riboflavin, contained methyl groups. *Id.* at 952. An ethyl group consists of two fully saturated carbons while a methyl group consists of one. *Id.*

88. *Id.* at 955.

89. *Id.*

> There is no evidence *in the record* which would lead one skilled in this art to expect that the differences in molecular structure between riboflavin and appellant's compound would cause this difference in properties. The former compound is a vitamin, the latter an antivitamin; the former is a metabolite, the latter an antimetabolite; the former acts to promote the well-being of the animal, the latter acts to its detriment. We find it difficult to conceive of a better example of a difference *in kind* than is presented in this case and we also find *in view of this record* that this difference was unexpected and unobvious.

Id.

prior art is in teaching the applicant's invention.[90] In chemical patents, a claim may disclose a generic structure that can optionally be substituted by any one of a number of possible chemical groups.[91] When the number of positions for substituents on the generic structure is large and the number of possible chemical groups that can be substituents is also large, the number of chemical compounds embraced by such a generic claim is enormous or infinite.[92] An applicant may claim as his invention a specific compound that falls within the scope of another patent's generic claim.[93] If the written description of the patent that includes the generic claim does not teach that specific compound as "typical" or "preferred," the court may hold that the application for the specific compound is not obvious in light of the art because the art has not specifically taught the applicant's invention.[94]

---

90. *See* ROSENSTOCK, *supra* note 11, at 8-27.

> [W]here a genus or generic formula has a relatively small number of variables, that is, substituents, then a prima facie case of obviousness can be made out. One the other hand, where the genus or generic formula disclosed in the prior art has a relatively large number of substituents that can be made, a showing of obviousness is not so readily accomplished.

Id.

91. *In re* Baird, 16 F.3d 380 (Fed. Cir. 1994); Jones, 958 F.2d 347.

92. *Baird*, 16 F.3d at 382. "In the instant case, the generic diphenol formula disclosed in Knapp contains a large number of variables, and we estimate that it encompasses more than 100 million different diphenols . . . ." *Id.*

93. *Id.* at 382-83.

> While the Knapp formula [prior art] unquestionably encompasses bisphenol A [applicant's compound] when specific variables are chosen, there is nothing in the disclosure of Knapp suggesting that one should select such variables. Indeed, Knapp appears to teach away from the selection of bisphenol A by focusing on more complex diphenols . . . . [F]ifteen typical diphenols are recited. None of them, or any of the other preferred phenols recited above, is or suggests bisphenol A.

Id.

94. *Id. See also Jones*, 958 F.2d at 350.

> [T]hough Richter [prior art] discloses the potentially infinite genus of "substituted ammonium salts" of dicamba, and lists several such salts, the salt claimed here [applicant's compound] is not specifically disclosed. Nor, as we have explained above, is the claimed salt sufficiently similar in structure to those specifically disclosed in Richter as to render it *prima facie* obvious.

Id.

B. Biotechnology Practice[95]

With regard to DNA sequence claims, the consideration of structural similarity in making a case for obviousness arose in *Amgen, Inc. v. Chugai Pharmaceutical Co., Ltd*.[96] The court rejected the defendant's allegation that the plaintiff's claimed invention was obvious.[97] The defendant alleged that it was obvious to try to clone the human DNA sequence at issue because the human DNA sequence possessed a high degree of similarity to the monkey DNA sequence.[98] The Federal Circuit held that, even if a high degree of sequence similarity exists, obvious-to-try does not create a case of obviousness if motivation is absent and there is no likelihood of success if tried.[99] Thus, it appears that the standards for obviousness for DNA sequence claims may be consistent with the standards created by *Dillon* for chemical practice.[100]

Next, the Federal Circuit has addressed the issue of generic claims in the field of biotechnology. Specifically, the court has held that, due to the degeneracy[101] of the genetic code, disclosure of a protein sequence does not make the DNA sequence encoding that protein obvious.[102] In *In re Bell*, the court found that the prior art disclosure of a protein sequence suggested over ($10 \times e^{36}$) different DNA sequences that could encode for the protein.[103] The applicant claimed as his invention a few of those

---

95. *See* BURCHFIEL, *supra* note 12, at 85 (footnotes omitted). Relevant to the field of biotechnology, key secondary consideration factors are predicted to be: documentation of extensive technological competition focused on identical goals as a way to demonstrate long felt need in the art, "failure of others to attain the goal, skepticism of experts, [w]idespread licensing, [and] commercial success of the invention." *Id.*

96. *Amgen*, 927 F.2d 1200.

97. *Id.* at 1209.

98. *Id.* at 1208-09.

99. *Id.* at 1208. "While this testimony indicates that it might have been feasible, perhaps obvious to try, to successfully probe a human gDNA library with a monkey cDNA probe, it does not indicate that the gene could have been identified and isolated with a reasonable likelihood of success." *Id.*

100. *See supra* note 82.

101. See JAMES DARNELL ET AL., MOLECULAR CELL BIOLOGY ch. 3 (2d ed. 1990) for a discussion of the degeneracy of the genetic code.

102. *See In re* Bell, 991 F.2d 781, 784 (Fed. Cir. 1993); *In re* Deuel, 51 F.3d 1552, 1559 (Fed. Cir. 1995).

103. 991 F.2d at 784.

> [B]ecause of the degeneracy of the genetic code, there are a vast number of nucleotide sequences that might code for a specific protein . . . . In the case of IGF [protein at issue], Bell has argued without contradiction that the . . . amino acid sequences could be coded for by more than 10^{36} different nucleotide sequences, only a few of which are the human sequences that Bell now claims.

Id.

sequences; those that actually encode the human protein IGF.[104] The court held that although the prior art suggested an enormous number of DNA sequences that could code for the protein, including the applicant's sequences, the art provided no teaching to suggest which of the vast number of sequences encoded the human protein.[105] Thus, the applicant's invention was not obvious over the prior art because the art did not teach or suggest that the sequences claimed by the applicant would encode the human protein.[106] The Federal Circuit reiterated this view in *In re Deuel*.[107] Also, the court held that the existence of a general technique for isolating DNA sequences when a protein sequence is known does not render the DNA sequence obvious because knowledge of the protein sequence, coupled with the general method, still does not suggest the selection of specific DNA sequences.[108] In the absence of such a suggestion, the *prima facie* case of obviousness is not made.[109]

Although the courts have yet to address a number of issues pertaining to obviousness, the few teachings that do exist suggest consistency with the field of chemical practice.[110]

---

104. *Id.*

105. *Id.*

> [G]iven the nearly infinite number of possibilities suggested by the prior art, and the failure of the cited prior art to suggest which of those possibilities is the human sequence, the claimed sequences would not have been obvious . . . . [A]bsent anything in the cited prior art suggesting which of the possible sequences suggested by Rinderknecht [prior art] corresponds to the IGF gene, the PTO has not met its burden of establishing that the prior art would have suggested the claimed sequences.

Id.

106. *Id.*

107. *In re* Deuel, 51 F.3d at 1558-59.

> A prior art disclosure of the amino acid sequence of a protein does not necessarily render particular DNA molecules encoding the protein obvious because the redundancy of the genetic code permits one to hypothesize an enormous number of DNA sequences coding for the protein. No particular one of these DNAs can be obvious unless there is something in the prior art to lead to the particular DNA and indicate that it should be prepared.

Id.

108. *Id.* at 1559.

109. *Id.* "There must, however, still be prior art that suggests the claimed compound in order for a *prima facie* case of obviousness to be made out. . . . A general incentive does not make obvious a particular result . . . ." *Id.*

110. *See supra* notes 81-94.

IV. WRITTEN DESCRIPTION[111]

A. Chemical Practice

"To fulfill the written description requirement, a patent specification must describe an invention and do so in sufficient detail that one skilled in the art can clearly conclude that 'the inventor invented the claimed invention.'"[112] Because of the unpredictability of the properties of seemingly-related compounds, this standard is heightened in chemical cases.[113] Therefore, chemical inventions require a greater degree of description and examples of the invention in order to ensure that the inventor understands and possesses all that he claims as his invention.[114] However, the Federal Circuit has also recognized that generic claims can be allowed in chemical practice: The description of the structure in a generic chemical claim may be sufficient to allow one skilled in the art to envision which species specifically fall within or outside of the claim.[115]

---

111. 35 U.S.C. § 112 ¶ 1 contains three requirements that must be satisfied in order to obtain a patent: written description, enablement, and best mode. The courts have recognized that each is a distinct, separate requirement. *In re* Ruschig, 379 F.2d 990 (C.C.P.A. 1967). This Note focuses exclusively on the written description requirement of § 112 ¶1 and does not discuss the enablement or best mode requirements. For a discussion of these two requirements, see CHISUM *supra* note 2, ch. 3. 35 U.S.C. § 112 ¶1 reads: Specification:

> The 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.

35 U.S.C. § 112 (2001).

112. Regents of the University of California v. Eli Lilly and Co., 119 F.3d 1559, 1566 (Fed. Cir. 1997) (quoting Lockwood v. American Airlines, Inc., 107 F.3d 1565, 1572 (Fed. Cir. 1997)). Stated another way, to comply with the written description requirement, an applicant must "'describ[e] the invention, with all its claimed limitations, not that which makes it obvious,' and by using 'such descriptive means as words, structures, figures, diagrams, formulas, etc., that set forth the claimed invention.'" *Id.* (quoting Lockwood, 107 F.3d at 1572).

113. *In re* Smythe, 480 F.2d 1376, 1383 (C.C.P.A. 1973). "In other cases, particularly but not necessarily, chemical cases, where there is unpredictability (citation omitted) in performance of certain species or subcombinations other than those specifically enumerated, one skilled in the art may be found not to have been placed in possession of a genus . . . ." *Id.*

114. *Id.* at n.3. "[I]t is the predictability or the unpredictability of the elements, be they chemical or mechanical, which is determinative . . . ." *Id.*

115. *Regents of the University of California*, 119 F.3d at 1568.

> In claims involving chemical materials, generic formulae usually indicate with specificity what the generic claims encompass. One skilled in the art can distinguish such a formula from others and can identify many of the species that the claims encompass. Accordingly, such a formula is normally an adequate description of the claimed genus.

Id.

The degree of disclosure required is dependent on the particular case.[116]

Inherent in the written description requirement is the requirement that the inventor has a conception of his invention.[117] However, conception of the structure alone cannot satisfy the written description requirement: A sufficient description of how to obtain or make the invention must also exist.[118] Furthermore, conception of an invention cannot be defined in terms of functional utility alone.[119]

Cases dealing with the written description requirement in chemical practice also consider whether the scope of the claimed invention is commensurate with the scope of description of the invention in the specification.[120] Even if the specification enables one of skill in the art to practice a broader scope than what the specification teaches, the court interprets and limits the claims only to be as broad as what is described in the specification.[121]

B. Biotechnology Practice

Initially, with respect to the written description requirement, biotechnology practice appeared to be consistent with chemical practice.[122] The Federal Circuit in *Fiers v. Revel* made it clear that the rules from chemical practice governed determinations of whether a patent applicant satisfied the written description requirement for claims pertaining to DNA.[123] Specifically, the DNA itself, not a method for isolating or using

116. *See supra* note 112.

117. Fiers v. Revel, 984 F.2d 1164, 1168 (Fed. Cir. 1993) (quoting Amgen, Inc., 927 F.2d at 1206). "Conception does not occur unless one has a mental picture of the structure of the chemical, or is able to define it by its method of preparation, its physical or chemical properties, or whatever characteristics sufficiently distinguish it." *Id.*

118. *Amgen, Inc.*, 927 F.2d at 1206. "[C]onception of a chemical compound requires that the inventor be able to define it so as to distinguish it from other materials, and to describe how to obtain it." *Id.*; Oka v. Youssefyeh, 849 F.2d 581, 583 (Fed. Cir. 1988). "Conception requires (1) the idea of the structure of the chemical compound and (2) possession of an operative method of making it." *Id.*

119. *See infra* note 123.

120. ROSENSTOCK, *supra* note 11, at 9-6. The PTO rejects patent applications for lack of written description when "the claim or claims have encompassed more elements, compositions, utilities, and the like than those recited in the specification." *Id.*

121. *In re* DiLeone, 436 F.2d 1404, 1405 n.1 (C.C.P.A. 1971). "For greater clarity on this point, consider the case where the specification discusses *only* compound A and contains *no* broadening language of any kind. This might very well enable one skilled in the art to make and use compounds B and C; yet the class consisting of A, B and C has not been described." *Id.*; *In re* Ahlbrecht, 435 F.2d 908, 911 (C.C.P.A. 1971) ("In the present case, there are no negative statements that esters with two methylenes are not within what is regarded as the invention, but rather here esters wherein n is 2 were never described in explicit terms at all.").

122. *See supra* notes 112-21.

123. *Fiers v. Revel*, 984 F.2d 1164, 1169 (Fed. Cir. 1993). "We thus determined that, irrespective

the DNA, must be described and the inventor must make it clear that he has possession of the DNA that is claimed.[124] The court held that the appellee had satisfied the written description requirement because, in contrast to the appellants, he actually described the DNA of the invention by providing the complete nucleotide sequence of the DNA.[125]

In *Regents of the University of California v. Eli Lilly*, the Federal Circuit held that disclosure and description of the DNA sequence from one vertebrate species, in combination with general methods for cloning DNA, was not a sufficient written description to allow a claim to all vertebrate DNAs that encode a particular protein of interest.[126] This holding was consistent with *Fiers*.[127] In addition, the court found that the claim for vertebrate DNAs that encode for the protein of interest merely described a function of the DNA, not the DNA itself.[128] Finally, the court specifically rejected a claim to the human DNA sequence that encoded for the protein because the human DNA was not described in the application and there was no way to distinguish this DNA from any other.[129] The holdings in

---

of the complexity or simplicity of the method of isolation employed, conception of a DNA, like conception of any chemical substance, requires a definition of that substance other than by its functional utility." *Id.*

124. *Id.* at 1170-71.

> An adequate written description of a DNA requires more than a mere statement that it is part of the invention and reference to a potential method for isolating it; what is required is a description of the DNA itself. . . . [A] bare reference to a DNA with a statement that it can be obtained by reverse transcription [a technique] is not a description; it does not indicate that Revel [appellant] was in possession of the DNA.

Id.

125. *Id.* at 1172.

> "[S]ugano's [appellee's] application satisfies the written description requirement since it sets forth the complete and correct nucleotide sequence of a DNA coding for B-IF [protein of interest] and thus 'conveys with reasonable clarity to those skilled in the art that . . . [Sugano] was in possession of the [DNA coding for B-IF].'"

Id.

126. *Lilly*, 119 F.3d at 1569. "The claimed genera of vertebrate and mammal cDNA are not described by the general language of the 525 patent's written description supported only by the specific nucleotide sequence of rat insulin [protein of interest]." *Id.*

127. *See supra* note 124.

128. *Lilly*, 119 F.3d at 1566. "An adequate written description of a DNA . . . 'requires 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." *Id.*

> It is only a definition of a useful result rather than a definition of what achieves that result. Many such genes may achieve that result. The description requirement of the patent statute requires a description of an invention, not an indication of a result that one might achieve if one made that invention.

Id. at 1568.

129. *Id.* at 1567.

> The name cDNA is not itself a written description of that DNA; it conveys no distinguishing information concerning its identity . . . it thus does not describe human insulin [protein of

Fiers and *Lilly* are consistent with the written description requirements of chemical practice.[130]

Recently, in *Enzo Biochem, Inc. v. Gen-Probe, Inc.*, the Federal Circuit appears to have broken away from the rules of chemical practice.[131] In *Enzo*, the court held that the written description requirement could be satisfied by deposit[132] of the biological material at a publicly-accessible depository.[133] Significantly, the court's decision was directly in contradiction to the precedent set forth in *Fiers* and *Lilly*: As a result of the *Enzo* decision, DNA no longer needs to be described by its sequence or structural information or in a way that distinguishes the claimed DNA from other DNA that may perform the same function.[134] The court claimed to be applying the written description requirement guidelines that the PTO had recently published.[135] According to the guidelines, a functional description can be used to describe the invention, *only if* it is "coupled with a known or disclosed correlation between function and structure. . . ."[136] However, in *Enzo*, the court did not apply this standard; instead, the court held that a deposit *alone* could satisfy the written description requirement, even in the absence of structural data.[137]

In addition, the PTO's Manual for Patent Examination Procedure ("MPEP") states that a deposit can substitute for a written description when words alone cannot sufficiently describe the invention.[138] However,

---

> interest] DNA. Describing a method of preparing a cDNA or even describing the protein that the cDNA encodes . . . does not necessarily describe the cDNA itself.

Id.

130. *See supra* notes 112-21 and accompanying text.

131. Enzo Biochem, Inc. v. Gen-Probe, Inc., 296 F.3d 1316 (Fed. Cir. 2002). For a discussion of the *Enzo* decision and its impact on the written description requirement, see Chandra Garry, *Enzo Biochem, Inc. v. Gen-Probe Inc.*, 18 BERKELEY TECH. L.J. 195 (2003); Jeffie A. Kopczynski, Note, *A New Era For § 112? Exploring the Developments in the Written Description Requirement as Applied to Biotechnology Inventions*, 16 HARV. J.L. & TECH. 229 (2002).

132. *Enzo*, 296 F.3d at 1325. The technique of depositing biological materials originally arose as a way to satisfy the enablement requirement. *Id.* By letting the public have the material, they were enabled to use it. *Id*.

133. *Id.*

> [W]e hold that reference in the specification to a deposit in a public depository, which makes its contents accessible to the public when it is not otherwise available in written form, constitutes an adequate description of the deposited material sufficient to comply with the written description requirement of § 112 ¶ 1.

Id.

134. *See* notes 124 and 128. The *Enzo* holding contradicts established biotechnology practice. *Id.*

135. Guidelines for Examination of Patent Applications Under the 35 U.S.C. 112 ¶ 1, "Written Description" Requirement, 66 Fed. Reg. 1099 (January 5, 2001).

136. *Id.* at 1106.

137. *See supra* note 133.

138. *Enzo*, 296 F.3d at 1325-26. The court referred to the MPEP, § 2402 (8th ed. Aug. 2001), by

Enzo's invention was a DNA sequence and until this case, the Federal Circuit had required the sequence of the DNA to be disclosed in order to satisfy the written description requirement.[139] The Federal Circuit set forth no reason for breaking from precedent and why words alone could no longer describe DNA.[140]

Another concern is the fact that the court's new standard does not require that the inventor be in possession of or have a conception of his invention.[141] In this case, the inventor knew that the deposited bacteria contained DNA that could perform a desired function.[142] Rather than describe that DNA, the inventor described the function and deposited the bacteria containing the DNA.[143] The court required no correlation between function and structure; instead, a deposit replaced disclosure of the structure.[144] Thus, it is not clear that the inventor had the DNA in his possession: Enzo could not describe the sequence of the DNA, could not describe its structure, physical or chemical properties, or any functional property *in combination with* a structural property.[145] In other words, Enzo could not satisfy the written description requirement or possession

---

stating "[a] deposit may be necessary . . . 'where the invention involves a biological material and words alone cannot sufficiently describe how to make or use the invention . . . .'" *Id.*

139. *See supra* notes 124, 128-29.

140. *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313 (Fed. Cir. 2003). In a recent case, the court addressed the issue of the written description requirement for biotechnology inventions. *Id.* The invention at issue did not pertain to the written description requirement for a novel DNA sequence. *Id.* at 1332. Thus, the *Enzo* precedent did not apply. *Id.* The court did, however, mention the *Enzo* decision and comment positively on its holding. *Id.* The court stated,

> [I]n *Enzo-Biochem*, we clarified that *Eli Lilly* did not hold that all functional descriptions of genetic material necessarily fail as a matter of law to meet the written description requirement; rather, the requirement may be satisfied if in the knowledge of the art the disclosed function is sufficiently correlated to a particular, known structure." The paradox of this court's affirmance of the holding of *Enzo* is that the *Enzo* court required no disclosure of the structure of the DNA. *See supra* note 133. Thus, the *Amgen* court failed to acknowledge what the court actually did in *Enzo*. The Federal Circuit has yet to apply the *Enzo* precedent.

Id.

141. *Enzo*, 296 F.3d at 1326 "Although the structures of those sequences, *i.e.*, the exact nucleotide base pairs, are not expressly set forth in the specification, those structures may not have been reasonably obtainable and in any event were not known to Enzo when it filed its application . . . .". *Id.* If the sequence was not known, how was Enzo found to be in possession of the invention, as required to satisfy the written description requirement? *See supra* note 124.

142. *Enzo*, 296 F.3d at 1321. "The inventors believed that if the preferential hybridization ratio . . . were greater than about five to one, then the 'discrete nucleotide sequence would hybridize to virtually al strains of *Neisseria gonorrhoeae* and to no strain of *Neisseria meningitidis*.'" *Id.* However, the inventors never identified the DNA sequence of those nucleotides. *Id.*

143. *Id.*

144. *See supra* note 133.

145. *Enzo*, 296 F.3d at 1326.

requirement of the PTO guidelines and hence of section 112 paragraph 1, as established for chemical practice.[146]

V. ANALYSIS

As discussed Part II.B, the utility requirement guidelines issued by the PTO contradict chemical practice in several ways.[147] First, the guidelines allow utility to be inferred based on similarity to compounds with known use and second, when a DNA or protein is similar to a known compound, the PTO will ascribe the same function to the new invention.[148]

To date, the Federal Circuit has not heard a case addressing the utility requirement for a DNA or protein sequence. Thus, there is no guidance from the court on this issue. When a case does come before the Federal Circuit, it will be of interest to see if the court acknowledges that chemical practice is applicable or whether the court will try to set new precedent, in accord with the PTO Guidelines, for this area by distinguishing the chemical field.

The Federal Circuit has not yet decided on whether a claimed invention of a DNA sequence will be rejected as obvious if it is highly homologous (similar) or nearly identical to a sequence known in the art. That is, the court has not decided if similar DNA sequences are *prima facie* obvious. For example, the prior art may disclose the DNA sequence for a protein that is a key intermediate in an intracellular signaling pathway. The art only discloses a role for the protein in signaling. The applicant may have discovered the DNA sequence for a protein that is identical to the protein known in the art except for one amino acid difference due to the change of one nucleotide in the DNA.[149] Although this difference is slight and results in only a single amino acid change in the encoded protein, it causes the protein to inhibit signaling and thus behave in an opposite manner from the already-known protein.

---

146. Guidelines for Examination of Patent Application Under the 35 U.S.C. 112 ¶ 1, "Written Description" Requirement, 66 Fed. Reg. at 1106. The requirements for satisfying the possession requirement are very similar as those for satisfying the written description requirement:

> An applicant may also show that an invention is complete by disclosure of sufficiently detailed, relevant identifying characteristics which provide evidence that applicant was in possession of the claimed invention, *i.e.*, complete or partial structure, other physical and/or chemical properties, functional characteristics when coupled with a known or disclosed correlation between function and structure . . . ."

Id. See also supra notes 112-21.

147. *Compare supra* notes 33-58 *with* 68-77.

148. *See supra* notes 71-76.

149. For a review of molecular biology, see ALBERTS, *supra* note 15.

Biotechnology is a subset of chemical practice, but it is not clear that the Federal Circuit will apply the same standards, although *Amgen* raises the hope that the same standard will apply.[150] Applying the standards of *Dillon*, a *prima facie* case of obviousness is not made in the hypothetical presented in the preceding paragraph.[151] Although there is a high degree of sequence structural similarity, the motivation to discover or try this invention is absent. The art only teaches a role in promoting intracellular signaling, not in inhibiting signaling. If the PTO erroneously rejected the application due to *prima facie* obviousness, on appeal, the result should be the same as in *Lambooy*, where the patentee overcame an obviousness rejection by a showing of unexpected results.[152]

In addition, the Federal Circuit has declined to decide if the amino acid sequence of a protein is obvious if the DNA sequence is known.[153] The standard set forth in *Dillon* does not apply because the DNA and protein sequences are not structurally similar because they are composed of different chemical subunits.[154] Because the amino acids encoded by particular triplets of nucleotides are known, it seems obvious to expect success in determining the exact amino acid sequence encoded by a DNA sequence.[155] The *prima facie* case of obviousness is made: Knowledge of the nucleotides can be used to deduce the exact amino acid sequence. However, proteins are sometimes changed by post-translational modification after they have been translated.[156] For example, amino acids at one end of the protein may have to be removed before the protein can be functional.[157] This modification is not reflected in the DNA sequence.[158] Thus, if a claim for such a protein is rejected as *prima facie* obvious, this obviousness rejection should be overcome by showing the unexpected

150. *See supra* notes 96-99.

151. *Id.*

152. *See supra* notes 87-89.

153. *In re* Bell, 991 F.2d 781, 784 n.6 (Fed. Cir. 1993). The court notes: "We also express no opinion concerning the reverse proposition, that knowledge of the structure of a DNA, e.g., a cDNA, might make a protein obvious." *Id.*

154. *See* ALBERTS, *supra* note 15.

155. *In re* Bell, 991 F.2d at 783. "A *prima facie* case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art." (quoting In re Rinehart, 531 F.2d 1048, 1051 (C.C.P.A. 1976)).

156. *See* THOMAS E. CREIGHTON, PROTEINS: STRUCTURES AND MOLECULAR PROPERTIES 78-99 (2d ed. 1993). A protein can be translated into a form that is inactive and nonfunctional. *Id.* To become functional, the protein must be modified after translation is completed (i.e., it must be post-translationally modified). *Id.* Different types of post-translational modifications can be performed. *Id.*

157. *Id*. at 79.

158. *Id.* at 78-99. Certain post-translational modifications can be predicted based upon knowledge of the sequence, while other modifications cannot be predicted from DNA sequence knowledge alone. *Id.*

result that the mature protein sequence cannot be discerned from knowledge of the DNA sequence.[159]

In *Enzo*, the Federal Circuit declined to rule and instead remanded the issue of whether claims to subsequences and mutations of the claimed DNA sequences were valid.[160] Since the inventor could not describe the structure or sequence of the invention and instead deposited the sequences, it is difficult to understand how the inventor can claim to be in possession of subsequences and variants or even know if such sequences will perform the claimed function.[161] However, the court suggests that such claims will be allowed under the new rules set forth in the case: Since deposit satisfies the written description requirement of the sequences, the deposit may also satisfy this requirement as to subsequences because they too have technically been deposited.[162]

Additional issues with regard to the written description requirement exist. For example, DNA inventions often claim any DNA sequences that are similar by a certain percentage to the disclosed sequence.[163] However, it is not clear that such claims are sufficiently described. What if the patented prior art sequence is thirty nucleotides in length and a sequence that is over 1,000 nucleotides in length has the requisite amount of similarity in a region that is similar to the disclosed sequence of thirty nucleotides? Would the court consider the sequence of over 1,000

159. *See supra* notes 87-89 wherein a seemingly minor modification caused an unexpected result, thereby overcoming an obviousness rejection.

160. *Enzo*, 296 F.3d at 1326. Subsequences are parts or regions of the full length DNA of the invention. *Id.* Mutations are nucleotide differences from the original sequence. ALBERTS, *supra* note 15, at 242. There is no way to predict where these changes will occur. *Id.* at 245.

161. *Enzo*, 296 F.3d at 1326. "[T]here are at least hundreds of subsequences of the deposited sequences, an unknown number of which might also meet the claimed hybridization ratio [function]." *Id.*

162. *Id.* at 1326-27. "[B]ecause the deposited sequences are described by virtue of a reference to their having been deposited, it may well be that various subsequences, mutations, and mixtures of those sequences are also described to one of skill in the art." *Id.*

163. As an example, see U.S. Patent No. 6476206B1, claims 3, 15 (issued Nov. 5, 2002). Claim 3 reads: 3. A cDNA molecule which is at least 99% identical to the nucleotide sequence shown in SEQ ID NO:1, wherein percent identity is determined using a Smith-Waterman homology search algorithm using an affine gap search with a gap open penalty of 12 and a gap extension penalty of 1. Claim 15 reads: 15. A cDNA molecule which is at least 99% identical across its entire length to the nucleotide sequence shown in SEQ ID NO:1, wherein percent identity is determined using a Smith-Waterman homology search algorithm using an affine gap search with a gap open penalty of 12 and a gap extension penalty of 1. Note that claim 15 contains the requirement that the percent-identity must extend along the entire length of the DNA, while claim 3 does not contain such a requirement. In claim 15, the identity must exist along the length of the disclosed sequence (SEQ ID NO:1); however, the other DNA molecule may be considerably longer than the DNA shown in SEQ ID NO:1 so that the percent-identity could exist for only a small section of that second DNA's length. Should the claimed, patented sequence embrace this second sequence? It is not clear that the inventor ever conceived of such a sequence.

nucleotides to fall within the claim and to be sufficiently described just because it happens to contain the thirty nucleotides of the invention? Would it fall within the claim even though the patentee never conceived of the idea of the sequence that is over 1,000 nucleotides? What if a protein encoded for by a DNA sequence with a high degree of similarity to a disclosed DNA sequence performs function opposite to the function of the protein encoded for by the disclosed and described sequence? Would such a sequence fall within the scope of the claims even though it arguably has not been described functionally and has not been conceived?

Further, the court has held that the scope of the claims cannot be broader than what the inventor describes as his invention in the specification.[164] This is at least true for chemical practice. However, a claim to sequences with similarity to a known sequence may be enabled and one skilled in the art could isolate that sequence based on the enablement. It is unclear whether such a claim is adequately disclosed in the patent or that the inventor ever possessed or conceived of that particular sequence.[165]

The court in *Enzo* set a new standard, holding that a deposit of the invention satisfies the written description requirement.[166] However, this deposit option originally arose for a different purpose: to satisfy the enablement requirement for complex biotechnology inventions that could not easily or adequately be enabled by words alone.[167] Such acknowledgment of the complexities of biotechnological inventions seems reasonable for inventions such as cell lines and other inventions that are difficult to describe or teach how to make.[168] These inventions do not fall within the area of chemical practice.[169] However, DNA, although classified within the field of biotechnology, is in fact a chemical and thus chemical practice should apply to DNA inventions.[170] In addition, the deposit option exists for inventions that are not adequately described or

164. *See supra* notes 120-21 and accompanying text.
165. *See supra* notes 111, 121 and accompanying text.
166. *See supra* note 133 and accompanying text.
167. *See supra* note 132.
168. *See* ROSENSTOCK, *supra* note 11, at 9-7.

> Where an invention, which is the subject of a patent application, depends on the use of a microorganism or other biological material, such microorganism or other biological material, if it is not known and is not readily available, must be deposited and made available to the public upon issuance of the patent.

Id. See also supra note 138.
169. *See* ROSENSTOCK, *supra* note 11, at 9-7.
170. *See supra* notes 18-19 and accompanying text.

enabled by words alone.[171] DNA is easily described by its sequence: The knowledge and ability to sequence DNA has existed since the 1970s.[172] In *Fiers*, the court required that the DNA at issue be described by its sequence before the written description requirement was satisfied.[173] The dates of invention in that case were 1979 and 1980.[174] It is not clear why the court did not require Enzo to sequence the DNA of the invention, because DNA sequencing methodology had been well established.[175]

Finally, it is yet to be determined what effect the *Enzo* decision will have on the patenting of biotechnology inventions.[176] Will this holding change biotechnology practice? Will inventors now routinely deposit their materials, including sequences, deciding to forgo writing an adequate description of their invention with its chemical or structural properties?

VI. PROPOSAL

As the Federal Circuit stated in *Amgen*, "DNA is a chemical compound, albeit a complex one."[177] I propose that courts follow the precedent set in the field of chemical practice since DNA is a chemical compound and until recently, the Federal Circuit had acknowledged this fact.[178] If the court follows chemical practice precedent, some patent holders risk invalidation if their patents were allowed under the PTO guidelines that contradict chemical practice.[179] However, this result is more favorable than the alternative, which is the creation of a new body of law for a subset of an established area of patent law. This alternative would create unpredictability in the fields of both chemistry and biotechnology: The classification of DNA as a chemical or biotechnology invention would become dispositive of the question of a patent's validity.[180]

---

171. *See supra* notes 167-68 and accompanying text.
172. *See* DARNELL, *supra* note 101, at 213-14.
173. *See supra* note 124 and accompanying text.
174. *Fiers*, 984 F.2d at 1167-68.
175. *See supra* note 172. The sequences were 850 or 1300 nucleotides in length. *Enzo*, 296 F.3d at 1326.
176. *Compare* notes 124 and 128 *with* note 133.
177. *See supra* note 19.
178. *Compare* notes 124 and 128 *with* note 133.
179. *Compare* notes 33-58 *with* notes 68-77.
180. If classified as a *biotechnology invention*, a statement that the sequence resembles a known sequence would satisfy the utility requirement and disclosure of only a functional property or deposit of the material would satisfy the written description requirement. If classified as a *chemical invention*, a higher level of scrutiny would apply. This standard would require proof of actual utility of the claimed invention to satisfy the utility requirement and disclosure of a chemical or structural property

The Federal Circuit has yet to hear a case that specifically deals with the utility requirement. The PTO recently set forth guidelines on how to satisfy this requirement.[181] However, as discussed above, several of the provisions contradict established chemical practice.[182] The risk currently exists that the court, although not bound by the PTO guidelines, will apply the guidelines exclusively and ignore the precedent set forth in *Brenner*.[183] Also, the risk exists that the PTO has been issuing patents for DNA sequences that fail the patentability requirements set forth in *Brenner* yet satisfy the requirements in the guidelines. If such cases reach the Federal Circuit, since DNA is a chemical,[184] the court should follow chemical practice and apply the precedent from *Brenner*.[185] The court should not create a new field of practice for the biotechnology subset of chemical practice, even at the risk of invalidation of patents the PTO has allowed.[186]

Next, the standards applied for obviousness appear to be consistent between chemical and biotechnology practice.[187] However, the Federal Circuit has heard only a limited number of cases[188] and, as discussed above, the court has yet to decide numerous issues. When these issues come before the court, the court should look to chemical practice to maintain consistency and predictability with an established area of patent law. Specifically, the court should first look to determine the degree of similarity between the prior art and the proposed invention and determine whether or not the art provides motivation to try the proposed invention.[189]

Finally, while it appeared that the written description requirements between chemical and biotechnology practices were consistent, the recent *Enzo* decision has changed that appearance dramatically.[190] The *Enzo* decision directly contradicts the standard and teaching from *Fiers*: that regardless of how complex or simple the DNA may be, its structure, not function, must be described.[191] Also, the court in *Enzo* implied that a description of the invention's function alone may satisfy the written

---

to satisfy the written description requirement. *See supra* notes 33-58, 78-77, 113-21, 131-46.

181. *See supra* note 68.
182. *See supra* notes 71, 74 and accompanying text.
183. *See supra* notes 33-46 and accompanying text.
184. *See supra* note 19 and accompanying text.
185. *See supra* notes 33-46 and accompanying text.
186. *See supra* notes 33-58 and 68-77 and accompanying text.
187. *See supra* notes 81-109 and accompanying text.
188. *See supra* notes 96-109 and accompanying text.
189. *See supra* notes 81-94 and accompanying text.
190. *Compare* notes 112-29 *with* notes 131-33.
191. *See supra* note 124.

description requirement.[192] This specifically contradicts *Fiers* and *Lilly*.[193] Hence, the *Enzo* dictum cannot be broadly applied or followed in future cases.

If the *Enzo* decision becomes precedent, the Federal Circuit should narrow the rule from *Enzo* and only allow a deposit to satisfy the written description requirement for biotechnology inventions that are not in fact chemical compounds. In other words, the court should not allow a deposit to satisfy the written description requirement for a DNA sequence.[194]

CONCLUSION

The current patent standards that exist in the fields of chemical and biotechnology practice are inconsistent. The standards for the utility requirement vary between the two fields.[195] Specifically, the PTO recently set forth new utility guidelines that appear to lower the utility requirement for biotechnological patent applications, while a heightened standard applies to chemical claims.[196] The Federal Circuit has yet to hear a case resolving this issue.

The standards for review of obviousness appear to be consistent between chemical and biotechnology practices.[197] However, the Federal Circuit has yet to hear a number of specific issues relating to obviousness with regard to DNA sequences. When these issues do come to the Federal Circuit, the court must continue to follow chemical practice precedent.

Finally, the Federal Circuit recently changed the written description requirements for biotechnology practice.[198] The break from established practice is unsupported and is inconsistent with the new PTO guidelines for written description.[199] This decision will likely impact and alter how companies pursue their patent strategies and file patent applications.[200]

Today's pharmaceutical companies spend hundreds of millions of dollars in the development of new drugs and therapies.[201] The companies

192. *Enzo*, 296 F.3d at 1330. "It is not correct, however, that all functional descriptions of genetic material fail to meet the written description requirement."*Id.*

193. *See supra* notes 124, 128.

194. *See supra* note 138. The MPEP instructions specifically state that a deposit satisfies the written description requirement only when words alone cannot. *Id.*

195. *Compare* notes 33-58 with 66-77.

196. *Id.*

197. *See supra* notes 81-109.

198. *See supra* notes 131-37, 139-45.

199. *See supra* notes 113-21, 138.

200. *See supra* note 180.

201. *See supra* note 6.

need to ensure that their rights will be protected, otherwise, the incentives to invest in research are lost. The court must carefully consider how to proceed in the rapidly growing area of biotechnology, which is a subset of chemical practice, and set clear, predictable precedents that are consistent with chemical practice.

Natalie A. Lissy[*]

---

* Ph.D. (2001), Molecular Genetics, Washington University School of Medicine; J.D. Candidate (2004), Washington University School of Law.