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Litigating Biotechnology Patents: The Next Frontier for Patent Litigation in the United States

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I. Introduction

Computer-related inventions have dominated the landscape of patent litigation over the past 30 years in the United States, and likely will continue to wield influence over patent litigation in the coming decades, albeit in a somewhat different way. The hot area of patent litigation in the late 1980s through the early 2000s was semi-conductors, in particular high-speed processors and memory storage devices, such as DRAMs (dynamic random access memory devices) and flash memory devices.¹ These micro-devices were responsible for the personal computer boom. They enabled these devices to get smaller, faster and cheaper, thus bringing the power of computers to the masses. As the industry matured, litigation in the area, however, began to quiet.

The past decade saw patent litigation pivot away from computer chips and toward the cell phone and other PDA devices, which further miniaturized the personal computer by putting it into the palms of users' hands.² The decade also saw cases focusing on the routing systems and software that supported this technology. Due to the maturation and commoditization of the cell phone and PDA industry, as well as new limits placed on the patentability of software and business method patents in the U.S., we are seeing patent litigation in this area also begin to wane. It's the author's prediction that litigation in this field will be virtually non-existent in the next three to five years.

The new frontier for patent litigation that is emerging is biotechnology. As the developments in this technological area are exploding, in part due to the strides made in computing and artificial intelligence, so are the fights over the intellectual property upon which these technologies are based. Given that many of the fundamental developments in this area are taking place at universities and within start-up companies, these cases present unique challenges to litigate. Also, many of these technologies are so advanced that the law is struggling to keep up.

This paper will discuss this burgeoning area of intellectual property litigation in the U.S., the legal developments trying to keep pace with these technologies, and the challenges associated with litigating these types of cases.

II. Emergence of Biotech Litigation

One leading indicator that biotech patent disputes are starting to dominate the patent litigation landscape is that half of the top ten highest damage awards in the past 20 years were biotech patents, with the biggest awards overall being awarded within the past several years. The chart below from the PwC 2017 Patent Litigation Study³ shows the size of these damage awards and how they compare to their software/high-technology peers.

Fig 2: Top ten largest initial adjudicated damages awards: 1997–2016

| Year | Plaintiff | Defendant | Technology | Award (in \$M) |
|------|-----------------------------|---------------------------------|---|----------------|
| 2016 | Idenix Pharmaceuticals LLC | Gilead Sciences Inc. | Hepatitis C drugs | \$2,540 |
| 2009 | Centocor Ortho Biotech Inc. | Abbott Laboratories | Arthritis drugs | \$1,673 |
| 2007 | Lucent Technologies Inc. | Microsoft Corp. | MP3 technology | \$1,538 |
| 2012 | Carnegie Mellon University | Marvell Technology Group | Noise reduction on circuits for disk drives | \$1,169 |
| 2012 | Apple Inc. | Samsung Electronics Co. | Smartphone software | \$1,049 |
| 2012 | Monsanto Company | E.I. Du Pont De Nemours and Co. | Genetically modified soybean seeds | \$1,000 |
| 2005 | Cordis Corp. | Medtronic Vascular, Inc. | Vascular stents | \$595 |
| 2015 | Smartflash LLC | Apple Inc. | Media storage | \$533 |
| 2004 | Eolas Technologies Inc. | Microsoft Corp. | Internet browser | \$521 |
| 2011 | Bruce N. Saffran M.D. | Johnson & Johnson | Drug-eluting stents | \$482 |

As noted in the PwC study, 2016 saw the largest damages award for a single patent infringement case in U.S. history when Merck Pharmaceutical subsidiary Idenix was awarded \$2.54 billion against Gilead in a case over treatments for the Hepatitis C virus. As large damage awards continue to emerge, the number of case filings in this area will continue to rise.

As alluded to above, biotech patent cases present unique challenges when litigating. They are often complex technologies and thus difficult to explain to judges and juries. Also, because of the unpredictability of these technologies, they often come with written description and enablement challenges. Furthermore, with the recent attacks on patents under Section 101, biotech patents have not been immune to such challenges. The issue of nonobviousness has also presented some unique challenges with biotech litigation. Lastly, because many biotech inventions were developed at universities and/or through joint development efforts, litigating these licensed rights have also presented their own challenges and in some cases opportunities. The sections that follow address these issues in greater detail.

III. Challenges to Patentability – Written Description & Enablement

Biotechnology patents are more susceptible to validity challenges under 35 U.S.C. § 112 for lack of written description and lack of enablement than mechanical, electrical and even chemical patents. Because of the unpredictable nature of most areas of biotechnology, it is often difficult for patent

drafters to adequately describe and enable all possible future embodiments of the invention. This makes broad genus claims in the biotech area particularly vulnerable to attack. Unlike inventions in other areas, where genus claims are often used to capture undisclosed embodiments, such claims in the biotech area are easier to attack because experts can often point to challenges that still remain in the field for practicing the undisclosed or inadequately disclosed embodiments. They can also often find support in the technical literature as to why undue experimentation would be needed to practice those embodiments. This makes it difficult to enforce such claims in the United States.

Very often in biotech litigation, both written description and enablement are raised as defenses. However, often these defenses are conflated because the difference between them is not always appreciated. One court offered a classic example of how written description can often diverge from enablement in biotechnology cases: Suppose a specification discusses chemical compound A, which would allow somebody skilled in the art to make related compounds B and C—even though compounds B and C are not described in the disclosure. Compound A is both enabled and described in this scenario, while compounds B and C are only enabled. Given that an invention in biotechnology with practical applications for one complex category (*e.g.*, chemicals, DNA sequences, or taxonomies) often informs applications for other categories, the distinction between these requirements is especially relevant for biotechnology.⁴

The question of whether a disclosure is enabling depends on whether “undue experimentation” is required.⁵ As noted above, because the implications of biotechnology inventions are not always foreseeable, and patent drafters attempt to maximize claimed applications of an invention, courts have often invalidated overbroad claims in biotechnology patents for lack of enablement. For instance, in *Amgen Inc. v. Chugai Pharmaceutical, Co.*, the Federal Circuit invalidated Amgen’s claim to all possible DNA sequences for analogs that were “sufficiently duplicative” of the natural human erythropoietin (EPO) protein.⁶ Enabling this broad claim would require a disclosure allowing a person skilled in the art to produce predictable DNA sequences encoding EPO analogs with EPO-like activity. Amgen did not enable its invention by producing “the gene and a handful of analogs whose activity ha[d] not been clearly ascertained”⁷ because undue experimentation was required to obtain all possible DNA sequences with EPO-like activity.

The undue experimentation was introduced to address predictability and state of the art.⁸ For example, *Plant Genetic Sys. v. DeKalb Genetics Corp.*⁹ involved method claims directed to the use of *Agrobacterium* to insert a gene into both monocots and dicots. The district court invalidated these claims for lack of enablement because at the time of patent, a person skilled in the art could not insert the gene into monocots.¹⁰ The patent included working examples only of inserting the gene into dicots. However, technology that permitted insertion into monocots was not available to those skilled in the art until three years after the patent issued.¹¹ The fact that it took several more years of research and development to make the invention work for monocots underscored the lack of enablement of the patent’s specification.

In another case, the Federal Circuit held that Genentech’s patent for human growth hormone (hGH) was invalid for lack of enablement because the patent suggested a theoretical method that was unavailable to those skilled in the art at the time of filing.¹² Such patents are sometimes referred to

as prophetic patents. Genentech's patent included a claim directed to producing a protein by cleavable fusion expression.¹³ Genentech's patent specification suggested that hGH could be produced by cleavable fusion expression, even though it had never actually reduced its invention to practice. This theoretical method for generating hGH was found non-enabling because the Court questioned "whether the specification would have enabled a person having ordinary skill in the art *at the time of filing* to use cleavable fusion expression to make hGH without undue experimentation."¹⁴ Five years of further experimentation was required before Genentech was able to actually reduce the theoretical method to practice.

In the early cases, lack of written description was used more to challenge priority than as a direct attack on validity. However, through a series of decisions in the 1990s in the biotechnology area, the Federal Circuit elevated the written description requirement to an accepted basis for invalidating a patent under 35 U.S.C. § 112. In these cases, the Federal Circuit expanded the written description defense to include the concept of *possessing the full scope of a generic claim*. This heightened standard is still often invoked in litigation to invalidate claims in biotechnology patents.

The Federal Circuit signaled that it would start relying on this heightened written description standard in *The Regents of the University of California v. Eli Lilly*¹⁵. Under *Lilly*, the Court held, broad genus claims must be supported by adequate descriptions of representative examples or common structure. The case involved a dispute over recombinant DNA technology used to produce human insulin. Researchers at the University of California filed a patent that covered such an invention after it discovered cloning a modified cDNA in rats encoded for insulin. The patent contained two different types of claims to cDNA-produced insulin.¹⁶

The first type of claim was directed to cDNA-produced insulin in all vertebrates. The court found that the specification failed to adequately describe the broader class of vertebrate cDNA, even though the patent included a description of rat insulin cDNA.¹⁷ While every species in a genus need not be described to meet the written description requirement, the court observed that written description of a DNA "requires a precise definition, such as by structure, formula, chemical name, or properties" sufficient to distinguish it from other materials.¹⁸ Generic statements such as "vertebrate insulin cDNA" or "mammalian insulin cDNA" were not adequate written descriptions of the genus because they did not distinguish the claimed genus from others, except by function.¹⁹

The second type of claim was a dependent claim directed to a specific embodiment directed to a modified cDNA encoding for human insulin. The specification prophetically described a method of obtaining human insulin-encoding cDNA by means of a constructive example. However, the court reasoned that this description was inadequate:

The patent describes only a general method for obtaining the human cDNA (it incorporates by reference the method used to obtain the rat cDNA) along with the amino acid sequences of human insulin A and B chains. *Whether or not it provides an enabling disclosure*, it does not provide a written description of the cDNA encoding human insulin, which is necessary to provide a written description of the subject matter of claim 5.²⁰

Thus, as a general matter, broad genus claims should be supported by representative examples or common structure to satisfy the written description requirement. Accordingly, in litigating the validity of such patents, accused infringers are often quick to point to the absence of such examples or common structure in attacking biotech patents for lack of written description. Patent owners only real defense in the absence of such examples is to look for other disclosure in the specification that can be argued adequately supports the specific species being litigated. This is where expert witnesses are critical not only in identifying such other disclosure but also in advocating why the other disclosure satisfied the standard. They can also bring into the analysis their perspective of what a person of ordinary skill in the art would understand from the limited disclosure that may exist.

As with the enablement requirement, accused infringers can also challenge a patent's validity for lack of written description by pointing to the unpredictability of the invention. The Federal Circuit in *Capon v. Eshbar* explained:

The written description requirement must be applied in the context of the particular invention and the state of the knowledge . . . Precedent illustrates that the determination of what is needed to support generic claims to biological subject matter depends on a variety of factors, such as the existing knowledge in the particular field, the extent and content of the prior art, the maturity of the science or technology, ***the predictability of the aspect at issue***, and other considerations appropriate to the subject matter.²¹

Again, in the event an opponent challenges a claim's validity on this basis, an expert can be crucial in defending against such an attack. Regardless of which side of the issue is being advocated, it's important the expert have a firm grasp of the state of the art. In presenting the case to a jury, the state of the art should be the starting point of any expert's testimony, because it provides context for the rest of the arguments being made. This is particularly the case with Section 112 validity challenges.

Before moving on, a discussion of this issue would be incomplete without saying a word about functional genus claims. These types of claims are inherently vulnerable to written description challenges.²² Such claims can be shown to meet the written description requirement if a reasonable structure-function correlation is established.²³ That was not the case with the claims in the *Ariad* case, however. The patent at issue included broad genus claims directed to "the use of all substances that achieve the desired result of" inhibiting NF-kB activity.²⁴ The specification used broad functional language to disclose three classes of molecules potentially capable of reducing NF-kB activity: specific inhibitors, dominantly interfering molecules, and decoy molecules. In finding the claims invalid for failing to meet the written description requirement, the Federal Circuit reasoned that - like in earlier cases - "the specification did not describe any specific compound capable of performing the claimed method and the skilled artisan would not be able to identify any such compound based on the specification's functional description."²⁵ The claims merely recited a description of the problem to be solved while claiming all solutions, which would cover any compound invented later that were encompassed by the claim's functional boundaries.²⁶

Accordingly, accused infringers in biotech cases have two potentially powerful weapons in their arsenal to challenge the asserted patent's validity with enablement and written description. Not only are these now well-recognized defenses in the biotech area, they can often be the winning ones.

Furthermore, raising these defenses has other strategic value in biotech cases. As in any other patent infringement case, the parties in biotech cases almost always find themselves fighting over what is the proper scope of the claim, with a broad interpretation leading to infringement and a narrow one escaping infringement. The benefit of having a lack of enablement and/or written description defenses in the case is that often under the broader the construction, the patent fails to meet one or both of these requirements. Conversely, a patent's lack of adequate written description or enablement can be used to support a narrower claim interpretation under the principle that when presented with two competing constructions, the one that preserves the validity is often the one the court should choose.²⁷ Thus, enablement and written description defenses can have other strategic benefits in biotech cases beyond just offering additional challenges to validity.

IV. Challenges to Patentability – Subject Matter Eligibility

Like software patents of late, biotech patents have been subject to attack under 35 U.S.C. § 101 as covering patent ineligible subject matter. These attacks have started to come in the form of a motion to dismiss under Rule 12(b)(6) of the Federal Rules of Civil Procedure on the basis that complaints asserting infringement of such patents fail to state a claim because the patents should never have been granted given that they lack patentable subject matter. Such motions can be very powerful if granted because they have the effect of ending the case at a very early stage.

It was only several decades ago that patent protection was expanded to cover many of the biotech patents that exist today. *Diamond v. Chakrabarty* was the landmark case that opened the door to such patents. That case expanded patent eligible subject matter to genetically modified life forms, such as microorganisms, plants, and isolated tissues.²⁸ Chakrabarty, a microbiologist at General Electric, developed a genetically engineered microorganism, which was capable of breaking down crude oil for use in cleaning up oil spills, but the Patent Office rejected his patent, arguing that living organisms were not patentable subject matter. The case ultimately made its way up to the United States Supreme Court, which found the claims patentable under Section 101 reasoning that the modified bacterium was directed to “a non-naturally occurring manufacture or composition of matter - a product of human ingenuity ‘having a distinctive name, character [and] use,’” rather than a previously unknown natural phenomenon.²⁹

The *Mayo Collaborative Servs. v. Prometheus Labs, Inc.*³⁰ case started the recent trend of invalidating biotech patents under Section 101. The patent in that case recited a method of administering a drug to a patient, measuring the resulting metabolite levels in the patient's blood, and subsequently adjusting the amount of drug administered based on the concentration of metabolites.³¹ Writing for the Court, Justice Breyer found that the patent set forth a law of nature - “namely, relationships between concentrations of certain metabolites in the blood and the likelihood that a dosage . . . will prove ineffective or cause harm.”³² Since natural laws are patent-ineligible, Justice Breyer then considered whether the patent contained an inventive concept sufficient to transform the patent-ineligible concept into a patent-eligible application.³³

The Court concluded that additional steps of “administering,” “determining,” and “wherein” were not sufficient to transform the nature of the claim to patentable subject matter. First, the “administering” step merely limited the use of the natural law to a particular technological environment.³⁴ Second, the “determining” step was a purely conventional and obvious pre-solution activity.³⁵ Lastly, the “wherein” clause merely instructed the relevant audience about the laws, while trusting them to implement the laws appropriately.³⁶ Essentially, all the claims were directed to instructing doctors to gather data and draw inferences from the data in light of correlations, which was not a patent-eligible process.

After not addressing the patent eligibility of biotech patents for over twenty years, it only took the Supreme Court another term to address this issue a second time in recent history. It did so again in *Association for Molecular Pathology, Inc. v. Myriad Genetics, Inc.* (“*Myriad I*”).³⁷ That case involved a patent that claimed the exclusive right to isolate an individual’s *BRCA1* and *BRCA2*³⁸ genes. Mutations in these genes were associated with a high risk of breast cancer. Since isolation was necessary to conduct genetic testing, the patent excluded others from developing tests to detect mutations in these genes. The claims challenged were product claims directed to (1) isolated genomic DNA molecules that instruct cells to produce strings of amino acids for the *BRCA1* and *BRCA2* genes; (2) cDNA sequences that coded for the genes; and (3) the subset of data from those claims (*i.e.*, any series of 15 nucleotides that exist in the typical *BRCA1* and *BRCA2* genes).³⁹

The Supreme Court held that “[a] naturally occurring DNA segment is a product of nature and not patent eligible merely because it has been isolated, but cDNA is patent eligible because it is not naturally occurring.”⁴⁰ In view of *Chakrabarty*, the isolated DNA strand was found not patent eligible because “separating [a] gene from its surrounding genetic material [is] not an act of invention.”⁴¹ Even though isolating DNA strands creates a non-naturally occurring molecule, Myriad’s claims were nevertheless invalid because they were not directed to the specific chemical composition of a particular molecule, nor did they rely on chemical changes that result from the isolation process.⁴² Instead, the claims were concerned primarily with the genetic information encoded in the *BRCA* genes. The Court found cDNA patent-eligible, however, because while “cDNA retains the naturally occurring exons of DNA, but it is distinct from the DNA from which it was derived.”⁴³ Accordingly, cDNA is not a product of nature.

*Myriad II*⁴⁴ addressed the patent eligibility of method claims that were not at issue in *Myriad I*. The claims were directed to comparing the patient’s *BRCA* genetic sequence with wild-type *BRCA* sequences and identifying differences between the two sequences. The Federal Circuit held that such a method was directed to an abstract idea, and therefore was not patentable.⁴⁵ The method lacked the transformative step required by the *Mayo* test because the comparisons set forth in the claim were “not restricted by the purpose of the comparison or the alteration being detected. Because of its breadth, the comparison step covers detection of yet-undiscovered alterations, as well as comparisons for purposes other than detection of cancer.”⁴⁶

The Federal Circuit has been presented with a number of recent cases where it has had to apply the holdings of *Mayo* and *Myriad*. For example, in *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*,⁴⁷ the Federal Circuit upheld a district court's summary judgment of patent invalidity in view of the patent's claimed method for detecting fetal DNA in maternal blood samples, which included steps for amplifying, and detecting the DNA. The district court found that the claims were ineligible under 35 U.S.C. § 101 because they were directed to a natural phenomenon and the steps of *amplifying and detecting* were "well-understood, routine, or conventional activity." On appeal, the Federal Circuit held that fetal DNA was a naturally occurring phenomenon and the claims failed to contain "an inventive concept sufficient to 'transform' the naturally occurring phenomenon into a patent eligible application." The court found that the claimed method was merely a "general instruction to doctors to apply routine, conventional techniques."

Subsequent to the Federal Circuit's panel decision, the patent owner filed for an en banc review, and the Federal Circuit denied an en banc rehearing on the patentability of the claimed method for detecting fetal DNA in maternal blood samples. The court held that it was bound to follow the Supreme Court's decision in *Mayo* and that this case was not distinguishable from the holding in *Mayo*. In dissent, Judge Newman argued that the Supreme Court cautioned against generalizations that all discoveries of natural phenomena or their applications are ineligible for patenting.⁴⁸

In a case upholding the validity of a biotech patent under 35 U.S.C. § 101, the Federal Circuit in *Rapid Litigations Management Ltd. v. CellzDirect, Inc.* found a patent directed to an improved method of preserving liver cells to cover patentable subject matter.⁴⁹ The patent's improved method included the steps of separating, recovering, and refreezing viable liver cells from those previously frozen and thawed. The detailed steps of the claimed method included performing density gradient fractionation to separate viable and nonviable hepatocytes, recovering the viable hepatocytes, and cryopreserving the recovered viable hepatocytes. The district court had found that the claims were directed to a patent-ineligible law of nature that liver cells naturally could survive multiple freeze-thaw cycles and that the patent's "well-understood freezing process" was insufficient to transform the law of nature into patent-eligible subject matter.

On appeal, the Federal Circuit reasoned that it was necessary to determine whether the claims were directed to a patent eligible concept rather than merely identifying a patent ineligible concept underlying the claims. The court found that the inventors not only discovered the cells' ability to survive multiple freeze-thaw cycles but also employed this natural discovery to find a new and improved way of preserving hepatocyte cells. The court found the claims patent eligible under the first step of the *Mayo/Alice*⁵⁰ framework regarding whether a claim is directed to a law of nature (step 2A in USPTO's subject matter eligibility guidance). The court found that the claims were directed to a "new and useful laboratory technique" for preserving liver cells. And the court distinguished this case from other recent cases such as *Ariosa* and *Genetic Technologies* whose claims were directed to "nothing more than observing or identifying the ineligible concept itself."

Thus, the patent owner in the *CellzDirect* case was able to preserve the validity of the patent by pointing to the steps that were found to be new and useful under the second step of the *Mayo/Alice* cases. This second step of the analysis is likely where most of the future battles under Section 101 in the biotech area will be fought. This is because generally speaking the analysis under the first step is more straight forward – generally speaking either something is an abstract idea or law of nature or it is not. Whether the invention is transformative involving new and useful aspects is a factual inquiry that often is subject to debate. Once again, experts can be very effective in helping to prove your case regardless of which side of this issue you might find yourself. And again having a command of the state of the art will be critical to effectively litigating this issue on behalf of your client.

V. Nonobviousness

There are some nuances on the law of nonobviousness in the biotech context that are important to understand in litigating this issue in such cases and thus worth mentioning here. Application of the obvious to try doctrine is one of them. In *In re Kubin*, the Federal Circuit declined to apply *In re Duehl's* “obvious to try” nonobviousness standard to a DNA patent, instead opting for a “reasonable expectation of success” standard.⁵¹ Kubin’s patent involved the isolation and sequencing of a human gene that encodes a particular domain of protein known as Natural Killer Cell Activation Inducing Ligand (NAIL). The patent specification recited the amino acid sequence of NAIL polypeptide, and also isolated and sequenced the polynucleotide that encodes NAIL polypeptide.

Valiante, the other party in the case possessed the prior art, which rendered Kubin’s patent obvious. The prior art disclosed a 5-step cloning protocol for isolating and identifying the receptor protein P38, which is found on the surface of NK cells. P38 is the same as NAIL. The Federal Circuit found Kubin’s patent obvious, reasoning that a person of ordinary skill would have resoundingly had a *reasonable expectation of success* in deriving the Kubin’s claims in light of the prior art. The prior art disclosed the protein of interest (P38), the motivation to isolate the gene coding from the protein as well as illustrative instructions to use a monoclonal antibody specific to the protein for cloning the gene. Therefore, Kubin’s claims were found not to be a product of innovation but of ordinary skill and common sense.

The reasonable expectation of success standard was also at issue in a recent highly publicized, PTAB decision relating to CRISPR (clustered regularly interspaced short palindromic repeats) technology. The decision involved an interference proceeding between the University of California (UC) and the Broad Institute in Cambridge, Massachusetts.⁵² The inventors affiliated with UC showed that CRISPR-Cas9 could use guide RNA to direct a Cas9 protein to slice a target section of DNA. UC filed a patent application in 2013 on the CRISPR gene-editing technique after showing applications of the technique in the DNA on prokaryotes in vitro. Researchers at the Broad Institute were simultaneously working on Cas9 applications in eukaryotic cells. Shortly after UC filed its patent, the Broad Institute filed a patent directed towards CRISPR’s applications in eukaryotic cells - a distinction that UC did not appear to make in its patent.

UC maintained that its 2012 patent rendered obvious the Broad Institute's patent involving genome editing in eukaryotic cells. However, the PTAB rejected this argument. It was of the view that UC's claims failed to address an environment in which their CRISPR-Cas9 system was employed. It further rejected UC's arguments that rapid success in other labs demonstrated that a person of ordinary skill would have had a reasonable expectation of success in extending the UC patent to eukaryotic applications.⁵³

Whether a person of ordinary skill in the art would have had a reasonable expectation of success is generally harder to establish than whether something is obvious to try. Not only does it require deeply understanding the level of skill in the art but also once again the state of the art. Here an expert who actually practices in the field, as opposed to someone who is purely an academic, will be important to litigating this issue, whichever side you may be representing. A research scientist with real hands on experience in the specific area at issue can be especially beneficial. And while the PTAB did not find actual success by others persuasive, such evidence may stand a better chance before a jury if this issue ever gets litigated in district court.

VI. Issues Associated Licensed Technology

Many biotech inventions require a significant amount of fundamental research and expensive equipment. As a consequence, it is not uncommon for start-ups and even well established companies to team up with universities to develop their technologies. Teaming-up with universities also enables start-up companies to get into the development of early-stage technologies that they would otherwise not be able to invest in due to their limited financial resources. Indeed, doing so enables these companies to leverage their resources in a way that can often make them competitive in the technology race with their larger more-well established counter-parts. Furthermore, many recent developments in computing and neural networks have enabled start-up companies to do research that just a few years ago would have either been impossible or prohibitively expensive.

There are some issues of which biotech companies dealing with universities must be aware. One issue is that universities often hire graduate students and even in some instances undergraduate students to perform some of the research being done in the technology area being licensed to the company. In some instances, their contributions to the invention are not always appreciated such that they may turn out to unknowingly be an inventor of the technology being licensed. Such was the case in *Ethicon v. U.S. Surgical* discussed below. Also, on occasion researchers at universities, usually faculty members, but not always, consult with other companies outside of the university. In such circumstances, there is a danger that the company they consult with ends up owning or co-owning the technology being licensed by the university. That was the case in *Stanford v. Roche*.

The patents in *Stanford v. Roche* used Polymerase Chain Reaction (PCR) technology to measure the level of HIV virus present in a patient's blood.⁵⁴ Cetus scientists in the mid-1980s developed PCR, the Nobel Prize-winning technique. Dr. Holodniy was a research fellow at Stanford, who signed an agreement stating he agreed to assign Stanford his rights in inventions resulting from employment there. As part of a collaboration between Cetus and Stanford, Holodniy conducted research at Cetus to learn about PCR. As a condition of accessing Cetus' facilities, Holodniy signed a confidentiality

agreement containing a provision “stating that he ‘will assign and do[es] hereby assign’ to Cetus his ‘right, title and interest in the ideas, inventions, and improvements’ made ‘as a consequence of [his] access’ to Cetus.”⁵⁵ After returning to Stanford, he tested the procedure with other researchers and Stanford secured three patents to the measurement procedure.⁵⁶

Roche Molecular Systems acquired Cetus’ PCR-related assets and commercialized the HIV quantification method developed at Cetus.⁵⁷ Stanford filed suit against Roche, claiming that their HIV kits infringed Stanford’s patents. Roche argued that it had co-ownership of the procedure due to Holodniy’s agreement with Cetus.

Stanford countered that Holodniy had no rights to assign because the University had superior rights under the Bayh-Dole Act, which allocates rights in federally funded “subject invention[s]” between the Federal Government and federal contractors.⁵⁸ “Subject inventions” are defined by the Act as “any invention of the contractor conceived or first actually reduced to practice in the performance of work under a funding agreement,”⁵⁹ and provides that contractors may “elect to retain title to any subject invention.”⁶⁰

The Supreme Court held that the Bayh-Dole Act does not *vest* title to patents resulting from federally funded research in universities.⁶¹ Essentially, Roche’s claim to patent ownership by virtue of the assignment contained within the confidentiality agreement Holodniy signed superseded Stanford’s claim to ownership under the Act. Thus, Stanford had no standing to sue Roche for infringement and the case was dismissed.

U.S. Surgical is another example of the possible dangers associated licenses stemming from a joint collaboration situation. Although *U.S. Surgical* did not involve a researcher working at a university, what happened in the case could easily have occurred in a university setting given the similar type of collaboration that takes place within and among universities. Yoon was a medical doctor who owned the ‘773 Patent, which related to trocars, a tool for endoscopic surgery.⁶² For eighteen months, starting from 1980, Yoon collaborated with Choi, who was an electronics technician and researcher in that area. Yoon approached Choi to work on several projects, including one for safety trocars. In 1982, Choi stopped cooperating with Yoon because he believed Yoon found his work unsatisfactory.

Yoon filed for the patent at issue in 1985 and did not inform Choi of the patent proceedings. Yoon later granted an exclusive license under the patent to Ethicon, which later sued U.S. Surgical, a maker of endoscopy devices, for infringement. U.S. Surgical learned of Choi’s involvement in Yoon’s research and agreed with Choi to enter a retroactive license agreement, allowing U.S. Surgical to practice the ‘773 Patent. The district court granted U.S. Surgical’s motion to dismiss the suit on the basis that Ethicon lacked standing to continue its suit against U.S. Surgical, which had become licensed under the patent by virtue of its agreement with Choi.

The Federal Circuit agreed with the district court’s determination that Choi conceived part of the invention in two relevant claims and thus was a co-inventor and co-owner of the patent, and thereby denied Ethicon the ability to pursue its claims for infringement of the ‘773 Patent against U.S. Surgical in view of its license from Choi.⁶³

Stanford v. Roche and *Ethicon v. U.S. Surgical* present useful lessons to biotech companies licensing technology from universities and other third parties. The company should do its diligence to make sure that all of the co-inventors and thus co-owners have assigned their rights to the university or other third party supplying the license, otherwise competitors may end up with rights to the technology. In the litigation context, accused infringers should search for undisclosed inventors that may have collaborated with the listed inventors. Such individuals may have contributed enough to qualify as co-inventors of the asserted patent. Obtaining a license from such an individual can really pay off as it did in the *US Surgical* case, with dismissal of the action for lack of standing.

Another issue biotech companies should also be watchful of when dealing with state universities is sovereign immunity. A number of states recognize the sovereign immunity of their state universities. As a consequence, absent a clear waiver of sovereign immunity, a state institution cannot be sued. Where this potentially affects a biotech company holding a patent license from such a university is that generally the company will need the institution's agreement to participate in any lawsuit asserting the patent against third parties where less than all substantial rights to the patent have been transferred to the licensee. A mere agreement to participate in the lawsuit, as is typically found in many standard license agreements, may not be enough.⁶⁴ It is not entirely clear whether this would be sufficient, but at the very least, the company may wish to obtain a waiver of sovereign immunity in the license agreement to allow the company to join the university in any lawsuit enforcing the licensed patent against third parties.

VII. Conclusion

As patent litigation shifts away from computer and software related inventions to biotech patents, new legal issues and twists on old ones have emerged. In the coming decade, these issues will continue to evolve, as they are litigated. Those litigating in this area will be faced with many new and interesting challenges. This next frontier will undoubtedly prove to be exciting times for those at the forefront of these disputes.

Endnotes

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¹ Indicative of this era, Intel sued a number of microprocessor manufacturers, including AMD, Taiwanese IC Manufacturer UMC, and Citrix, for infringement of U.S. Patent No. 4,972,338 issued to Crawford (the "Crawford '338 Patent"), which was a critical patent detailing how to cache and refer to memory efficiently via the microprocessor. Intel alleged that these manufacturers' 386 and 486 processors infringed the Crawford '338 Patent. It obtained a critical judgment against AMD in *Intel Corp. v. Advanced Micro Devices, Inc.*, No. C-93-20301 PVT, 1994 WL 621665 (N.D. Cal. Oct. 31, 1994) (order requiring parties to agree on terms of permanent injunction after having stipulated to the terms of a preliminary injunction). Intel's actions against UMC spanned the globe with actions in the U.K. Germany, Singapore, Hong Kong, and the U.S (including before the ITC).

MOSAID and Texas Instruments launched a similar worldwide campaign against a number of DRAM and semiconductor companies for infringement. These litigants brought suits against notables such as Fujitsu, Hynix, Infineon, NEC, Toshiba, Hitachi, Mitsubishi Electric, Oki Electric, Matsushita, Sony Corporation, Royal Philips

- Electronics, and Samsung Electronics. *See, e.g., Mosaid Technologies Inc. v. Hynix Semiconductor Inc. et al.*, case no. 6:05-cv-00013-WMS (ED Tex 2005); *Mosaid Technologies Inc. v. Infineon Technologies North America Corp et al.*, case no. 6:05-cv-00120-WMS (ED Tex 2005); *Mosaid Technologies V. Samsung Electronics, et al.*, case no. 2:01-cv-04340-WJM-RJH (D.N.J. 2005); and *Texas Instruments Inc. v. U.S. Int’l Trade Comm’n*, 871 F.2d 1054 (Fed. Cir. 1989).
- 2 The cell phone wars pitted, among others, Qualcomm against Motorola, Qualcomm against Nokia, Broadcom against Qualcomm and industry titans Apple versus Samsung. *See, e.g., Qualcomm Inc. v. Nokia Corp.*, 466 F.3d 1366 (Fed. Cir. 2006); *Broadcom Corp. v. Qualcomm Inc.*, 543 F.3d 683 (Fed. Cir. 2008); and *Apple v. Samsung*, https://en.wikipedia.org/wiki/Apple_Inc._v._Samsung_Electronics_Co. (2017) (discussing the worldwide disputes between Apple and Samsung concerning Apple’s graphical user interface patents).
 - 3 *2017 Patent Litigation Study: Change on the Horizon*, www.pwc.com/us/forensics (May 2017).
 - 4 *In re DiLeone*, 436 F.2d 1404, 1405 n.1 (C.C.P.A. 1971).
 - 5 *Ariad Pharmaceuticals, Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1367 (Fed. Cir. 2010) (en banc).
 - 6 927 F.2d 1200, 1212-14 (Fed. Cir. 1991), *cert. denied*, 502 U.S. 856 (1991).
 - 7 *Id.* at 1214.
 - 8 *See In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988) (citing non-mandatory factors to consider for the “undue experimentation” inquiry: “(1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims.” (emphasis added)).
 - 9 175 F. Supp. 2d 246 (D. Conn. 2001), *aff’d sub nom. Plant Genetic Sys., N.V. v. DeKalb Genetics Corp.*, 315 F.3d 1335 (Fed. Cir. 2003).
 - 10 *Id.* at 255-56.
 - 11 *Id.* at 256.
 - 12 *Genentech, Inc. v. Novo Nordisk A/S*, 108 F.3d 1361 (Fed. Cir. 1997).
 - 13 *Id.* at 1363.
 - 14 *Id.* at 1365 (emphasis added).
 - 15 119 F.3d 1559 (Fed. Cir. 1997).
 - 16 The claims at issue in the patent-in-suit were independent claim 1 and dependent claims 2 and 5:
 1. A recombinant plasmid replicable in a prokaryotic host containing within its nucleotide sequence a subsequence having the structure of the reverse transcript of an mRNA of a vertebrate, which mRNA encodes insulin.
 2. A recombinant prokaryotic microorganism modified to contain a nucleotide sequence having the structure of the reverse transcript of an mRNA of a vertebrate, which mRNA encodes insulin.
 5. A microorganism according to claim 2 wherein the vertebrate is a human.
 - 17 *Id.* at 1562-63.
 - 17 *Lilly*, 119 F.3d at 1568.
 - 18 *Id.* at 1566 (quoting *Fiers*, 984 F.2d 1164, 1171 (Fed. Cir. 1993)).
 - 19 *Id.* at 1568.
 - 20 *Id.* at 1567 (emphasis added).
 - 21 418 F.3d 1349, 1358 (Fed. Cir. 2005) (emphasis added).
 - 22 *AbbVie Deutschland GmbH & Co., KG v. Janssen Biotech, Inc.*, 759 F.3d 1285, 1301 (Fed. Cir. 2014).
 - 23 *Id.*
 - 24 *Ariad*, 598 F.3d at 1341.
 - 25 *See id.* at 1353 (citing *Univ. of Rochester v. G.D. Searle & Co.*, 916, 927-28).
 - 26 *Id.*
 - 27 *See, e.g., Ruckus Wireless, Inc. v. Innovative Wireless Sols., LLC*, 824 F.3d 999, 1004 (Fed. Cir. 2016) (“If, after applying all other available tools of claim construction, a claim is ambiguous, it should be construed to preserve its validity. Because the specification makes no mention of wireless communications, construing the instant claims to encompass that subject matter would likely render the claims invalid for lack of written description. The canon favoring constructions that preserve claim validity therefore counsels against construing ‘communications path’ to include wireless communications.”) (internal citations omitted).
 - 28 447 U.S. 303 (1980).
 - 29 *Id.* at 309-310 (quoting *Hartranft v. Wiegmann*, 121 U.S. 609, 615 (1887)).
 - 30 566 U.S. 66 (2012).
 - 31 *Id.* at 74.
 - 32 *Id.* at 77.

- 33 *Id.* (“If a law of nature is not patentable, then neither is a process reciting a law of nature, unless that process has additional features that provide practical assurance that the process is more than a drafting effort designed to monopolize the law of nature itself.”).
- 34 *Id.* at 78.
- 35 *Id.*
- 36 *Id.* at 79.
- 37 133 S.Ct. 2107 (2013).
- 38 *Id.* at 2112-13.
- 39 *See id.* at 2113.
- 40 *Id.* at 2111.
- 41 *Id.* at 2117.
- 42 *Id.* at 2118.
- 43 *Id.* at 2119.
- 44 *In re BRCA1- & BRCA2-Based Hereditary Cancer Test Patent Litig.*, 774 F.3d 755, 758 (Fed. Cir. 2014).
- 45 *Id.* at 764-65.
- 46 *Id.* at 763-64.
- 47 788 F.3d 1371 (Fed. Cir. 2015).
- 48 *See also, Genetic Technologies Ltd. v. Merial L.L.C.*, 818 F.3d 1369 (Fed. Cir. 2016) (upholding summary judgment of invalidity under 35 U.S.C. § 101 of patent claims directed to a method for analyzing DNA sequences for genetic variations, specifically the relationship between coding and noncoding sequences in “linkage disequilibrium,” because they were directed to a law of nature and “any additional steps collectively consist only of well-understood, routine, conventional activity already engaged in by the scientific community.”)
- 49 2016 WL 3606624 (Fed. Cir. 2016).
- 50 The *Alice* case was another recent United States Supreme Court decision finding patent claims invalid under 35 U.S.C. § 101. That case, however, was directed to a computer-implemented, electronic escrow service for facilitating financial transactions. *See Alice Corp. v. CLS Bank International*, 573 U.S. ___, 134 S. Ct. 2347 (2014) (holding the patent invalid because the claims were drawn to an abstract idea, and implementing those claims on a computer was not enough to transform that idea into patentable subject matter).
- 51 *In re Kubin*, 561 F.3d 1351 (Fed. Cir. 2009).
- 52 *Broad Institute, Inc. et al. v. The Regents of the University of California*, Patent Interference No. 106,048(DK), Decision on Motions (February 15, 2017).
- 53 *Id.* at 23-24.
- 54 *Bd. of Trustees of Leland Stanford Junior Univ. v. Roche Molecular Sys., Inc.*, 131 S. Ct. 2188, 2189 (2011).
- 55 *Id.* at 2189.
- 56 *Id.*
- 57 *Id.*
- 58 35 U.S.C. §§ 201(e), (c), 202(a).
- 59 *Id.* § 201(e).
- 60 *Id.* § 202(a).
- 61 *Stanford v. Roche*, 131 S. Ct. at 2197.
- 62 *Ethicon, Inc. v. U.S. Surgical Corp.*, 135 F.3d 1456, 1459 (Fed. Cir. 1998).
- 63 *Id.* at 1462.
- 64 Indeed, there are several recent instances of a court dismissing a patent infringement action where the licensee of less than all substantial rights to the technology obtained its rights from a state institution, which refused to join in the case and could not be forced to do so under the principle of sovereign immunity. Some examples are *A123 Sys. V. Hydro-Quebec*, 626 F.2d 1213 (Fed. Cir. 2010) and *Cyanotech Corp. v. U.S. Nutraceuticals, LLC*, No. CIV. 12-00352 JMS, 2013 WL 504862 (D. Haw. Feb. 7, 2013).

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