A Rawlsian Approach to Solving the Problem of Genetic Discrimination in Toxic Workplaces

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I. INTRODUCTION TO THE PROBLEM: THE HUMAN GENOME PROJECT AND GENETIC DISCRIMINATION

The Human Genome Project (HGP) may well be the beginning of a technological leap that rivals the advent of the Industrial Age. The principal goal of the project is to map and fully sequence the twenty-four chromosomes that contain the complete genetic contents of a normal human cell. The human genome consists of twenty-two pairs of chromosomes plus the X and Y chromosomes that determine gender. As would be expected for such a technologically adventurous undertaking, the HGP has been accompanied by a substantial outpouring of concern about the ethical, legal, and social issues that will arise from this vast new knowledge and anticipated power. These concerns were of such a magnitude that the federal agencies funding the HGP set aside up to five percent of their total budgets to fund projects that would examine

1. The word “problem” is used here in the sense of a difficult decision as to what choice to make in a particular situation or group of related situations. It is often the role of law to prescribe what choices are permissible in particular circumstances. Lawyers, or more precisely lawmakers, must bring to bear a variety of tools to formulate a good or just law prescribing the permissible courses of future conduct. See generally Nola Nouryan & Martha S. Weisel, Essays on Creative Problem Solving: Psychologists, Attorneys and Disclosure, 36 CAL. W. L. REV. 125 (1999) (analyzing the conflict between legal ethics and psychologists’ ethics concerning the disclosure in litigation of psychological test data). The purpose of this Essay is to demonstrate the value of a particular approach to an emerging problem of considerable significance. I argue that the social philosophy of John Rawls in A Theory of Justice, JOHN RAWLS, A THEORY OF JUSTICE (rev. ed. 1999), provides an adequate basis for the resolution of the good or just solution to the problem of whether employers may be allowed to use genetic testing to discriminate against individuals who are hypersensitive to workplace toxins.

2. Larry B. Stammer, Physicist Awarded $948,000 Templeton Prize, L.A. TIMES, Mar. 23, 2000, at A23 (“Biotechnology, including breakthroughs in the application of discoveries in human genetics, will pose the biggest impact on human development in the next 100 years.” (quoting Freeman J. Dyson)).

3. Mapping a chromosome means to determine, first, the location of thousands of identifiable areas of deoxyribonucleic acid (DNA), and ultimately the location of genes on the chromosome. National Human Genome Research Institute, From Maps to Medicine: About the Human Genome Research Project, at http://www.nhgri.nih.gov/Policy_and_public_affairs/Communications/Publications/Maps_to_medicine/about.html (last visited June 18, 2002). Sequencing a chromosome, or its constituent part, a gene, means to determine the order of its nucleotide bases adenine (A), thymidine (T), guanine (G), and cytosine (C), which comprise the building blocks of DNA and encode the genetic instructions of all living things. Id. Some viruses, however, use ribonucleic acid (RNA) only, which relies on similar principles, except RNA contains uracil (U) rather than thymidine. JAMES D. WATSON ET AL., RECOMBINANT DNA 36, 225 (2d ed. 1992). For an excellent introduction to the general science of genetics and molecular biology, see generally id.

4. For additional details concerning the HGP, visit the Web site of the National Human Genome Research Institute, National Human Genome Research Institute, at http://www.genome.gov (last visited Aug. 13, 2002).
The ethical, legal, and social problems that surround the potential ramifications of the HGP can be divided into two basic groups: knowledge and power. By this bifurcation I mean that many of the problems involve issues that are raised by the simple availability of a great deal of new knowledge about the genotype of people, regardless of whether or not that information is accompanied by any significant new power to affect the possible outcomes of particular genotypes. Other problems, however, would emerge from the availability of any significant new power to alter genotypes or the outcome of particular genotypes. To further illustrate this dichotomy, let us consider the possibility of new genetic information concerning an individual’s probable increased risk of dying of some very deadly form of cancer, such as neuroblastoma glioma. There are ethical, legal, and social problems concerning the use of such knowledge. These problems arise regardless of whether or not there is anything more that a high-risk individual can do beyond current measures, such as monitoring, surgery, and chemotherapy, which are currently largely ineffective to reduce the risk significantly. However, if gene therapy for the particular high risk of neuroblastoma genotype becomes possible, then different issues concerning access and use of that power arise. In both the informational and power categories even more difficult problems arise concerning other possible genotypic information beyond disease susceptibility, such as genotypic information about factors related to intelligence or skills, such as mathematical or musical ability.

The information problems need to be solved before the power questions need to be answered because genotypic information is accumulating rapidly, while the power to affect significantly the

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6. Genotype refers to the “complete genetic composition of an organism, while its phenotype is the physical expression of that genotype.” Watson et al., supra note 3, at 7. For example, a person with a particular genotype may be identifiable at the phenotypic level by blue eyes, or by extreme height, while other genotypic variations cannot be easily detected at the phenotypic level.

7. Robert Pear, Rules on Privacy of Patient Data Stir Hot Debate, N.Y. TIMES, Oct. 30, 1999, at A1 (“Scientists have developed more than 450 genetic tests that may help identify people with an increased risk of developing breast cancer, prostate cancer, cystic fibrosis and other diseases.”).
genotype is moving slowly. As a result of the rapid growth of information about the relationships between a large number of genes and potential disease, a great deal of public attention has already been given to the question of how access to such information should be controlled and the circumstances under which such genetic testing could be required by third parties, such as employers or insurers. Because these informational issues have received a great deal of attention, a widespread consensus now supports protecting the absolute right of persons to control the information provided by any genetic testing they might choose to undergo and also prohibiting the use by employers of any genetic tests or genetic information concerning their employees. That consensus is reflected in an Executive order signed by President

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8. Nicholas Wade, writing for the *New York Times*, stated:
Gene therapy, a technique long on promise and so far very short on fulfillment, may be achieving a glimmering of success in a treatment for hemophilia B, a disease in which the blood does not clot properly.

The idea of gene therapy is to treat diseases that are the result of a defective gene by inserting the correct form of the gene into a patient’s cells. If the technique worked, it could be a powerful remedy for many diseases that are hard to treat. But despite 20 years of effort and some 200 current trials, the Food and Drug Administration has yet to approve any form of gene therapy.


10. See, e.g., Wendy R. Uhlmann, *When Genes Are Decoded, Who Should See the Results?: Every One of Us Is at Risk*, N.Y. TIMES, Feb. 29, 2000, at F7 (praising President Clinton’s Executive order banning federal agencies from using genetic information in decisions to hire, promote, or dismiss employees); see also Mark A. Rothstein, *Genetics and the Workforce of the Next Hundred Years*, 2000 Colum. Bus. L. Rev. 371, 392–95 (2000) (stating that the issue is part of a broad conflict between paternalistic and autonomy driven strands of employment law, and suggesting that the proper resolution is in favor of autonomy and worker choice as to whether or not to be tested and whether or not to accept the risks of employment). *But see* Richard A. Epstein, *The Legal Regulation of Genetic Discrimination: Old Responses to New Technology*, 74 B.U. L. Rev. 1, (1994) (arguing vigorously that a free market approach to genetic testing based on libertarian and economic efficiency rationales is appropriate); Mark A. Hall, *When Genes Are Decoded, Who Should See the Results?: Many ‘Greatly Overestimate the Risk’*, N.Y. TIMES, Feb. 29, 2000, at F7 (asserting that companies are unlikely to use genetic tests even if they are permitted to do so). Interestingly, Professor Epstein does briefly refer to John Rawls, using Rawls as representative of the modern view that inequalities due to luck should be offset by social action:

The position of John Rawls that certain attributes are morally arbitrary surely carries over to the situation of genetic differences. Many people do not believe that individuals own their talents and abilities. Still more people believe that they should not be burdened with bad luck in the genetic draw. When differences in luck are attributable solely to external circumstances, this modern view holds that something ought to be done to rectify the situation. That is, we must equalize the positions of various individuals or groups, even if it means (as it always does) that property, wealth, and opportunities must be taken from one group of people and given to another.

Epstein, *supra*, at 4 & n.15 (citing JOHN R. RAWLS, A THEORY OF JUSTICE 506–12 (1971)).
Clinton that prohibits discrimination in federal employment based on genetic information and prevents federal employers from requesting, requiring, or collecting genetic information about federal employees.11

The purpose of this Essay is to build a case for the viewpoint that, with appropriate limits and safeguards, it is appropriate to exclude individuals from some employment opportunities if they are known to have genetic factors that predispose them to diseases that would render them abnormally sensitive to the dangers of that workplace.12

I defend the use of genetic information in decisionmaking about exposure to workplace toxins on the basis of fairness, particularly as that concept has been developed in John Rawls’s A Theory of Justice.13 I do so in part to demonstrate that the solution of difficult social problems14 requires the use of a coherent jurisprudential or philosophical framework.

In reflecting on the particular problem of genetic discrimination, it appears that the problem is one that is best resolved by recourse to the philosophical framework of John Rawls. A Rawlsian approach to the problem is the most useful both because of the inherent power and value of Rawls’s philosophy and because his device of the “veil of ignorance”15 parallels our current social circumstance of being on the

11. Exec. Order No. 13,145, 3 C.F.R. 235 (2000). The principal exception to the absolute ban on genetic testing is to allow for such testing to be used to determine whether or not an employee had suffered genetic damage as a result of exposure to workplace radiation or toxic substances. Id. The consensus against genetic discrimination may also be seen in the growing number of state statutes that also prohibit the use of genetic information. See, e.g., CONN. GEN. STAT. § 46a-60(a)(11) (2001); ME. REV. STAT. ANN. tit. 5, § 19302 (West 2002); WIS. STAT. ANN. § 111.39 (West 1997 & Supp. 2001).

12. A rather similar argument to that made here could also be used to argue for the exclusion of some persons from some occupations on the basis of a genetic predisposition to disease which would render them abnormally dangerous to others were they to be given particular employment responsibilities. For instance, an abnormally high risk of sudden death or seizure might disqualify one from serving as an airline pilot. Although that argument is not made here, it would follow much the same logic. What is not intended to be implied here is the extent to which fairness or justice requires that the norms for other contexts that cannot be easily avoided, such as general air pollution, must be adjusted to protect the genetically least advantaged. I hope to explore that issue in a subsequent article.

13. RAWLS, supra note 1.

14. That is, the delimitation of appropriate choices in circumstances that present difficulties and trade-offs. For further commentary on making appropriate choices under such circumstances, see Nouryan & Weisel, supra note 1, and RAWLS, supra note 1. In the present case, competing values of privacy, efficiency, and autonomy are at issue in the use of genetic information in the workplace.

15. RAWLS, supra note 1, at 11.
cusp of the era of vast amounts of new genetic information. In an important sense, we stand behind a veil of genetic ignorance, attempting to decide the rules that should govern us after that veil is soon lifted. In brief, the notion developed here is that genetic disadvantage, at least insofar as it refers to latent hypersusceptibility to the ill effects of workplace toxins, is very much the kind of difference between individuals that, under a Rawlsian analysis of justice and fairness, should be subject to an arrangement that would increase aggregate social well-being by excluding the genetically most susceptible while compensating them for their lost opportunities.\footnote{16}

Part II of this Essay provides a very brief introduction to the Rawlsian concept of justice upon which this argument is based. Part II distinguishes this Rawlsian argument from any attempt to ground an argument for genetic discrimination in existing law, such as the Americans with Disabilities Act (ADA).\footnote{17} In Part III, I use Rawls’s framework to analyze a hypothetical scenario in which a newly developed genetic test would permit the identification of a subpopulation of individuals who are at a much higher risk of developing cancer in a particular industrial workplace. The analysis in Part III leads to the conclusion that the correct choice in that scenario is a system in which employers can test and exclude by contributing to a compensation fund that would benefit those excluded, which I will refer to as pay-to-exclude. Finally, Part IV attempts to describe briefly the basic outlines

\footnote{16. It is important to note that I use the word “opportunity” here in its ordinary economic sense, rather than in the context of Rawls’s carefully defined “fair equality of opportunity,” as part of the two principles of justice. \textit{See Rawls, supra note 1, at 53.} What must also be clearly understood is that the rights to particular jobs are not basic liberties as Rawls defined them, and that Rawls explicitly allowed inequalities in wealth (and presumably access to particular jobs) so long as the inequality “is to everyone’s advantage.” \textit{Id. at 54.} In this sense, equality of opportunity no more requires that a hypersensitive person be entitled to a job that puts her at extraordinary risk than I have the right to start as a linebacker for the San Diego Chargers, engendering even greater risks to my well-being. We are both genetically unsuited for positions we might otherwise desire. However, I would argue that my lack of talent, which at least thirty years ago was in no small measure due to my genes for size and fast-twitch muscle fiber, requires no compensation for my limitation, whereas I believe genetic susceptibility to a workplace toxin is the sort of disadvantage that requires special concern from a Rawlsian perspective. The distinction between these two types of genetic disadvantage derives from the difference between the existence of unique positions to which only a fortunate few are suitably talented and the existence of more common positions from which only an unfortunate few are excluded. If particular positions, such as a member of a professional football team or a position as a chaired professor of physics at California Institute of Technology, require unusual talent, our sense of fairness is not aroused by the fact that the great majority of people do not have the ability required. Rawls is more concerned with the plight of the least advantaged. \textit{See Rawls, supra note 1, at 136 (explaining that within his system of justice “we are to maximize (subject to the usual constraints) the prospects of the least advantaged”).}}\footnote{17. \textit{42 U.S.C. §§ 12101–12213 (1994 & Supp. II 1996).}}
of the pay-to-exclude system and demonstrate the way in which it addresses some of the foreseeable issues and objections to such a system.

II. A BRIEF INTRODUCTION TO RAWLS’S THEORY OF JUSTICE

John Rawls’s *A Theory of Justice* is widely considered to be one of the most important contributions to the literature of law and philosophy written in the twentieth century. Rawls’s stated objective in *A Theory of Justice* was to explore the meaning of justice from within the contractarian tradition of Locke and Rousseau and with an essentially Kantian orientation towards the primacy of individual rights over utilitarian-derived norms. To anchor his contractarian exploration of justice, Rawls used the device of the original position, which he likened to the state of nature conceptions of his philosophical forebears. However, Rawls added to the original position the constraints of the veil of ignorance.

A brief exposition of these related concepts should suffice for purposes of this Essay. First, Rawls assumed that a society and the social institutions which comprise it would be fair or just if the rules governing that society were those that would be freely chosen by persons entering into the society as autonomous, self-interested individuals with equal rights to determine the rules. This presocietal negotiation is the original position. Second, Rawls assumed that in order to insure the true fairness of the rules that would be selected, the parties in the original position must bargain without knowledge of the strengths, talents, weaknesses, and disabilities they would actually possess once they left the original position and entered into the society whose rules they had chosen. This absence of individual knowledge is the veil of ignorance. Thus, the individuals are self-interested in a very particular way; they would bargain for rules that would benefit themselves regardless of their actual lot in life. Thus an individual

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19. A rough measure of its impact can certainly be seen in the frequency with which it is cited. First published in 1971, a search of the law review database in LEXIS revealed close to 500 articles citing *A Theory of Justice* in the two-year period ending April 25, 2000.
20. Rawls, supra note 1, at 11.
21. Id.
considering the possibility that she might be gifted with intelligence, leadership, and health would bargain for rules governing society that would reward persons so blessed. However, at the same time, mindful of the possibility that she might be of below average intelligence, socially inept, and afflicted by significant physical disability, she would also bargain for rules that minimized the impact of those shortcomings on her welfare to the greatest possible extent. The fundamental principle that accommodates both the reward for talents and the minimization of disadvantage is Rawls's “difference principle.” The difference principle requires that the more talented are rewarded only to the extent necessary to induce them to exercise their talents fully, in order to create an overall structure that works to minimize the disadvantage and maximize the welfare of the least-well-off or most disadvantaged members of society.

The present problem is one that is remarkably amenable to examination through a Rawlsian lens. The conceptual starting point of Rawls's A Theory of Justice, the original position accompanied by the veil of ignorance, has been criticized as resting on a very artificial and unworkable device. That criticism might be least well-founded in the present context. With most of the information from the HGP still to be deciphered, we are, perhaps, as close to being in the original position and truly behind the veil as we can ever be. We are already beginning to discover numerous genetic variations that are associated with increased risks of cancer. We will undoubtedly be discovering many more in the next decade. Furthermore, we will begin to understand a great deal more about the nature of the risk posed by particular variations, both with respect to the absolute magnitude of such risks and also as to particular environmental events that interact with particular variant genes and gene products to increase the risks of those variant genes. We can set the

22. Id. at 65–68.
23. Id. at 68.
25. In presenting the main thesis of this Essay at a symposium attended by Dr. Francis Collins, Director of the National Human Genome Research Institute, the question of the hypersensitivity gene assumption was the subject of considerable discussion with Dr. Collins, both during the symposium and during a private discussion during lunch. Symposium, Genes and the Just Society, University of San Diego School of Law (Jan. 29, 2000). Dr. Collins's believed the current data showed environmental carcinogenicity to be largely “stochastic,” that is, a matter of random probability. Such a stochastic model would arise so long as most environmental carcinogens are DNA damaging in a nonselective manner, that is, they damage DNA but do so without preference for interacting with or damaging any particular stretch of DNA. These
rules for the postgenome society while still behind the veil, largely ignorant of our actual lot in the postgenomic order.

It is important to note that this argument is not an attempt to determine the application or significance of existing laws for the problem of employer testing for employee susceptibility to workplace toxins, interesting though that exercise might be. For example, whether the ADA prohibits employers from discriminating on the basis of genetic information is currently an unanswered question.\textsuperscript{26} Although the Equal Employment Opportunity Commission (EEOC) has taken the position

nonselective DNA damaging molecules will generally not cause any damage at all, because they will likely damage the non coding majority of DNA in a cell or do minimal damage, because they are damaging the DNA of a nondividing cell or only one copy of a gene where the remaining copy is sufficient. Thus, for such nonselective agents, the low incidence of cancers produced relates not to individual differences in sensitivity, but to mere chance, given a low probability event in any one exposed individual. Dr. Collins’s point, however correct it may be for the large percentage of cases, does not address the issue of what to do in those cases where selective carcinogens can be identified.

Further research on the carcinogen used as an example in this Essay reveals that there is a growing body of evidence that supports the proposition that there are, in fact, particular genotypes that result in significantly elevated risk from exposure to benzene. See Richard A. Larson et al., Prevalence of the Inactivating $^{609}C\rightarrow T$ Polymorphism in the NAD(P)H:Quinone Oxidoreductase (NQO1) Gene in Patients with Primary and Therapy-Related Myeloid Leukemia, 94 BLOOD: J. AM. SOC’Y HEMATOLOGY 803, 806 (1999) (concluding that persons with a particular NQO1 genotype may be particularly vulnerable to the leukemogenic effects of particular carcinogens); Martyn T. Smith, Benzene, NQO1, and Genetic Susceptibility to Cancer, 96 PNAS 7624,7624–25 (1999) (explaining benzene’s carcinogenic effect on DNA and its role in genetic susceptibility to cancer).

\textsuperscript{26} Paul Steven Miller, Is There a Pink Slip in My Genes? Genetic Discrimination in the Workplace, 3 J. HEALTH CARE L. & POL’Y 225, 239 (2000). Mr. Miller, who was Commissioner of the EEOC, stated that:

[C]ourts have still not determined whether the ADA should be understood to restrict discrimination on the basis of a diagnosed, but asymptomatic, genetic condition or trait.

In 1995, the U.S. Equal Employment Opportunity Commission (EEOC) adopted policy guidance stating that the ADA prohibits discrimination against workers based on their genetic makeup. This policy guidance explicitly states that the third part of the definition of disability, the “regarded as” prong, covers individuals who are subjected to discrimination on the basis of a genetic predisposition to illness, disease, or other disorder, even if the disability has not yet manifested.

Id. (citations omitted). Mr. Miller and the EEOC were referring to genetic predispositions that are not necessarily altered by the particular workplace environment. The question of whether the ADA covers workplace discrimination on the basis of genetic predispositions that are adversely affected by the particular workplace environment is a different issue. See discussion \textit{infra} note 28.
that genetic discrimination is a violation of the ADA. It has also issued a regulation that allows employers to discriminate against individuals whose employment would pose a direct threat to their own health. However, the question dealt with in this Essay is whether an ideal Rawlsian law would permit employer discrimination against hypersusceptible individuals, not whether such discrimination is permitted under current law.

III. A HYPOTHETICAL SCENARIO FOR GENETIC DISCRIMINATION

Genetic variations will likely be found that increase the risks, in particular environments, of a variety of different disease types, including cardiovascular disease and central nervous system diseases such as Parkinson’s disease and Multiple Sclerosis. However, for purposes of simplifying the discussion, I will address only the hypothetical risk of a particularly intractable and fatal form of brain cancer, glioblastoma. I also assume for this discussion that in the future a particular genetic variation will be found to be associated with a greatly increased risk of that disease particularly after exposure to even very small amounts of a particular workplace toxin, such as benzene.

27. Miller, supra note 26, at 239.
28. 29 C.F.R. § 1630.15(b)(2) (2001). In *Chevron USA, Inc. v. Echazabal*, No. 00-1406, 2002 U.S. LEXIS 4202, at *1 (June 10, 2002) the Supreme Court unanimously upheld the EEOC’s position that the ADA permitted employers to discriminate against at risk employees in order to avoid a direct threat to the individual’s health. Chevron had refused to hire an applicant with liver damage due to Hepatitis C for a position in a refinery, where he would be exposed to chemical levels that Chevron’s doctors asserted would aggravate his liver disease. *Id.* at *7*. The *Chevron* Court’s ruling that employers could discriminate against employees to protect them from direct threats to their own health was not made in the context of a threat that was identified on the basis of genetic testing. However, it could be argued as generally supportive of the position here. It would be hard to identify an ethical principle that would justify discrimination to protect workers or job applicants against all risks to health other than those that arose from their genetic susceptibility. The Supreme Court’s opinion in *Chevron* resolved the prior conflict between the circuit courts on the issue of discrimination against at risk employees. *Compare* *Echazabal v. Chevron USA, Inc.*, 213 F.3d 1098, 1108 (9th Cir. 2000) (ruling in favor of job applicant Echazabal and against the EEOC’s position), *with* *Moses v. Am. Nonwovens, Inc.*, 97 F.3d. 446, 447–48 (11th Cir. 1996) (permitting discrimination against an epileptic worker whose contact with dangerous machinery would have posed a direct risk to his own health).

29. I have chosen benzene as the toxic substance for this discussion because the regulatory history of OSHA’s attempt to set stringent standards for workplace exposures to benzene provides a rather rich factual context for discussions of workplace toxic exposures. *See* Indus. Union Dep’t v. Am. Petroleum Inst., 448 U.S. 607, 652–53 (1980) (holding that just because benzene is a carcinogen, OSHA may not presume that the prior standard posed an unreasonable risk to worker health and set the acceptable exposure level at the lowest level feasible); *see also* Larson et al., *supra* note 25, at 806 (concluding that persons with a particular NQO1 genotype may be particularly vulnerable to the leukemogenic effects of particular carcinogens); Smith, *supra* note 25,
Benzene is a known carcinogen, or cancer-causing substance. Benzene-induced cancers can result from exposure to air containing low concentrations of benzene. In the protracted litigation over the attempt by the Occupational Safety and Health Administration (OSHA) to set very stringent standards for exposure to benzene in workplace air, the focus was primarily on benzene’s known linkage to leukemia. Although we are assuming a future discovery of a linkage between benzene exposure and the risk of glioblastoma for persons with a particular genotype, a bit of discussion about the known risks of benzene would be helpful. The industry affected by OSHA’s proposed benzene standard disagreed with OSHA’s risk assessment that benzene was carcinogenic at the then-prevailing standard of ten parts per million (p.p.m.). For our purposes it is important to understand that, even if OSHA was correct in assuming that the risk was several times greater than normal at ten p.p.m., the risk may not have been evenly distributed across the exposed population. We know that individual susceptibilities to toxic exposures can vary, in the same way that some people can smoke for many years without developing lung cancer while others will develop lung cancer after having smoked cigarettes for a much shorter period of time. What we do not yet know, but are likely soon to begin understanding, is the biochemical and genetic basis for some of the variation in such susceptibilities. It may indeed prove to be the case for benzene that a risk of, for example, fifty additional cases of cancer per million exposed persons is not a fifty per million risk that is borne by each of any million exposed persons. Rather than being equally distributed, it may be a much less than one in a million risk for 990,000 of those million exposed persons and a far higher risk for the remaining one percent or less of the exposed population. That is to say, virtually all of the additional cases of cancer from exposure to low levels of benzene or some other carcinogen may arise in a relatively small subgroup that is genotypically distinct and at a relatively high risk of exposures that are likely to present a trivial risk to persons with more common genotypes.

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at 7624–25 (discussing NQO1’s hypothesized ability to protect against benzene toxicity and benzene induced leukemia).

32. Id.
With that as a prologue, we convene our discussion from behind the veil of genotypic ignorance of how best to deal with our soon to be laid bare susceptibility to benzene. Let us assume that none of us know our genotype in that regard and that a particular genotype has been discovered to create a one percent risk of glioblastoma, even at the prevailing OSHA workplace standard of one p.p.m.\textsuperscript{33} Furthermore, we may assume that the risk has never been detected epidemiologically because the particular genotypic variant is believed to be extremely uncommon, for example, occurring only in one of every 1000 people. Thus, a million people exposed at those levels, which is probably three times the actual benzene-exposed workforce, would include one thousand susceptible individuals and would generate an additional ten cases of glioblastoma. Because the actual exposed workforce is about one third of that, the additional three cases of glioblastoma that would actually occur in the approximately 330 genotypically sensitive persons in an exposed population of 350,000 would be virtually impossible to detect epidemiologically. Let us also assume that the other 349,670 genotypically more fortunate persons in the exposed population would be at no measurable increased risk of glioblastoma, even after a lifetime of exposure at one p.p.m.

A one percent risk of glioblastoma is a very serious risk indeed. It is a risk of a particularly virulent and implacable cancer that, over the course of twelve months, inflicts increasingly terrible suffering and pain on its victims before they die. It is a fate that no rational person would choose, and a one percent risk of such a fate, if it easily could be avoided, would almost certainly be avoided by any rational person. Of course, the key word is \textit{easily}. A rational person might accept a one percent risk of glioblastoma if virtually all gainful employment carried with it such a risk and if the alternative to the one percent risk of glioblastoma was a far greater risk of being totally without the means of basic support, with concomitant misery, suffering, and starvation for one’s self and one’s family. However, it is precisely to bargain over the ramifications of newly discovered genetic susceptibilities such as this that we must retreat behind the veil of ignorance.\textsuperscript{34}

\textsuperscript{33} Occupational Safety and Health Standards, 29 C.F.R. § 1910.1028(c) (2001).

\textsuperscript{34} In \textit{From Chance to Choice: Genetics and Justice}, the authors noted the troubling possibility that upon lifting the veil the genetically advantaged will “form their own risk pools, making their industries more efficient at the expense of justice.” ALLEN BUCHANAN ET AL., \textit{FROM CHANCE TO CHOICE: GENETICS AND JUSTICE} 58 (2000). This Essay argues that this undesirable outcome of genetic knowledge would be avoided under this proposal and that the ex-ante commitment to the genetically disadvantaged embodies the principles of justice to which the authors required commitment. \textit{Id.} at 58–59.
So, we know nothing of our actual genotype for this particular purpose.\textsuperscript{35} We do know that in the real world some greatly heightened susceptibilities to some workplace toxins are likely to be discovered. Our scenario is also one in which the greatly heightened susceptibility affects a relatively small percentage of the overall population that is thereby at a much greater risk of a serious disease. Assuming a normal distribution of sensitivities, those persons who are several standard deviations above the mean, in terms of increased risk at a given exposure level, will be a very small percentage of the overall population. Our scenario is based on the assumption that some such highly skewed risk distributions will ultimately be identified and attributed to particular genetic variations. We can also assume, in crafting our bargain, that for benzene, as for many such toxins, it would impose enormous incremental costs to lower the exposure levels to a level safe for this subset of most sensitive individuals, rather than maintaining a level that is merely safe for persons within the ordinary range of sensitivity.\textsuperscript{36}

What are our possible choices? First, we could insist that all workplace environments spend whatever is necessary to make their environments reasonably safe for the individuals who are most genetically susceptible to that environment or, if unwilling or unable to do so, shut down.\textsuperscript{37} I

\textsuperscript{35} Of course, someone with a close relative who has died of glioblastoma or some other family history of cancer might suspect something about their genotype, but for purposes of this discussion I will assume that such suspicions do not affect the bargaining.

\textsuperscript{36} If there are cases in which there is minimal additional expense necessary to clean up the environment to the level safe for the most sensitive, we might well want to treat those cases as different in kind and subject to different rules from those cases in which the expense is great and the numbers affected few. For purposes of this Essay, I limit my argument to the cases in which the savings in cleanup costs is clearly enough to allow the employer to pay the required fee into the central compensation fund. In fact, any substantial compensation requirement acts as its own self-regulating mechanism on employer behavior—an employer who chooses to test and discriminate would do so only when the savings warrant such a course. See infra Part IV.

\textsuperscript{37} This is substantially the position taken by Elaine Draper in her article, The Screening of America: The Social and Legal Framework of Employers’ Use of Genetic Information:

If risk is conceptualized in terms of the personal habits or biology of individuals, it naturally appears beneficial to develop screening programs to identify people who take drugs or have genetic characteristics that may present a health hazard on the job. But if employers want to provide a safe workplace, they should tighten engineering controls, monitor exposure hazards, replace hazardous products, and collect scientific information on risks to populations; only such efforts can reveal whether working conditions are indeed safe. Priorities in health policy should be redirected toward reducing risk without
think that the Rawlsian bargainers would not require such an absolutist approach because of its obvious impact on the overall welfare of the group.\footnote{This is a basic postulate of Rawls, where he argued that differences in the distribution of goods are tolerable so long as they work to the advantage of all, including the least advantaged. See \textit{Rawls}, supra note 1, at 13 (“\textit{I}nequalities in wealth and authority are just only if they result in compensating benefits for everyone, and in particular for the least advantaged members of society.
”). The application of this principle in the context of this Essay is that, so long as the savings from the reduced requirements of workplace toxics control systems are adequate to compensate the genetically susceptible, such a system is fair.}

Second, we could simply require that workplace environments be made reasonably safe for persons of ordinary sensitivity and prohibit those workplaces from using tests of genetic sensitivity to exclude those persons who would face a significant risk of glioblastoma at the levels that are reasonably safe for persons of ordinary sensitivity. Under this alternative, we would only prohibit employers from gaining and using such knowledge; workers or applicants for employment would be free to self-test and to make their own decisions as to whether to accept the risks associated with employment. The potential employees would then divide up into at least three groups, the risk ostriches who simply do not want to know of their susceptibility, the risk averse who test and self-exclude if at risk, and the risk takers who test and ignore the risk.

The question of whether risk ostriches and risk-prone individuals that take jobs despite knowing or avoiding knowledge of their genetic susceptibility should be allowed to recover in tort or workers’ compensation for their resulting injuries is beyond the scope of this Essay. However, the question of whether persons who are behind the veil would bargain for a freedom of choice for risk ostriches and risk-taking individuals is a very interesting question that comes close to the heart of Rawls’s system.\footnote{Richard Schmalbeck notes that Rawls implicitly assumed that there are extremely risk-averse individuals who act only to maximize their own income because of their concern for the possibility that they will be at the very, very bottom of the actual distribution of social goods. \textit{Richard Schmalbeck, The Justice of Economics: An Analysis of Wealth Maximization as a Normative Goal}, 83 \textit{Columbia L. Rev.} 488, 512–13 (1983). “Rawls is at one extreme, implicitly assuming complete risk aversion.” \textit{Id.} at 513 (reviewing Richard A. Posner, \textit{The Economics of Justice} (1981)).} While from behind the veil, individuals
might conceivably wish to bargain for the right to be risk takers in the postoriginal position real world, their actual inclination to do so must take into account the impact of such freedoms on others, particularly those whose lot will be made significantly worse by such a freedom, such as minor children. What is at issue is the bargainers’ position on the ex-ante possibilities of either being a genetically susceptible but non-risk-averse individual (risk ostrich or risk-taking) or a surviving dependent or loved one of such an individual. Bargaining for freedom under such circumstances is bargaining for the acceptability of such avoidable losses and the costs that they impose on others. Because for every non-risk-averse individual that incurs an avoidable loss there is likely to be more than one aggrieved loved one, I think the rational bargainers would determine that their self-interest actually provides a sufficient incentive to limit their future freedom to inflict avoidable losses on others. Under Rawls’s difference principle, the infliction of avoidable losses on those disadvantaged by the freedom to choose would point us toward limiting the freedom to choose risk if reasonable compensation for the loss of opportunity were provided.

Third, we could agree that employers would have the right to test individuals to determine their sensitivity and exclude those that were determined to be at greatest risk, so long as the employers had contributed to a centrally administered compensation fund a percentage of the savings from the more lenient exposure limits. Persons excluded from a workplace by virtue of their genetic susceptibility would be compensated by the centrally administered fund for their loss of opportunity.40

40. The authors of From Chance to Choice: Genetics and Justice state: [T]his reconciliation of equality with liberty and efficiency takes place through the choice of principles that deliberators would make in the Original Position . . . . . In the general case, it may be better for deliberators, even for those who anticipate they may turn out to be worse off with regard to marketable talents and skills, to mitigate the effects of inequalities by redistributions of other important goods than to insist on what may turn out to be a highly inefficient “equalizing” of the distribution of natural talents and skills (or even a more modest elimination of obviously disadvantaging traits). . . . The Difference Principle, which allows inequalities only if they maximally benefit the worst off, provides maximal mitigation of the consequences of the natural lottery, at least in the general case. . . . Rawls assumes that deliberators in his Original Position would make just such a reconciliation of competing concerns, requiring that the system as a whole can be made to work to the advantage even of those worst off . . . .
Fourth, we could allow employers to test and exclude sensitive individuals, but not require any payment by the employers or compensation of the excluded persons.

It could be argued that the choice between the third and fourth options should, in some cases, depend on the breadth of the disability that a particular sensitivity poses.\textsuperscript{41} We might agree, from behind the veil, that persons who are ultra sensitive to a substance that is found only in a relatively small number of workplace environments have suffered such a small loss of opportunity that it would not be worth the costs of administering a compensation system to provide appropriate compensation for that minor injury. In Part IV, I will argue that the need to contribute to a pay-to-exclude compensation system is an important systemic safeguard against any abuse of the right to discriminate and, therefore, must be assured in all cases.

On the other hand, we would all presumably agree that persons abnormally sensitive to a substance commonly present in a great many workplaces, at levels injurious only to the abnormally sensitive, may suffer such substantial loss of life opportunities that compensation for their losses, from the efficiency gains of the more fortunate, is required by fairness and justifies the administrative expense of the compensation scheme. Despite the fact that we are more likely to be among the genetically normal compensators rather than the genetically sensitive compensated, the difference principle clearly requires compensation when the few sacrifice opportunity, albeit in part because of “brute luck,”\textsuperscript{42} for the benefit of the many.

\section*{IV. THE OUTLINES OF A PAY-TO-EXCLUDE COMPENSATION SYSTEM FOR WORKPLACE GENETIC DISCRIMINATION}

I have argued, up to this point, that the bargainers behind the Rawlsian veil of ignorance would agree to allow employers to test employment

\textsuperscript{41} But cf. Draper, \textit{supra} note 37, at 313–14 (arguing that workplaces should be made safe for the genetically sensitive rather than removing them from exposure to the potential harm). Draper’s argument appears to be premised on the assumption that such reductions in workplace risk could be made at reasonable cost. This Essay assumes that by attaching a compensation cost to discrimination against the genetically sensitive, rational employers would prefer to make changes in the workplace to reduce exposure where doing so would be cost-effective.

applicants or employees for genetically determined hypersensitivity to workplace toxins. I have also argued that it would be permissible to exclude from the workplace those who are found to be at significant risk of death or serious bodily harm at levels of exposure that would pose little risk to the nonhypersensitive individuals. The right of an employer to test and exclude is predicated on the excluded individuals’ compensation for their lost employment opportunity, from a fund to which the employer must contribute. The appropriate level of compensation and the corollary level of employer contribution are essential to the fairness of the system from a Rawlsian perspective.

While on strictly utilitarian grounds such compensation might not be necessary, as the elimination of the unusually high risk of death would provide a net benefit, Rawls quite clearly rejects the utilitarian analysis. Instead, he argues that the bargainers in the original position would not agree to allow arrangements in which the well-being of the least advantaged would be simply sacrificed for the greater net good to others. In order to satisfy the principles of equality and respect that are central to *A Theory of Justice*, Rawls required that arrangements work to the benefit of the least advantaged. Under the “maximin principle,” Rawls required a choice of that alternative which provides the best result for the least advantaged (maximizing the minimum), even if the total value of all the possible outcomes under that alternative is less than that of other alternatives.43

If Rawls made the question of whether to require payment an easy one, he also provided a rough guide as to how to calculate compensation. The starting point is the savings that are generated by not modifying the workplace to accommodate the health risk posed to the most genetically susceptible individuals. Rawls would require that the bulk of those savings be devoted to the needs of the least-well-off, who in our case are the excluded, hypersensitive individuals. This requires a reasonable payment to an individual, even when the actual damages may be minimal because the lost opportunity is of minimal impact on the individual’s economic prospects.44 This requirement of a minimum payment might be one year’s wages in the particular job sought, for instance.

43. *Rawls, supra* note 1, at 133–37.

44. The economic impact would be minimal if the sensitivity is to a substance not found in most workplace environments and where the individual can very likely find other work at comparable pay.
The minimum payment requirement serves at least several purposes. First, it discourages employers from using genetic testing to exclude individuals when the costs of reducing the exposure levels would be relatively low. Second, it discourages reliance on tests of questionable value. Third, it encourages employers to reduce exposure to relatively rare toxins. If an employer’s workplace presents a rarely encountered toxin (thereby generating the minimum lost opportunity and the minimum compensation requirement) that would affect a more common genotype (producing a relatively large number of persons who would be excluded), then the costs of compensation even at the minimum quickly mount to the point where the employer must either find an alternative means of production or of toxic exposure control.

What if neither alternative is feasible? Let us assume that a particular workplace contains a rare toxin, but one that may affect a relatively common genotype (say twenty percent of the general population) by giving rise to a substantial risk of a serious disease such as glioblastoma (let us assume one percent, as in the case of our benzene and glioblastoma example). If no means of eliminating the exposure can be found, and the marketplace for the good and its substitutes cannot bear the cost of providing one out of five job applicants with a full year’s wage, then, under Rawls’s pay-to-exclude system, may the employer provide the applicants with the choice to take the risk with the assurance of full compensation for any resulting injury?\footnote{Note that full compensation for actual injuries many years later, discounted by the probability of actual injury, is only likely to be cheaper than paying (and excluding) each of the at-risk workers one percent of a full ex-post award because of the time value of money. Due to the time period between onset of exposure and disease, it is much cheaper to face a twenty percent risk of a full award in thirty years than to pay twenty at-risk workers one percent of an award today.} The ex-ante argument against allowing risk-prone individuals to take unreasonable risks, from behind the veil, depended on the costs imposed on secondarily affected persons.\footnote{See supra note 39 and accompanying text.} Would the bargainers behind the veil permit risk-taking under this variant scenario where full compensation is assured? It is difficult to argue that a compensation scheme for injuries incurred would cause the original position bargainers to accept risk-taking behavior simply to benefit marginally competitive enterprises, being those that cannot impose a sufficient price increase to cover the costs of ex-ante compensation. This is particularly true where, as here, the rarity of the particular toxin is evidence that the affected persons will have other adequate opportunities for gainful employment. Thus, the conclusion of the pay-to-exclude system, with its minimum payment requirement, is that a workplace that cannot bear the costs of the minimum ex-ante
payments, or workplace modifications that make payment superfluous, would be forced out of business. 47

The calculation of the maximum percentage to be contributed to the central fund becomes somewhat more complex. A formula for such calculations should primarily reflect the magnitude of the aggregate lost opportunity to an affected individual as well as the savings engendered by the exclusion. The magnitude of the aggregate lost opportunity to any individual might be significantly affected by the extent to which that person is excluded from a significant percentage of workplaces. An unskilled laborer in south Texas might find that exclusion from working in the petroleum exploration and processing industries reduces her probable lifetime income by thirty to forty percent. If the average industrial worker today is earning $35,000 per year and has a working life expectancy of forty years, that loss of opportunity 48 would be thirty to forty percent of $1.4 million, discounted to present value and adjusted upward for future inflation. The difficult question for the central compensation fund’s administrators would be how to calculate the impact on lifetime income that particular workers would suffer by exclusion from a substantial percentage, for example, ten percent of industrial workplaces. While we have set one year’s wages as a floor, it may be that the wages for alternative employment choices for most affected workers would result in no real lifetime income diminution. This may mean that the minimum payment would be sufficient in almost all cases.

Two other features of the centrally administered fund would also be necessary. First, an affected worker would get one payment for any particular genetic susceptibility. There would be no point in having an

47. Note that this result is only true where the substitutes for the particular product are sufficiently competitive that the price cannot be raised to cover the minimum payment requirements, that is, where the demand for the good is relatively elastic. If, for example, the product in question were a terribly critical pharmaceutical, then the cost of the product would in fact rise to include the social cost of the genetic discrimination involved in its production.

48. The loss of opportunity for our purposes will virtually never be total because there will always be occupations available in nonindustrial settings, albeit at a potentially lower wage for unskilled workers. Total loss of opportunity, which would occur when an individual is hypersensitive to a substance found at otherwise reasonably safe levels in virtually all workplaces, should be a very rare occurrence because the sensitivity must be to an essentially ubiquitous toxin, and the individual must not be suitable for employment in nonindustrial settings that do not contain the toxin. If the toxin is in fact found everywhere, then the problem is not one of workplace risk, and it is beyond the scope of this Essay. See supra note 12.
affected worker travel from one petroleum plant to another collecting multiple payments for the same sensitivity.49 Second, the centralized fund is then in the position of being able to make the sort of actuarial adjustments to payments that an individual employer might find difficult. These adjustments would reflect the centralized fund’s ability to monitor the sorts of testing being done, the results of those tests, the changing distribution of risks over time, and the percentage of workplaces that contain and test for particular toxins.

The requirement that an employer pay a significant amount of the savings that are produced when genetic testing and exclusion of the most sensitive allows a safe workplace at lower cost serves an additional important function—it provides a significant safeguard against employers using ill-founded or suspect genetic tests. Because the employer will be required to pay a significant amount into a centralized compensation fund for each excluded worker, employers will be loath to test unless they believe the tests are accurate and the savings are substantial. A test that is over inclusive would be very costly and much less attractive to employers. The substantial payment requirement should result in employers making much more realistic decisions about the cost of workplace toxins and the value of genetic testing, while generating incentives for cheaper and more effective ways to eliminate or reduce workplace toxin exposures.

49. John Mendeloff, Professor of Public Management and Policy at the University of Pittsburgh, commented to the author in a discussion of this Essay that the compensation system might be burdened by persons who are well qualified by education and training for professional and managerial occupations, yet who decide to have themselves tested to find out whether they could collect compensation by applying for an industrial job for which they would otherwise never apply. This type of system gaming may be impossible to avoid completely; however, employers are likely to adapt by screening out from further consideration those who are overly qualified by education and experience. The thrust of this analysis also extends to the broader social issue of fairness. Numerous environmental justice commentators have raised the issue of whether toxic risks are primarily born by the poor and persons of color. See generally Richard J. Lazarus, Pursuing “Environmental Justice”: The Distributitional Effects of Environmental Protection, 87 Nw. U. L. Rev. 787 (1993) (arguing vigorously that environmentalists should be greatly concerned by the extent to which the effects of pollution and toxic-generating activities have a disproportionate impact on the health and welfare of the poor and persons of color). The proposal made in this Essay is not an attempt to minimize the importance of the sort of environmental justice with which Lazarus is concerned by suggesting that genetic susceptibility is a more important mark of disadvantage (in the Rawlsian sense) than poverty or race. Rather, I assume that the children of the upper middle class are significantly less likely to be applicants for jobs in industrial settings that present toxic risks and thus will not be beneficiaries of the compensation system proposed here. While remedying the distributional injustice of current environmental and workplace safety laws is not the objective of this Essay, doing so to a limited degree may be an ancillary benefit of the approach proposed here.
V. CONCLUSION

The choice between a system in which employers can exclude genetically hypersensitive individuals from exposures to workplace toxins and a system in which individuals are allowed to make their own decisions about risk and employment is a difficult choice if one reaches beyond Rawls’s contractarian framework for competing notions of fairness. I have previously asserted that a one percent risk of glioblastoma is almost certainly a grave enough risk that rational persons would choose to avoid it if it could be easily avoided. If that is true, then predictive knowledge and adequate compensation makes risk avoidance relatively easy and the only rational course. I suppose some might criticize this conclusion as failing to value fairly individual autonomy, that is to say that compensation for the loss of individual freedom and autonomy is never adequate. Whether individuals should be allowed to opt out and take such risks, waiving their right to a safe workplace, is a serious and difficult question but one that I have also argued can be answered in the negative by recourse to Rawls’s model of justice. The application of Rawls’s justice as fairness principle leads to the conclusion that employers should be allowed to use genetic tests to identify and exclude persons who are unusually susceptible to the potential hazards of their workplace environments so long as employers are required to offer, through a centralized system, compensation to those excluded. The sweeping theory of justice provided by John Rawls provides a powerful tool for analyzing and resolving the problem of genetic discrimination in the workplace.