

**HANDLING HUMAN-CREATED RISKS****James M. Hennessy\***

The risk of calamity and doom has been a common feature of human life since the earliest times. Over thousands of years humans fought to survive and gradually began to tame their natural environment and improve their quality of life. The results have been mostly positive but the modern world is threatened by risks created by humans that arose out of this developmental process. Starting with the detonation of the first atomic bomb in 1945 and the subsequent stockpiling of nuclear weapons, humans have developed technologies that are capable of causing worldwide calamity.<sup>1</sup> Human ingenuity has both created and contained these risks. The essays in this issue of *Jurimetrics* consider whether we can and will continue to handle these risks successfully.

Twenty-five professors, students, and interested colleagues associated with the Sandra Day O'Connor College of Law at Arizona State University (ASU Law School Group) met biweekly eight times during the 2015 spring semester to consider these human-created risks. We focused on the depletion of key resources; technological unemployment; war and civilizational conflict; emerging technologies that may bring radical life extension; profound human enhancement; and the possible replacement of humans by super intelligent machines. Any one of these risks could cause large scale ruin. No true consensus was reached by the ASU Law School Group but generally it is our expectation that the world's seven billion-plus inhabitants will continue to respond imaginatively to nature and human-created risks as we have throughout history.

But success is hardly a given. The risks are high, they often are difficult to discern, and there is little time to deal with them. In addition, large-scale, politically sophisticated, competent strategies, which may be needed to avoid doom, are exceedingly difficult to achieve and implement.

**I. BACKGROUND**

Individually and collectively humans have always been at risk of doom. Individually, humans face accidents, disease, predators, enemies, and starvation

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1. RICHARD A. POSNER, CATASTROPHE: RISK AND RESPONSE 21–91 (2004); Nick Bostrom, *Existential Risks: Analyzing Human Extinction Scenarios and Related Hazards*, 9 J. EVOLUTION & TECH., no. 1, 2002, at 1, 2.

among other risks. Collectively, humans face famine, plague, war, volcanoes, and asteroids. Nearly all species that ever existed are extinct.<sup>2</sup> All human hominid cousins including Neanderthals and Denisovans are extinct.<sup>3</sup> Even humans had a very close call. We nearly disappeared in 70,000 BC when a super volcano exploded and reduced us to an estimated 2,000 to 10,000 mating pairs worldwide.<sup>4</sup>

Why have humans survived when almost all other species have not? Let's look back 12,000 years. After the last ice age, humans began a slow process of gradually controlling their environment. Most importantly, instead of hunting and gathering, we began to grow our own food and increasingly we learned to control our fate.<sup>5</sup>

Human success is based on human ingenuity. Humans do not just hope for the best. Unlike all other animals, humans use their ability to think to alter their environment and improve their chances for survival as well as increase their security, comfort, and enjoyment.<sup>6</sup> All other creatures are at the mercy of nature and human-made challenges. If a nonhuman's environmental niche radically changes, it likely perishes. Humans on the other hand moved, made clothes, developed weapons, built shelters, and continuously modified their behavior to adapt to new conditions. Because we changed, as necessary, we survived.<sup>7</sup>

Humans have ingeniously modified nature throughout recorded history and before. In the process, we have created increasingly complex social and economic organizations. We built dams, irrigation systems, towns, temples, bridges, and more.<sup>8</sup> This developmental process progressed but not evenly and often with serious setbacks. The early European Middle Ages is a notable example. The glories of Egypt, Rome, and Greece were forgotten, and Europe was reduced to a subsistence existence with little social or economic interaction other than war. Most people lived a small tribal life in isolated villages.<sup>9</sup>

Although the process stalled and periodically nearly ended, human ingenuity was durable. The results are obvious. The world population has increased

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2. BEVERLY PETERSON STEARNS ET AL., WATCHING FROM THE EDGE OF EXTINCTION, at x (1999).

3. R.P. SRIVASTAVA, MORPHOLOGY OF THE PRIMATES AND HUMAN EVOLUTION 159–67 (2009).

4. JOHN SAVINO & MARIE D. JONES, SUPER VOLCANO: THE CATASTROPHIC EVENT THAT CHANGED THE COURSE OF HUMAN HISTORY: COULD YELLOWSTONE BE NEXT? 140 (2007); Michael R. Rampino & Stanley H. Ambrose, *Volcanic Winter in the Garden of Eden: The Tabor Supereruption and the Late Pleistocene Human Population Crash*, 345 SPECIAL PAPERS GEOLOGICAL SOC'Y AM. 71 (2000).

5. Michael Balter, *Farming Was So Nice It Was Invented Twice*, SCIENCE (July 4, 2013, 2:15 PM), <http://www.sciencemag.org/news/2013/07/farming-was-so-nice-it-was-invented-least-twice>.

6. See ANNALEE NEWITZ, SCATTER, ADAPT, AND REMEMBER, HOW HUMANS WILL SURVIVE A MASS EXTINCTION 70 (2013).

7. Brian Handwerk, *How Climate Change May Have Shaped Human Evolution*, SMITHSONIAN.COM (Sept. 30, 2014), [www.smithsonianmag.com/science-nature/how-climate-may-have-shaped-human-evolution-180952885](http://www.smithsonianmag.com/science-nature/how-climate-may-have-shaped-human-evolution-180952885).

8. See ROGER COLLINS, EARLY MEDIEVAL EUROPE, 300–1000, at 173 (3d ed. 2010).

9. JEAN CHAPELOT & ROBERT FOSSIER, THE VILLAGE & HOUSE IN THE MIDDLE AGES 15–16 (1985).

from 300 million when the modern era began to over seven billion today.<sup>10</sup> By nearly any measure, this process has been a huge success. Worldwide, human longevity has increased from an average of 30 years in 1800 to over 70 today. People are healthier, diseases are being conquered, education is flourishing, and the arts and culture are available to a growing percentage of people.<sup>11</sup> But humanity has paid a price. Humans have softened nature's rougher edges, but in doing so have created risks that are even more threatening than those posed by nature.

Thomas Malthus was among the first to sound the alarm about the potential limits of humans controlling and conquering their environment.<sup>12</sup> According to Malthus the carrying load of the earth was fixed and the human population was capped. If he had been right, the continued increase in the number of humans would have stalled at about one billion in 1800.<sup>13</sup> But he was wrong and again humans used their ingenuity, adapted, and outraced the limits of nature. That said, success was neither complete nor permanent.<sup>14</sup> Every advance seemed to bring new challenges and limits.

For example, nitrogen was an essential ingredient of fertilizer that was the foundation of agricultural productivity. In the early twentieth century, nitrogen from natural sources was reaching its limit, and without more plentiful, inexpensive fertilizer agricultural productivity would have stalled. German chemist and Nobel Prize winner Fritz Haber laid the foundation for converting airborne nitrogen, which is nearly limitless, into usable fertilizer.<sup>15</sup> Agricultural productivity continued to increase and the world's growing human population continued to be fed.

Human success was neither complete nor permanent. During the 1960s and 1970s, academics like Paul Ehrlich and John Holdren sounded the alarm that food limits again were being reached and soon mass starvation in Mexico, India, and elsewhere would occur, with social breakdown and chaos to follow.<sup>16</sup> One of their recommendations was to create a world government with broad coercive powers to handle this pending doom.<sup>17</sup> Meanwhile, Norman Borlaug, a pragmatic American biologist, worked on the creation of new strains of rice and other crops, used advanced agricultural productivity techniques, mustered

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10. *World Population: Historical Estimates of World Population*, U.S. CENSUS BUREAU, [http://www.census.gov/population/international/data/worldpop/table\\_history.php](http://www.census.gov/population/international/data/worldpop/table_history.php) (last revised July 9, 2015); *World Population: Total Midyear Population for the World: 1950–2050*, [http://www.census.gov/population/international/data/worldpop/table\\_population.php](http://www.census.gov/population/international/data/worldpop/table_population.php) (last revised July 9, 2015).

11. Max Roser, *Life Expectancy*, OUR WORLD DATA, <https://ourworldindata.org/life-expectancy/> (last visited June 22, 2016).

12. THOMAS MALTHUS, AN ESSAY ON THE PRINCIPLE OF POPULATION (Elec. Scholarly Publ'g Project 1998) (1798), <http://www.esp.org/books/malthus/population/malthus.pdf>.

13. *World Population: Historical Estimates of Human Population*, *supra* note 10.

14. RUTH DEFRIES, THE BIG RATCHET: HOW HUMANITY THRIVES IN THE FACE OF NATURAL CRISIS; A BIOGRAPHY OF AN INGENIOUS SPECIES 106 (2014).

15. *Id.* at 108–13.

16. PAUL R. EHRLICH, THE POPULATION BOMB 131–36 (1968).

17. PAUL R. EHRLICH ET AL., ECOSCIENCE: POPULATION, RESOURCES, ENVIRONMENT 942 (3d ed. 1978).

strong local political support, and helped launch the Green Revolution.<sup>18</sup> Human ingenuity triumphed again.

But will humanity continue to triumph? The problems humans create are becoming increasingly complex. Marshaling political support needed to solve these problems and avoid doom is a daunting challenge. The pace of change is increasing, there is less time to handle ever larger problems, and the possibility for failure seems more likely. Humans are ingenious but time may be running out.

## II. ISSUES AND AUTHORS

Human-created risks are identified and analyzed in this issue of *Jurimetrics* by the following five authors who participated in the ASU Law School Group discussion about Doomsday.

Arnie Calica addresses the issue of resource limits. He considers the increasingly rapid process of development and growth, the dramatic increase in our human population, and the resulting rapid depletion of resources. There is growing concern about many basic resources and the continuing vitality of the earth's ecosystems. Soil quality is deteriorating from excess farming and grazing.<sup>19</sup> Fresh water, especially from aquifers, is being depleted.<sup>20</sup> Natural habitats are being destroyed and whole species are disappearing.<sup>21</sup> Some believe that there is not enough oil based on current usage and we will soon run out.<sup>22</sup> Not only are resources being depleted but their increasing use is causing a potential disaster with the earth's environment and climate. Calica considers and supports the alternative point of view. He examines the works of Julian Simon, Professor of Economics at the University of Maryland, who believes that human ingenuity, the ultimate resource, will never run out and will always provide solutions. Simon is a careful and savvy observer, and so far he has been right.<sup>23</sup> Human ingenuity has answered the call in timely fashion.

Most famously, Simon won a public wager with Stanford Professor Paul Ehrlich about the price performance of five commodities from 1980 to 1990. Ehrlich believed that natural resources were running out and prices would rise. Simon believed that natural resources were plentiful and new supplies would be found and prices would decline.<sup>24</sup> Simon won the wager, although critics note

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18. NOEL VIETMEYER, *OUR DAILY BREAD, THE ESSENTIAL NORMAN BORLAUG* 241 (2011); DEFRIES, *supra* note 14, at 175–88.

19. World Economic Forum, *What if the World's Soil Runs Out?*, TIME (Dec. 14, 2012), <http://world.time.com/2012/12/14/what-if-the-worlds-soil-runs-out/>.

20. USGS Water Sci. School, *Groundwater Depletion*, U.S. GEOLOGICAL SURVEY, <http://water.usgs.gov/edu/gwdepletion.html> (last modified May 2, 2016).

21. Stuart L. Pimm et al., *The Future of Biodiversity*, 269 SCIENCE 347–50 (1995).

22. Bryan Walsh, *The IEA Says Peak Oil Is Dead. That's Bad News for Climate Policy*, TIME (May 15, 2013), <http://science.time.com/2013/05/15/the-ia-says-peak-oil-is-dead-thats-bad-for-climate-policy/>.

23. Paul Dragos Aligica, *Julian Simon and the Limits to Growth*, 1 ELEC. J. SUSTAINABLE DEV. 49, 49 (2009); JULIAN SIMON, *THE ULTIMATE RESOURCE* 1 (1981).

24. David McClintick & Ross B. Emmett, *Betting on the Wealth of Nature: The Simon-Ehrlich Wager*, PERC REP. (Fall 2005), <http://www.perc.org/articles/betting-wealth-nature>.

that he was lucky based on his choice of commodities and time period. Other commodities and decades would have given another result.<sup>25</sup>

Calica believes that natural resources are plentiful and substitutes exist for any that really are running out. Oil for example has been declared at its peak availability numerous times for the last several decades. Despite these gloomy prognostications, oil supplies and production are increasing.<sup>26</sup> Calica also notes that substitutes for oil are being developed, which will provide energy to power civilization indefinitely. Energy converted directly from the sun will last as long as needed. With abundant energy and other natural resources, Calica believes that the earth's population can continue to comfortably multiply.

Recently, French economist Thomas Piketty has proposed that although the capitalist market economic system efficiently processes natural resources, it results in the increasing concentration of wealth in the hands of the few. Piketty's opinion is that the concentration of wealth is inevitable in capitalist market economies and it results in gross unfairness that will be socially destructive.<sup>27</sup> Calica deconstructs Piketty's analysis and concludes that unfairness and concentration of wealth is not an inevitable outcome of market economies and he recommends that markets should be allowed to continue to efficiently process resources and provide abundance for all.

Calica provides reasons to be optimistic, but we will continue to be vulnerable to calamity if we fail to find adequate substitutes for essential natural resources and we continue to destructively alter the environment. Gary E. Marchant and Karen Bradshaw address resource limits as well. Their specific focus is on the fine balance that is needed in policy making to enable humans both to innovate and address new limits and regulate development to provide safety, health, security, and fairness. Any balance will be difficult to achieve, and any balance achieved will need to constantly change as technologies morph and develop. The risk is both too much regulation and too little.<sup>28</sup> Disaster may occur because regulations are too tight and needed innovations are not developed in a timely manner. On the other hand, the lack of proper regulatory control and guidance may allow new technologies to be unleashed improperly or prematurely, so resulting in doom. The road blocks to creating proper rules and regulations are numerous, including bureaucratic lethargy, political gridlock, ideology, greed, fear, misunderstanding and ignorance, lack of proper funding, and complacency among others. Marchant and Bradshaw consider both the road blocks and the various strategies for developing balanced and effective rules and regulations.

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25. *Id.*

26. Bill Blackwell, *Transitioning from the Age of Fossil Fuels*, HARVARD LOCAL: SOLUTIONS FOR A SUSTAINABLE COMMUNITY (Feb. 27, 2007), [www.harvardlocal.org/files/HL-070227-Harvard.ppt](http://www.harvardlocal.org/files/HL-070227-Harvard.ppt).

27. THOMAS PIKETTY, *CAPITAL IN THE TWENTY-FIRST CENTURY* 571 (2014).

28. DAVID VOGEL, *THE POLITICS OF PRECAUTION: REGULATING HEALTH, SAFETY, AND ENVIRONMENTAL RISKS IN EUROPE AND THE UNITED STATES*, at x (2012); Luca Enriques & Dirk Zetsche, *The Risky Business of Regulating Risk Management in Listed Companies*, 10 *EUROPEAN COMPANY & FINANCIAL L. REV.* 271–303 (2013).

Yvonne Stevens focuses on technological unemployment. Two Massachusetts Institute of Technology (MIT) economists, Erik Brynjolfsson and John McAfee, consider this issue in their two recent books: (1) *Race Against the Machine: How the Digital Revolution Is Accelerating Innovation, Driving Productivity and Irreversibly Transforming Employment and the Economy* and (2) *The Second Machine Age: Work, Progress and Prosperity in a Time of Brilliant Technologies*.<sup>29</sup> They conclude that machines are negatively impacting human work. Similarly, in 2013 the Martin Foundation at Oxford University published a study claiming that during the next twenty years 47% of all jobs in the United States are likely to be done by machines better and cheaper.<sup>30</sup>

The issue of technological unemployment has deep roots. More recently, the fear of significant job losses resurfaced with nineteenth century English textile workers called Luddites who feared that their mill jobs would be replaced by newly invented machines. They smashed the machines but failed to save their jobs.<sup>31</sup> But all was not lost. The efficiencies and savings produced by mechanization allowed labor and capital to be diverted to other economic activities resulting in the creation of far more jobs. The Luddites' failure to understand this process of creative destruction is known as the Luddite Fallacy.<sup>32</sup> But maybe it is no longer a fallacy. Stevens considers whether the Luddites may now be right and whether halting technological progress finally is the right answer.

She also considers whether human ingenuity will be able to solve the problem of what people will do if most jobs disappear. Historically, jobs have served as a fundamental part of our social contract.<sup>33</sup> Without jobs to provide people with purpose and the ability to support themselves and their families, a new social contract will have to be adopted to ensure that wealth is fairly distributed, motivation is maintained, and people continue to bind together in social harmony.<sup>34</sup>

Braden Allenby considers the constant evolution of humanity's capacity for conflict and destruction. As ingenious as man has become, his emotions, needs, and bad behavior constantly threaten to undo the good that human ingenuity provides. Detonation of two nuclear bombs to end World War II in Asia and the

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29. ERIK BRYNJOLFSSON & ANDREW MCAFEE, *RACE AGAINST THE MACHINE: HOW THE DIGITAL REVOLUTION IS ACCELERATING INNOVATION, DRIVING PRODUCTIVITY, AND IRREVERSIBLY TRANSFORMING EMPLOYMENT AND THE ECONOMY* (2012); ERIK BRYNJOLFSSON & ANDREW MCAFEE, *THE SECOND MACHINE AGE: WORK, PROGRESS, AND PROSPERITY IN A TIME OF BRILLIANT TECHNOLOGIES* (2014).

30. Carl Benedikt & Michael Osborn, *The Future of Employment: How Susceptible Are Jobs to Computerisation* 47–48 (Oxford Martin Programme on Tech. & Emp't, Working Paper, 2013), <http://www.oxfordmartin.ox.ac.uk/downloads/academic/future-of-employment.pdf>.

31. Richard Conniff, *What the Luddites Really Fought Against*, SMITHSONIAN MAG. (Mar. 2011), <http://www.smithsonianmag.com/history/what-the-luddites-really-fought-against-264412/>.

32. Tejvan Pettinger, *The Luddite Fallacy*, ECON. HELP (Jan. 15, 2014), [www.economicshelp.org/blog/6717/economics/the\\_luddite\\_fallacy/](http://www.economicshelp.org/blog/6717/economics/the_luddite_fallacy/).

33. Thomas A. Kochan, *Reconstructing America's Social Contract in Employment: The Role of Policy, Institutions, and Practices*, 75 CHI.-KENT L. REV. 137, 138 (1999).

34. THOMAS KOCHAN & BETH SHULMAN, EPI BRIEFING PAPER NO. 184, A NEW SOCIAL CONTRACT RESTORING DIGNITY AND BALANCE TO THE ECONOMY, ECON. POL'Y INST.: AGENDA FOR SHARED PROSPERITY (Feb. 22, 2007), <http://www.gpn.org/bp184/bp184.pdf>.

subsequent stockpiling and proliferation of ever more destructive weapons during the Cold War created the first human-made existential risk.<sup>35</sup> The process of development, growth, and the resulting control of nature has resulted in the possibility of civilization ending in a nuclear winter. Allenby considers this history and the changing dynamics of civilizational competition among the United States, Russia, and China for superiority and mastery.<sup>36</sup> This competition does not have to end badly according to Allenby, but it will require flexibility and compromise on a level previously not experienced in geopolitics. The only certainty is that destructive competition and war must be avoided and cooperation must be achieved to assure that human-created risks are contained.

Joel Garreau considers possible outcomes based on human-created risks. In his book *Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies—and What It Means to Be Human*, Garreau contemplates whether we are looking forward to heaven or hell or whether humans will once again demonstrate their durability, muddle through, and prevail.<sup>37</sup> Garreau notes that the demonstrated historical competence of humans is strong, and although there is no road map for dealing with the myriad human-created problems, he concludes that we humans may once again surprise ourselves. A credible scenario—Prevail—exists in which we come together to accelerate our response on a curve even steeper than our challenges.<sup>38</sup> Obviously, this will not be accomplished easily.

### III. EMERGING TECHNOLOGIES AND RISK

Human ingenuity is not standing still. The world is more prosperous; there are many more scientists and technologists; information is widely and easily shared; and technology is developing rapidly. The benefits are enormous and people worldwide are harvesting a multitude of positive developments. But as in the past, new and troubling risks also are arising. Three of these technological risks are highlighted below to illustrate the daunting problems created by humans as they continue to invent and create.

The potential extension of human life is one of these three illustrative technologies. Oxford Biology Professor Aubrey de Grey famously claims that the human body is a machine and that with proper care and maintenance using new technologies we may be able to live much longer and maybe indefinitely.<sup>39</sup> The possibility of a true fountain of youth will disrupt nearly every aspect of our

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35. Bostrom, *supra* note 1, at 4.

36. Samuel P. Huntington, *The Clash of Civilizations?*, FOREIGN AFF., Summer 1993, at 22.

37. JOEL GARREAU, RADICAL EVOLUTION: THE PROMISE AND PERIL OF ENHANCING OUR MINDS, OUR BODIES—AND WHAT IT MEANS TO BE HUMAN 13–14 (2005).

38. Nick Bostrom, *The Future of Humankind: Scenarios from Heaven to Hell, With Steps Along the Way*, SCI. AM. (July 1, 2005), [www.scientificamerican.com/article/the-future-of-humankind/](http://www.scientificamerican.com/article/the-future-of-humankind/).

39. Caspar Llewellyn Smith, *Aubrey de Grey: We Don't Have to Get Sick as We Get Older*, GUARDIAN (Jul. 31, 2010, 7:02 PM), <http://www.theguardian.com/technology/2010/aug/01/aubrey-de-grey-ageing-research>.

social, economic, political, and personal lives. The current life steps of education, job, marriage, family, retirement, and death may no longer apply.<sup>40</sup> It is an open question whether humans will be able to tolerate this revolutionary change and whether our institutions will be durable enough to guide us to this brave new world.

The second illustrative emerging technology that will profoundly challenge our ability to prevail is CRISPR, a technique that allows for the quick, easy, inexpensive, and precise manipulation of genes.<sup>41</sup> CRISPR (clustered regularly interspaced short palindromic repeats) offers the possibility of curing genetically based diseases, creating new plants and animals, and fundamentally changing humans.<sup>42</sup> The world's scientists and policy makers are just beginning to address how to manage this potentially history-altering technology. Scientists and policy experts who met in December 2015 to consider how CRISPR should be used recommended that scientists refrain from using this technology on human germ line genes until it is better understood and a broad consensus is reached on its proper use.<sup>43</sup> The possibilities of this technology are frightening, but Jennifer Doudna, the coinventor of CRISPR, has claimed that, ethically, there will come a time when CRISPR will be applied to human embryos and human germ line DNA.<sup>44</sup>

The third dramatic development in emerging technology is the possibility of creating artificial intelligence superior to our own. Raymond Kurzweil in *The Singularity Is Near: When Humans Transcend Biology* conjectures that artificial intelligence superior to human intelligence will occur in the late 2020s and artificial intelligence will self-improve at super speed in the 2040s and either merge with or replace humans altogether.<sup>45</sup> Many critics debate whether these developments will occur or at least as quickly as Kurzweil proposes.<sup>46</sup> But, if machine intelligence advances as Kurzweil postulates, human ingenuity and the ability to survive will be seriously tested. Obviously, no one knows for certain whether

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40. Ker Than, *Toward Immortality: The Social Burden of Longer Lives*, LIVE SCIENCE (May 22, 2006, 6:13 AM), <http://www.livescience.com/10458-immortality-social-burden-longer-lives.html>.

41. Sarah Zhang, *Everything You Need to Know About CRISPR, The New Tool that Edits DNA*, GIZMODO (May 6, 2015, 2:10 PM), <http://www.gizmodo.com/everything-you-need-to-know-about-crispr-the-new-tool-1702114381>.

42. Heidi Ledford, *CRISPR, the Disruptor: A Powerful Gene-Editing Technology Is the Biggest Change to Hit Biology Since PCR; But with Its Huge Potential Comes Pressing Concerns*, NATURE (June 3, 2015), <http://www.nature.com/news/CRISPR-the-Disruptor-1.17673>.

43. Nicholas Wade, *Scientists Seek Moratorium on Edits to Human Genome That Could Be Inherited*, N.Y. TIMES (Dec. 3, 2015), <http://www.nytimes.com/2015/12/04/science/crispr-cas9-human-genome-editing-moratorium.html>.

44. Jennifer Khan, *The CRISPR Quandary: A New Gene Editing Tool Might Create an Ethical Morass or It Might Make Revising Nature Seem Natural*, N.Y. TIMES MAG. (Nov. 9, 2015), <http://www.nytimes.com/2015/11/15/magazine/the-crispr-quandary.html>.

45. RAYMOND KURZWEIL, *THE SINGULARITY IS NEAR: WHEN HUMANS TRANSCEND BIOLOGY* (2005).

46. Paul G. Allen & Mark Greaves, *The Singularity Isn't Near*, MIT TECH. REV. (Oct. 12, 2011), <https://www.technologyreview.com/s/425773/Paul-allen-the-singularity-isn't-near/>; Nathan Pensky, *Ray Kurzweil Is Wrong: The Singularity Is Not Near*, PANDO (Feb. 3, 2014), <https://Pando.com/2014/02/03/the-singularity-is-not-near/>.



this emerging technology will be developed and whether it will end our reign as the earth's only surviving hominid. The future is near and there is little time to waste. We need to develop necessary survival strategies promptly.



Maybe we will survive, control all of these changes, and thrive—but it will not be easy. There is no certainty of a positive outcome. The number and complexity of human-created existential risks is growing. The pace of change is accelerating and the margin for error is shrinking. As the risks increase, the amount of careful thinking about what may happen and what can be done also will need to increase. The purpose of these essays is to broaden and accelerate this discussion. With enough careful thinking on a worldwide basis we may get lucky and prevail.