

PATENTING RACE IN A GENOMIC AGE

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In the growing field of biotechnology research and development, a new phenomenon is emerging – the strategic use of race as a genetic category to obtain patent protection and drug approval. The imbrication of race in the field of patent law as an adjunct to biotechnological inventions is producing new racialized spaces of intellectual property that may have profound implications for broader social understandings and mobilizations of race. When the federal government grants a patent to an invention that is based on an asserted or implied genetic basis for a particular racial group, it gives the imprimatur of the federal government to the construction of race as genetic. Moreover, once granted, such patents may provide the basis for similarly race-based clinical trial designs, drug development, capital raising and marketing strategies that carry the construction of race as genetic out to ever widening and consequential segments of society.

A dramatic rise in the use of race in biotechnology patents since the completion of the first draft of the human genome in 2000 indicates that researchers and affiliated commercial enterprises are coming to see such social categories as presenting opportunities for gaining, extending, or protecting monopoly market protection for an array of products and services. The commercial mobilization of race and ethnicity is not merely coincidental with the proliferation of new genetic knowledge. Rather, federal initiatives have played a central role in producing, classifying, and disseminating human genetic information. Once race is conceptualized in relation to biotechnology products, the patent system itself provides incentives for using race and ethnicity in order to maximize patent scope, duration, and viability. Federal initiatives, guidelines, and approvals thus provide specific, targeted incentives to see and use race and ethnicity in relation to biotechnological innovation in a manner that promotes, indeed rewards, the reification of race as a genetic category.

Few areas of the law currently are as fully engaged in a pervasive management of genetic material and information as intellectual property law. Patent law and genetics, however, while much examined, are generally explored in terms of how best to promote the efficient production and exploitation of genetic information. While the ethical implications of patenting human genetic material have been explored at length, little attention has been given to the ways in which social categories of race and ethnicity are increasingly being mobilized in the context of biotechnology patents.

A “product of nature” cannot be patented. To be rendered patentable, it must be “purified and isolated” through human interventions to produce a substance that does not otherwise exist. Historically, this involved complex chemicals such as adrenaline (see, e.g., Parke-Davis & Co. v. H.K. Mulford Co., 1911). In the genomic era, however, it has come to encompass engineered complementary DNA (cDNA). DNA as found in nature contains both nucleotide sequences that code for producing proteins (exons) and sequences that do not code for proteins (introns). cDNA is synthesized *in vitro* by using an enzyme (reverse transcriptase) that produces a molecule containing only exons. While clearly scientific and technical in origin, isolation and purification are distinctively legal concepts when it comes to granting a patent (Kahn, 2003). The PTO has asserted that, “the inventor’s discovery of a gene can be the basis for a patent of the genetic composition isolated from its natural state and processed through purifying steps that separate the gene from other molecules naturally associated with it.” (Federal Register) (emphasis added).

Sheila Jasanoff observes that “biotechnology . . . renders continually problematic the boundary between the natural and the unnatural” (Jasanoff, 2002, p. 895). The authoritative discourses of science and law, however, are rendered precarious by such uncertainty. Those seeking the legal recognition of patentability for biotechnological achievements work hard to

resolidify and naturalize the boundary between natural and unnatural. Thus, the PTO recognizes arguments that scientific intervention creates a patentable object by severing it from its “natural associations.” The PTO constructs cDNA as isolated, not only in the sense of separating exons from introns, but more powerfully, in the sense of separating the genetic material itself from nature. This is not a scientific process but a legal one. The scientist may create cDNA but the PTO draws the line between nature and artifice. Similarly, purification involves stripping the genetic material of its identity as a part of nature -- purifying it of its “natural associations.”

This chapter will explore how the rise of racial patents inverts this traditional dynamic. Patents have long been premised on a legal recognition of how human intervention may take a product out of nature and into culture. In contrast, race enters the world of biotechnology as a social construct. It serves as an admitted surrogate for presumed underlying genetic variations in particular populations. In the patent and drug approval process necessary to bring the drug to market, race is implicitly recoded as a genetic category. The patent process takes race as a social category and recodes it as “natural” by according it legal force as a component of a biotechnological invention. Law thereby is taking race out of culture and locating it in nature.

The chapter begins with a consideration of diverse federal mandates that structure the collection, classification, and circulation of data about both social categories of race and genetic categories of population. When brought together in the context of biotechnology research and product development, these diverse federal classificatory schemes become easily entangled and conflated providing a structural incentive for reifying race as genetic. It proceeds to a discussion of BiDil, the first drug ever approved by the Food and Drug Administration with a race specific indication – for the treatment of heart failure in African-Americans. It argues that the dynamic whereby commercial and legal considerations drove the development of BiDil is a portent of

further commercial exploitation of race in biotechnology. The chapter then moves on to a detailed analysis of the new racial patents in biotechnology exploring the myriad ways in which the legal imperatives of patent law are appropriating the language of science and medicine to imbue products with new commodity value by reifying race as genetic. It concludes with the observation that biotechnology corporations are mining the raw material of race as a social category and using the patent process to refine it into a natural construct in order to gain patent protection and market advantage.

### The Impact of Federal Schemes of Classification

The racialization of patent law can only fully be understood when viewed in relation to broader federal initiatives that shape the production and use of racial<sup>1</sup> categories in biomedical research. Prominent among these are a wide array of federal mandates that dictate the characterization and application of genetically-based biomedical interventions, such as pharmaceuticals and diagnostic tests, in relation to socially defined categories of race. Key federal mandates include: the NIH Revitalization Act of 1993, which directed the National Institutes of Health to establish guidelines for inclusion of women and minorities in clinical research; the Food and Drug Modernization Act of 1997, which, in the context of drug development, directed that “the Secretary [of Health and Human Services] shall, in consultation with the Director of the National Institutes of Health and with representatives of the drug manufacturing industry, review and develop guidance, as appropriate, on the inclusion of women and minorities in clinical trials. . .;” and two subsequent Food and Drug Administration “Guidances for Industry.” The first, a 1999 guidance titled “Population Pharmacokinetics,” made recommendations on the use of population pharmacokinetics in the drug development

process to help identify differences in drug safety and efficacy among population subgroups, including race and ethnicity (FDA, 1999); and the second, a 2005 guidance entitled "Collection of Race and Ethnicity Data in Clinical Trials," (FDA, 2005b) which recommends a standardized approach for collecting and reporting race and ethnicity information in clinical trials that produce data for applications to the FDA for drug approval.

Underlying the standardization of data collection in all of these mandates is the Office of Management and Budget's Revised Directive 15 on "Standards for Maintaining, Collecting, and Presenting Federal Data on Race and Ethnicity" (OMB, 1997b). The standards were developed "to provide a common language for uniformity and comparability in the collection and use of data on race and ethnicity by Federal agencies." The standards set forth the following basic racial categories for organizing such data: American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, and White. There are two categories for data on ethnicity: "Hispanic or Latino," and "Not Hispanic or Latino" (OMB, 1997b). Michael Omi observes, "Directive 15 has become the de facto standard for state and local agencies, the private and nonprofit sectors, and the research community" (Omi, 1997, p. 21). This dynamic reinforces what Omi has characterized as an "interesting dilemma" facing scientists in the United States: "On the one hand," Omi asserts, "scientists routinely use racial categories in their research and regularly make comparisons between races with respect to health. . . . On the other hand, many scientists feel that racial classifications are meaningless and unscientific" (Omi, 1997, p. 7).

#### Producing and Organizing Genetic Information:

##### Federally Sponsored Genetic Data Bases

This dilemma is likely to become ever more problematic when biomedical researchers and clinicians are using the social categories of race mandated by Directive 15 alongside of purportedly genetic population groupings produced and organized by federally sponsored genomic initiatives. As genetic research has grown over the past three decades, the federal government has sponsored or co-sponsored an array of data banks that collect, store, and classify genetic information for use by biomedical researchers. Such data banks include the National Institute of General Medical Sciences (NIGMS)-Coriell Human Genetic Variation Collections and the DNA Polymorphism Discovery Resource (PDR), the dbSNP data base, and the International Haplotype Map Project (also known as the HapMap). Each of these data bases organize genetic information into highly problematic population groupings that have been taken up and used by researchers as correlates for or equivalents of racial categories. Overarching these collections is a repository maintained by the federal government's National Center for Biotechnology Information (NCBI, 2005), known as GenBank, which contains a web-based annotated collection of all publicly available DNA sequences. These data bases are powerful, not only because of the categories they use to organize genetic information internally, but also because as examples of authoritative scientific knowledge, they provide working models of acceptable schemes of categorization by which any genetic data may be organized, wherever obtained or stored.

These federal data bases mix and match crude categories that variously employ racial and ethnic constructs (e.g. U.S. Caucasians, African Americans, and Hispanics), geographic constructs (e.g. North Africa, East Africa), political nation states (e.g., Russia and Satellite republics), mixes of geography and nation states (e.g., Sub-Saharan Nations bordering the Atlantic North of the Congo River); and mixes of all three (e.g. "All samples north of Tropic of

Cancer. This would include defined samples of U.S. Caucasians, African Americans and Hispanics.”) As biomedical researchers mine such data, they are accessing and organizing it in terms that juxtapose or directly classify genetic data in terms of race, ethnicity, nation, and/or geography. When used in studies or trials covered by federal mandates, the diverse and sometimes contradictory population classifications employed variously by the NIGMS, the PDR and dbSNP data bases cry out to be simplified and reclassified in terms of the basic OMB 15 categories of race and ethnicity. Thus, for example, a locally specific genetic sample, originally designated as from an individual in Tokyo, Japan, is likely in subsequent practice to be conflated into the overarching category of “Asian.”

All of these genetic data bases are technologies of classification. Systems of classification, however, are artifacts that embody ethical choices. As Geoffrey Bowker and Susan Star note, “each standard and category valorizes some point of view and silences another. This is not inherently a bad thing – indeed it is inescapable. But it is an ethical choice, and as such it is dangerous – not bad, but dangerous” (Bowker and Star, 1999, p. 5-6). In the realm of genetics, where such systems address the human body, new biologically based categories can profoundly affect people’s identities, aspirations, and dignity. Genetic classification is powerful but it is also dangerous because it involves biological categories that may be confused and conflated with race. Any resulting reification of social categories of race as biological constructs risks new forms of exclusion and stigma (Duster, 1990; Foster, 2002; Lock, 1999; Marks, 1995).

Bowker and Star argue that “politically and socially charged agendas are often first presented as purely technical and they are difficult even to see. As layers of classification system become enfolded into a working infrastructure, the original political intervention becomes more and more firmly entrenched. In many cases, this leads to a naturalization of the political

category. . . . It becomes taken for granted” (Bowker and Star, 1999, p. 196). Genetic data bases and OMB Directive 15 are seemingly “technical” methods of categorization, but such apparent neutrality is precisely what drives and lends the aura of legitimacy to the casual and often reflexive conflation of race and genetics in a variety of biomedical contexts.

These federal mandates have a profound effect upon the use of racial categories in biomedical research, clinical practice, product development, and health policy. At the most basic level, they incentivize the introduction of race into biomedical contexts, regardless of their relevance. Once introduced, racial categories can take on a life of their own and become exploited in new and unanticipated ways, with unforeseen and potentially harmful consequences.

#### BiDil: Portent of Things to Come

This has already begun to happen. In June, 2005, a drug called “BiDil” became the first drug ever approved by the FDA with a race specific indication: to treat heart failure in African Americans (FDA, 2005a). Underlying the New Drug Application (NDA) submitted for this drug to the Food and Drug Administration (FDA) is a race-specific methods patent: to use the drug for treatment of heart failure in an African American patient. The patent is premised on underlying assumptions regarding race and the genetic basis of heart disease. By granting such a patent, the Patent and Trademark Office (PTO) is giving the imprimatur of the federal government to the use of race as a genetic category (Kahn 2004). BiDil’s history is complex and has been explored explored in detail (Kahn, 2003; Kahn, 2004; Kahn, 2005a; Lee, this volume). It reveals a story of how race and ethnicity were exploited in conjunction with patent law and the drug approval process to bring a new drug to market. In short, BiDil became a racially marked drug more because of law and commerce than because of medical evidence (Kahn, 2004).

All indications seem to show that the drug is highly effective at treating heart failure. The FDA approval, however, was based on results from A-HeFT, the African-American Heart Failure Trial, that were published the previous November in the New England Journal of Medicine (Taylor et al., 2004). The trial design, approved by the FDA, was itself path-breaking because it included only self-identified African Americans. The results therefore give the impression that BiDil works only in African Americans. This is clearly not the case. The trial investigators themselves concede that BiDil will work in people regardless of race. Without a comparison population, the investigators cannot even claim that the drug works differently in African Americans than in any other group. Nonetheless, NitroMed, the corporate sponsor of BiDil, applied for and received FDA approval for the drug with a race- specific indication to treat heart failure only in African-Americans. Pervasive media coverage of the announcement of the results and the FDA approval has also focused on the racial-specificity of the drug, often explicitly claiming that this shows race is genetic (Kahn, 2004; 2005a). Thus, for example, in addition to casual references to a race-specific genetic basis for BiDil's efficacy in the popular media, articles published in such scientific and professional journals such as Genome Biology, the British Medical Journal, and Health Affairs have also incorrectly asserted a genetic variation more prevalent in self-identified African-Americans to underlie BiDil's efficacy (Petsko, 2004; Rahemtulla and Bhopal, 2005; Carlson, 2005).

BiDil is the prototypical example of patenting race in a genomic age. Underlying the trial design is a race-specific patent that is premised on a genetic conception of race. The PTO issued the patent on October 15, 2002 (U.S. Patent No. 6,465,463). It confers intellectual property protection for the method of using the drug to treat heart failure in African Americans until 2020. This is thirteen years longer than a previous patent issued in 1987 to the same inventor for the

same method of using the same drug in the general population without regard to race. In this case, bringing race into the patent system allowed the inventor to gain a substantial extension of his intellectual property monopoly. With a projected annual revenue stream of one to three billion dollars, the additional thirteen years amounts to a tremendous windfall for NitroMed. (Kahn 2004; Sankar and Kahn, 2005). BiDil's race-specific patent provided the underlying support that drove NitroMed's subsequent development of a race-specific trial design, its campaign to raise capital (first through private venture funding and later through a public offering of stock in 2004), the approach to the FDA for race-specific approval, and its massive marketing campaign to third party payers, individual doctors, and the public at large. But the broader implications of using race to obtain patent protection and drug approval have only begun to be explored.

Both the patent and the drug trial for BiDil explicitly relate their race-specific design to a search for genetic markers underlying the disease (Taylor et al., 2004). On the one hand, this reflects an approach, largely sanctioned by many in the field of pharmacogenomics, of using race instrumentally as a surrogate to get at underlying genetic variation that could be ultimately identified without reference to race. On the other hand, for the foreseeable future, it presents the immediate reality of race being used as a quasi-genetic category to obtain patents and drug approval.

Is BiDil an anomaly? Discussions of similar race-specific trials for the cancer drug Iressa and the statin Crestor, among others, would seem to indicate that BiDil is ushering in a new era of race-based medicine (Herper, 2005). As Tate and Goldstein observe in this volume, there are already numerous drugs on the market that claim to have shown differential efficacy among different races. While they note that most of these claims are not well-supported by the

evidence, this merely underlines the importance of examining more closely what other factors may be providing incentives to see race as relevant. Similar dynamics are at work in Europe. In June 2005, over the strenuous objections of the European Council of Human Genetics (ESGH), the European Patent and Trademark Office upheld a patent owned by Myriad Genetics relating to testing for the BRCA2 genetic mutation “for diagnosing a predisposition to breast cancer in Ashkenazi Jewish women” (Kienzel, 2005). Opponents of the patent noted that the test is currently available from other sources for all women regardless of ethnic or religious background. As a practical matter, this new patent means that individuals identified as Ashkenazi Jews will either have to pay a premium for the test or deny their identity. As with BiDil, here Myriad apparently is marking an ethnic group as genetically distinct primarily in order to extend patent protection – with potentially profound consequences (Gessen, 2005).

A recent report from the Royal Society in the United Kingdom asserted that the promise of truly individualized pharmacogenomic therapies remains decades away (Royal Society, 2005). In the gap between present reality and future promises there may be various strategies for capitalizing on emerging genetic knowledge relating to drug response and efficacy. Targeting a racial audience presents a particularly attractive interim option because at this point the technology and resources do not exist to scan efficiently every individual’s genetic profile. Instead businesses may market the product to a particular social group that is hypothesized to have a higher prevalence of a relevant genetic variation. Patent protection provides an essential underpinning for such commercial ventures. As race is becoming more relevant to marketing drugs, it is becoming a salient component of underlying biotechnology patents.

Patent law provides a focused and dynamic site in which to identify and examine emerging examples of race and genetics being mobilized in tandem to serve both biomedical and

commercial projects. As researchers derive new inventions based on mining existing genetic data bases, patent law provides powerful commercial incentives to conflate race and genetics. In approving such uses, the United States Patent Office gives the imprimatur of the federal government to the reification of race and ethnicity as genetic categories. It also puts the weight of federal authority behind such uses by placing the burden of disputing such reification upon those (if any) who have the time, money, expertise and inclination to challenge the patents.

### The Rise of Racial Patents

A modern patent is a “government issued grant which confers upon the patent owner the right to exclude others from ‘making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States’ for a period of 20 years ending from the filing date of the application” (Chisum, Nard, Schwartz, Newman, & Kieff, 2001, p. 2, citing 35 U.S.C. § 154). This authority derives from the United States Constitution, Article 1, section 8, which states: “The Congress shall have power to . . . promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries.” All patent applications must meet several statutory requirements. The most prominent of these are known as “useful[ness]” (or utility), (35 U.S.C. § 101) “novelty,” (35 U.S.C. § 102) “non-obvious[ness],” (35 U.S.C. § 103) and “specification” (35 U.S.C. § 112). The usefulness, or utility, requirement can be met by a showing that the claimed invention has a specific, substantial, and credible utility. Specificity requires the use to be specific to the character of the claimed subject matter. The novelty requirement is met if the invention is not “anticipated” (described in its relevant particulars) in a single reference of “prior art,” (e.g. another patent or a published scholarly paper). The non-

obviousness requirement is met if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole” would not be perceived as obvious to a “Person Having Ordinary Skill in the Art” (known in patent lingo as a PHOSITA, 35 U.S.C. § 103[a]). Specificity requires a written description of the invention that is adequate to enable a PHOSITA to make and use the invention (Elliott, 2002).

Patent law is premised on legally constructing a divide between nature and society. In affirming the patentability of a genetically engineered bacterium, the U.S. Supreme Court asserted that patentable subject matter included “anything under the sun made by man.” (Diamond v. Chakrabarty, 1980). . The U.S. patent system recognizes that genes can be patented to the extent that such patents are based on information derived from complementary DNA (cDNA) sequences. cDNA does not exist in nature but is produced only through human technological interventions that produce strands of DNA made up only of exons with the intermixed introns deleted.<sup>2</sup> This intervention is legally understood as isolating and purifying the DNA in manner that effectively takes it out of the realm of nature and into the realm of society as an artifact of human creation (Kahn, 2003).

Ironically, and ominously, when race is used in a gene-related patent a reverse of this transformation may occur. In such patents, race begins as a social category, often derived from categories specified by OMB directives. Biomedical professionals may link race to genetic categories with the goal of somehow facilitating their research or practice. But when a gene-related race-identified patent issues, it legally marks race as, at least in part, a genetic category – i.e. the patent takes the social category of race and transforms it into a “natural” category grounded in genetics. DNA, however, is not patented simply to claim title to a nucleotide sequence. It is patented in order ultimately to bring some DNA-related product to market. When

that product is a drug, federal guidelines mandate that clinical trial data be collected with reference to social categories of race and ethnicity that are promulgated by the Office of Management and Budget (FDA, 2003; FDA, 2005b).

Patent law is supposed to promote the invention of new and useful products. In recent biotechnology patents race and ethnicity are being exploited in new ways that do not spur the invention of a new product, but rather the reinvention of an existing product as racial or ethnic. In so doing, patent law both racializes the space of intellectual property, transforming it into a terrain for the re-naturalization of race as some sort of “objective” biological category, and commodifies race and ethnicity as goods to be patented and subjected to the dictates of market forces.

A review of “Claims” and “Abstract” sections of gene-related patents and patent applications filed since 1976 indicates a significant trend toward using race in gene-related patents with a marked increase in just the past few years. This rise is clearly coincident both with an increase in genetic information being produced through the federally sponsored Human Genome and HapMap Projects, and also with rising federal emphases on requiring the use of racial and ethnic categories in the collection of data relating to clinical trials and drug applications. A typical patent is divided into several sections. The Claims section presents a primary focus for investigation because it is the legal heart of a patent. The claims specify the legally operative scope of the patent, defining the formal legal “metes and bounds” of the territory covered by an invention. The Abstract is the basic summary presentation of the central purpose of the patent. Other sections typically include a “Background” or “Description of Invention,” plus drawings or other technical support data. A review of the Claims or Abstract

sections of patents that employ OMB 15 categories of race and ethnicity<sup>3</sup> in a manner that implies or asserts a genetic component to or basis for race<sup>4</sup> reveals the following:

<u>Category</u>	<u>Issued Patents:</u>		<u>Patent Applications</u>
	<u>1976-1997</u>	<u>1998-2005</u>	<u>filed since 2001<sup>5</sup></u>
Race	0	2	15
Ethnic	0	0	2
African-American/Black	0	4	11
Alaska Native	0	0	0
Asian	0	0	13
Caucasian/White	0	6	18
Hispanic/Latino	0	0	3
Native American	0	0	2
Pacific Islander	0	0	1
Total	0	12	65

A reading of the entire text of these identified patents and applications indicates a remarkable trend toward the increasing use of racial and ethnic categories in relation to patenting gene-related biomedical innovations. Of the twelve granted patents identified, the earliest specifies the use of the term “Caucasian.” It relates to diagnostic testing for the BRCA1 genetic mutation for breast cancer and was granted only in 1998. Two of the remaining patents concern the drug BiDil, discussed above, the first of which was granted in 2002. In the four years since 2001, there has been close to a five-fold increase in the use of racial and ethnic categories in gene-related patent applications over existing patents issued in the twenty-nine years since 1976. This is not because race has not previously been used in biomedical research, but rather because it is taking on increasing significance in the commercial world of biotechnology patenting. While there are some overlapping references (i.e. patents that use more than one OMB category) the trend remains powerful and clearly parallels the availability of vast new amounts of genetic information being produced and classified in federally sponsored data bases. For example, November 20, 2003, Tony Frudakis of DNAPrint Genomics filed an application “Compositions

and methods for inferring a response to statin,” which explicitly bases some of its race-specific claims on samples taken from the Polymorphism Discovery Resource. The application looks at allele frequencies in a “Caucasian” population to infer a differential race-specific response to statin – a blockbuster class of cholesterol-lowering drugs.

How exactly is race being used in these patents? At the most pragmatic level, many patent applicants appear to be invoking race in a strategically defensive manner to provide added protection against possible patent challenges. The structure of a typical Claims section of a patent begins with Claim #1 being as broad as possible. Successive claims generally provide narrower and narrower focus to the territory covered by the patent. The idea here is that if the broadest claim is struck down by the patent examiner or a subsequent challenge, the narrower claims may still survive. Patent claims are thus structured something like a medieval castle, with an outer ring encompassing the most territory with successively smaller rings providing additional layers of protection back to the core area of the castle keep.

A Patent application for, “Detection of susceptibility to autoimmune diseases,” filed on July 1, 2004, exemplifies the use of concentric rings of race to provide maximum protection for its claims. Its first three claims are as follows:

1. A method for determining an individual's risk for type 1 diabetes comprising: detecting the presence of a type 1 diabetes-associated class I HLA-C allele in a nucleic acid sample of the individual, wherein the presence of said allele indicates the individual's risk for type 1 diabetes.
2. The method of claim 1, wherein the individual is of Asian descent.
3. The method of claim 1, wherein the individual is of Filipino descent. [Emphasis added]

Claim 1 is not race-specific, referring only to an “individual’s” risk. Claim 2 takes a smaller subset of humanity which it marks as “Asian.” Claim 3 takes yet a smaller sub-set of the group “Asian” which it marks as “Filipino.” In each case the categories are clearly linked to genetic alleles, forcefully implying a genetic basis to the specific racial groups.

The logic of connecting race and genetics in this context, however, is not driven by science so much as by the commercial imperatives of patent law. The body of the patent, which generally describes the invention and its background, reviews the scientific literature underlying the claims. In this, less legally potent portion of the patent, the terms “Asian” and “Filipino” are invoked in terms of variable distributions of HLA allele frequency across populations. The “Description” section of the patent compares, in particular, the incidence of type 1 diabetes in Japan and China to populations in the U.S. and Europe. It goes on to discuss the frequency in the Philippines as well. In this context, the boundaries of the racial or national categories being employed are not hard and fast. It is not that “Asians” per se have different genes from “Europeans.” Rather, it notes that there appear to be variable allele frequency and disease incidence across certain populations. Such uses of population categories may remain problematic in their broad generality but they are not essentially genetically reductive because they deal with relative allele frequencies that are acknowledged to exist across populations. In contrast, in the “Summary of the Invention” section, the application states that, “The individual can belong to any race or population. In one embodiment, the individual is an Asian, preferably a Filipino.” An embodiment refers to the formal metes and bounds of the patent delineated by the claims. Like the claims themselves, the Summary sets forth definitively bounded categories that mark specified races as (genetically) distinct. The legal and commercial imperatives of effective patenting have here promoted the transmutation of variable genetic frequencies across

populations that nonetheless all share common alleles, into bounded genetic categories that are marked as distinct and functionally different.

Also of note is that the category “Asian” is apparently derived from studies only of Japanese and Chinese subjects, thus conflating two national populations with the an entire continent. Moreover, there are separate claims regarding Asians and Filipinos, implying some distinctive genetic basis to Filipinos that distinguishes them from other populations encompassed by the larger category “Asian.” This separate claim is apparently based on a study of ninety Filipinos discussed in the body of the patent.

Many of the patents invoke race when the inventors construct a perceived departure from an unstated White norm (e.g. of disease or allele prevalence) in a non-White group. In such contexts, the term “individual” or “human” implicitly stands for “White” in the claims. As Rene Bowser notes:

In nearly all racialized research published in the United States, the comparison group has been the majority (White) population. Far from being a neutral category, this approach consolidates Whites as the group with which all "others" should be compared; it also disregards research that demonstrates the value of studying variations in health among, say, Blacks, as opposed to always comparing them with White Americans. The norm in racialized research is and has always been an unspoken but taken-for-granted White norm (Bowser, 2001, p. 111).

This is particularly evident in one of the BiDil patents. Issued on October 15, 2002, patent #6,465,463 refers in Claim 1 to “A method of reducing mortality associated with heart failure . . . in a black patient.” Claim 2 goes on to specify, “the method of Claim 1, wherein the black patient has a less active rennin-angiotensin system relative to a white patient.” Here White is the

norm from which Black deviates. As elaborated in the “Background of the Invention,” the patent goes on to assert that “heart failure in black patients has been associated with a poorer prognosis than in white patients. In diseases such as hypertension, Blacks exhibit pathophysiologic differences and respond differently to some therapies than whites.” The body of the patent thus pathologizes Blackness as both biologically distinct from and less healthy than the purportedly robust White norm.

Another typical example of the unstated White norm may be seen in a patent application for a, “Method of identifying a polymorphism in CYP2D6,” filed November 11, 2003. (CYP2D6 is of particular interest to pharmaceutical corporations because it is involved with drug metabolism.) The first Claim specifies “A method of determining a cytochrome P-450 2D6 genotype of an individual. . .” Claim 12 specifies “The method, as claimed in claim 1, wherein said individual is Asian.” The focus on an “Asian” individual is explained in the “Background to the Invention” which discusses “differences between Caucasians and Asians are explained by an unequal distribution of CYP2D6 alleles.” The application asserted different population-based allelic frequencies between Caucasians and Asians; but this is a two sided difference -- that is, each differs from the other. But it is only Asians that are specified in the Claims as a sub-set of the broader term individual. Caucasians logically could be but here are not similarly marked out. On the one hand, this appears to be a failure of legal imagination to take advantage of an additional defensive claim. On the other hand, it seems to indicate an uncritical assumption that the category “Caucasian” and “individual” in the first claim were co-extensive and that only non-White races counted as distinct sub-groups to be marked out as the basis for defensive claims.

Perhaps most incongruous, yet illustrative of the strategic reification of race and ethnicity in the context of biotechnology patents, are the few applications, such as one for , “Manganese

superoxide dismutase gene polymorphism for predicting cancer susceptibility,” filed April 8, 2004, that invoke “Hispanic” as a genetic term. This particular application is distinctive both for its foregrounding of ethnicity in its first claim, and for its genetic reification of the ethnic category “Hispanic” which generally does not have the same pronounced history of reification as racial categories such as “African” or “Asian.” Indeed, as an ethnic category, Hispanic is so diffuse and diverse that it does not even have a purported link to continental ancestry that sometimes undergirds justifications for using racial categories as surrogates for ancestral descent populations. Using Hispanic as a catch-all genetic category risks both reifying ethnicity and providing misleading and conceptually muddled scientific data.

As the chart of race-specific patents indicates, there are many references to “Caucasians.” Several of these involve disease conditions and so may be understood implicitly to pathologize Whiteness as well. Upon closer examination, however, two qualifying characteristics mark “Whiteness” in several of these patents as neither deviant nor pathological. First, are situations where the overwhelming majority of test subjects in the studies underlying a patent were White and so Whiteness becomes a sort of default category for an additional defensive claim. Second, are the patents that mark Whiteness out of concern for a heightened efficacy of a potential medical treatment.

In a patent application for “Genetic diagnosis of depression,” filed July 8, 2004, the first claim specifies “a method of identifying individuals predisposed to major depressive disorder.” Its race-specific Claim 4 specifies “The method of claim 1, wherein said subject is Caucasian.” At first blush the patent might seem to be pathologizing Whiteness by associating it with depression. Upon closer examination, however, it turns out that the studies underlying the invention were conducted in an exclusively “Caucasian” population (which the patent defines

rather broadly as members of “the white race consisting of individuals of European, north African, or southwest Asian ancestry”). The clinical studies alluded to in the body of the patent did not show anything distinctive about Caucasians that would identify them as having race-specific markers for depression that differentiated them from any other race. The invocation of race here does not logically follow from the clinical evidence. Rather, following the commercial logic of patent law, rather than science, the patent drafters have employed race defensively to protect against possible challenges to the patent. Such strategic reification of race has been facilitated as race has come more commonly to be understood and accepted as a legitimate and salient category both in genetic research and in patent strategy. Having learned to “see” race as relevant to patent protection, the inventors invoked the category “Caucasian” because it was the only available race they could extract from their data.

A patent for a, “Peptide-based vaccine for influenza,” issued May 25, 2004, exemplifies the use of Whiteness as a target for improved therapy. Its first Claim refers to “the NP380-393 epitope<sup>6</sup> according to SEQ ID NO: 5 that are the most prevalent HLA molecules in a Caucasian human population.” As elaborated in the “Description of the Invention” section, the patent specifies that the vaccine will change “according to the population type” and asserts that “the CTL influenza epitopes are different in the Caucasian, the Asia- or Africa-originated population [sic].” It does not define these populations, but it refers to them elsewhere as “Caucasian and non-Caucasian,” clearly privileging Caucasian as the norm. And indeed, Caucasian is the only race specified in the legally enforceable Claims section, making it a target of the invention.

Similarly, in a patent application for a “Mixture of peptides derived from e6 and/or e7 papillomavirus proteins and uses thereof,” filed November 2, 2004 characterizes the invention of terms of an allele with a particular frequency in the Caucasian population. Unlike the BiDil

patent, this application does not use Caucasian as a term that deviates from a particular norm or has a pathological gene variation, but rather as a population with a gene variation that will enable it to take advantage of the proposed invention. Here Caucasian genes are positive and empowering.

One reason for this, of course, is that Caucasian genes are where the money is. This is made abundantly clear in a patent application for “Methods for obtaining and using haplotype data,” filed December 21, 2001 by scientists from Genaisance Pharmaceuticals, a biotech company that describes itself as “a world leader in the discovery and use of human gene variation for the development of a new generation of DNA-based diagnostic and therapeutic products” (Genaisance, n.d.). The market model of Genaisance is built around capitalizing on human genetic variation. It has a stake in finding population-specific genetic differences. In developing new products, Genaisance mines existing federally maintained genetic data bases as an exploitable resource – a resource that already employs a myriad of population categories that are ripe for being conflated with the OMB 15 social categories of race.

Genaisance’s application also explicitly capitalizes on the type of data being produced by the federally sponsored HapMap project. This application begins with a broad claim to “A method of generating a haplotype database for a population.”<sup>7</sup> It goes on in Claim 8 to specify that the reference population may include an “ethnic population,” thereby directly connecting ethnicity to genetics. In the body of the patent it becomes clear that Genaisance is using the terms “race” and “ethnicity” more or less interchangeably. Thus, for example, it notes that “The invention may also be used to link variations in DNA to personal identity and racial or ethnic background.” In describing the “Field of the Invention” after the Claims section, the patent marks pharmacogenomic uses as primary, noting that genetic haplotype information can be used

“to predict an individual’s susceptibility to a particular disease and/or their response to a particular drug.” Here the patent invokes the pharmacogenomic promised land of personalized medicine, but the invention largely depends on using racial and ethnic categories as proxies for genetic variation precisely because the practical reality of widespread use of truly individualized therapy remains far in the future.

To this point, the patent uses race and ethnicity broadly, without singling out any particular group. Strikingly, however, in the “Detailed Description of the Invention,” the patent elaborates on one particular embodiment of the invention declaring that,

Analysis of the candidate gene(s) (or other loci) requires an approximate knowledge of what haplotypes exist for the candidate gene(s) (or other loci) and of their frequencies in the general population. To do this, a reference population is recruited, or cells from individuals of known ethnic origin are obtained from a public or private source. The population preferably covers the major ethnogeographic groups in the U.S., European, and Far Eastern pharmaceutical markets. [Emphasis added]

This description weaves ethnicity into the concept of a “reference population.” This is essential to a marketing strategy that exploits race in the gap between current realities and the promised future benefits of individualized pharmacogenomic therapies. Secondly, the description, whether intentionally or not, is a brazen declaration that ethnicity only matters where markets matter – the U.S., Europe and the Far East. Africa, South America, the Middle East and South Asia apparently are irrelevant. The patent invokes ethnicity not solely as a short cut to finding genetic correlations with particular population groups, but also, and inextricably, as a basis for developing drugs for major markets. Ethnicity here becomes a function not only of genes, but of genes plus markets.

## Conclusion

In the cases of BiDil and the Myriad Genomics BRCA2 test, racialized patents have played a central role in the marketing strategy for the product. Both involve technologies that were already available and in use. Adding race to the patents did not change the technology so much as it provided an added incentive to market and extend monopoly control for the product. This moves beyond the use of race to defend a patent against potential challenges to an affirmative projection of race as a central component of product development and marketing. In the case of BiDil, race also unmistakably added publicity value to the product. A good deal of the publicity both produced and was produced by social understandings that reified race as genetic.

The striking rise of racialized biotechnology patents indicates that cases such as BiDil are paving the way for a new proliferation of patents and drug approvals that are producing new and highly problematic understandings of race as genetic. BiDil obtained its commodity value from the rebiologization of race in the regulatory process. Additional racial patents, for products not yet as prominent as BiDil, have secured the imprimatur of the state for using race as a genetic category. Like more traditional extractive industries, biotechnology corporations are mining the raw material of race as a social category and using the patent process to refine it into a natural construct that lends legal utility and novelty to their inventions. The patents are in place and proliferating, ready to be invoked to protect a product or extend a commercial market. Genetic race literally is becoming a commodity as race-specific patents allow biotechnology corporations to raise venture capital and develop marketing strategies that presented a reified conception of race as genetic to doctors, regulators, and the public at large.

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<sup>1</sup> In the interests of economy and manageable syntax, in the remainder of the paper I will often refer only to “race” when speaking generally of racial and ethnic categories. I am assuming both to be socially constructed categories that nonetheless have come to have biological implications as they play out in real world biomedical contexts. I will use the terms “race” and/or “ethnic” when referring to specifically marked groups. Thus, for example, the U.S. Census codes “White” or “Asian” as racial categories and “Hispanic” or “Latino” as ethnic categories.

<sup>2</sup> Briefly to elaborate on this process: Deoxyribonucleic Acid (DNA) is composed of ordered combinations of four nucleotides: adenine, guanine, thymine, and cytosine – generally abbreviated as A, G, T, and C. A given section of nucleotides along the double helical strands of DNA may code for certain amino acids that, in turn, provide a particular protein. Protein synthesis occurs through a process where the genetic information describing the protein is transcribed from the coding portion of the DNA molecule to a smaller “messenger” molecule of ribose nucleic acid (RNA). This messenger RNA (mRNA) then combines with a ribosome and a third factor called transfer RNA (tRNA) to produce a protein. When scientists intervene in this process by adding the enzyme reverse transcriptase to the mRNA they produce a new and discrete DNA “transcript” that codes for the particular protein. This transcript is known as clones or complementary DNA (cDNA). (Davis, 1995, 310-315; Ducor, 1998, 36-69) [think about a general “science endnote” to explain all your terms.]

<sup>3</sup> The results are from searches of the US PTO patent data base conducted between 8/25/05 and 9/15/05, using the web-based search engine available at [www.uspto.gov](http://www.uspto.gov). The search terms used included: Race, Racial, Ethnic, Ethnicity, Caucasian, Caucasoid, African, African-American, Negro, Negroid, Asian, Oriental, Mongoloid, Hispanic, Latino, Native American, Alaska Native, Pacific Islander. The terms “black” and “white” alone were too

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broad to be useful and so were qualified with the additional terms of “gene” or “genetic” or “nucleotide.” Searches were also conducted using the terms “Jewish” and “Jew” because of the distinctive history of the development of genetic screening technologies for diseases highly prevalent in Ashkenazi Jewish populations. The terms yielded an additional seven patents in each category. Yet, because of that distinctive history, and this paper’s focus on the OMB categories, the results for the terms “Jewish” and “Jew”[“these” is not clear, I think you mean “Ashkenazi specific patent” ]results will not be incorporated into the present analysis. [but you do use that example at least once in the paper, so make sure this is consistent]

<sup>4</sup> This is an admittedly subjective basis for sorting the patents. The categorization of patents that imply or assert a significant genetic component to race or ethnicity is meant to exclude those patents that use racial/ethnic categories as one or more of a longer list of general demographic characteristics, usually employed for information organization, rather than for identifying or treating a particular physiological state. The categorization is meant to include those patents that use racial/ethnic categories as a basis for asserting a distinctive prevalence or etiology for a physiological condition, genetic variation, and/or drug response.

<sup>5</sup> Issued patents have been formally approved by the PTO. Patent applications are currently pending before the PTO for review. Under new policies applications are made available to the public 18 months after their initial filing while still pending review.

<sup>6</sup> An epitope is a single antigenic site on a protein against which an antibody reacts.

<sup>7</sup>Genaissance’s patent application #20030091998, “Association of beta2-adrenergic receptor haplotypes with drug response,” filed on May 15, 2003, provides another telling example. It includes a Claim for “A method for predicting a Caucasian individual's genotype for one or both of PS9 and PS10 in the individual's .beta..sub.2AR gene . . .” [emphasis added] The invention goes on to describe genetic samples taken from individuals identified as “Caucasian,” “African descent,” “Asian” and “Hispanic-Latino.” The samples, it turns out, come from the publicly maintained GenBank data base, and the some of the “Caucasian” samples in particular are from the “CEPH-Utah cohort” that is maintained as part of the NIGMS-Coriell Human Genetic Variation data base.