



# Protecting essential information about genetic variants as trade secrets: a problem for public policy?

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## ABSTRACT

In 2013, the U.S. Supreme Court held that naturally occurring human genes are not patentable subject matter. This decision, invalidating patents held by Myriad Genetics involving genes affecting breast cancer, appeared to further the constitutional policy behind intellectual property protection to promote scientific progress and to make genetic testing more readily available to patients. However, the decision's ironic aftermath is continuing assertion by genetic testing companies of trade secrets protections over information about the significance of genetic variants.

This article analyzes possible approaches to the assertion of trade secret protections over information about the significance of genetic variants. Specifically, we consider five approaches: voluntary responses from the scientific community; Food and Drug Administration (FDA) or CMS regulation; creation of additional march-in rights as under the Bayh Dole Act; compulsory licensing as under patent law; and creation of a public policy exception to trade secret protection. We explore what each approach would require legally if applied to break trade secret barriers, together with their advantages and disadvantages. While our analysis concerns genetic information, we conclude with some thoughts about its relevance to other

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types of big data now protected by trade secrets such as information about innovations in quality of care.

**KEYWORDS:** trade secret, public policy, myriad genetics, march-in rights, genetic test, genetic variant

## I. INTRODUCTION

In 2013, the US Supreme Court invalidated Myriad Genetics' patents over genes implicated in the development of breast and ovarian cancer. The Court held that human genes in their naturally occurring state are not patentable under the Patent Act's limits on patentable subject matter.<sup>1</sup> On its face, this decision appeared to further the constitutional policy behind intellectual property to 'promote the Progress of Science and Useful Arts ...'.<sup>2</sup> Indeed, a primary justification of the challenges to Myriad's patents was to ensure that the genetic information they protected remained in the public domain for all to utilize.<sup>3</sup> However, the decision's ironic aftermath has been the continued assertion by Myriad and some other genetic testing companies of the protections of trade secret law over information they possess about the significance of genetic variants.<sup>4</sup> This result is contrary to the goal of scientific progress and may have deleterious results for patients.

This article responds to the challenges posed by the assertion of trade secret protections over information about the significance of genetic variants. We begin with an account of trade secret law and how its protections have been asserted over this genetic information. We call this the trade secret barrier. We then describe potential legal responses to these assertions of trade secret protection. Specifically, we consider four approaches: voluntary responses from the scientific community; Food and Drug Administration (FDA) or Centers for Medicare and Medicaid Services (CMS) regulation; march-in rights as under the Bayh Dole Act; and compulsory licensing as under patent law. We explore what each approach would require legally if applied to break the trade secret barrier, together with their advantages and disadvantages. We conclude by suggesting that public policy requires pursuing one or more of these strategies so that information about genetic variants will be shared more readily for the benefit of patients and the advancement of science. Although we recognize that efforts are emerging to share information about variants more widely, to the extent that these efforts remain slow and incomplete, further efforts will be necessary to break the trade secret barrier.

<sup>1</sup> Patent Act § 1 ('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 therefor ...'), 35 U.S.C. § 101; Association for Molecular Pathology v. Myriad Genetics, Inc., 133 S. Ct. 2107, 2116 (2013).

<sup>2</sup> U.S. CONST. Art. I, § 8.

<sup>3</sup> See generally 569 U.S. at 590 (explaining that if it were not for the exception of not allowing patents over laws of nature, natural phenomenon, and abstract ideas 'there would be considerable danger that the grant of patents would "tie up" the use of such tools thereby "inhibit[ing] future innovation premised upon them. This would be at odds with the very point of patents, which exist to promote creation'.')

<sup>4</sup> See generally Robert Cook-Deegan et al., *The Next Controversy in Genetic Testing: Clinical Data as Trade Secrets?*, 21 EUR. J. HUM. GENET. 585, 586 (2013) (discussing laboratories asserting trade secret law over genetic data) (hereinafter Cook-Deegan et al.).

## II. TRADE SECRET LAW AND ITS USE BY GENETIC TESTING COMPANIES

Trade secret law protects intellectual property in a manner that is the obverse of patent law. Seeking a patent requires disclosure of the discovery or invention, whereas protecting a trade secret requires reasonable efforts to conceal the discovery from others. When trade secret protections are asserted over genetic information, such as the association between variants and the expression of disease, no one but the company with the information can benefit, at least directly, from the information.

### Trade Secret Law

The general definition of a trade secret under the Uniform Trade Secrets Act ('UTSA') is

information, including a formula, pattern, compilation, program, device, method, technique or process that: derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by other persons who can obtain economic value from its disclosure or use, and is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.<sup>5</sup>

While there are no bright-line tests to determine whether information is actually a trade secret, several factors are analysed when making this determination. The UTSA analyses what helps maintain an information as a 'trade secret' and analyses factors such as the reasonable efforts to maintain secrecy, possibility of reverse engineering, and the extent to which the information is known both inside and outside of the business.<sup>6</sup>

Trade secret protection automatically attaches when 'information of value to the owner is kept secret by the owner' and has some sort of commercial value.<sup>7</sup> This protection remains as long as the requirements for trade secret protection are met: value to owner and secrecy.<sup>8</sup> Trade secret law, unlike patent law, contains no such provision that states what is proper 'trade secret subject matter'.

Although trade secret law is a subcategory of intellectual property law, it has historically been governed by the various laws of individual states.<sup>9</sup> Thus, litigation involving trade secrets typically takes place in state courts<sup>10</sup> unless the parties have an additional federal question claim or diversity jurisdiction that could bring them into the federal system.<sup>11</sup> Because trade secret law only allowed a state cause of action, it developed unevenly across the United States.<sup>12</sup> Some states utilized common law over their trade

<sup>5</sup> UNIFORM TRADE SECRETS ACT § 1 (1985) (hereinafter 'UTSA'). As we note below, trade secret law in the USA is governed at the state rather than the federal level. For this general description of the principles of trade secret law, we refer to the UTSA, which is widely adopted among the states.

<sup>6</sup> *Id.* at Comment to § 1 (1985).

<sup>7</sup> See *Id.*; see also Ronald T. Coleman, Jr., et al., *Trade Secrets — The Basic Principles and Issues*, 2014 A.B.A. LIT. SEC. CORE KNOWLEDGE 3 (hereinafter 'Coleman').

<sup>8</sup> See UTSA, *supra* note 5, at Comment to § 1; see Coleman, *supra* note 7, at 3.

<sup>9</sup> Coleman, *supra* note 7, at 3.

<sup>10</sup> *Id.*

<sup>11</sup> FED. R. CIV. P. 28 U.S.C. § 1331; FED. R. CIV. P. 28 U.S.C. § 1332.

<sup>12</sup> Ernie Linkek, *A Brief History of Trade Secret Law, Part 1*, BIOPROCESS INTERNATIONAL 1, 1 (2004), [https://bannerwitcoff.com/media/\\_docs/library/articles/briefhistory1.pdf](https://bannerwitcoff.com/media/_docs/library/articles/briefhistory1.pdf) (accessed Feb. 15, 2019).

secrets, while others enacted statutes specifically for trade secrets.<sup>13</sup> To address this unevenness, many states began adopting the UTSA beginning in the 1980s.<sup>14</sup> While the UTSA does define a trade secret,<sup>15</sup> the definition itself still encompasses a vast range of information types. However, adoption of the UTSA did begin to create some uniformity among state trade secret laws.<sup>16</sup> This was important because trade secret laws largely intersect with interstate business, and streamlining the state laws may ultimately help with consistency in litigation.<sup>17</sup>

Beyond state laws, federal law now offers some protection for trade secrets. On May 11, 2016, President Obama signed into law the Defend Trade Secrets Act (“DTSA”).<sup>18</sup> The DTSA was passed ‘in light of the Congress’ understanding that misappropriation of trade secrets is an increasingly serious problem in need of national attention’.<sup>19</sup> The DTSA allows civil remedies in federal courts for the misappropriation of trade secrets; a civil action under the DTSA can be brought ‘if the trade secret is related to a product or service used in, or intended for use in, interstate or foreign commerce’.<sup>20</sup> The DTSA broadly defines the term ‘trade secret’ in the same way as the UTSA and does not preempt state trade secret law, so the two regimes now operate in parallel.<sup>21</sup> The DTSA is arguably one of the ‘most significant expansion[s] of federal law in intellectual property since the Lanham Act in 1946’.<sup>22</sup>

Critically for our purposes, neither the UTSA nor the DTSA contains any provision for the possibility that continued assertion of trade secret protection might, under some circumstances, have deleterious effects on the public. In what follows, we analyse voluntary efforts and possible changes in trade secret law to address this issue, weighing the advantages and disadvantages of implementing each.

### Patenting Genes: the Use of Patent Protections by Genetic Testing Companies

In the late 1980s and early 1990s, genetics researchers at a number of institutions were in competition to identify a region of the genome associated with a high risk of breast and ovarian cancer.<sup>23</sup> A team at the University of Utah led by Mark Skolnick founded Myriad Genetics in 1991 in the effort to obtain funding for their research to sequence the gene itself. Their research was initially funded by Eli Lilly and Co., a

<sup>13</sup> *Id.*

<sup>14</sup> *Id.* at 2.

<sup>15</sup> See generally UTSA, *supra* note 5.

<sup>16</sup> Linkek, *supra* note 12.

<sup>17</sup> *Id.* at 1.

<sup>18</sup> Peter J. Toren, *The Defend Trade Secrets Act*, 28 NO. 7 INTELL. PROP. & TECH. L.J. 3, 3 (2016).

<sup>19</sup> Christopher v. Ryan & Fred Qiu, *New Legislation Creates Federal Civil Cause of Action for Trade Secret Misappropriation*, BakerBotts (May 13, 2016), <http://www.bakerbotts.com/ideas/publications/2016/05/ip-update> (accessed Feb. 15, 2019).

<sup>20</sup> 18 U.S.C. § 1836 (2016).

<sup>21</sup> *Id.*; see also Ryan & Fred Qiu, *supra* note 19.

<sup>22</sup> Jacob Gershman, *Congress May Be About to Shake up Trade Secret Law: Is That a Good Thing?*, WALL STREET JOURNAL (Apr. 27, 2016, 4:24 PM), <http://blogs.wsj.com/law/2016/04/27/congress-may-be-about-to-shake-up-trade-secret-law-is-that-a-good-thing/> (accessed Feb. 15, 2019).

<sup>23</sup> Natalie Angier, *Scientists Identify a Mutant Gene Tied to Hereditary Breast Cancer*, THE NEW YORK TIMES (Sept. 15, 1994) [online], <http://www.nytimes.com/1994/09/15/us/scientists-identify-a-mutant-gene-tied-to-hereditary-breast-cancer.html> (accessed Feb. 15, 2019).

US-based pharmaceutical company. In addition to the \$10 million in private stock offering raised by Myriad, the National Institute of Health also contributed \$5 million to the research.<sup>24</sup>

Eventually, patents over the BRCA1 and BRCA2 genes ('BRCA1/2') were granted to Myriad Genetics and the University of Utah Foundation.<sup>25</sup> Myriad received these patents after 'discovering the precise location and sequence' of BRCA1/2. The value of this knowledge was that Myriad could now create useful medical tests for detecting mutations on these particular genes, ultimately allowing Myriad to evaluate the patient's potential elevated cancer risk.<sup>26</sup> Myriad began marketing its patented DNA test in 1996; the test was the first of its kind in the realm of high-risk breast and ovarian cancer.<sup>27</sup> With its patent rights, Myriad gained the exclusive right to 'isolate an individual's' BRCA1/2 gene. The rights also gave 'Myriad the exclusive right to synthetically create' exon-only strands of nucleotides known as cDNA.<sup>28</sup> Importantly, in this respect Myriad was *not* claiming patent rights to the pieces of DNA or cDNA that occurred within the human body, but the 'relevant DNA sequences in a form outside the human body, isolated from the remainder of the cellular components'.<sup>29</sup>

Nearly 4000 gene-related patents were issued in the three decades leading up to the litigation challenging Myriad's patents. Among patent holders of genetic information, Myriad was especially 'fervent in protecting its patents, ensuring that the company was the sole source of diagnostic tests for the BRCA mutations'.<sup>30</sup> Over the years, Myriad protected access to its test and the company acquired extensive data about BRCA1/2 variants and their associated clinical presentations. This strategy that Myriad adopted created controversy for several reasons—Myriad's tests were costly, the test sometimes failed to detect some mutations in patients because not every allele was initially tested, and Myriad did not share *any* of its database of the BRCA1/2 gene variants with the medical research community.<sup>31</sup>

The Association for Molecular Pathology, along with several other medical associations, physicians, and patients, sued Myriad Genetics and the United States Patent and Trademark Office (USPTO), challenging the patents covering the BRCA1/2 gene.<sup>32</sup> The petitioners sought a declaration that Myriad's patents were invalid under 35 U.S.C. § 101, arguing that the genes in the Myriad patents occurred naturally within the human body.<sup>33</sup> Ultimately, the Supreme Court found that naturally occurring DNA

<sup>24</sup> E. Richard Gold & Julia Carbone, *Myriad Genetics: In the Eye of the Policy Storm*, 12 GENET. MED. S39, S41 (2010).

<sup>25</sup> Association for Molecular Pathology v. Myriad Genetics, Inc., 569 U.S. 576, 583–84 (2013).

<sup>26</sup> *Id.*

<sup>27</sup> MYRIAD, COMPANY MILESTONES. <https://myriad.com/about-myriad/inside-myriad/company-milestones/> (last visited May 15, 2018).

<sup>28</sup> Myriad Genetics, 569 U.S. at 585.

<sup>29</sup> Robin Feldman, *Gene Patenting After the U.S. Supreme Court Decision—Does Myriad Matter?*, 26 STAN. L. & POL'Y REV. ONLINE 16, 18 (2014).

<sup>30</sup> Chris Palmer, *The Myriad Decision: A Move Toward Trade Secrets?*, THE NIH CATALYST, Mar.–Apr. 2014 1, 9 (hereinafter 'Palmer'). <https://irp.nih.gov/catalyst/v22i2/the-myriad-decision-a-move-toward-trade-secrets> (accessed Feb. 15, 2019).

<sup>31</sup> *Id.*

<sup>32</sup> See generally Association for Molecular Pathology v. Myriad Genetics, 653 F.3d 1329 (2011); see also Association for Molecular Pathology v. Myriad Genetics, Inc., 569 U.S. 576 (2013).

<sup>33</sup> Myriad Genetics, 569 U.S. at 589.

segments are a product of nature and ‘not patent eligible ... simply because they have been isolated from the surrounding genetic material’.<sup>34</sup> Patent rights over cDNA, the synthetically created strands of exons, were not invalidated but were soon to expire in any event.

The *Myriad* decision has been viewed as a ‘potential turning point for the biotech industry’s thinking about intellectual property protection’.<sup>35</sup> Since *Myriad* established that isolated human genes cannot be patented, companies seeking to protect their intellectual property have turned instead to trade secret law.<sup>36</sup> While the Supreme Court’s decision in *Myriad* does potentially mean more competition in tests available for breast and ovarian cancer, biotech innovation may also be impacted by this turn to trade secret law.<sup>37</sup> A major impetus for the litigation in *Myriad* was to ensure that the genetic information *Myriad* asserted a patent over remained in the public domain for all to utilize.<sup>38</sup> However, Mark Rohrbaugh, former director of the National Institutes of Health (‘NIH’) Office of Technology Transfer, stated that ‘[w]ithout genomic DNA being patentable, it may throw into question protection for important technology that’s critical to improving public health. The decision may even *backfire* on its proponents, leading to increased secrecy in research and reduced collaboration’.<sup>39</sup> Eleonore Pauwels, a public policy scholar at the Woodrow Wilson International Center for Scholars, also stated that the *Myriad* decision can make this trade secret route more ‘attractive’ to the biotech industry and could see biotech companies keeping secret ‘innovations regarding the peripheral aspects of gene discovery—analysis algorithms, sequencing technologies, and gene databases’.<sup>40</sup>

### Trade Secret Protection for Data About Genetic Variants

Since the *Myriad* decision, the exercise of trade secret protection over information about the significance of genetic variations has indeed continued. Although many of the laboratories with information about variants have agreed to share information, as we outline below, as of 2013, three laboratories continued to refuse to contribute data on human genetic variants: Prevention Genetics, Medical Neurogenetics, and *Myriad*.<sup>41</sup> These laboratories continue to maintain their trade secret protections as of this writing, according to the best recent information we have.<sup>42</sup>

Although three laboratories asserting trade secret law over their data may seem minimal, the withholding of this information by these laboratories does in fact impact the

<sup>34</sup> *Id.* at 596 (emphasis added).

<sup>35</sup> Palmer, *supra* note 30.

<sup>36</sup> *Id.*

<sup>37</sup> *Id.*

<sup>38</sup> See *Myriad Genetics*, 569 U.S. at 589 (explaining that if the exception of not allowing patents over laws of nature, natural phenomenon, and abstract ideas ‘there would be considerable danger that the grant of patents would “tie up” the use of such tools thereby “inhibit[ing] future innovation premised upon them. This would be at odds with the very point of patents, which exist to promote creation.”’).

<sup>39</sup> Palmer, *supra* note 30 (paraphrasing the American Intellectual Property Law Association) (emphasis added).

<sup>40</sup> *Id.*

<sup>41</sup> Cook-Deegan et al., *supra* note 4, at 586.

<sup>42</sup> See Robert Cook-Deegan & Amy L. McGuire, *Moving Beyond Bermuda: Sharing Data to Build a Medical Information Commons*, GENOME RES. APR. 3, 2017, doi:10.1101/GR.216911.116.



realm of genetic testing, as we describe below.<sup>43</sup> For genetic testing, information about the significance of variants is crucial. Many variants may be quite rare; if laboratories fail to make available what is known about their significance, testing may be less informative than it otherwise could be.

Myriad, specifically, is one of the *leading* molecular diagnostic companies<sup>44</sup> and has accumulated a large reservoir of genetic information.<sup>45</sup> Until the Court's *Myriad* decision, Myriad Genetics provided the *only* commercially available test for BRCA1/2 diagnostic testing in countries where their patents were filed.<sup>46</sup> Because Myriad did have a patent over this form of testing prior to the *Myriad* decision, they have tested over 1 million people and gained an immense amount of information in the process.<sup>47</sup> Myriad's patent exclusivity over the BRCA1/2 genes 'allowed the company to be the sole distributors of the genetic test, and thus it has been the largest collector of any clinically discovered [variant of unknown significance] VUS'.<sup>48</sup> In addition, Myriad offers any patient with a VUS free testing for their family members in order to gain more information and help determine the clinical significance of the variant.<sup>49</sup> This has only further expanded Myriad's database.<sup>50</sup> Ultimately, the assertion of trade secret protection over this highly valuable information creates a sort of 'monopoly' over BRCA1/2 testing.<sup>51</sup> Judge Shelby of the District of Utah has also recognized that Myriad's actions 'distorts rather than serves the patent system's goal of public disclosure in exchange for exclusive rights ... Myriad has chosen a commercial path that turns much of our patent system policy on its head'.<sup>52</sup> As the various efforts to share data develop over time, Myriad's advantage may erode. But for now, it remains important to consider alternative legal strategies in the trade secret realm.

Test results for the BRCA1/2 gene require complex interpretations. Some variants are of known clinical significance, either as benign or as deleterious.<sup>53</sup> In other cases, a patient can be told whether she/he has a variant that has been known to be deleterious in relatives.<sup>54</sup> However, some variants are 'of unknown significance' ('VUS') in that the 'effect of the variation is not yet known'.<sup>55</sup> These may be

<sup>43</sup> See generally Stephanie Nguyen & Sharon F. Terry, *Free the Data: The End of Genetic Data as Trade Secrets*, 17 GENET. TEST. & MOL. BIOMARKERS 579, 579 (2013) (discussing how 'providers of the BRCA1/2 tests will face unnecessary challenges due to the lack of transparency of data.') (hereinafter 'Nguyen & Terry').

<sup>44</sup> *Message from Gary King, Executive Vice President, International Operations, Myriad Genetics, Inc.*, MYRIAD, <http://myriadgenetics.eu/home/message-from-gk/> (accessed Feb. 15, 2019).

<sup>45</sup> See Anna B. Laakmann, *The New Genomic Semicommons*, 5 UC IRVINE L. REV. 1001, 1014 (2015) (hereinafter 'Laakmann').

<sup>46</sup> Nguyen & Terry, *supra* note 43, at 579.

<sup>47</sup> *Id.*

<sup>48</sup> *Id.*

<sup>49</sup> *Id.*

<sup>50</sup> *Id.*

<sup>51</sup> Angela M. Oliver, *Personalized Medicine in the Information Age: Myriad's De Facto Monopoly on Breast Cancer Research*, 68 SMU L. REV. 537, 540 (2015).

<sup>52</sup> *In re BRCA1-, BRCA2-Based Hereditary Cancer Test Patent Litigation*, 3 F. Supp. 3d 1213, 1276 (D. Utah Mar. 10, 2014); see also Oliver, *supra* note 51, at 541–42 (discussing further the implications of Myriad's action over genetic information).

<sup>53</sup> Nguyen & Terry, *supra* note 43, at 579.

<sup>54</sup> *Id.*

<sup>55</sup> *Id.*

variants that are rare or new mutations and have not yet been observed in clinical testing or they may be variants for which there is limited evidence about phenotypic significance. Such variants of unknown significance present difficult clinical and ethical questions. '[U]nless sufficient evidence is available that a given missense change is deleterious', individuals are left with this uninformative test result.<sup>56</sup> In order to lessen the frequency of VUS results, several kinds of evidence may be collected to help classify the variants. Some examples of this evidence are co-occurrences of the variant with a known deleterious mutation in one or more tested individuals, the nature and position of the amino acid substitution, and the congregation of the variant with disease in families.<sup>57</sup> And the primary way to collect this evidence requires having *access* to the relevant data about variants and their correlation with phenotypic presentation in patients and perhaps also their relatives.<sup>58</sup> Especially for novel variants, large data sets including diverse patient populations may be critical to improving knowledge of variant significance.

Myriad stopped sharing their data publicly in November 2004,<sup>59</sup> nine years *before* the *Myriad* decision. In 2005, Myriad officially adopted a 'deliberate policy of retaining data as a trade secret'.<sup>60</sup> Asserting trade secret law over this information has enabled Myriad to 'retain its dominant position in the BRCA1/2 clinical testing market despite the invalidation of some of its patent claims'.<sup>61</sup> Myriad has even negotiated contracts with several US health plans that have agreed to protect their trade secrets in order to help better secure their competitive advantage.<sup>62</sup>

This withholding of information by Myriad ultimately results in other providers facing challenges due to the lack of transparency about data.<sup>63</sup> These challenges may be reflected in the fact that only 3% of Myriad's analyses are returned with a diagnosis of VUS, compared to the 20% that most European laboratories receive.<sup>64</sup> Until Myriad publicly shares their proprietary data and interpretive algorithms, 'competing testing services with VUS results will either have to pay Myriad to analyze their samples using its proprietary technology or deliver clinically unhelpful information to patients'.<sup>65</sup>

### The Importance of Shared Information About Variants

Over 100 laboratories and services have agreed to contribute mutation data to comprehensive databases.<sup>66</sup> Some of these databases are ClinVar, The Human Gene Mutation Database in Cardiff, MutaDATABASE, the Human Variome Project database, the Leiden Open Variation Database, etc.<sup>67</sup> However, in order

<sup>56</sup> Goldgar et al., *Integrated Evaluation of DNA Sequence Variants of Unknown Clinical Significance: Application to BRCA1 and BRCA2*, 75 AM. J. HUM. GENET. 535, 535 (2004).

<sup>57</sup> *Id.*

<sup>58</sup> See Nguyen & Terry, *supra* note 43, at 579.

<sup>59</sup> Cook-Deegan et al., *supra* note 4, at 586.

<sup>60</sup> *Id.*

<sup>61</sup> Laakmann, *supra* note 45, at 1014.

<sup>62</sup> *Id.* at 1015.

<sup>63</sup> Nguyen & Terry, *supra* note 43, at 579.

<sup>64</sup> Laakmann, *supra* note 45, at 1015.

<sup>65</sup> *Id.*

<sup>66</sup> Cook-Deegan et al., *supra* note 4, at 586.

<sup>67</sup> *Id.*



for these databases to function for the purpose of tracking and interpreting VUS data, it is essential that laboratories share their data to these comprehensive databases.<sup>68</sup>

Recent litigation about the standard of care for disclosing the significance of variants illustrates the importance of timely access to this information. In 2016, Amy Williams filed suit against Quest Diagnostics, Athena Diagnostics, and ADI holdings for the wrongful death of her son Christian.<sup>69</sup> Williams alleges that the laboratory's negligence in failing to report the significance of a genetic variant caused Christian's death.<sup>70</sup> Christian frequently had seizures and his doctor suspected that the cause of the seizures was Dravet syndrome, a severe form of epilepsy.<sup>71</sup> To test for this, in 2007 Christian's doctors sent his blood sample to Athena for analysis of whether he had mutations in the *SCN1A* gene.<sup>72</sup> Defects within the *SCN1A* gene can create an imbalance of 'excitatory and inhibitory electrical impulses in the brain and caus[e] seizures'.<sup>73</sup> It has been well established that mutations within the *SCN1A* gene cause Dravet syndrome and that 80% of patients with Dravet syndrome will have an *SCN1A* mutation.<sup>74</sup> The laboratory report of test results indicated that Christian had an *SCN1A* mutation, but classified it as a 'variant of unknown significance'.<sup>75</sup> That is, the lab determined that there was not enough evidence at the time of testing to link his particular mutation to epilepsy or determine it as benign.<sup>76</sup> Relying on those test results, Christian's physicians treated him for an unspecified mitochondrial disorder; this was the wrong management for his Dravet syndrome and he passed away in January 2008.<sup>77</sup> Williams' lawsuit contends that the laboratory misclassified her son's *SCN1A* mutation as a VUS. She asserts that there was sufficient evidence at the time of the test that her son's mutation was disease-causing.<sup>78</sup> To support her case, she cites two articles, one published in June 2006 and the other in March 2007, which specifically mention Christian's exact mutation and

<sup>68</sup> *Id.*

<sup>69</sup> Williams v. Quest Diagnostics, Inc., et al. described in Jennifer K. Wagner, *Litigating the Accountability of Clinical Genomics Laboratories*, GENOMICS LAW REPORT (May 31, 2016), <http://www.genomicslawreport.com/index.php/2016/05/31/litigating-the-accountability-of-genomics-laboratories/> (accessed Feb. 15, 2019) (hereinafter 'Wagner'). The alleged negligence claims the laboratory failed to comply with the statutory requirements of the Clinical Laboratory Improvement Amendments (CLIA). The issue currently awaiting resolution by the court is whether the allegation is medical malpractice; if so, the lawsuit was brought after the statutory limitations period had ended. Laurel Coons, *Williams v. Athena Motion to Dismiss Hearing—SC Supreme Court May Be Asked to Decide Whether a Diagnostic Laboratory Qualifies as a Healthcare Provider*, GENOMICS LAW REPORT (Jan. 26, 2017) [online], <https://www.genomicslawreport.com/index.php/2017/01/26/williams-v-athena-motion-to-dismiss-hearing-sc-supreme-court-may-be-asked-to-decide-whether-a-diagnostic-laboratory-qualifies-as-a-healthcare-provider/> (accessed Feb. 15, 2019).

<sup>70</sup> Wagner, *supra* note 69.

<sup>71</sup> *Id.*

<sup>72</sup> Turna Ray, *Mother's Negligence Suit Against Quest's Athena Could Broadly Impact Genetic Testing Labs*, GENOMEWEB (Mar. 14, 2016), <https://www.genomeweb.com/molecular-diagnostics/mothers-negligence-suit-against-quests-athena-could-broadly-impact-genetic> (accessed Feb. 15, 2019) (hereinafter 'Ray').

<sup>73</sup> *Id.*

<sup>74</sup> *Id.*

<sup>75</sup> Wagner, *supra* note 69.

<sup>76</sup> Ray, *supra* note 72.

<sup>77</sup> Wagner, *supra* note 69.

<sup>78</sup> Ray, *supra* note 72.

how it had 'been studied and seen in another patient who had epileptic encephalopathy [Dravet Syndrome]'.<sup>79</sup>

Although the *Williams* case involves many issues, including whether the claim against the laboratory sounds in medical malpractice and is thus subject to the applicable statute of limitations, it presents the fundamental question of the importance and timing of shared genetic information. Williams alleges that there was in fact enough published information in 2007 to link Christian's mutation to Dravet syndrome by the laboratory's own standards. On the other hand, it is also possible that the laboratory actually did not have a sufficient basis to determine the significance of Christian's variant of the *SCN1A* gene and that widespread sharing of information about the variant could have aided the interpretation of Christian's test.<sup>80</sup> *Williams* illustrates the potential adverse effects on patients of not having a genetic database that includes information from all laboratories and that all laboratories may access. In *Williams*, the test results came back as a VUS because, according to the laboratory, it did not have enough information at the time to classify the variant.<sup>81</sup> While the *Myriad* case was not finally resolved until 2013, trade secret law was already being asserted over genetic data by 2005.<sup>82</sup> Withholding genetic information potentially creates a gap in the knowledge among laboratories, resulting in different results from different laboratories.<sup>83</sup> As *Williams* illustrates, these gaps may have lethal results.

Trade secret protection for information about genetic variants thus may be problematic both for medical care and for the advancement of science. To be sure, continuing with the current state of trade secret protection is an available strategy. However, because of the potential importance of the information to patients, we believe alternative strategies should be explored.

### III. STRATEGIES FOR ADDRESSING TRADE SECRETS IN GENETIC INFORMATION

In this section, we present several legal strategies that could be pursued in response to the assertion of trade secret protection over information about genetic variants. These strategies are analysed prospectively to apply to newly acquired information to mitigate concerns that they would be takings of property subject to constitutional claims for just compensation. Appropriation of the intellectual property for public use is another potential strategy, but we set it aside here as impractical because of the likely expense of the compensation that could be required. We begin with voluntary efforts within the scientific community. We then consider the potential for regulation by administrative agencies and analogies from other areas of intellectual property law, in particular, march-in

<sup>79</sup> *Id.*

<sup>80</sup> Note that little of substance has occurred within litigation of *Williams*. Several motions to dismiss have been filed; however, the case is now back at the state court level. *Williams* has a somewhat complex procedural history as well. The case was initially filed in the Court of Common Pleas for Richland County, South Carolina, then was removed under diversity jurisdiction on Mar. 28, 2016 to the United States District Court for the District of South Carolina. However, the District Court Judge ordered that the question at issue within the case be certified to the South Carolina Supreme Court. Order of Certification, *Williams et al. v. Quest Diagnostics Inc. et al.*, No. 3:26-cv-00972-MBS (D.S.C. Mar. 31, 2017), ECF 40.

<sup>81</sup> Wagner, *supra* note 69.

<sup>82</sup> Cook-Deegan et al., *supra* note 4, at 586.

<sup>83</sup> See Laakmann, *supra* note 45, at 1015.

rights under the Bayh-Dole Act and compulsory licensing under patent law. In each case, we consider the advantages and disadvantages of the strategy and any changes in law that would be required.

### Voluntary Efforts: Responses From the Scientific and Patient Community

Myriad's assertion of trade secret protection over BRCA1/2 variants has not gone unnoticed. Projects have emerged to further the shared accumulation of data. These projects include The Sharing Clinical Reports Project, Free the Data, and a variety of registries to which data are transferred from both clinical records and patients themselves. The FDA has also issued guidance encouraging the formation of these arrangements for sharing information about genetic variants as a way of improving clinical validity of genetic tests.<sup>84</sup> A common challenge to these projects is the privacy rule of the Health Insurance Portability and Accountability Act (HIPAA); for purposes of this article, we set aside these challenges.<sup>85</sup>

The Sharing Clinical Reports Project ('SCRIP') is a 'volunteer, grass-roots effort ... to encourage open sharing of variant information. SCRIP specifically aims to collect information on BRCA1/2 variants and make this information publicly available in the NCBI's [National Center for Biotechnology Information] ClinVar'.<sup>86</sup> ClinVar is a 'freely accessible, public archive of reports of the relationships among human variations and phenotypes, with supporting evidence'.<sup>87</sup> Additionally, ClinVar collaborates with interested organizations to help meet the needs of the 'medical genetics community as efficiently and effectively as possible'.<sup>88</sup> Specifically, SCRIP requests information about variants in the BRCA1/2 genes because of the 'clinical importance of BRCA1 and BRCA2, the restrictions on who can do clinical testing in the United States, and the loss of open access to variant database maintained by Myriad Genetics in 2006 ...'.<sup>89</sup> SCRIP's project encourages physicians to submit their patients' de-identified reports to be uploaded to the ClinVar database.<sup>90</sup> SCRIP also requires protected health information about patients to be de-identified to HIPAA standards.

Another project that has emerged post-Myriad is Free the Data. This project allows individuals to share their information themselves. Free the Data avoids violating HIPAA by 'enabling tested individuals to share their variant in ClinVar and to set their own sharing, privacy, and data access preferences. [Patients] can also share

<sup>84</sup> U.S. FOOD & DRUG ASS'N, GUIDANCE FOR STAKEHOLDERS AND FOOD AND DRUG ADMINISTRATION STAFF: USE OF PUBLIC HUMAN GENETIC VARIANT DATABASES TO SUPPORT CLINICAL VALIDITY FOR GENETIC AND GENOMIC-BASED IN VITRO DIAGNOSTICS (2018) (hereinafter 'FDA GUIDANCE').

<sup>85</sup> HIPAA protections extend to identifiable patient information for 50 years after the death of the patient. 45 C.F.R. § 160.103(2)(iv) (2017). A threshold HIPAA problem is whether genetic information can ever be effectively de-identified. If the information cannot be deidentified, or loses utility when deidentified, HIPAA authorization would be required unless the information is collected under a waiver for research purposes. 45 C.F.R. § 164.512(i) (2017). Authorization may be difficult to obtain if people cannot be located or if they have died and their personal representatives cannot be located. Also, if certain demographic subgroups are less willing to share genetic data, information about genetic variants within these subgroups may be far more limited than information about people in other population groups.

<sup>86</sup> SHARING CLINICAL REPORTS PROJECT (SCRIP), <https://www.clinicalgenome.org/data-sharing/sharing-clinical-reports-project-scrp/> (last visited May 15, 2018).

<sup>87</sup> CLINVAR, WHAT IS CLINVAR, <https://www.ncbi.nlm.nih.gov/clinvar/intro/> (last visited May 15, 2018).

<sup>88</sup> *Id.*

<sup>89</sup> See *supra* text accompanying note 86 (emphasis added).

<sup>90</sup> Nguyen & Terry, *supra* note 43, at 579.

phenotypic information ... providing researchers with information to help ... [understand] ... these variants'.<sup>91</sup> This project gathers information from patients, not from HIPAA-covered entities, and so avoids the need for HIPAA authorization.

These voluntary efforts by ClinVar, Free the Data, and others are useful steps for accumulating genetic information to ascertain the significance of variants. But their great disadvantage is that they are fully voluntary. If trade secret law continues to be utilized by testing laboratories such as Myriad, the information that is available will remain importantly incomplete at best. Scholars have even suggested that *even if* all competitors cooperated in contributing data to a public database, this still would not be a viable alternative due to the amount of genetic information collected by Myriad before their patent was invalidated.<sup>92</sup> Moreover, Dr. Robert Nussbaum, a founder of SCRP, estimated that SCRP had collected about 1000 mutations as of April, 2013—this only equates to 1.5% of the genetic information collected by Myriad.<sup>93</sup> Although scientists are working to chip away at Myriad's trade secret advantage, progress is at best slow. Moreover, the public may be unwilling to share sufficient information with voluntary databases such as ClinVar. Without further steps, voluntary efforts alone are unlikely to address the trade secret barrier successfully, at least in the foreseeable future.

### Regulation: the FDA or the CMS

Another possible avenue for addressing the trade secret barrier for genetic information could be the regulatory authority of either the FDA or CMS. Neither agency has yet asserted its authority to the extent of requiring companies to share the information about genetic variants that is our concern here, but either one could take at least some further steps under current law.

The FDA has authority to regulate medical devices under the Medical Device Amendments Act of 1976<sup>94</sup> as subsequently amended. The Amendments define 'medical device' broadly: 'an instrument, apparatus, implement, machine, contrivance, implant, in vitro reagent, or other similar or related article, including a component part, or accessory which is' in the official National Formulary or in the United States Pharmacopeia or any supplement to them; intended for use in diagnosing diseases or other conditions, or in the cure, mitigation, treatment of diseases, within man or other animals; or intended to have an effect on the structure or any function of the body of man or other animals, and 'does not achieve any of its primary intended purposes through chemical action within or on the body of man or other animals and which is not dependent upon being metabolized for the achievement of any of its primary intended purposes'.<sup>95</sup> Genetic testing covers a wide array of techniques and is used to 'detect gene variants associated with a specific disease or condition' and can also be performed to 'determine the genetic cause of a disease, confirm a suspected diagnosis, predict future illness, [and] detect when an individual might pass a genetic mutation to his or

<sup>91</sup> *Id.*

<sup>92</sup> Brenda M. Simon & Ted Sichelman, *Data-Generating Patents*, 111 NW. LAW REV. 377, 395 (2017).

<sup>93</sup> Gina Kolata, *DNA Project Aims to Make Public a Company's Data on Cancer Genes*, THE NEW YORK TIMES (Apr. 12, 2013), <http://www.nytimes.com/2013/04/13/health/dna-project-aims-to-make-companys-data-public.html> (accessed Feb. 15, 2019).

<sup>94</sup> Medical Device Amendments Act of 1976, 21 U.S.C. ch. 9, Pub. L. No. 94–295, 90 Stat. 539 (1976).

<sup>95</sup> *Id.*

her children...<sup>96</sup> but does not act chemically or metabolically within the body. Therefore, under this broad definition, genetic tests could be considered medical devices<sup>97</sup> and thus genetic testing of BRCA1/2 by Myriad *could* fall under the FDA authority to regulate devices.

Determining that a genetic test is a medical device, however, is insufficient to establish the authority of the FDA to require laboratories to make public the information they have about the significance of genetic variants. At least two initial problems exist about the FDA asserting such authority.

The first problem involves the Amendments' schema for classifying devices based on their risk and intended purpose.<sup>98</sup> Under the Amendments, devices fall into three different classifications; only Class III devices are subject to premarket approval by the FDA.<sup>99</sup> Class III devices are those for which there is insufficient evidence to believe general or special controls provide reasonable assurance of their safety and effectiveness, or those which are for a use in supporting or sustaining human life or preventing impairment of human health or which present a potential unreasonable risk of illness or injury.<sup>100</sup> The FDA has explained its decision not to impose restrictions on marketing most genetic tests thus: the 'degree of FDA oversight of a genetic test is based on its intended use and the risks posed by an inaccurate test result'.<sup>101</sup> Asserting further regulatory authority over genetic tests would require their classification as a device with more significant risks or establishment of a separate regulatory category by statute.

The second problem with using the regulatory authority of the FDA to address trade secrets involves the relationship between the laboratory's trade secret information and the safety or efficacy of the test as a device. Arguably, while the information about variants is clearly very useful to patients in general, whether it is protected as a trade secret bears no direct relationship to the test's safety. Under the Amendments, the safety and efficacy of a device are to be determined with respect to the persons for whose use the device is intended, with respect to the conditions of use prescribed, and weighing any probable benefit to health against any probable risk of injury or illness from the device use.<sup>102</sup> The most that could be said about the impact of trade secret protection is that access to more information could make tests more informative, not that the tests in their current form are unsafe as used for particular patients.

The FDA released draft guidance on next generation sequencing activities on July 8, 2016, and guidance on April 13, 2018.<sup>103</sup> However, a guidance document does not establish any 'legally enforceable responsibilities'.<sup>104</sup> This guidance notes the importance of creating a 'genetic variant data aggregation' that is publicly accessible and 'useful to

<sup>96</sup> NATIONAL HUMAN GENOME RESEARCH INSTITUTE, *Regulation of Genetic Tests*, <https://www.genome.gov/10002335/regulation-of-genetic-tests/> (accessed Feb. 15, 2019).

<sup>97</sup> *Id.*

<sup>98</sup> 21 U.S.C. § 360c(a) (2018). In order for premarket approval to be required, genetic tests would need to be classified as class III devices, which would require that they be for a use in supporting or sustaining human life or for a use which is of substantial importance in preventing impairment of human health, or that they present a potential unreasonable risk of illness or injury. 21 U.S.C. § 360c(a)(1)(C)(ii) (2018).

<sup>99</sup> 21 U.S.C. § 360c(a)(1)(C) (2018).

<sup>100</sup> 21 U.S.C. § 360c(a)(1)(C)(i), (ii) (2018).

<sup>101</sup> *Id.*

<sup>102</sup> 21 U.S.C. § 360c(a)(2) (2018).

<sup>103</sup> See generally, FDA GUIDANCE, *supra* note 84 at 16110–2.

<sup>104</sup> *Id.* at 4.

support clinical validity of genetic and genomic-based tests'.<sup>105</sup> It specifically recommends that:

genetic variant database administrators make publicly available sufficient information regarding data sources and standard operating procedures (SOPs) for evaluation and interpretation of evidence to allow FDA and the public to understand the criteria and processes used to collect and evaluate evidence about variants and enable patients and healthcare providers to make fully informed medical decisions.<sup>106</sup>

The FDA intends to implement a recognition process for publicly accessible genetic variant databases. In order for the FDA to review a database for recognition, entities/individuals would have to undergo three steps: (1) voluntary submission of detailed information about the database; (2) FDA review of genetic variant database policies and procedures for obtaining and maintaining data and making variant assertions; and (3) maintenance of FDA recognition of a database.<sup>107</sup> This recognition process remains voluntary and is unlikely to change the behavior of companies such as Myriad asserting trade secret protection over their data. It is another voluntary step along the lines of those described in the preceding section: likely to be useful, but insufficient to fully address the trade secret barrier.

CMS also has some regulatory authority over genetic testing through the Clinical Laboratory Improvement Amendments (CLIA).<sup>108</sup> CLIA established a mandatory certification process for laboratories performing clinical testing that focuses on clinical testing quality.<sup>109</sup> Under CLIA, CMS reviews the analytical validity of genetic tests—that is, whether the tests accurately reveal the presence of a particular genetic variant. Beyond this analytic validity, CMS does not evaluate whether the tests accurately predict the presence, absence, or risk of disease or have utility with respect to the clinical management of patients.<sup>110</sup> CMS has also issued a rule under HIPAA that gives patients the right to request the results of their clinical laboratory tests.<sup>111</sup> These results, however, will not include the information about genetic variants that were used by the laboratory in creating the report for the patient.

Due to these CLIA limits, members of Congress and expert panels pushed the FDA to fill this 'regulatory gap'. In response, the FDA does now regulate a small number of genetic tests sold to laboratories as 'kits'.<sup>112</sup> These are commercial products sold to multiple labs that consist of groups of reagents used in genetic tests. Regulation of these kits is directed to ensuring the safety and quality of the reagents, not to the issues raised by the trade secret barrier. Other genetic tests such as those developed by individual laboratories are not regulated, as described above.<sup>113</sup>

<sup>105</sup> *Id.* at 5.

<sup>106</sup> *Id.* at 9.

<sup>107</sup> *Id.* at 13.

<sup>108</sup> 42 U.S.C. § 263a (2018).

<sup>109</sup> 42 U.S.C. § 263a(d) (2018).

<sup>110</sup> *Id.*

<sup>111</sup> 42 C.F.R. § 493.1291(l) (2018).

<sup>112</sup> *Id.*

<sup>113</sup> *Id.*



Even if the FDA were to assert regulatory authority over laboratory-developed genetic tests under their regulatory authority over medical devices, including Myriad's developed test, premarket approval regulations and postmarketing regulatory controls would raise further problems. To assess the clinical utility of a genetic test premarket would have little significance because the safety/effectiveness of the test can only be analysed after the test has been widely used—'presumably after the FDA clears or approves it'.<sup>114</sup> Reliance on premarket review raises an 'inherent contradiction' because the FDA can only get the evidence they need to establish the effectiveness and safety of the test after the test is allowed on the market as more and more knowledge about the significance of variants is developed. In order to assess the genomic tests, what is needed is 'ongoing, decades-long program of continuous learning to clarify both benefits and risks that are not yet known'.<sup>115</sup> To assess premarket would require this ongoing information stream, but that information is only known postmarket. In addition, postmarket surveillance of these genetic tests is limited to 36 months under the Amendments,<sup>116</sup> so this process as well is too limited to fill the gap.

FDA and HHS regulatory authority are thus insufficient to address trade secret protections. We now analyse two additional legal strategies to achieve this goal, march-in rights and compulsory licensing, which may have more potential.

### March-in Rights as Under the Bayh-Dole Act

If they were to be established for trade secrets, march-in rights could permit the federal government to retain certain rights in information that is created through federal funding. March-in rights are a condition of intellectual property created with federal funding, thus not a change in trade secret law itself. In this connection, we note that some of the research leading to the Myriad patents was funded by the federal government—and that it was this patent protection that gave Myriad the great advantage it has in knowledge of genetic variants and their significance.

March-in rights for patents were created under the Bayh-Dole Act in 1980.<sup>117</sup> Bayh-Dole was enacted to address concerns about the failure to commercialize technology developed with public funds.<sup>118</sup> To stimulate bringing discoveries to market, Bayh-Dole allows title (ownership) to be awarded to inventions created with federal government support if the contractor consists of a small business, a university, or other non-profit institution.<sup>119</sup> In granting these ownership rights, however, the federal government under Bayh-Dole also retains certain rights to protect the public interest in inventions produced with federal financial assistance.<sup>120</sup> These rights include a 'march-in right' for federal agencies to require a 'contractor or successors in title to the patent to grant a "nonexclusive, partially exclusive, or exclusive license" to a "responsible

<sup>114</sup> Barbara J. Evans, Wylie Burke, and Gail P. Jarvik, *The FDA and Genomic Tests—Getting Regulation Right*, 372 *NEW ENG. J. MED.* 2258, 2259 (June 4, 2015).

<sup>115</sup> *Id.* at 2260.

<sup>116</sup> 21 U.S.C. § 3601 (2018).

<sup>117</sup> JOHN R. THOMAS, CONG. RESEARCH SERV., R44597, *MARCH-IN RIGHTS UNDER THE BAYH-DOLE ACT 1* (2016).

<sup>118</sup> *Id.*

<sup>119</sup> *Id.*

<sup>120</sup> *Id.*

applicant or applicants”<sup>121</sup>. In the event that the patent owner refuses to grant this license, the government has the right to grant the license themselves.<sup>122</sup>

Bayh-Dole march-in rights can be exercised in four specific instances:

- (1) Action is necessary because the contractor or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use;
- (2) Action is necessary to alleviate health or safety needs which are not reasonably satisfied by the contractor, assignee, or their licensees;
- (3) Action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the contractor, assignee, or licensees; or
- (4) Action is necessary because the agreement required by section 204 (generally requiring that patented products be manufactured substantially in the United States unless domestic manufacture is not commercially feasible) has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of its agreement obtained pursuant to section 204.<sup>123</sup>

In its current form, Bayh-Dole does not create march-in rights to trade secrets created through federal funding, but such rights could be created prospectively, in two ways. The first would be as an extension of any patent rights created through federal funding. Bayh-Dole march-in rights apply to the patent itself, not to information generated as a result of patent exclusivity such as the data about genetic variants now possessed by Myriad as a result of its years of testing. The Bayh-Dole Act could, however, be amended to include march-in rights with respect to such patent-acquired information in addition to the right to march-in on the patent itself.

A second possibility would be to establish rights more *generally* over the fruits of federally funded research. Historically, federal policy required researchers to share data and samples with other scientists after publication. Concerns about the use of data in federal policy-making resulted in the Data Access in 1999, which required the Office of Management and Budget (‘OMB’) to revise its standards for the administration of federal grants to ensure that all data produced under federal grants be subject to Freedom of Information Act (‘FOIA’) requests.<sup>124</sup> At present, many federal agencies have policies requiring data sharing for funded research. For example, scientists receiving grants from the National Institutes of Health (‘NIH’), the agency which funded Myriad, are required to comply with the policy regarding human data sharing.<sup>125</sup> More specifically, the NIH has established a Genomic Data Sharing Policy that applies to

<sup>121</sup> *Id.*

<sup>122</sup> *Id.*

<sup>123</sup> 35 U.S.C. § 203(a) (2018).

<sup>124</sup> Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations, OMB Circular A-110 (1999); see also ERIC A. FISCHER, CONG. RESEARCH SERV., R42983, PUBLIC ACCESS TO DATA FROM FEDERALLY FUNDED RESEARCH: PROVISIONS IN OMB CIRCULAR A-110 (2013).

<sup>125</sup> NATIONAL INSTITUTES OF HEALTH, HUMAN DATA SHARING, <https://oir.nih.gov/sourcebook/intramural-program-oversight/intramural-data-sharing/human-data-sharing> (last visited Aug. 23, 2018).

all NIH-funded research that generates large-scale genomic data.<sup>126</sup> Investigators applying for funding are required to develop genomic data sharing plans for making de-identified data to NIH-designated data repositories; investigators are expected to obtain broad consent for participants to allow use of data (including de-identified data) for secondary research, unless an exception is justified.<sup>127</sup> These policies apply only to data generated by the federally funded research, however.<sup>128</sup> Additional information created outside the scope of research that is federally supported, but stemming from the funded work, is not covered and could be trade-secret protected. A general march-in right could be created for such fruits, although as we discuss below, a difficulty would be identifying the scope of data thus covered. A less general possibility would be to encourage federal agencies to include more extensive data-sharing agreements in research awards.

As with patent march-in rights, trade secret march-in rights could be limited to the four circumstances in which action is judged necessary for the public good in technology commercialization. For example, a company may utilize government funding for scientific research. This company then may discover information that could be useful to other researchers, or in medical treatment—such as the significance of a rare genetic variant—but assert trade secret law over this information. Under this proposed theory of march-in rights for trade secrets, the government would be able to utilize their march-in rights on several grounds. By analogy to § 203(a)(1), action would be necessary because the contractor or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use.<sup>129</sup> Although using the trade secrets in performing its own genetic tests, the company asserting trade secret over information about variants would be compromising the extent to which genetic testing can be informative more generally and thus arguably not taking effective steps to achieve practical application of their invention/discovery. March-in rights arguably could also be utilized under 35 USC § 203(a)(2) as ‘necessary to alleviate health or safety needs which are not reasonably satisfied by the contractor, assignee, or their licensees’.<sup>130</sup>

March-in rights, however, yet to be successfully exercised for patents. During the 37-year history of Bayh-Dole, only six march-in petitions have been filed, specifically requesting the NIH to exercise the right with respect to particular pharmaceuticals.<sup>131</sup> Each and every one of these petitions has been denied.<sup>132</sup> All six of these petitions dealt with the same two sections of 35 U.S.C. § 203—(a)(1) and (a)(2). Four alleged that the price of the drug in question was too high.<sup>133</sup> The NIH denied each of these petitions because they did not believe that high pricing

<sup>126</sup> See *National Institutes of Health Genomic Data Sharing Policy*, NIH (Aug. 27, 2014), <https://grants.nih.gov/grants/guide/notice-files/NOT-OD-14-124.html> (accessed Feb. 15, 2019).

<sup>127</sup> Final NIH Genomic Data Sharing Policy, 79 Fed. Reg. 51,345 (Aug. 28, 2014).

<sup>128</sup> See *Id.*

<sup>129</sup> 35 U.S.C.A. § 203(a) (2018).

<sup>130</sup> *Id.*

<sup>131</sup> THOMAS, *supra* note 117.

<sup>132</sup> *Id.*

<sup>133</sup> See *Id.* at 9. The four march-in requests concerning the high price of the drug were Norvir/Ritonavir (in both 2004 and 2012), Xalatin/latanoprost, and Xtandi/enzalutamide. *Id.*

of drugs was sufficient to provoke a march-in.<sup>134</sup> Trade secret protection, however, raises the additional problem beyond costs that critical information is simply unavailable.

The other two petitions, although denied, better indicate the potential utility of the threat of march-in rights for trade secrets created with the support of federal funding. One petition arose after a patent dispute arose over a stem cell separation device. Johns Hopkins University had developed a separation device with federal funding, which was patented, licensed to Becton-Dickenson, and sublicensed to Baxter Healthcare Corporation.<sup>135</sup> CellPro had developed a similar device that was found to infringe Hopkins' patents. CellPro later filed a petition with the Secretary of Health and Human Services requesting march-in rights to be exercised in connection with the Hopkins patents.<sup>136</sup> CellPro argued that the march-in rights were necessary to alleviate health or safety needs that had arisen because the court in the patent litigation had enjoined the sale of the CellPro device.<sup>137</sup> In addition, CellPro also asserted that the march-in was appropriate because Hopkins and Baxter failed to take the reasonable steps to commercialize the technology, and CellPro was the only company with a commercially available, FDA-approved device.<sup>138</sup> However, the NIH denied this request because Hopkins and its licensees were making reasonable efforts to commercialize their own product.<sup>139</sup>

The second march-in petition requested for non-price reasons was Fabrazyme.<sup>140</sup> This petition asked the NIH to grant an open license on certain patents related to the treatment of Fabry disease.<sup>141</sup> Petitioners claimed that Genzyme Corporation was encountering difficulties in manufacturing sufficient quantities of the drug.<sup>142</sup> However, the NIH denied this petition because Genzyme Corporation was working diligently to resolve their manufacturing difficulties and other enterprises were likely to obtain FDA marketing approval on agalsidase beta (equivalent to Fabrazyme) products before those problems were addressed.<sup>143</sup>

<sup>134</sup> *Id.* at 9; see also, National Institute of Health, Determination in Case of NORVIR Manufactured by Abbott Laboratories, Inc. (July 29, 2004), <https://www.ott.nih.gov/sites/default/files/documents/policy/March-in-xalatan.pdf> (accessed Feb. 15, 2019); National Institute of Health, Determination in Case of NORVIR Manufactured by Abbvie (Nov. 1, 2013), <https://www.ott.nih.gov/sites/default/files/documents/policy/March-In-Norvir2013.pdf> (accessed Feb. 15, 2019); National Institute of Health, Determination in Case of Xalatan Manufactured by Pfizer, Inc. (Sept. 17, 2004), <https://www.ott.nih.gov/sites/default/files/documents/policy/March-in-xalatan.pdf> (accessed Feb. 15, 2019); National Institute of Health, Final Response in Case of Xtandi (June 20, 2016), <http://keionline.org/sites/default/files/Final-Response-Goldman-6.20.2016.pdf> (accessed Feb. 15, 2019).

<sup>135</sup> *The Johns Hopkins University v. CellPro*, 978 F.Supp. 184 (D.Del. 1997); National Institute of Health, Determination in Case of CELLPRO, INC. 1 (Aug. 1, 1997), [http://web.archive.org/web/20070102183356/http://www.nih.gov/icd/od/foia/cellpro/pdfs/foia\\_cellpro39.pdf](http://web.archive.org/web/20070102183356/http://www.nih.gov/icd/od/foia/cellpro/pdfs/foia_cellpro39.pdf) (accessed Feb. 15, 2019).

<sup>136</sup> National Institute of Health, Determination in Case of CELLPRO, INC. 1 (Aug. 1, 1997), [http://web.archive.org/web/20070102183356/http://www.nih.gov/icd/od/foia/cellpro/pdfs/foia\\_cellpro39.pdf](http://web.archive.org/web/20070102183356/http://www.nih.gov/icd/od/foia/cellpro/pdfs/foia_cellpro39.pdf) (accessed Feb. 15, 2019).

<sup>137</sup> *Id.*

<sup>138</sup> *Id.*

<sup>139</sup> THOMAS, *supra* note 117, at 9.

<sup>140</sup> National Institute of Health, Final Determination in Case of Fabrazyme Manufactured by Genzyme Corporation (Dec. 1, 2010), <https://www.ott.nih.gov/sites/default/files/documents/policy/March-In-Fabrazyme.pdf> (accessed Feb. 15, 2019).

<sup>141</sup> THOMAS, *supra* note 117, at 9.

<sup>142</sup> *Id.*

<sup>143</sup> *Id.*

Arguably, although these petitions were denied, the presence of the march-in right gave the government a bargaining advantage. The possibility of a march-in petition may encourage moderation of pricing, efforts to commercialize a product, or efforts to manufacture the product in needed quantities. Extension of march-in rights to trade secrets could provide similar bargaining advantages to the government when trade secrets are developed with government funding and are asserted to the detriment of the public. With respect to the trade secret barrier we are addressing, the presence of march-in rights could create incentives to share information voluntarily that do not exist today.

Further criticisms of patent march-in rights might explain the reluctance to grant them, however, and these criticisms might extend to trade secrets. Some believe that 'diluting the patent incentive will discourage private investments and ultimately work against the aims of the Bayh-Dole Act'.<sup>144</sup> Patent law is intended to promote the labors that lead to innovation. Similar considerations support trade secret protection; with these march-in rights,<sup>145</sup> commercialization incentives might be reduced.<sup>146</sup> Allowing march-in rights on trade secrets could diminish the economic benefit of commercial development if companies are required to share information they have made significant investments in developing. Federal funding typically does not pay the full costs of basic or translational research, as it did not with Myriad. Moreover, attaching additional conditions to federally funded research might dampen researchers' interests in that funding source.

On the other hand, differences between how patents are protected and how trade secrets are protected may favor march-in rights for the latter. Protection of intellectual property in patent law is intended to 'distribute the fruits of those labors to the public'.<sup>147</sup> Despite its protections, patent law makes information available in a number of ways that trade secret law does not. Information about the invention must be shared before inventors may gain the economic benefit of patent protection. Even though patent protection applies, other investigators are aware of and may build on the discoveries that led to the patent. They also are on notice of the patent and may be able to avoid redundant efforts as a result. Finally, patents are time limited.

By contrast, under trade secret law, no information is provided to the public. Indeed, the public may not even be able to identify *what* information should be shared if the public does not know the precise nature of the trade secret being protected. And trade secrets can be protected indefinitely. If a contractor or assignee has asserted trade secret protection over something as essential as genetic data, release of this information is arguably in the public interest. There is thus an even more compelling case for march-in rights for trade secrets than for patents when they have been generated through the use of federal funds.

Nonetheless, additional difficulties may emerge in making trade secrets subject to march-in rights. Once the secrets are revealed, the benefit of the intellectual property is lost; unlike with patent rights, the holder of the property has nothing left to protect. Maintaining secrecy is the crux of a trade secret. Moreover, identifying the trade secrets to be subject to march-in may prove challenging. It may be difficult to trace particular

<sup>144</sup> THOMAS, *supra* note 117, at 13.

<sup>145</sup> *Id.*

<sup>146</sup> Michael Risch, *Why Do We Have Trade Secrets?*, 11 INTELL. PROP. L. REV. 1, 6 (2007).

<sup>147</sup> *Id.*

trade secrets to a tie with federal funding, or to determine how strong the nexus must be between the federal funding and the information for march-in to apply. If march-in rights are to apply prospectively, as might be necessary to avoid a constitutional taking challenge, it will also be necessary to separate new data that utilized federal funding from the old data that used federal funding, a delineation that may be difficult to implement.

### Compulsory Licensing

Compulsory licensing is the ‘grant of permission for an enterprise seeking to use another’s intellectual property to do so without the consent of its proprietor’.<sup>148</sup> The UTSA does not provide compulsory licensing. Patent law presents several avenues for the development of a compulsory licensing option, however. In this section, we explain these possibilities and how they have the potential for extension to trade secrets.

Under US law, the federal government has the power of eminent domain, which may be exercised for the public good. This power extends not only to physical but also to intellectual property. Exercise of this power requires compensation and the US code provides owners of intellectual property with rights to seek compensation in the US Court of Claims:

Whenever an invention described in and covered by a patent of the United States is used or manufactured by or for the United States without license of the owner thereof or lawful right to use or manufacture the same, the owner’s remedy shall be by action against the United States in the United States Claims Court for the recovery of his reasonable and entire compensation for such use and manufacture.<sup>149</sup>

The government cannot be enjoined from so using a patented invention; the owner’s remedy lies in compensation rather than prohibition of the infringement.<sup>150</sup> Thus the federal government could use patented inventions for the public good, but would be required to pay compensation. A similar use of government power could be created for trade secrets, under either state or federal law. This approach, however, could be prohibitively expensive because of the requirement to pay compensation.

Another possibility is that newly created patents could be issued subject to compulsory licensing authority from the beginning, as they have been in some other countries. Under the Patent Act, the United States has yet to implement such ‘general compulsory licensing’.<sup>151</sup> However, the United States is a signatory to the World Trade Organization’s (‘WTO’) Trade-Related Aspects of Intellectual Property Rights (‘TRIPS’) Agreement and compulsory licensing is ‘one of the flexibilities on patent protection’<sup>152</sup> included in TRIPS.<sup>153</sup> To illustrate, the United States used this TRIPS

<sup>148</sup> JOHN R. THOMAS, CONG. RESEARCH SERV., R43266, COMPULSORY LICENSING OF PATENTED INVENTIONS 1 (2014).

<sup>149</sup> 28 U.S.C. § 1498a (2018).

<sup>150</sup> 28 U.S.C. § 1498 (2018); see also THOMAS, *supra* note 148, at 9.

<sup>151</sup> See generally Mark W. Lauroesch, *General Compulsory Patent Licensing in the United States: Good in Theory, But Not Necessary in Practice*, 6 SANTA CLARA HIGH TECH. L.J. 41 (1990).

<sup>152</sup> World Trade Organization, *Compulsory Licensing of pharmaceuticals and TRIPS* (last visited Jan. 28, 2018), [https://www.wto.org/english/tratop\\_e/trips\\_e/public\\_health\\_faq\\_e.htm](https://www.wto.org/english/tratop_e/trips_e/public_health_faq_e.htm)

<sup>153</sup> Trade-Related Aspects of Intellectual Property Rights art. 31, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C.



power to *threaten* Bayer during the anthrax scare in 2001. Ciprofloxacin, manufactured by Bayer, was to be used as a stockpile as a defense against Anthrax. The government threatened compulsory licensing in order to assemble adequate stores of the antimicrobial. As a result, Bayer lowered their prices and the compulsory license was not utilized.<sup>154</sup>

Under the TRIPS structure, there are significant limits to such use of compulsory licensing. The proposed user must have made efforts to obtain authorization from the rights holder on reasonable commercial terms and conditions, and such efforts must have been unsuccessful within a reasonable period of time.<sup>155</sup> This requirement can be waived by a member of the TRIPS agreement in cases of national emergency, other circumstances of extreme urgency, or in cases of public non-commercial use.<sup>156</sup> When in situations of national emergency or other circumstances of extreme urgency, the right holder shall be notified as soon as reasonably practicable.<sup>157</sup> In cases of public non-commercial use, 'where the government or contractor, without making a patent search, knows or has demonstrable grounds to know that a valid patent is or will be used by or for the government, the right holder shall be informed promptly'.<sup>158</sup> US patent law could include such a provision; if all patents were to be subject from the outset to such compulsory licensing powers by the federal government, it is unclear whether the use of the power would require compensation as the right never existed from the beginning.

Trade secret law is more complicated in this respect, as most trade secret law rests with the states. However, as we described above with respect to the DTSA, the federal government has begun to take action in the trade secret arena. Either states or the federal government could conceivably build a compulsory licensing possibility into the recognition of trade secrets. However, as with march-in rights, problems would arise in separating data developed prospectively from data developed retrospectively.

#### IV. CONCLUSION: A LIMITED PUBLIC POLICY EXCEPTION FOR TRADE SECRETS?

At the heart of the difficulties in extending legal strategies used for patent law to trade secret law is that patent and trade secret protections are structured very differently. Trade secrets maintain protection as long as appropriate efforts are made to shield them. But the legal responses sketched above—voluntary databases, regulation, march-in rights, or compulsory licensing—require revelation, thus dissipating the value of secrecy. These solutions thus place claims to intellectual property in the form of trade secrets in conflict with what might be important public interests, including primarily individuals' interests in health and public interest in scientific replicability and progress. Because trade secret protection can be asserted over any subject matter, as long as the information has commercial value and appropriate secrecy methods are in place, this dilemma is especially challenging.

<sup>154</sup> Jerome H. Reichman, *Compulsory Licensing of Patent Pharmaceutical Inventions: Evaluating the Options*, 37 PHARM. REGUL., J. L. MED. & ETHICS 247–50 (2009).

<sup>155</sup> See text accompanying note 153.

<sup>156</sup> *Id.*

<sup>157</sup> *Id.*

<sup>158</sup> *Id.*

One possibility for addressing this dilemma is considering the need for large-scale data sets in order to analyse the significance of genetic variants. While information may be available about how variants function biochemically at the molecular level or are associated with pathology in a given family, analysis may also require large databases to identify factors such as the frequency of certain alleles in a given population.<sup>159</sup> Very rare variants associated with pathogenicity may not be seen even in databases with hundreds of thousands of patients. The need to assemble data from a variety of sources is especially pressing when frequencies vary among population subgroups.<sup>160</sup> Thus, data gleaned largely from testing populations of European ancestry may be problematic for assessing the pathogenicity of variants found in populations arising largely from sub-Saharan Africa.<sup>161</sup>

When companies assert trade secret protection over data they have collected from prior genetic analysis, they take large volumes of potentially diverse information out of the data stream. Testing therefore may be less informative than it otherwise could have been, whichever company performs the test. The problem is not whether patients are put in a position in which they must use a test from a particular company such as Myriad if they want access to the information that company has—that is, the problem is not simply that one company has a competitive advantage because it has information its competitors lack (a ‘better test’ problem). Nor is the problem that one company may charge more for its better test, thus increasing the costs of health care. Rather, the problem is a deeper one about how analysis of the significance of genetic variants works. Without data sharing, genetic tests are less informative than they might otherwise be, even for companies with far more extensive databases. The difference could be life-saving, as in the *Williams* case. This is a feature of the analytic methods currently used for identifying the significance of genetic variants. Genetic testing needs large-scale, diverse data to be increasingly informative—and potentially life-saving in the information it provides to patients and families.

Genetic testing aims to help the public, ‘provide a genetic diagnosis’ and ‘provide as much information as possible to patients and families’.<sup>162</sup> Asserting trade secret protection for information about genetic variants runs contrary to these aims.<sup>163</sup>

Additionally, assertion of trade secret protection over information about genetic variants slows scientific progress.<sup>164</sup> Reproducibility is an important scientific value and may require access to data: ‘The practice of privatizing clinical data obstructs the scientific community from independently verifying the data’s clinical significance and accuracy’.<sup>165</sup> Selective reporting of data and the inability to access initial data have been

<sup>159</sup> Sue Richards et al., on behalf of the ACMG Laboratory Quality Assurance Committee, *Standards and Guidelines for the Interpretation of Sequence Variants: A Joint Consensus Recommendation of the American College of Medical Genetics and Genomics and the Association for Molecular Pathology*, 17 *GENET. MED.* 405 (2015).

<sup>160</sup> Ting Yan et al., *Genetic Association With Multiple Traits in the Presence of Population Stratification*, 37 *GENET. EPIDEMIOL.* 571 (2013).

<sup>161</sup> Alice B. Popejoy & Stephanie M. Fullerton, *Genomics is Failing on Diversity*, 538 *NATURE* 161 (2016).

<sup>162</sup> Heidi Feldman, *The Purpose of Genetic Testing and Its Relevance to Children with Apraxia*, CASANA (2009), <https://web.archive.org/web/20170710173019/https://www.apraxia-kids.org/library/the-purpose-of-genetic-testing-and-its-relevance-to-children-with-apraxia/> (accessed Feb. 15, 2019).

<sup>163</sup> Kolata, *supra* note 93

<sup>164</sup> Zahra N. Sohani et al., *Assessing the Quality of Published Genetic Association Studies in Meta-Analyses: The Quality of Genetic Studies (Q-Genie) Tool*, 16 *BMC GENET.* 50 (2015).

<sup>165</sup> Nguyen & Terry, *supra* note 43, at 579.

cited by scientists as barriers to reproducibility, among other factors.<sup>166</sup> Allowing the public to access the variants and associated phenotypes on all genes is *essential* for the understanding of health and disease.<sup>167</sup>

These problems may not be unique to genetic variants, moreover. In the area of individual health care, identification of low-frequency drug side effects or low-frequency drug–drug interactions may be other illustrations of the need for large data sets. In public health, large data sets are used in syndromic surveillance, which identifies possible outbreak risks from unusual patterns in data.<sup>168</sup> A particular problem in this area is that if data sets are skewed to particular populations—as they may be if the data are assembled from patients treated in that area—they may under or over-represent particular patterns. Data sharing may be necessary to prevent such sampling bias.

When life or health may be on the line and there is a critical need for data, public policy thus cuts against the assertion of trade secret protection. However, significant problems attend the creation of a public policy exception to trade secret protection for such essential information, even in the area of health. One institutional problem is that in the United States, trade secret law is implemented by states; states may have different views of the weight and scope of such public policy concerns.

Another problem is privacy to the extent that the information is drawn from or about individuals. To be sure, companies may protect information as trade secrets even when the information is used in ways to which people might object. An example would be use of a health institution’s data for research of which individuals would disapprove.<sup>169</sup> Although privacy notoriously may be inadequately protected even when held under trade secret protection, surely the problems would worsen if data were more widely available. Deidentification is unlikely to be a successful solution, especially for genetic information which cannot be deidentified with assurance. Moreover, survey evidence suggests that even apart from re-identification risks, concerns remain for patients about how data are used.<sup>170</sup>

Still, further questions attend the potential scope of any public policy exception to trade secret law. We have focused on the area of essential health information, but even here scope may be difficult to define. Beyond health information, trade secret protection has become especially controversial in the area of policing and sentencing practices, both of which may have important consequences for the lives of individuals, including their safety.<sup>171</sup>

<sup>166</sup> Monya Baker, *Is There a Reproducibility Crisis*, 533 NATURE 452 (2016).

<sup>167</sup> Nguyen & Terry, *supra* note 43, at 579.

<sup>168</sup> Beverley J. Paterson & David N. Durrheim, *The Remarkable Adaptability of Syndromic Surveillance to Meet Public Health Needs*, 3 J. EPIDEMIOL. & GLOB. HEALTH 41 (2013).

<sup>169</sup> See eg Mark A. Rothstein, *Ethical Issues in Big Data Health Research*, 43 J. L. MED. & ETHICS 425 (2015); Evette J. Ludman et al., *Glad You Asked: Participants’ Opinions of Re-Consent for dbGaP Data Submission*, 5 J. EMPIR. RES. HUM. RES. ETHICS 9 (2010).

<sup>170</sup> See eg Deborah Goodman et al., *De-identified Genomic Data Sharing: The Research Participant Perspective*, 8 J. COMMUNITY GENET. 173 (2017); Mark A. Rothstein, *Is Deidentification Sufficient to Protect Health Privacy in Research?*, 10 AM. J. BIOETHICS 3 (2010).

<sup>171</sup> See eg P. Jeffrey Brantingham, Matthew Valasik, & George O. Mohler, *Does Predictive Policing Lead to Biased Arrests? Results From a Randomized Controlled Trial*, 5 STAT. & PUB. POL’Y 1 (reporting results of a randomized controlled trial in Los Angeles that indicate arrest rates correlate with crime frequencies even when predictive analytics are used); Aaron Shapiro, *Reform Predictive Policing*, 541 NATURE 458 (2017) (arguing that checks and balances are necessary to avoid abuse of policy discretion when predictive analytics are used).

Finally, the impact on commercial incentives will surely also loom large in any debate over attempts to use public policy to break the trade secret barrier. Companies may argue that without the commercial advantages of trade secret protection they will be less likely to curate data in useful ways, to maintain data, or even to collect data in the first place. These arguments will be less plausible when companies have other, critical reasons for having and curating data—as Myriad does for its own genetic tests, or hospital systems have for analysing the quality and cost-efficacy of the care they provide. Nonetheless, critical needs for information used in genetic testing, or for other purposes in health care and public health, pose novel challenges to continuing the current absolute protection for trade secrets.

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