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# The Fruit of the Human Genome Tree: Cautionary Tales about Technology, Investment, and the Herritage of Humankind

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# The Fruit of the Human Genome Tree: Cautionary Tales About Technology, Investment, and the Heritage of Humankind

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## I. INTRODUCTION

The completion of the Human Genome Project (HGP)[1] is intensifying the polemics over access to technology and the expected benefits of genomics research and development.[2] As a result of the previous North-South[3] Resource Regime Negotiations, some are already dubbing the human genome the new common heritage of

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1. Alastair T. Iles, *The Human Genome Project: A Challenge to the Human Rights Framework*, 9 HARV. HUM. RTS. J. 27, 29 (1996).

2. *Id.* at 32–35.

3. The term "North" is often used to designate the advanced or developed industrial-technological countries of North America, Europe, and Japan, while the term "South" designates the developing nations of Africa, Latin America, and Asia.

humankind (CHH).[4] This Article examines the promise of the CHH approach for a genomics regime[5] and the difficulties of reconciling CHH approaches with the imperatives of technology development, investment security, and controversial technology transfer provisions,[6] which have often imperiled the likelihood of substantive agreements.[7]

While placing the human genome under common heritage governance[8] in a binding convention may be justifiable and/or desirable, such an arrangement could be controversial and perhaps counter-productive. Specifically, the inclusion of stringent technology transfer provisions, and the perception that the CHH undermines investment security and retards technological development,[9] often precipitate rejection of binding commonage agreements.[10] In effect, technology and investment are critical variables in understanding, explaining, and predicting the likelihood of public and private U.S. support for a binding international convention on the human genome.[11] This Article concludes with recommendations designed to achieve many of the normative aspirations of common heritage governance, while maximizing prospects for crucial U.S. support of a prospective international convention on the human genome.

Part II of this Article outlines the history and purpose of the HGP and the imminent revolutionary changes and scientific benefits

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4. *See infra* Part III. The CHH "principle has become the *leitmotif* in the progressive development of international law governing the use" of common areas/resources, and it purports to create obligations for states to use these areas/resources for "the well-being of mankind as a whole." LAKSHMAN D. GURUSWAMY ET AL., INTERNATIONAL ENVIRONMENTAL LAW AND WORLD ORDER 400–01 (1994). The CHH harks back to the civil law concept of *res communes*, denoting "things common to all; that is, those things which are used and enjoyed by every one, even in single parts, but can never be exclusively acquired as a whole, *e.g.*, light and air." BLACK'S LAW DICTIONARY 1304–05 (6th ed. 1990). *See also* Melissa L. Sturges, *Who Should Hold Property Rights to the Human Genome? An Application of the Common Heritage of Humankind*, 13 AM. U. INT'L L. REV. 219, 245–47 (1997)(arguing that the human genome is a common heritage of humankind).

5. *See infra* Part II.

6. J.M. Spectar, *Elephants, Donkeys, or Other Creatures? Presidential Election Cycles and International Law of the Global Commons*, 15 AM. U. INT'L L. REV. 975, 992–93 (2000).

7. *Id.*

8. *See* Sturges, *supra* note 4, at 223, 245.

9. *Id.* at 242, 244.

10. *See* Spectar, *supra* note 6, at 1002–08.

11. *Id.*

at the dawn of the "Genomic Age." Part III discusses the increasing acceptance and use of the common heritage principle as a means of achieving international equity and access to the fruits of the genome. Part IV analyzes the attempt to employ CHH principles in the seabed and moon regimes[12] to illustrate the difficulties and the limits of common heritage governance given the competing commercial interests in technology development and investment security. Part V discusses the lessons learned from technology and investment variables in resource regime negotiations and Part VI recommends guidelines for developing a viable CHH framework for the human genome. These recommendations to drafters of a prospective genome convention are designed to protect the genome as common heritage, without imperiling the prospects for agreement by jeopardizing the development of technology and investment security.

## II. AN OVERVIEW OF THE HUMAN GENOME PROJECT AND ITS ANTICIPATED BENEFITS

The human organism is made of cells containing deoxyribonucleic acid (DNA) that are organized into twenty-three pairs of chromosomes.[13] Each chromosome has hundreds of codes for building proteins.[14] Genes are functional segments of the double-stranded, helix-shaped DNA molecules that make up chromosomes; they direct the assembly of every cell in the body.[15] Genes generate proteins by transcribing their codes into single-stranded ribonucleic acid (RNA) molecules, which serve as templates for protein construction.[16] Every one of the billions of cells in the body (except for red blood cells) contains a copy of the same DNA.[17] The totality of genetic material contained in any

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12. *See generally Agreement Governing the Activities of States on the Moon and Other Celestial Bodies: Hearings Before the Subcomm. on Sci., Tech., and Space of the S. Comm. on Commerce, Sci., and Transp.*, 96th Cong. 93 (1980) [hereinafter *Senate Moon Treaty Hearings*] (statement of S. Neil Hosenball, Chairman, U.S. Delegation, U.N. Committee on the Peaceful Uses of Outer Space, 1979; General Counsel, National Aeronautics and Space Administration); United Nations Convention on the Law of the Sea, *opened for signature* Dec. 10, 1982, U.N. Doc. A/Conf.62/122, *reprinted in* 21 I.L.M. 1261.

13. Antonio Regalado, *Mining the Genome*, TECH. REV., Sept.–Oct. 1999, http://www.techreview.com/articles/oct99/regalado.htm. For more information about the Human Genome Project, see *About the Human Genome Project* at http://www.ornl.gov/hgmis/project/about.html (last modified Feb. 28, 2001).

14. *Id.*

15. Sharon Begley, *Decoding the Human Body*, NEWSWEEK, Apr. 10, 2000, at 52, 61.

16. *Id.* at 53, 61.

17. *Id.* at 53.

one cell of a particular organism is its genome.[18] Human DNA consists of 3.2 billion chemical letters in a seemingly endless four-letter alphabet (ATCG),[19] with each representing a molecule, and together constituting a code: A—adenine, T—thymine, C—cytosine, and G—guanine.[20] Nevertheless, only about 3% of the 3.2 billion chemical letters actually spell out the approximately 30,000 human genes.[21] These genes, or instructional codes, order the special machinery inside a human cell to snatch particular amino acids that are combined to create proteins that may lead to the expression of certain traits, conditions, dispositions, or tendencies.[22] The HGP seeks to decipher the precise chemical sequence of the ATCGs that makes up the DNA of each cell of every human body, thus documenting the human genetic roadmap.[23]

For a consortium of about 1,100 biologists, computer scientists, and technicians from at least half-a-dozen countries, sequencing the human genome is at the top of the research agenda.[24] The U.S. government and Britain's Wellcome Trust financed the $250 million project, making it the most expensive biology project in world history.[25] The public sector of the project included scientists at the U.S. National Institute of Health (NIH), the U.S. Department of Energy, the National Human Genome Research Institute, and several university labs.[26] Not to be outdone, private genomics companies have also played key roles in complementing or extending the work of the public project.[27] While the entire public project will be completed by 2003 (well

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18. *Id.*
19. *Id.*
20. *Id.*
21. *About the Human Genome Project*, *supra* note 13. It was previously thought that there were about 80,000–100,000 genes. Regalado, *supra* note 13; Begley, *supra* note 15, at 53.
22. *See* Begley, *supra* note 15, at 55.
23. *Id.* at 52.
24. *See id.*
25. *Id.* In fact, with its $250 million price tag, the public project has been a relative bargain as the task was originally estimated to cost $3 billion. *See generally* Amy Carroll, *Not Always the Best Medicine: Biotechnology and the Global Impact of U.S. Patent Law*, 44 AM. U. L. REV. 2433, 2435 (1995).
26. Begley, *supra* note 15, at 52–53.
27. *See* David L. Wheeler, *The Real Impact of the Race to Sequence the Human Genome*, CHRON. HIGHER EDUC., July 16, 1999, at A18.

ahead of the original 2005 deadline),[28] aggressive private sector companies, such as Celera Genomics Corporation, have "vowed to trounce the public project" and be the first to finish the human genome sequence.[29]

Since 1988, the HGP has dumped billions of bits of data into the online gene sequence repository known as GenBank, which is maintained by the National Center for Biotechnology Information (NCBI) at the NIH in Bethesda, Maryland.[30] Researchers with Internet connections tap into this DNA-sequence database free of charge about 650,000 times daily.[31] Because most of the genome contains useless data,[32] the primary task involves sorting and organizing the useful genes, then identifying their protein-coding elements and the language that guides gene expression (the process that activates genes to make proteins).[33]

The completion of the HGP and the concomitant expansion of knowledge in molecular and cellular biology are creating the same kind of excitement experienced by physicists in the early part of the twentieth century and legal scholars in the 1960s.[34] This

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28. *Id.* The project was originally estimated to take about twenty years to complete. *Id.* Some attribute the early completion of the project to the aggressive push of private genomics companies. *Id.* As Richard Gibbs, director of the genome center at Baylor College of Medicine in Houston stated: "[i]t's fair to say we have been stimulated by industrial pressure to be a little more aggressive." *Id.*

29. Begley, *supra* note 15, at 54. Celera's groundbreaking feat came about three years after the complete sequencing of the first animal genome, that of a common worm, *Caenorhabditis elegans*, in 1997. David L. Wheeler, *For Biologists, the Postgenomic World Promises Vast and Thrilling New Knowledge*, CHRON. HIGHER EDUC., Aug. 13, 1999, at A17. Celera's J. Craig Venter was also the first to sequence the entire genome of any organism when he announced the sequencing of a bacterium that causes ear infections. Wheeler, *supra* note 27, at A18.

30. Regalado, *supra* note 13.

31. Wheeler, *supra* note 27, at A18. While the public HGP insists on free access, Celera Genomics, which boasts the world's second-largest supercomputer, is planning to sell access to customized "suites of genes" (information about "complicated pathways of gene regulation") to those who wish to compare genomes across many species. *Id.* Celera plans to charge universities $5,000 to $20,000 for each laboratory use, but would prefer to offer a subscription to the entire university at a reduced rate. *Id.* Meanwhile for $5 million a year, three pharmaceutical companies will get an advance peek at Celera's data. *Id.* at A19. To assure its future profitability, Celera plans to identify at least 100 to 300 genes that it will patent and then license the rights for commercial development to other companies. *Id.*

32. Regalado, *supra* note 13.

33. *Id.*

34. *See* Wheeler, *supra* note 29, at A17. As the authors of the Bilbao Declaration stated: "[n]ever, at least since nuclear fission, has science presented humanity with opportunities and dilemmas of such magnitude and complexity." 4 FUNDACIÓN BBV,

genomics revolution is transforming biology. For example, biology departments at universities rush to create new species of scientists in fields such as bioinformatics, molecular epidemiology, molecular evolution, functional genomics and pharmacogenetics (using gene tests to fashion drug therapy), and biomedical computing.[35] At the same time, many U.S. corporations are staking out dominant positions in this new frontier and enriching their stockholders in the process.[36]

Much genome mining is characterized by a marriage between computer science and biology, as scientists use DNA chips to detect patterns in thousands of cells as they are turned on and off.[37] The new science relies on algorithms and the advanced pattern-recognition capabilities of neural networks to find the hidden structure in massive amounts of molecular data.[38] These pattern-recognition algorithms are designed to scour genetic databases in order to discover and interpret the functions of

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THE HUMAN GENOME PROJECT: LEGAL ASPECTS 365 (1994) [hereinafter THE HUMAN GENOME PROJECT, VOL. IV].

35. Wheeler, *supra* note 29, at A17. Many major universities have also taken steps to prepare for the future of biology by establishing institutes dedicated to the scientific, ethical, legal, and economic dimensions of the genomics revolution. Regalado, *supra* note 13. A side-effect of the biotech revolution has been the steady "brain drain" of academics including astrophysicists, mathematicians, and other computational scientists migrating from the Ivory Tower to high-paying private sector fields such as bioinformatics. *Id.*

36. There are already several genomics companies with enormous market capitalization as well as cutting edge products or projects. Adam Bryant, *The Gold Rush,* NEWSWEEK, Apr. 10, 2000, at 65. Affymetrix, a so-called "pick and shovel" company (an allusion to the fact that the only people who made real money during the California Gold Rush were those who sold supplies to miners), developed the famed GeneChip system that analyzes gene sequences and other activity on disposable microchips. *Id.* Similarly, PE Biosystems developed powerful technological devices for analyzing genomics data. *Id.* Other companies such as Celera Genomics and Incyte are software service companies that supply genetic information databases to subscribers. *Id.* Human Genome Sciences, Inc. (HGSI) stands out as a pioneer and leader in the use of genomics and in moving these genomics-based drugs into patient-based clinical trials. *See Human Genome Sciences, Corporate Profile*, www.hgsi.com/cprofile/index.html.

37. Regalado, *supra* note 13; *see also* Bryant, *supra* note 36, at 65. Some of these specialized computer chips have the capacity to perform over four-thousand genomic analyses simultaneously. Kenneth Manton, *The Vital Role of Economists in Realizing Medicine's Golden Age*, CHRON. HIGHER EDUC., Feb. 18, 2000, at B5. This calculating power makes it possible to complete the genomic analysis of a grain of rice in eight weeks instead of the ten years predicted by the Japanese government a few years ago. *Id.*

38. Regalado, *supra* note 13. For more about the fantastic abilities of advanced neural networks, see RAY KURZWEIL, THE AGE OF SPIRITUAL MACHINES: WHEN COMPUTERS EXCEED HUMAN INTELLIGENCE (1999) and also, RAY KURZWEIL, THE AGE OF INTELLIGENT MACHINES (1990).

genes.[39] The knowledge obtained is crucial to the development of new genetic therapies.[40]

The primary focus of genomics is shifting the analysis of sequences and structures of genes into a discussion about their function and the uses of the proteins based on genes or proteomes.[41] For the genomics industry, the task ahead lies in mining the benefits of the genome to create new genetic therapies, to detect and fight diseases and even to enhance genes by amplifying normal genes to make them better.[42] By 2010, genetic screening tests will enable individuals to gauge their unique health risks, including tolerance for cigarettes.[43] Genetic science will be used to fix and predict health problems, and by 2050 "many potential diseases will be cured at the molecular level before they arise."[44] There is hope that the new genetic discoveries will trigger the invention of new pharmaceuticals, including drugs aimed at the causes of diseases, not just the symptoms.[45] Doctors will prescribe different treatments for different patients according to their specific genetic profiles.[46] In fact, one of the most promising avenues of genetic medical research is the process of identifying and analyzing single nucleotide polymorphisms (SNPs).[47] SNPs are the smallest forms of genetic variation between individuals.[48] There is great research interest in determining how these variations affect the presence or absence of disease, the intensity of disease, and the response to drugs.[49] Classic gene therapy,

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39. *Id.*
40. *See id.*
41. *See* Wheeler, *supra* note 29, at A17.
42. Arnold J. Rosoff, 20 J. LEGAL MED. 291, 293 (1999) (reviewing MAXWELL J. MEHLMAN & JEFFREY R. BOTKIN, ACCESS TO THE GENOME: THE CHALLENGE TO EQUALITY (1998)).
43. Geoffrey Cowley & Anne Underwood, *A Revolution in Medicine*, NEWSWEEK, Apr. 10, 2000, at 58.
44. *Id.* The official U.S. government web site claims the HGP "will reap fantastic benefits for humankind, some that we can anticipate and others that will surprise us." *About the Human Genome*, *supra* note 13. Information gleaned from the study of DNA and technologies developed will "revolutionize future biological explorations." *Id.* In addition, "learning about nonhuman organisms' DNA sequences can lead to an understanding of their natural capabilities that can be applied toward solving challenges in health care, energy sources, agriculture, and environmental cleanup." *Id.*
45. *Id.*
46. *Id.*
47. Wheeler, *supra* note 27, at A19.
48. *Id.*
49. *Id.*

which treats ailments by harnessing useful genes and inserting corrective genes into patients, holds great promise despite a few initial tragic mishaps.[50] Meanwhile, there are great expectations for other forms of gene therapy designed to restrain harmful genes by interfering with the genes' production of proteins or by blocking the action of the disease-causing proteins.[51] The gold rush to harvest the fruits of the HGP is proceeding at a quick pace, prompting some to call for an international convention that designates the genome as a CHH.[52]

## III. IS THE HUMAN GENOME A COMMON HERITAGE?

There appears to be a prevailing opinion in the international community that the human genome is, or should be, designated as a common heritage of mankind (CHH).[53] The CHH principle disavows state sovereignty over commonage and mandates or recommends that the benefits from common areas be allocated to all humankind, including future generations.[54] The CHH principle (and interpretations of the principle) is also shaped by ideology, legal philosophy, and/or political bias.[55] Additionally, CHH areas may not be subject to appropriation by state or non-state actors and they must be used solely for peaceful purposes.[56] All humankind has a right to participate in the management of the CHH, and economic benefits derived from exploiting the CHH area must be shared by all.[57] Scientific research in CHH areas should be free and open.[58] Finally, it is claimed that the CHH

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50. *See, e.g.*, David Wheeler, *Patient Dies in Gene Therapy Trial at the University of Pennsylvania Medical Center*, CHRON. HIGHER EDUC., Oct. 8, 1999, at A23; *see also*, Cowley & Underwood, *supra* note 43, at 61. The process of keeping RNA from generating harmful protein may entail a bombarding of the RNA with "anti-sense" molecules that block out parts of its sequence. *Id.* at 62.

51. Cowley & Underwood, *supra* note 43, at 61.

52. *See infra* Part III.

53. *See infra* notes 54, 56, 59 and accompanying text. For purposes of this Article, the term "CHH" is used as an acronym for both the phrases "common heritage of humankind" and "common heritage of mankind."

54. For an extensive discussion of the shifting meanings and alternative interpretations of the common heritage principle, see J.M. Spectar, *Saving the Ice Princess, NGOs, Antarctica & International Law in the New Millennium*, 23 SUFFOLK TRANSNAT'L L. REV. 57, 59–60 (2000).

55. *See generally id.*

56. Christopher Joyner, *Legal Implications of the Concept of the Common Heritage of Mankind*, 35 COMP. L.Q. 191, 192 (1986).

57. *Id.* at 192.

58. *Id.*

principle necessitates technology transfers from North to South, so the South can effectively develop and participate in resource extraction from the CHH.[59] The CHH principle has been suggested for or used as a major theme for governance of global environmental and resource regimes, including the seas, the moon, Antarctica, and plant genetic resources.[60]

Even prior to the involvement of formal institutions in the law of genomics, the international community shared an emerging consensus that the human genome was a CHH.[61] The Human Genome Organization (HUGO) has taken a leading role in preserving the genome as a CHH since its founding in April 1988.[62] HUGO is composed of 239 consultants from about two dozen countries who seek to promote genomics research, coordinate between countries, and facilitate the study of ethical, legal, and commercial issues surrounding the project.[63] HUGO maintains that "the human genome is our common heritage and collective property," and genetic information is "in the public domain."[64]

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59. *See* Rüdiger Wolfrum, *Common Heritage of Mankind*, *in* 11 ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW 66 (Rudolf Bernhardt ed., 1989).

60. *See generally* Carl Q. Christol, *The Common Heritage of Mankind Provision in the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 14 INT'L LAW. 429 (1980); ARVID PARDO, THE COMMON HERITAGE: SELECTED PAPERS ON OCEANS AND WORLD ORDER 1967–1975 (1975); ELISABETH MANN BORGESE, THE FUTURE OF THE OCEANS: A REPORT TO THE CLUB OF ROME 125–33 (1986); Spectar, *supra* note 54; Joyner, *supra* note 56.

61. Barbara Looney, *Should Genes be Patented? The Gene Patenting Controversy: Legal, Ethical, and Policy Foundations of an International Agreement*, 26 LAW & POL'Y INT'L BUS. 231, 238–39 (1994).

62. 1 FUNDACIÓN BBV, THE HUMAN GENOME PROJECT: LEGAL ASPECTS 78 (1994) [hereinafter THE HUMAN GENOME PROJECT, VOL. I]. The group of scientists that founded HUGO (at Cold Spring Harbor Laboratory) included the renowned geneticist, James Watson. *Id.*

63. Sturges, *supra* note 4, at 231.

64. *See* HUMAN GENOME ORGANIZATION, ETHICAL IMPLICATIONS OF THE HUMAN GENOME PROJECT: INTERNATIONAL ISSUES 10 (1992). Watson was shortly thereafter appointed NIH Associate Director for Human Genome Research. *Id.* At first, the U.N. Educational, Scientific and Cultural Organization (UNESCO) wanted to play the lead role in coordinating and facilitating research efforts, but was persuaded by HUGO to step aside. *Id.* HUGO argued that the task would be best performed by a more specialized body whose sole purpose was the human genome. *See* Allyn L. Taylor, *Globalization and Biotechnology: UNESCO and an International Strategy to Advance Human Rights and Public Health*, 25 AM. J.L. & MED. 479, 541 (1999).

The Bilbao Declaration of 1994,[65] adopted after the seminal international meeting on "Legal Aspects of the Human Genome Project,"[66] also represents a key step forward in designating the human genome as another CHH.[67] The Declaration posits that "the benefits of the Human Genome Project affect the entire world, and its results belong to the human beings of this and future generations, and not to the scientists . . . or to the countries supporting them."[68] The Bilbao Declaration noted that the HGP "has to develop in a truly global, interdisciplinary manner and its effects must benefit the whole of humanity without distinction of race, continent, creed or opinion. All human beings without exception are involved in it. The issue is nothing more or less than the future of humanity."[69] The convergence of extant political, social, and technological trends "imposes on this generation the obligation of working together for the benefit of future generations and for all the species inhabiting the planet."[70] As the Bilbao Declaration further noted, "it would be a travesty of justice if its benefits were not to be made available to all human beings in every country."[71] The Bilbao Declaration echoes a key aspect of the CHH principle when it posits that scientific research "will be essentially free, with no limits other than those imposed by the researcher's own self-control."[72] Further, out of respect for human dignity, the human body "must not be subject to commercialization,"[73] although free and "controlled availability"[74] to the human genome will be allowed for therapeutic or scientific purposes. Finally, the Bilbao Declaration states that genetic

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65. THE HUMAN GENOME PROJECT, VOL. IV, *supra* note 34, at 363.
66. *Id.*
67. *Id.* at 364.
68. *Id.* at 365. The international meeting on the HGP, held in Bilbao, Spain, in May 1993, brought together over two-hundred leading scientists and jurists from over eighteen countries. *Id.* at 363. The gathering included several prominent judges, four Nobel Prize winners, pioneers of the HGP, and private industry representatives. *Id.* The Bilbao Declaration summarized the "principal questions raised, the reflections arising, and the conclusions reached." *Id.* at 364.
69. *Id.* at 363–64.
70. *Id.* at 364–65.
71. *Id.* at 365.
72. *Id.* at 367.
73. *Id.*
74. *Id.*

knowledge "belongs to humanity and must be freely communicated."[75]

Meanwhile, the U.N. Educational, Social, and Cultural Organization (UNESCO) also played a central role in developing the notion that the genome is a CHH.[76] UNESCO became involved with the scientific and social issues of the genome in January 1989, when it formed the Scientific Coordination Committee for the Human Genome.[77] In 1997, UNESCO adopted the seminal Universal Declaration on the Human Genome and Human Rights (UDHGHR).[78] This Declaration notes that the human genome "underlies the fundamental unity of all members of the human family"[79] and also states the genome is, "[i]n a symbolic sense . . . the heritage of humanity."[80] Furthermore, the "[b]enefits from advances in biology, genetics and medicine, concerning the human genome, shall be made available to all, with due regard to the dignity and human rights of each individual"[81] and "[t]he human genome in its natural state shall not give rise to financial gains."[82] It is hoped that genomics will "offer relief from suffering and improve the health of

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75. *Id.*

76. THE HUMAN GENOME PROJECT, VOL. I, *supra* note 62, at 78. Later in June 1989, UNESCO, along with the members of HUGO and the government of the USSR, participated at an international conference on the HGP in Moscow, sponsored by the Council on International Cooperation on the Human Genome. *Id.* at 79. In February 1990, UNESCO sponsored a debate on the ethical issues of genome. *Id.* at 80.

77. *Id.* at 80.

78. *Universal Declaration on the Human Genome and Human Rights*, U.N. Educational, Scientific and Cultural Organization, 29th Sess., 26th plen. mtg. at 41, U.N. Doc. 29 C/Res. 16 (1997) [hereinafter UNESCO]. It is hoped that the Declaration will be followed by the development of an international convention on the human genome. *See* Taylor, *supra* note 64, at 507–08. The UNESCO-sponsored International Bioethics Committee (IBC) produced the Declaration. *Id.* The IBC is comprised of experts in the fields of medicine, biology, genetics, philosophy, anthropology, law, and other human and social sciences. *Id.* The IBC's primary goal was to spark dialogue on, *inter alia*, the ethical issues raised by genomics and to build consensus for international norms on the genome and human rights. *See id.*

79. UNSECO, *supra* note 78, at 42.

80. *Id.* Numerous international organizations were consulted, including the World Health Organization, the U.N. Environmental Programme (UNEP), and the International Labour Organization (ILO). *See* Taylor, *supra* note 64, at 508–09. The Declaration was completed by a committee of government experts from eighty-one states and adopted in November 1997. *See id.* at 509.

81. UNESCO, *supra* note 78, at 44.

82. *Id.* at 43.

individuals and humankind as a whole."[83] The UDHGHR exhorts nations to encourage measures enabling "the capacity of developing countries to carry out research in human biology and genetics, taking into consideration their specific problems, to be developed and strengthened."[84] States must ensure that developing countries "benefit from the achievements of scientific and technological research so that their use in favour of economic and social progress can be to the benefit of all."[85] Finally, the UDHGHR encourages the free exchange of scientific knowledge and information in the areas of biology, genetics, and medicine, as well as peaceful uses of the fruits of the HGP.[86] The U.N. General Assembly adopted the UDHGHR in March 1999.[87]

The application of a CHH approach to the human genome is viewed as a necessity by some commentators, especially because of the genome's similarity (by analogy) to internationally designated common areas such as the seabed and the moon.[88] In addition, others warn of the "grave ethical consequences of privatizing the genome[,]"[89] an essential aspect of human identity.[90] The application of the CHH approach to the genome is favored by some because it preserves the resource for future generations, rather than merely focusing on economic interests.[91] Furthermore, the human genome, literally the source code for human life,[92] is an integral part of every person and constitutes "the manifestation of

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83. *Id.* at 44.
84. *Id.* at 45.
85. *Id.*
86. *Id.*
87. *The Human Genome and Human Rights*, U.N. Res. 53/152, 53d Sess., Agenda Item 110(b), U.N. Doc. A/RES/53/152 (1999). For a general understanding of the UDHGHR and its contents see *Human Rights and Bioethics*, U.N. ESCOR, 58th mtg., U.N. Doc. E/CN.4/Res/1999/63 (1999); *Human Rights and Bioethics*, U.N. ESCOR, 67th Meeting, U.N. Doc. E/CN.4/RES/1997/71 (1997).
88. *See* Sturges, *supra* note 4, at 248. Sturges compares the human genome to "frontiers," similar to Antarctica and the moon, and she emphasizes the need for a "balance of power between developed and developing countries." *Id.* at 250. She also contends that the relative ignorance of the world community about the genome and the grave social implications of the HGP mandates a CHH approach. *Id.* at 248–50. Given that most of humanity lacks the basis to make a knowledgeable decision to surrender its claims to this new frontier, a CHH approach would protect the interests of all humankind, including the interests of future generations. *See id.* at 249.
89. *Id.* at 248.
90. *See id.* at 249.
91. *See id.*
92. *Id.*

our evolution."[93] Hence, it ought to belong to all humanity as a CHH.[94] The DNA structure that each person inherits—the result of millions of years of evolution and natural genetic variation—should not be appropriated by private corporations because of the potential for abuse, which includes insurance and job discrimination.[95] It is also argued that applying the CHH principle to the genome will increase the likelihood of international collaboration and increase the benefit to the world community.[96] Another claim is that joint ownership and management in a CHH framework will increase the likelihood of preserving the genome in the international public domain, leaving it completely accessible and intact for future generations.[97] Additionally, the application of the CHH concept to the genome would balance the interests of both developed and developing countries, thus protecting the interests of developing countries that are unwilling or unable to patent and exploit genes.[98] Finally, an agreement giving the human genome CHH status could provide an orderly regime that alleviates state concerns about protecting their investments.[99]

Various international human rights norms provide additional justification for a CHH approach to assure access to the benefits of the human genome. Article 25 of the Universal Declaration of Human Rights (UDHR)[100] states, "everyone has the right to a standard of living adequate for the health and well-being of himself and of his family." Some suggest that "a radical reading" of Article 25 of the UDHR "would require that individuals be given full medical access to the medical benefits generated by the HGP."[101] Similarly, Article 27 of the UDHR also provides some support for CHH-style genome governance as it grants all persons a right to share in the benefits of scientific advancement.[102] This

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93. *Id.*
94. *See id.*
95. *Id.* at 250.
96. *Id.* at 251.
97. *Id.*
98. *Id.* at 252.
99. *Id.* at 251.
100. *Universal Declaration of Human Rights*, G.A. Res. 217A (III), U.N. GAOR, 3d Sess., art. 25, at 140, U.N. Doc. A/810 (1948).
101. Iles, *supra* note 1, at 36.
102. Looney, *supra* note 61, at 239. Every human being is effectively part creator or author of the genome, therefore there may be a collective claim to the "material interests" resulting from the HGP in the spirit of Article 27. *Id. See* Darryl Macer, *Public Opinion on Gene Patents*, 358 NATURE 272, 272 (1992) (quoting the Universal Declaration of

position is echoed in the Vienna Declaration and Programme of Action of the World Conference on Human Rights,[103] which states that "everyone has a right to enjoy the benefits of scientific progress and its applications."[104] According to the International Covenant on Economic, Social and Cultural Rights,[105] everyone has "the right . . . to the enjoyment of the highest attainable standard of physical and mental health"[106] and similarly all are entitled "[t]o enjoy the benefits of scientific progress and its applications."[107] While states are primarily responsible for guaranteeing these rights to their own populations, there may be an expanding obligation to implement the right to health through international assistance.[108] This obligation arguably extends a duty to support community genetic services in poorer countries, particularly because one can hardly isolate the health concerns of one nation from others.[109]

## IV. THE LIMITS OF CHH GOVERNANCE

Concerns over investment security and the development and protection of technology (including the vexing matter of technology transfers associated with CHH approaches) weaken the prospects for consensus in the seabed and moon regimes. The following case studies will illustrate the difficulties of reaching a binding CHH agreement due to the perception that the CHH will undermine investment security, retard technological development, and lead to mandatory technology transfer provisions. In addition, even negotiated agreements sometimes remain unsigned or unratified because of the perceived effect of the CHH on technology and investment. As these case studies reveal, technology and investment are critical variables in understanding, explaining, and predicting the

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Human Rights, *supra* note 100, art. 27, at 140).

103. *World Conference on Human Rights: Vienna, 14–25 June 1993*, U.N. GAOR, 48th Sess., 22nd mtg., pt. 1, at 20, U.N. Doc. A/Conf. 157/24 (1993) [hereinafter *Vienna Convention*]; *see also Declaration on the Use of Scientific and Technological Progress in the Interests of Peace and for the Benefit of Mankind*, G.A. Res. 3384, U.N. GAOR, 30th Sess., 2400th plen. mtg. at 2, U.N. Doc. A/Res./3384 (1975).

104. *Vienna Declaration*, *supra* note 103, at 24.

105. G.A. Res. 2200, U.N. GAOR, 21st Sess., Supp. No. 16, arts. 12–15, at 8–10, U.N. Doc. A/6316 (1967).

106. *Id.* art. 12, at 8.

107. *Id.* art. 15, at 10.

108. *See* Taylor, *supra* note 64.

109. *See id.*

likelihood of public and private U.S. support for a prospective international convention on the human genome.

### *A. Technology, Investment, and Seabed Resources*

Ironically, the technological developments in the 1950s that increased the likelihood of profitable commercial exploitation of the manganese nodules in the seabed and other ocean resources[110] precipitated the CHH negotiations of the last three decades.[111] The anticipated commercial value of these ocean resources and the sunk costs of investments in technology, as well as other valuable economic interests,[112] are critical variables that shaped the intensity of opposition to the CHH in the seabed.[113]

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110. ROSS D. ECKERT, THE ENCLOSURE OF OCEAN RESOURCES: ECONOMICS AND THE LAW OF THE SEA 214 (1979). While the focus has always been on the manganese resources of the seabed because of their direct link to the common heritage question, the United States also has sizable deposits of hydrocarbons, particularly if offshore hydrocarbons beyond the two hundred-meter isobath are included. *Id.* at 92. In 1972, the U.S. Geological Survey (USGS) estimated domestic proven reserves of oil to be about 6% of the world's total. *Id.* Almost 10% of all U.S. oil reserves and 15% of natural gas were offshore within the two-hundred-meter isobath. *Id.* Changes in technology increasingly make offshore drilling comparable to or better than land drilling. *Id.* Robert R. Nathan Associates estimated the economic rent of offshore oil and natural gas production was about $3.9 billion in 1973 and was expected to climb to $7.7 billion in 1985 and $9.4 billion in 2000 (they calculated economic rents in part by examining the opportunity cost of offshore output, measured by the cost of replacing it with oil imports). *Id.* at 96. These estimates far exceeded the estimates of future economic rents to the United States from all other oceans uses combined. *Id.* Most of these revenues were captured by the public at large. Producers captured only about one-fifth of these rents owing to the continuation of petroleum price controls, reduced tax incentives for drilling, tighter environmental controls, increased drilling at greater depths, increased entry by new oil producers, and higher front end bonus payments to U.S. federal and state governments for offshore leases (these exceeded $3.0 billion in 1973 alone). *Id.* at 112. The oil industry wanted the USGS to "assert . . . its exclusive jurisdiction over the mineral resources of the entire submerged portion of the Continent off its shores." BARRY BUZAN, SEABED POLITICS 105 (1976).

111. Harold M. Schmeck, Jr., *Johnson Asks Joint Exploitation of Sea Resources*, N.Y. TIMES, July 14, 1966, at 10. Seeing the imminence of a sea-grab for manganese nodules, President Johnson called for a new regime for the seas, advocating a modest precursor of international governance of common spaces. *Id.* President Johnson urged nations to cooperate in this exploitation and avoid "a new form of colonial competition for the oceans' riches." *Id.* "We must be careful to avoid a race to grab and hold the lands under the high seas . . . . We must ensure that the deep seas and the ocean bottoms are, and remain, the legacy of all human beings." *Id.*

112. ECKERT, *supra* note 110, at 72. In 1972, Robert R. Nathan Associates estimated that avoiding the most important economic straits (the English Channel, Gibraltar, and Malacca) would cost the United States $51 million. *Id.* A study prepared for the U.S. Treasury estimated that if every nation along shipping routes imposed an extended territorial sea and an expanded no-pollution zone, U.S. oil shipping costs would increase

The age of seabed exploitation began with the remarkable findings of the *Glomar Explorer*.[114] The vessel, initially owned by the U.S. government, was outfitted with innovative fixed area dredging technology to scour the ocean bed for nodules.[115] Later, the expeditionary voyage of HMS *Challenger*[116] revealed that potato-sized manganese nodules lay at the deepest regions of the Atlantic, Indian, and Pacific oceans, with the latter containing about one trillion tons of manganese.[117] It is estimated that the total amount of nodules increases by about ten to sixteen million tons annually.[118]

Finding and dredging the manganese nodules is a very labor-intensive process.[119] Approaches to deep seabed mining include continuous path dredging, continuous line bucket dredging, and fixed area dredging.[120] Deposits occur in irregular patches and the richest deposits tend to be found in undulating hills or highly obstructed or inaccessible regions of the seabed.[121] At best, only about half of the deposits in a field will be harvested.[122]

In the 1970s, the mining industry was increasingly overoptimistic about the feasibility and desirability of commercial exploitation of the deep seabed.[123] Between 180 and 460

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by about $137 million annually or about $3.4 billion over a twenty-five-year period. *Id.* (citing David B. Johnson, "Comparative Costs for Oil Shipped by Alternative Routes from the Persian Gulf to the United States," Office of the Assistant Secretary for International Affairs and Research, U.S. Dep't of Treasury, Washington, D.C. (May 24, 1974)). Nevertheless, while these straits had a positive value for the United States in economic terms, "closure of such straits would affect the U.S. in ways that are less than devastating." *Id.* at 73. In 1976, U.S. coastal areas within two-hundred miles accounted for about 82% of the tonnage and 68% of the value of all commercial catches by U.S. fishermen. *Id.* at 133–34. Foreign fishermen took in 78% of the total value of fish caught between the twelve-mile and two hundred-mile contours. *Id.* at 134. While tonnage in catches increased, certain species were over-fished. *Id.* Foreign fleets exploited half of the fourteen over-fished species. *Id.*

113. *See generally id.*

114. *See id.* at 220.

115. *Id.*

116. *Id.* at 214. The HMS *Challenger* was a wooden steamship that set out on an epic scientific exploration of the oceans in 1872. *Id.*

117. *Id.* at 215.

118. Carl Q. Christol, *An International Seabed Authority*, *in* THE LAW OF THE SEA: ISSUES IN OCEAN RESOURCE MANAGEMENT 172, 179 (Don Walsh ed., 1977).

119. ECKERT, *supra* note 110, at 219–20

120. *Id.* at 217.

121. *Id.*

122. *Id.* at 224.

123. *Id.* at 237.

commercially exploitable sites were thought to exist, of which eighty to ninety were prime sites.[124] Ocean mining became increasingly appealing to U.S. miners as the extraction costs for land-based mining continued to mount.[125] In particular, a decline in assays accounted for the rising costs of terrestrial mining in the United States.[126] The average content of Canadian and U.S. copper declined from 0.82% to 0.71%.[127] Also, rising prices of land-based minerals increased the probability of viable seabed production.[128]

"[A]pprehensions that terrestrial mineral sources could be cartelized successfully[,] much like oil supplies[,]"[129] also caused U.S. miners to look to the sea.[130] In addition, concern over future prices of land-based minerals wildly fluctuating created an additional incentive for finding new substitute sources of supply at sea.[131] In a 1976 study, David B. Johnson and Dennis E. Logue projected that a significant portion of U.S. demand and imports could be satisfied by deep-sea sources by 2000.[132] In addition, a proliferation of environmental restrictions increased costs of terrestrial mining in the United States.[133] Thus, U.S. miners were enticed by the prospect of an ocean mining industry that would be "free of both political interference and restraints on production."[134]

The nodules of the deep seabed contain four minerals—manganese, nickel, copper, and cobalt—that are widely used by U.S. industries.[135] Because every nodule contains portions of all four metals, the mining industry was enticed by the prospect of producing a variety of metals from the harvested nodules.[136] Also, several minor metals such as molybdenum, vanadium, zinc, and silver are some expected by-products.[137]

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124. *Id.*
125. *Id.* at 226.
126. *Id.*
127. *Id.*
128. *Id.*
129. *Id.*
130. *Id.*
131. *Id.*
132. *Id.* at 232.
133. *Id.* at 226.
134. *Id.*
135. *Id.* at 226–27.
136. *Id.* at 230.
137. *See id.*

The minerals in the seabed nodules have a wide variety of commercial applications. Manganese, which makes up about half the mineral content of the seabed nodules, is primarily used in steel-making to add strength or remove impurities.[138] It is also a key ingredient in dry-cell batteries.[139] Nickel is also used in steel-making because of its ability to resist corrosion.[140] Steel alloys, particularly stainless steel products, are widely used in the U.S. consumer goods industry as well as in the production of capital goods, such as jet planes, refined petroleum, and pollution-control equipment.[141] The U.S. Department of the Interior estimated that nickel will be the most lucrative metal from sea-based mining.[142] It was expected that higher nickel prices would stimulate new investments in land and sea mining, but that ocean sites would have lower investment costs.[143] Cobalt, a by-product of processing nickel and copper ores, is the most expensive of the four metals.[144] It is often used in the manufacturing of permanent magnets and steel alloys.[145] Copper has the largest world market among the four metals with the United States being the world's major producer.[146] It is used extensively for electrical conductivity and fighting corrosion.[147]

A study conducted for Congress by Robert R. Nathan Associates assumed that three U.S. firms would produce about seven million tons of nodules per year.[148] They estimated that the total value of manganese nodule mining activity in 1985 would be about $534 million (at 1973 prices), a third of which would be attributable to ocean mining.[149] It was estimated that supply would outstrip demand, thus leading to a slump in the prices of cobalt and manganese.[150] While this would reduce the value of marine output in a commercial sense, in an economic or

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138. *Id.* at 226.
139. *Id.*
140. *Id.*
141. *Id.* at 227.
142. *Id.* at 229.
143. *Id.*
144. *Id.* at 227.
145. *Id.*
146. *Id.*
147. *Id.*
148. *Id.* at 232.
149. *Id.* at 233.
150. *Id.*

opportunity cost sense, the substitute marine minerals would be worth at least as much as the terrestrial minerals.[151] In fact, the sea-based minerals could be worth even more if lower prices caused increased consumption.[152] Nevertheless, assuming that only the price of cobalt declined, Robert R. Nathan Associates estimated the United States would receive $33 million in economic rents in 1985, and about $65 million in 2000.[153] If the by-products of cobalt also displaced U.S imports, estimates of economic rents could go as high as $51 million in 1985, and $95 million in 2000.[154]

The commercial value of seabed minerals, the costs sunk into investments in technology, as well as other valuable economic interests,[155] have shaped the intensity of the opposition to the CHH principle.[156]

### *B. Technology, Investment, and Moon Resources*

As the exploitation of lunar resources became increasingly feasible, many businesses expressed concerns over the impending CHH regime.[157] While there were no immediate plans for lunar exploitation,[158] there were ongoing scientific and research projects that could have been jeopardized by the Moon Treaty as proposed.[159] At the height of lunar exploration, several corporations initiated efforts that could be "translated to the exploration phase of the mining of off-earth materials in the next twenty or thirty years."[160] Many businesses and scientists had already reserved room on the space shuttle to carry their research projects into space.[161]

The Apollo program and various planetary missions, such as Viking and Voyager,[162] revealed the availability of silicon,

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151. *Id.*
152. *Id.*
153. *Id.* at 234.
154. *Id.*
155. *See generally id.*
156. *See infra* Part IV.C.
157. *Senate Moon Treaty Hearings*, *supra* note 12, at 163–64 ("[T]he treaty unacceptably increases the investment risk associated with successful commercial exploitation of extraterrestrial materials.") (statement of Mr. Edward Bock, Project Engineer at the Convair Division of General Dynamics Corporation).
158. *Id. at* 92.
159. *See id.* at 84, 93.
160. *Id.* at 93.
161. *Id.* at 84.
162. *Id.* at 37.

aluminum, and iron ore on the moon's surface that could be used for the construction of large space structures such as the Solar Power Satellite.[163] Titanium, magnesium, and high levels of hydrogen can also be found on the moon.[164] An Earth-approaching asteroid one-kilometer in diameter has about $1 trillion worth of steel—which is as much as the world produces in twenty years.[165]

National Aeronautics and Space Administration (NASA) studies in the 1980s indicated there were "no insurmountable technological impediments to the exploitation of extraterrestrial resources."[166] In order to make such ventures economically competitive, however, methods needed to be developed to process materials and fabricate system components in the unique environment of space, while minimizing transportation charges and operational costs.[167] The introduction of tele-operated and robotic systems technology appeared to be the enabling key to the exploitation of the space resources of energy and materials.[168] While estimates were difficult,[169] NASA calculated "that in the period 2000 to 2010 a viable capability could be tested through a technology readiness demonstration."[170]

The entry stake is extremely large—only very well-financed public or private entities can engage in moon exploitation.[171] It is estimated that an economic investment of approximately the scale of the Apollo program would be required to reach this lofty objective.[172] The NASA studies estimated start-up costs between $50–$100 billion.[173] The size of the "front-end" investment narrowed the possible industries to the production of electrical energy for terrestrial use.[174] The concept involved the manufacture and assembly of huge arrays of solar cells in space.[175]

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163. *Id.*
164. *Id.* at 44, 145.
165. *Id.* at 163.
166. *Id.* at 45.
167. *Id.*
168. *Id.*
169. *Id.*
170. *Id.*
171. *Id.* at 153.
172. *Id.* at 45.
173. *Id.* at 153.
174. *Id.*
175. *Id.*

Because the United States buys $50–$100 billion of oil from the Organization of Petroleum Exporting Countries (OPEC)[176] countries annually, some suggested that the United States should be prepared to consider an investment of this size because it could reduce energy dependence.[177]

During the Senate Moon Hearings, Mr. Edward Bock, a representative of General Dynamics Corporation, testified he was optimistic about the future technology for moon exploitation[178] and indicated it was possible to develop a lunar materials production facility.[179] Mr. Bock further testified that extraterrestrial sources of certain resources may be far more important than comparable alternatives such as those found in the seabed:[180]

> Use of extraterrestrail [sic] resources for in-space construction of large earth services satellites is one application for which seabed resources and substitutions are unlikely to compete. Utilization of extraterrestrial materials for applications on earth may also prove to be economically attractive. Innovative techniques for inexpensive delivery of space processed materials down through Earth's atmosphere have been proposed by qualified scientists. If these techniques prove to be feasible, and expansion of U.S. space activities encompasses technology permitting asteroid retrieval, then inexpensive resources obtained from space will be a reality.[181]

### *C. Two Cautionary Tales: Technology, Investment, and the Common Heritage*

Business interests are hostile to the CHH principle because of its presumed impact on the development of technology and investment security.[182] In particular, U.S. businesses are concerned about the multiple meanings associated with the CHH and the climate of uncertainty created by the principle.[183] A major difficulty in applying the CHH regime in a commercial context is the

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176. *Id.*
177. *Id.*
178. *See id.* at 155.
179. *See id.* at 154.
180. *Id.* at 161.
181. *Id.*
182. *See* Spectar, *supra* note 54, at 63–65.
183. *Id.* at 68

lack of consensus about the precise meanings of its elements and associated concepts.[184] Many business interests view the CHH principle as "ill-defined and elusive."[185] Because the CHH lacks a single "fixed, well defined, and generally accepted meaning,"[186] skeptics argue that it cannot be the basis of substantive obligations.[187]

There exists a considerable difference between the North and South as to the meaning and scope of certain key aspects of the CHH in the moon and seabed regimes.[188] At the core of the North-South division over CHH is the notion that the principle mandates large-scale technology transfers from North to South[189] on favorable and equitable terms.[190] The controversial technology transfer element, perhaps more than any other aspect of the CHH, is interpreted selectively and according to geo-political bias (the North-South divide) or economic interests, thus precipitating discordance and deadlock.[191] Thus, the technology transfer element of the CHH principle, as advanced by the South, is generally in conflict with Northern conceptions of free enterprise, particularly intellectual property rights.[192] As one commentator argues, the appurtenant principles of the CHH all mean "central economic planning and control of the development and marketing of resources."[193] Centralized planning, involving joint ownership and management of the resource for the benefit of humankind, presumably justifies North-South wealth transfers, as well as mandatory transfers of the technology needed to exploit common resources.[194] The general opinion is that technology transfer provisions are essentially part of a Third World plan "to gain control of critical raw materials and to gain access as a matter of right to the technology needed to exploit them."[195]

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184. *See, e.g., id.* at 65.
185. Gillian D. Triggs, *The Antarctic Treaty System: Some Jurisdictional Problems, in* THE ANTARCTIC TREATY REGIME: LAW, ENVIRONMENT AND RESOURCES 99 (Gillian D. Triggs ed., 1987).
186. *Senate Moon Treaty Hearings*, *supra* note 12, at 20.
187. *See* Triggs, *supra* note 185, at 101.
188. Spectar, *supra* note 54, at 60–64.
189. *Id.* at 60.
190. *See id.* at 69.
191. *See generally* id. at 60–65.
192. *Id.* at 64.
193. *Senate Moon Treaty Hearings*, *supra* note 12, at 120.
194. *Id.*
195. *Id.* at 220.

The view that the CHH includes a duty to provide preferential technology transfers or financial assistance to procure appropriate technology to the South has been incorporated into significant international legal instruments by the U.N. General Assembly (UNGA)—largely at the instigation of the Third World majority.[196] The seminal Declaration on the Establishment of the New International Economic Order (NIEO)[197] recommended North-South technology transfers[198] and "preferential and non-reciprocal treatment for developing countries."[199] The UNGA also adopted, on the same day, the Programme of Action on the Establishment of a New International Economic Order.[200]

The South also codified the new legal and economic order, which included technology transfers, in the Charter of Economic Rights and Duties of States adopted by the UNGA in 1974.[201] The Charter linked the NIEO agenda with CHH ideology,[202] and it affirmed the necessity of North to South technology transfers in Article 13.[203]

Many critics, particularly the American Mining Congress (AMC), a trade association comprised of U.S. companies that produce most U.S. metals, coal, and industrial and agricultural minerals, argued that the CHH principle would slow U.S. technological innovation.[204] The AMC was especially active in its opposition to the CHH principle on grounds that it impeded

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196. ANNUAL REVIEW OF UNITED NATIONS AFFAIRS 1974 209–11 (Joseph T. Vambery ed., 1976).

197. *Id.* at 208.

198. *Id.* at 211.

199. *Id.*

200. *Id.* at 212. The Programme begins: "In view of the continuing severe economic imbalance in the relations between developed and developing countries . . . urgent and effective measures need to be taken by the international community to assist the developing countries . . . ." *Id.*

201. G.A. Res. 3281, U.N. GAOR, 29th Sess., Supp. No. 31, U.N. Doc. A/9631 (1974).

202. ANNUAL REVIEW OF UNITED NATIONS AFFAIRS 1974, *supra* note 196, at 259.

> The sea-bed . . . , as well as the resources of the area, are the common heritage of mankind . . . the benefits derived therefrom are [to be] shared equitably by all States, taking into account the particular interests and needs of developing countries; an international régime applying to the area and its resources and including appropriate international machinery to give effect to its provisions shall be established by an international treaty of a universal character, generally agreed upon. *Id.*

203. *Id.* at 255.

204. *Senate Moon Treaty Hearings*, *supra* note 12, at 35.

technological development and reduced investment security.[205] The AMC's opposition was particularly significant because it was perhaps the largest stakeholder, representing over 300 companies that manufacture mining, milling, and processing equipment and supplies.[206] In addition, the AMC represents commercial banks and other institutions providing services to the mining industry and the financial sector.[207]

The members of the AMC viewed the CHH principle and its technology transfer provisions as fundamentally incompatible with requirements of private investment in the development of natural resources.[208] To them, the CHH principle represented a "system" of total international control over access to, and disposition of, key resources to effect North-South transfers of wealth and technology.[209]

Some members of the AMC such as the United Technologies Corporation (UT) mounted a vigorous public campaign against the Moon Treaty, lobbying members of Congress as well as the general public.[210] UT claimed a seabed-style CHH regime means strict production controls, technology transfers, and one-nation-

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205. *Id.* at 141.

206. *Id.* at 139.

207. *Id.*

208. *Id.* at 141. The CHH clearly has an entrenched meaning in the developing world, and this meaning has been repeatedly buttressed in public statements particularly because it has become a rallying point for the NIEO. *Id.* at 144. Thus, while the United States maintained that the CHH meant freedom of access, the Group of 77 (G-77) and others insisted that the CHH meant common ownership. *See generally* Spectar, *supra* note 54, at 61 (stating that in 1955, the G-77 was composed of newly independent states who lobbied for their economic and political interests).

209. *Senate Moon Treaty Hearings*, *supra* note 12, at 141. The United States was prepared to accept the deep seabed regime even with the offending characteristics "in order to obtain international agreement on a wide variety of ocean law questions perceived as important to our national interest." *Id.*

210. *See* PHILIP W. QUIGG, A POLE APART: THE EMERGING ISSUES OF ANTARCTICA 175 (1983). United Technologies (UT) ran an advertisement in *The Washington Post* on February 14, 1980, claiming that through the Moon Treaty, Third World Nations supported by the Soviet Union are seeking to exploit the United Nations to create a new order in which free enterprises of the industrialized West would be subordinated to the wishes of so-called non-aligned nations, guided by the Eastern bloc. The basic goal is redistribution of the world's wealth. *Id.* at 177. UT based its assessment of the implications of the CHH on the Law of the Sea model. *Senate Moon Treaty Hearings*, *supra* note 12, at 220. Like other American businesses, UT feared a CHH regime for the moon would be similar to a Law of the Sea Treaty regime, hostile to private enterprise. *Id.*

one-vote decision making as opposed to consensus.[211] The company also contended that the United States would suffer great harm because under CHH regimes, it would have to surrender many of the advantages of its current technological leadership.[212] For example, UT believed the proposed Moon Treaty would limit the ability of the aerospace industry to develop space resources.[213] In sum, the CHH concept was perceived as a key part of an overall Third World strategy to secure "fundamental redistribution of global wealth."[214]

Another major complaint of the mining industry was that activity in the industry was stymied by the absence of a firm U.S. policy and by the slow deliberations of the U.N. Convention on the Law of the Sea (UNCLOS).[215] Arguing that the important technical barriers had been removed, the ocean miners called for the removal of the political and legal uncertainties represented by the CHH.[216] While expressing confidence about the ability of the industry to overcome any technical hurdles, a prominent representative of a mining firm stated, "the technology is ready; the investment climate is not."[217]

Further, the political and legal uncertainty created by the CHH negotiation process was further exacerbated by the perception that estimates of economic rents were low when compared with the number of ocean mining companies and the sizable investments they were planning to make.[218] This factor may have contributed to the demand for legal assurances that mining sites that had been prospected and explored at "considerable expense" would not be "usurped by rival mining firms" or jeopardized by the imminent UNCLOS treaty.[219] There was a real fear that the emerging CHH regime would further squeeze already tight margins. If the seabed authority monopolized nodule production and/or tampered with market

211. *Id.*
212. *Id.*
213. *Id.*
214. *Id.*
215. ECKERT, *supra* note 110, at 237.
216. *See id.*
217. *Id.*
218. *Id.* at 234.
219. *Id.* at 237.

prices, the import substitution would have a negative impact on U.S. consumers.[220]

Also, U.S. business interests were concerned that a treaty that "established substantial royalties or taxes on ocean mining, or retroactively modified the boundaries of mine sites" would be inimical to the economic interest of the investors with sunk costs.[221] There was further concern that the emerging CHH regime could reduce the rents these consortia could otherwise collect.[222]

In addition, ocean miners were understandably reluctant to enter into the most expensive and risky phase of their activities in a climate of uncertainty. Ocean miners would be making financial commitments in excess of $500 million, without possessing deeds to mining sites from a governmental authority, nor assurances from the miners' own government that an unfavorable treaty to ocean mining would not be negotiated without an indemnification of their previous investments.[223] Uncertainty about the potential success of deep-sea mining also made bankers wary.[224] Hence, many of the consortia involved had to obtain direct financing.[225] Bankers were especially worried that UNCLOS was moving towards a CHH regime that was "unfavorable to mining by private firms."[226]

With regard to the Moon Treaty, the consensus in the business community appeared to be that the CHH approach "unacceptably increase[d] the investment risk associated with successful commercial exploitation of extraterrestrial materials."[227] Although there were no immediate plans for lunar exploitation, many U.S. businesses had invested substantial sums in scientific, research, and commercial projects in preparation for extraterrestrial mining that could have been placed at risk by the application of CHH to the moon.[228] As one observer remarked:

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220. *Id.*
221. *Id.* at 237.
222. *Id.*
223. *Id.*
224. *Id.* at 236.
225. *Id.*
226. *Id.* at 237.
227. *Senate Moon Treaty Hearings*, *supra* note 12, at 164.
228. *Id.* at 84.

> It is doubtful that these pioneers were aware at the time of commitment to their projects that the U.S. Department of State was engaged in negotiations designed to declare celestial bodies and their resources to be the common property of mankind to be administered by a future international regime, this being the meaning attributed to "common heritage" by most nations of the world, including the Soviet bloc and some 119 less developed countries.[229]

In addition, commercial interests were uncertain about the powers and operating procedures of a future international regime on resource exploitation.[230] Many believed that the Moon Treaty, as proposed, could "slow industry's involvement by introducing additional uncertainties into the investment/return equation."[231] Moreover, U.S. businesses believed that because of the ambiguity of the CHH principle, the Moon Treaty would limit free enterprise initiatives in outer space.[232]

At the time of the Moon Treaty hearings, some developing countries may have had their own perception of what common heritage means. Their perception, one commentator suggested, was not one that any mining company would want to go along with while considering an exploration program for the moon.[233] According to the prevailing view, a CHH regime for the moon:

> [W]ould not be desirable relative to traditional U.S. interests in market-oriented economic principles and in decentralized, pluralistic political principles. Further, to the extent that the regime incorporated stringent production controls, it would be undesirable from the perspective of global consumers and those concerned with the problems associated with the exploitation of limited global resources.[234]

Corporations were unwilling to engage in fifteen to twenty years of expensive research and development if there was a significant risk that it would be politically impossible for the company to recoup its investment.[235] Dr. Charles Sheffield, President of the American Astronomical Society, noted that parts

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229. *Id.* at 84–85.
230. *Id.* at 16.
231. *Id.* at 93.
232. *Id.* at 16.
233. *Id.* at 100.
234. *Id.* at 171.
235. *Id.* at 92.

of the Moon Treaty could be read as signifying a ban on private enterprise in the moon.[236] For example, Article 11(3) stated: "Neither the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become the property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person."[237]

According to Dr. Sheffield, the Moon Treaty's terminology is unclear and the resulting ambiguity discourages private investment.[238] Dr. Sheffield was disappointed that U.S industry leaders were not consulted as to a treaty addressing the exploitation or use of the moon's resources.[239] He scorned the belated consultation of industrialists, stating, "only now, when the treaty is a finished written report and a *fait accompli*, is industry being heard from and asked to provide inputs."[240] There were also economic concerns about the time-phased revenues and vague, speculative assessments of return on investment information.[241] Dr. Sheffield stated:

> No one has any idea what it would cost to produce a ton of a particular mineral from extraterrestrial sources, because there are such large uncertainties in two areas: the cost of systems to extract minerals away from earth (including, of course, the costs to go there and return); and the abundance of appropriate minerals. These parameters may not be known well enough for another thirty or forty years to encourage a private investment group to operate on a for-profit basis in the field of off-earth mineral exploration.[242]

Meanwhile, according to members of the Space Futures Society (SFS),[243] the Moon Treaty was designed to place obstacles

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236. *See id.*

237. *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* (Moon Treaty), G.A. Res. 34/68, 34 U.N. GAOR 34th sess., Supp. No. 46, at 79, U.N. Doc. A/34/664 (1979).

238. *Senate Moon Treaty Hearings*, *supra* note 12, at 92, 100.

239. *Id.* at 86.

240. *Id.* (emphasis added).

241. *Id.* at 92.

242. *Id.* at 92. Dr. Sheffield notes that merely because such exploration is presently difficult does not mean that exploratory activity may never occur in the future. *Id.* Companies presently have an interest in determining the parameters of extraterrestrial resource exploitation. *Id.*

243. *Id.* at 231. SFS is a non-profit organization dedicated to the industrialization and eventual humanization of space.

to the United States' development of an industrial base.[244] The SFS argued that even the principle of equitable sharing of benefits extends to more than simply the financial realm: "the principle has also been used to justify insistence on mandatory transfer of the technology used to exploit the resources."[245] According to the SFS, the Moon Treaty put the United States at a disadvantage in the proposed international regime and deprived the United States of "control over [its] economic destiny."[246]

SFS further argued that should this draft treaty be adopted, entities interested in making use of non-terrestrial resources would have to deal with the threat of such a moratorium and a regime that could tax it or drive it out of business. In addition, such a regime would force them to give up the competitive edge they had developed by having to "share" technology with the U.N. regime.[247] According to SFS, this clearly represents a risk that no corporation or nation could afford to take.[248]

Other critics of the Moon Treaty suggested that the United States make unilateral reservations favorable to U.S. industry because of the Treaty's negative effects on the development of technology.[249] Dr. Art Morrissey, Senior Policy Analyst at the Office of Science and Technology Policy, suggested that when the Moon Treaty was submitted for ratification, a declaration should be tendered that explicitly stated that "the common heritage language would not be a limiting aspect for American industry."[250]

Similarly, two representatives from the American Institute of Aeronautics and Astronautics (AIAA) suggested that given the present uncertainties with the Moon Treaty's language, the United States should withhold ratification until it was reworded to include certain interpretations and understandings.[251] Dr. Louis Friedman and other AIAA members made it clear that they did not necessarily oppose the Treaty.[252] In fact, they claimed indifference as to the "legal details" of the Moon Treaty.[253] Their focus,

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244. *Id.*
245. *Id.* at 120.
246. *Id.* at 231
247. *Id.* at 232.
248. *Id.*
249. *Id.* at 35.
250. *Id.* at 36.
251. *Id.* at 97.
252. *Id.*
253. *Id.*

instead, was on the state of technological development.[254] For the Moon Treaty to be helpful, the United States also needed to spend resources on research and development to have a viable, thriving space policy and program.[255] The pressure from these interest groups and individuals affected the pace, process, and outcome of the negotiations.[256]

The U.S. government, especially the Departments of Defense and State, had concerns about the CHH principle's effect on U.S. technological leadership and investment security.[257] On the whole, most U.S. policymakers feared that a technology transfer provision would be harmful to the United States' national security.[258] In the Export Administration Act of 1979, Congress expressed concern about exporting technology that could enhance the military capability of other nations at the expense of the United States.[259] One commentator observed that, to the extent that a CHH regime incorporated mandatory technology transfer provisions, such a regime might be "undesirable from the perspective of national security interests."[260]

Policymakers and legislators also blamed CHH politics for retarding the development and use of technology required in order to exploit the areas governed by CHH policies. As Senator Schmitt opined, UNCLOS had a "tremendously adverse effect on the rapid development on the technologies and management systems to work the resources of the deep sea."[261] The United States was strongly opposed to the view that the CHH principle mandated a pre-regime moratorium, arguing that the net effect of such a moratorium would be "to destroy any incentive for the development of the [needed] technology, either for use experimentally or for its mass production."[262] In a study of U.S. policy at the seabed negotiations, one observer concluded that the United States was "not at all interested in sharing its technology

254. *Id.* at 98.
255. *See id.*
256. *See generally* Spectar, *supra* note 6 (discussing the role of interest aggregation and articulation in shaping presidential positioning in regime formation in the global commons).
257. *Senate Moon Treaty Hearings*, *supra* note 12, at 220.
258. *Id.*
259. *Id.*
260. *Id.* at 171.
261. *Id.* at 43.
262. Christol, *supra* note 60, at 462.

with others."[263] Therefore, regimes that include technology-sharing provisions, are the "lowest ranked alternatives" for the United States.[264]

There were still some inconsistencies and contradictions in the U.S. stance as some administrations appeared to take a more lenient view towards technology transfer provisions.[265] As the U.S. stake in developing an orderly and efficient seabed regime increased, the United States showed a greater willingness to make some trade-offs in technology transfers in return for securing free and open access to the CHH.[266] For example, the United States wished to gain support from more moderate Third World states for a proposal that included the right of private parties, as well as the United Nations' Enterprise,[267] to mine the seabed. In an effort to gather this support, U.S. Secretary of State Kissinger promised a modest and limited transfer of technology to the United Nations and Third World.[268]

Similarly, the CHH principle received modest support from NASA Administrator, Dr. Robert Frosch, who observed that the potential chilling effect of UNCLOS on investment might have been overstated.[269] Furthermore, as S. Neil Hosenball of the U.N. Committee on the Peaceful Uses of Outer Space testified, "there is nothing in the [Moon] [T]reaty that prevents development of technology" by private or public concerns.[270]

In addition to the concerns that would come from accepting the technology transfer required by the CHH principle, other problems may have arisen if the United States did not accept these provisions. For example, if national security interests prevented the technology transfer required by the CHH, the regime that emerged could have been undesirable from the standpoint of U.S. mining interests, especially if they could not operate profitably.[271]

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263. WILLIAM E. WESTERMEYER, THE POLITICS OF MINERAL RESOURCE DEVELOPMENT IN ANTARCTICA 175 (1984).

264. *Id.*

265. *See* Spectar, *supra* note 6.

266. *Id.*

267. A 1976 Austrian proposal for a compulsory licensing system provided for one entity, known as the Enterprise, to be formed between any state and the U.N. Authority for each mining operation. *Id.* at 993.

268. *Id.* at 992.

269. *Senate Moon Treaty Hearings*, *supra* note 12, at 42.

270. *Id.* at 52.

271. *Id.* at 220.

Others argued that it was in the United States' national interest to participate in regimes that encouraged U.S. technological development.[272] Dr. Friedman contended that the Moon Treaty would be useful if, as a doctrine of policy, it encourages the government to boost development of celestial resource exploration.[273] In Dr. Friedman's view, the document itself was unimportant; what mattered was the United States' technological leadership.[274] If the United States maintained technological leadership by, *inter alia*, boosting research and development, the views of other states would be irrelevant.[275] In effect, the technological edge would give the United States the ability to dominate the emergent moon regime in much the same way that the United States dominated Intelsat (International Telecommunications Satellite Organization).[276]

Dr. Friedman was concerned that by abdicating its role in the moon regime, the United States might hinder technological development.[277] For the United States to be placed in a position comparable to one that it enjoyed in Intelsat, there would have to be strong federal research and development support for space technology.[278] Returns from moon investments are too long-range and risky—federal research and development support is required to spur private industry.[279] A General Accounting Office report indicated, however, an insufficient emphasis on space processing research by space industry planners.[280] At the time, NASA had no lunar research scheduled and since 1971, the United States had spent "hardly a nickel on the [m]oon."[281] In the meantime, the Soviets continued to develop and accelerate manned space

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272. *Id.* at 99.
273. *Id.*
274. *Id.* at 100.
275. *Id.*
276. *Id.* at 98. Intelsat is an organization founded in 1964 by the telecommunication agencies of eighteen nations, including the United States, who proposed the organization. 6 THE NEW ENCYCLOPÆDIA BRITANNICA 339 (15th ed. 1988). "Intelsat owns communications satellites and the ground stations from which they are controlled, but the transmitting and receiving apparatus in each country is owned by the Intelsat member from that country." *Id.*
277. *Senate Moon Treaty Hearings*, *supra* note 12, at 98.
278. *See id.*
279. *Id.* at 98, 99.
280. *Id.* at 98.
281. *Id.*

operations.[282] In fact, the Soviets were reportedly planning to build a permanent space station to use as a staging platform for manned flights to the moon and Mars.[283] Consequently, some policymakers were more concerned with the U.S. government's abdication of its leading role as a lunar pioneer than they were by the purported effect of the CHH negotiations on technology.[284]

Nevertheless, the opponents of both treaties persisted, and ultimately succeeded in defeating both treaties. In general, the opponents viewed the Third World (G-77) demands as antithetical to "U.S market-oriented and pluralistic interests."[285] The proposed mechanisms for technology transfers created an expansive and regulatory regime that could undermine private investment.[286] Many of the concerns of U.S. businesses centered on the widening implications of the CHH principle and the nature of the future CHH regime for the seabed and the moon.[287] In addition, many feared the Moon Treaty limited or foreclosed "free enterprise initiatives in outer space because of the ambiguity of the 'common heritage' concept."[288]

The negative perceptions of the CHH principle, including uncertainties about its precise legal implications, probably caused the Carter Administration to withhold support for the Moon Treaty.[289] Although the CHH principle of the moon regime did not include the requirement of technology transfer, opponents successfully placed the treaty in the same category as UNCLOS.[290] As a result of a successful lobbying campaign by the Treaty's opponents, the United States refused to sign or ratify the Moon Treaty.[291]

Meanwhile, UNCLOS affirmed the technology transfer component of the CHH principle. UNCLOS stated that the U.N. Authority shall "promote and encourage the transfer . . . of such

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282. *Id.*
283. *Id.*
284. *See id.*
285. *Id.* at 170.
286. *Id.* at 16.
287. *Id.*
288. *Id.*
289. *Id.* at 3. Growing criticism of the Treaty led the Carter Administration to defer its final approval or disapproval of the Treaty until after the 1980 elections. *Id.* Carter lost the election to Ronald W. Reagan.
290. *Senate Moon Treaty Hearings, supra* note 12, at 168.
291. *See* Spectar, *supra* note 54.

technology and scientific knowledge so that all States Parties benefit therefrom."[292] Nevertheless, any technology transfers have to be based on fair and reasonable commercial terms.[293] Given the wide-ranging powers of the International Seabed Authority, many analysts viewed Part 11 of UNCLOS as "a regime in compliance with the demands of the NIEO."[294]

The South's success in creating a CHH provision with a significant technology transfer component at UNCLOS, however, may have been a short-lived pyrrhic victory. In 1981, the newly-arrived Reagan Administration rejected the negotiated agreement and called for significant revisions.[295] The Reagan Administration desired changes in the provisions that would "not deter development of any deep seabed mineral resources to meet national and world demand."[296] In addition, President Reagan insisted that the Convention should not contain provisions creating serious commercial difficulties, including provisions for the mandatory transfer of private technology.[297]

## V. LESSONS LEARNED

The resuscitation of the CHH principle in a global context necessarily requires inclusion of North-South technology transfers to improve access to, and allow equitable allocation of, the benefits of commonage. Meanwhile, the demand for technology transfers or the quasi-legislation of technology transfers triggers intense negative reactions in Northern nations where private

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292. United Nations Convention on the Law of the Sea, *supra* note 12, at 1294.

293. *Id.*

294. Willy Østreng, *The Conflict and Alignment Pattern of Antarctic Politics. Is a New Order Needed?*, *in* THE ANTARCTIC TREATY SYSTEM IN WORLD POLITICS 433, 438 (Arnfinn Jørgensen-Dahl & Willy Østreng eds., 1991).

295. *See* CHRISTOPHER SIMPSON, NATIONAL SECURITY DIRECTIVES OF THE REAGAN AND BUSH ADMINISTRATIONS: THE DECLASSIFIED HISTORY OF U.S. POLITICAL & MILITARY POLICY 1981–1991, at 90 (1995).

296. *Id.*

297. *Id.* Eventually, the Clinton-Gore administration signed the seabed provisions but only after it had taken steps to clarify and limit the scope of the CHH principle. Letter from Warren Christopher, Secretary of State, to Ronald Reagan, U.S. President (Sept. 23, 1994) (recommending that the Convention and the Agreement be transmitted to the Senate for its advice and consent to accession and ratification) (on file with the Loyola of Los Angeles International and Comparative Law Review). The new Agreement of 1994 modifies Part XI of the Convention and it gives specific meaning to the common heritage principle as it applies to the mineral resources of the seabed beyond coastal state jurisdiction. *Id.*

business interests are concerned with the protection and development of proprietary technology as well as investment security.[298]

Controversies over the impact of the CHH scheme on technology development and investment security demonstrate the limits, efficacy, and acceptability of common heritage governance. In particular, concerns over technological development and investment security had significant consequences for the nature and outcomes of negotiations in the global commons.[299] Both the UNCLOS and moon regime negotiations were unduly protracted, largely because of the North-South discord over the CHH provision and its likely impact on the development of technology, property rights, and investment security.[300] Despite general support for a free and open access concept of the CHH in both the seabed and the moon regimes, the North was ambivalent towards the continually expanding and evolving CHH concept, specifically the attempts by the South to secure transfers of proprietary technologies.[301] Ultimately, the United States was much less likely to support strict and/or ambiguous CHH regimes that appeared to threaten technological development and investment security.

Plans to apply the CHH approach to the human genome must reflect the lessons of the seabed and moon regime case studies. These examples demonstrate that the normative aspirations of CHH governance often clash with other interests such as technology development and investment security. While the human genome may indeed be the new CHH, the concept has been tainted by the rancorous North-South polemics over its application in the seabed and the moon regimes. Given the baggage carried by the concept, its injection into a prospective genomic convention may stir the simmering North-South debate. If the negotiators of a prospective genomic convention ignore the history and lessons of previous regime negotiations, they could find themselves reenacting the interminable, tragicomic posturing so long associated with the North-South tangle.

While the South often views an unrestricted CHH provision as a panacea for a potpourri of perennial maladies, the moon and

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298. *See* Sturges, *supra* note 4, at 251.
299. *Senate Moon Treaty Hearings*, *supra* note 12, at 171.
300. *Id.* at 141.
301. *Id.*

seabed examples demonstrate that commercial interests in the North are likely to be undermined by a wide-ranging CHH provision. As concerns over technological development and investment security mounted, the United States often became less willing to enter into a binding CHH agreement. As a result, the escalating demands for technology transfer precipitated the rejection of the seabed and the moon treaties.[302]

Given the recent emergence of genomic stakeholders[303] interested in protecting technological development, investment security, and other interests of great commercial value, one can anticipate strong resistance to any CHH scheme that imperils these vested interests.[304]

Post-Cold War international law-making holds great promise for re-invigorated cooperation and profitable partnerships between North and South.[305] The drafting of a human genome convention presents policy makers with an opportunity to transcend the tempestuousness, acerbity, and recriminations of the old North-South debate. The anti-market approaches advanced by some proponents of the CHH have proven unworkable; therefore, such a genomic convention should reflect the increasingly decentralized and market-oriented framework of the post-Cold War world. Instead of relying on a vertically imposed regime, the recommendations set forth below lay the groundwork for a process of horizontal coordination between public and private entities, including non-governmental organizations.

Given the legitimacy of the competing interests on both sides of the North-South schism, drafters of a convention should seek

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302. *Id.* at 221.

303. *See* Bryant, *supra* note 36, at 65.

304. In March 2000, the stock market, especially the biotech sector, dropped precipitously when U.S. President Bill Clinton and British Prime Minister Tony Blair made comments that caused many investors to believe that the two governments wanted scientists to "have free access to corporate research on the charting of human genes." CNNfn, *Biotech Takes a Beating: Genomics Shares Slammed Amid Concerns Over Access to Genetic Data*, *at* http://cnnfn.cnn.com/2000/03/14/companies/biotech/index.htm (Mar. 14, 2000). Human Genome Sciences and Celera Genomics lost about 20% of their stock prices on March 14, 2000. *Id.*

305. *See* J.M. SPECTAR, THE PROMISE OF GLOBAL SOCIETY: MULTI-LEVEL PARTNERSHIPS AND THE POSSIBILITIES OF POST-INTERNATIONAL RELATIONS (forthcoming 2001)(arguing that to manage the critical challenges of twenty-first century international relations and to secure the benefits of globalization for all humankind, key elements of civil society and other non-state actors must join state actors in a pluralistic network of purposeful partnerships).

win-win solutions characterized by reciprocity and mutuality. It is hoped that these recommendations will serve as preliminary guidelines for less hierarchical and more flexible CHH governance that would satisfy the real concerns of both North and South. The recommendations are also intended to maximize prospects for crucial U.S. support of CHH governance for the human genome in a binding international convention. In addition, the recommendations provide a new way of thinking about the CHH principle without the vexing hex of hackneyed North-South rhetoric, rancor and recriminations. If negotiators of a future human genome convention follow these guidelines, they would probably increase the likelihood of protecting the genome as the CHH, without imperiling the prospects for an agreement by seeming to jeopardize the development of technology and investment security. As humankind enters the brave new "Age of the Genome," one must hope for success.

## VI. RECOMMENDATIONS FOR THE DRAFTERS OF THE HUMAN GENOME CONVENTION

The common heritage should be redefined, clarified, simplified, and limited. A suggested definition for the human genome reads as follows: *the common heritage of humankind for purposes of the international convention on the human genome simply means that the raw genetic data or natural material from the HGP will be freely available to all.*

The definition of the common heritage in the convention must not include the controversial technology and wealth transfer provisions. Despite the merits of many of the claims, the convention on the human genome must not be used as the forum for resolving unrelated and long-standing North-South economic or political issues. The simpler and more straightforward the definition, the greater the likelihood of crucial U.S. support for the emerging regime.

To speed up the pace of negotiations and to increase the likelihood of agreement, the common heritage aspect of the human genome convention should be separated from other parts of the agreement.

To garner the necessary support of developed countries, particularly the United States, the parties should agree at the onset of the negotiations that applying the common heritage principle to

the genome is not intended to prevent genomics companies from obtaining appropriate patents.

To increase the likelihood of necessary support from developed nations for a genome convention, the developing countries should support and enforce appropriate intellectual property agreements as well as appropriate investment security guarantees.

To improve access to the fruits of the genome, the international convention should strongly encourage all states, non-governmental organizations, foundations, corporations, universities, and individuals to establish and participate in a voluntary Human Genome Fund (HGF). This HGF should be used to purchase revolutionary genomic therapies, necessary vaccines, or other medicines for direct distribution to countries and peoples in need, thus accomplishing many of the distributive justice goals of the common heritage.

In constructive partnerships with genomics companies, research labs, universities, and state entities, the HGF would focus its efforts on the discovery, development, and distribution of gene-based vaccines, therapies, or other medicines necessary to cure or stave off pandemics such as AIDS or Ebola. The HGF should provide incentives for genomics companies worldwide to share their patents for purposes of speeding up drug discovery and delivery to countries facing pandemics. Charitable foundations should be encouraged to secure genomics patents and rights to gene-based therapies on behalf of the HGF. State parties should be encouraged to provide substantial and commensurate capital gains tax reductions, deductions, exemptions, credits, and other preferential economic treatment for corporations or entities contributing to the HGF. In addition, all research and development expenses for entities participating in the HGF should be completely tax deductible. Representatives from non-governmental organizations, such as HUGO, the International Red Cross, and Doctors Without Borders should be considered for supervisory/oversight functions in the HGF.

Private genomics enterprises and other involved non-state entities should be invited to participate in the drafting of the prospective international convention on the human genome. Non-state actors, including genomics corporations and non-governmental organizations, should be consulted for their expertise with regard to developing market-oriented frameworks

for increasing worldwide access to the fruits of the genome. Interested parties, including scholars, jurists, scientists, ethicists, researchers, and media and business personalities, should be given full access to the negotiations process as well as to other matters related to the international governance of the human genome.

Non-governmental organizations with an interest in health care and access to medicine should be encouraged to form partnerships with genomics corporations, pharmaceutical companies, universities, and research labs. These partnerships should act in concert to develop gene-based cures to epidemics that threaten global stability. Acting in concert on behalf of humankind, these partnerships should be encouraged to work in association with state actors for the purpose of developing new and innovative ways to distribute the benefits of the common heritage to the individuals who need drugs necessary to stave off pandemics.

All states should affirm or reaffirm their support for a meaningful human right to health care that includes access to any generally accepted gene-based vaccines or therapies capable of curing plagues such as AIDS and/or preventing other pandemics. The prospective convention on the human genome should treat this right to certain life-saving health benefits of the genome as a new *jus cogens* norm in international law. This human right should create an obligation on the part of states and non-state entities alike to act in good faith to spread the life-saving benefits of the genome to all humankind.

Upon proper showing of cause, states should be allowed to make and enter good faith reservations or unilateral understandings, regarding their interpretation of the common heritage or any obligations under this convention. These reservations and understandings should be given consideration when determining state responsibility or legal obligation with regard to the human genome convention.

## VII. CONCLUSION

The revolutionary changes heralded by the completion of the HGP could further widen the gap between the global "haves" and "have-nots," thus creating a new hotbed of North-South contention over the global distribution of goods. Although many international lawyers have been quick to confer the CHH mantle on the genome, caution must be exercised as this lofty concept has

often derailed or stymied global resource regime negotiations. Efforts to place the human genome under CHH governance in a binding convention, however justifiable and/or desirable, would probably face stiff resistance from genomic stakeholders.

Given the North's relative power position and its current monopoly of genomic technology, it would be imprudent for the South to attempt to wrestle the fruits of the human genome from the North by using hierarchical anti-market regulatory frameworks. If the South is to have any chance of benefiting from this revolution in the near future, it must forge constructive partnerships with the North. The recommendations posited here provide key elements of a constructive approach that can achieve many of the normative aspirations of CHH governance, while maximizing prospects for crucial Northern support for any prospective international convention on the human genome. By adopting these recommendations, the drafters of such a convention would ensure the widest possible dissemination of the benefits of the HGP within a framework of North-South cooperation. If they fail to accomplish this task, it is likely that the fruits of the human genome tree will remain beyond the grasp of the world's poorest countries for a very long time to come.