



Dædalus

Journal of the American Academy of Arts & Sciences

Winter 2008

on life

Lorraine Daston	Life, chance & life chances	5
Anthony Kenny	The beginning of an individual human	15
Robert P. George	Embryo ethics	23
Nikolas Rose	The somatic ethic & the spirit of biocapital	36
John Broome	What is your life worth?	49
Shai Lavi	How dying became a 'life crisis'	57
Jeff McMahan	Eating animals the nice way	66
Adrian Woolfson	The synthetic future of life	77

poetry

Ted Richer	Anon	84
------------	------	----

fiction

Chris Abani	Three Letters, One Song & A Refrain	87
-------------	-------------------------------------	----

notes

Phyllis D. Coley	on turning green into gold	92
Don Harrán	on a Jewish musical Renaissance	96





Sicilia

Candia

Cyprus

Malta

Syrtis parua

Syrtis magna

Cyrene

Alexãdria

Ierusalem Indet

Medin

ppa AFRICA

Regnũ Tunis

Mabomet

Marmarica

Ammon

AEGYPTVS

Syene

Mare Rubrũ

Lacus Libye

LIBYAE defectum

NVBIAE Regnum

Nubia

REGNVM Habesh

Horland

REGNVM Orgueng

Meroe

Hamarich Sedes Prẽ te Iohan

REGNVM Melinde

Cotia

Monoculi

Azania

Tellus Pfi tacorum

VTIOIAO Regnum

AFRICAE extremitas

Caput bong spei



Inside front cover: A detail from the first accurate map of Africa, drawn by Sebastian Münster (1488 – 1552), a pioneering German cartographer who was also the first to publish a set of maps of the known continents of the world. The first version of his African map appeared in Münster’s 1840 edition of Ptolemy, and was reprinted in several subsequent publications, including the *Cosmographia* of 1554 – the one depicted here dates from 1542. See Adrian Woolfson on *Synthetic life*, pages 77 – 83: “Münster’s map was also remarkable for its unusual depiction of Africa’s wildlife. In his exposition, the Dark Continent teemed not only with conventional creatures like elephants and parrots, but also with mythical ones such as one-eyed Monoculi. The incorporation of imaginary beasts suggests Münster’s anticipation of the synthetic future of life, and indeed his tacit appreciation of the fact that material existence represents only a fraction of natural and artificial possibility.” Image courtesy of Department of Special Collections, Stanford University Libraries.

James Miller, Editor of *Dædalus*

Phyllis S. Bendell, Managing Editor
and Director of Publications

Esther Y. Chen, Assistant Editor

Board of editors

Steven Marcus, Editor of the Academy

Russell Banks, Fiction Adviser

Rosanna Warren, Poetry Adviser

Joyce Appleby (U.S. history, UCLA), Stanley Hoffmann (government, Harvard), Donald Kennedy (environmental science, Stanford), Martha C. Nussbaum (law and philosophy, Chicago), Neil J. Smelser (sociology, Berkeley), Steven Weinberg (physics, University of Texas at Austin); *ex officio*: Emilio Bizzi (President of the Academy), Leslie Cohen Berlowitz (Chief Executive Officer)

Editorial advisers

Daniel Bell (sociology, Harvard), Michael Boudin (law, U.S. Court of Appeals), Wendy Doniger (religion, Chicago), Howard Gardner (education, Harvard), Carol Gluck (Asian history, Columbia), Stephen Greenblatt (English, Harvard), Thomas Laqueur (European history, Berkeley), Alan Lightman (English and physics, MIT), Steven Pinker (psychology, Harvard), Diane Ravitch (education, NYU), Amartya Sen (economics, Harvard), Richard Shweder (human development, Chicago), Frank Wilczek (physics, MIT)

Contributing Editors

Robert S. Boynton, D. Graham Burnett, Peter Pesic, Danny Postel

Dædalus is designed by Alvin Eisenman

Dædalus

Journal of the American Academy of Arts & Sciences



The labyrinth designed by Daedalus for King Minos of Crete, on a silver tetradrachma from Cnossos, Crete, c. 350 – 300 B.C. (35 mm, Cabinet des Médailles, Bibliothèque National, Paris). “Such was the work, so intricate the place, / That scarce the workman all its turns cou’d trace; / And Daedalus was puzzled how to find / The secret ways of what himself design’d.” – Ovid, *Metamorphoses*, Book 8

Dædalus was founded in 1955 and established as a quarterly in 1958. The journal’s namesake was renowned in ancient Greece as an inventor, scientist, and unriddler of riddles. Its emblem, a maze seen from above, symbolizes the aspiration of its founders to “lift each of us above his cell in the labyrinth of learning in order that he may see the entire structure as if from above, where each separate part loses its comfortable separateness.”

The American Academy of Arts & Sciences, like its journal, brings together distinguished individuals from every field of human endeavor. It was chartered in 1780 as a forum “to cultivate every art and science which may tend to advance the interest, honour, dignity, and happiness of a free, independent, and virtuous people.” Now in its third century, the Academy, with its more than four thousand elected members, continues to provide intellectual leadership to meet the critical challenges facing our world.

Dædalus Winter 2008
Issued as Volume 137, Number 1

© 2008 by the American Academy
of Arts & Sciences

Anon

© 2008 by Ted Richer

Three Letters, One Song & A Refrain

© 2008 by Chris Abani

Editorial offices: *Dædalus*, Norton's Woods,
136 Irving Street, Cambridge MA 02138.
Phone: 617 491 2600. Fax: 617 576 5088.
Email: daedalus@amacad.org.

Library of Congress Catalog No. 12-30299

ISBN 0-87724-067-1

Dædalus publishes by invitation only and assumes no responsibility for unsolicited manuscripts. The views expressed are those of the author of each article, and not necessarily of the American Academy of Arts & Sciences.

Dædalus (ISSN 0011-5266; E-ISSN 1548-6192) is published quarterly (winter, spring, summer, fall) by The MIT Press, Cambridge MA 02142, for the American Academy of Arts & Sciences. An electronic full-text version of *Dædalus* is available from The MIT Press. Subscription and address changes should be addressed to MIT Press Journals, 238 Main Street, Suite 500, Cambridge MA 02142. Phone: 617 253 2889; U.S./Canada 800 207 8354. Fax: 617 577 1545.

Printed in the United States of America by Cadmus Professional Communications, Science Press Division, 300 West Chestnut Street, Ephrata PA 17522.

Postmaster: Send address changes to *Dædalus*, 238 Main Street, Suite 500, Cambridge MA 02142. Periodicals postage paid at Boston MA and at additional mailing offices.

The typeface is Cycles, designed by Sumner Stone at the Stone Type Foundry of Guinda CA. Each size of Cycles has been separately designed in the tradition of metal types.

Subscription rates: Electronic only for non-member individuals – \$40; institutions – \$99. Canadians add 5% GST. Print and electronic for nonmember individuals – \$44; institutions – \$110. Canadians add 5% GST. Outside the United States and Canada add \$23 for postage and handling. Prices subject to change without notice.

Institutional subscriptions are on a volume-year basis. All other subscriptions begin with the next available issue.

Single issues: current issues – \$13; back issues for individuals – \$15; back issues for institutions – \$30. Outside the United States and Canada add \$5 per issue for postage and handling. Prices subject to change without notice.

Newsstand distribution by Ingram Periodicals Inc., 18 Ingram Blvd., La Vergne TN 37086. Phone: 800 627 6247.

Claims for missing issues will be honored free of charge if made within three months of the publication date of the issue. Claims may be submitted to journals-claims@mit.edu. Members of the American Academy please direct all questions and claims to daedalus@amacad.org.

Advertising and mailing-list inquiries may be addressed to Marketing Department, MIT Press Journals, 238 Main Street, Suite 500, Cambridge MA 02142. Phone: 617 253 2866. Fax: 617 258 5028. Email: journals-info@mit.edu.

Permission to photocopy articles for internal or personal use is granted by the copyright owner for users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the per copy fee of \$10 per article is paid directly to the CCC, 222 Rosewood Drive, Danvers MA 01923. The fee code for users of the Transactional Reporting Service is 0011-5266/08. Address all other inquiries to the Subsidiary Rights Manager, MIT Press Journals, 238 Main Street, Suite 500, Cambridge MA 02142. Phone: 617 253 2864. Fax: 617 258 5028. Email: journals-rights@mit.edu.

Lorraine Daston

Life, chance & life chances

Like all men in Babylon, I have been proconsul; like all, I have been a slave. I have known omnipotence, ignominy, imprisonment . . . I owe that almost monstrous variety to an institution – the Lottery – which is unknown in other nations, or at work in them imperfectly or secretly.

– Jorge Luis Borges, “The Lottery in Babylon”

The principles of justice are chosen behind a veil of ignorance. This ensures that no one is advantaged or disadvantaged in the choice of principles by the outcome of natural chance or the contingency of social circumstances. Since all are similar-

ly situated and no one is able to design principles to favor his particular condition, the principles of justice are the result of a fair agreement or bargain.

– John Rawls, *A Theory of Justice*

These two social fantasies, the Borgesian lottery and the Rawlsian veil of ignorance, seem to be poles apart: the one seeks to maximize the role of chance in social arrangements, the other to minimize it. The people of Babylon are subject to the most dizzying reversals of fortune; the only regularity in their lives is the ordained drawing of lots that will once again reshuffle their fates, for better or worse. “If the Lottery is an intensification of chance, a periodic infusion of chaos into the cosmos, then is it not appropriate that chance intervene in every aspect of the drawing, not just one?”¹ No society could contrast more starkly with Borges’s Babylon than Rawls’s polity of fairness, in which differences in citizens’ “initial chances in life” are branded as “especially deep inequalities,” which justice must alleviate.²

Lorraine Daston, a Fellow of the American Academy since 1993, is director at the Max Planck Institute for the History of Science in Berlin. Her many publications include “Classical Probability and the Enlightenment” (1988), “Wonders and the Order of Nature, 1150 – 1750” (with Katharine Park, 1998), “Things that Talk: Object Lessons from Art and Science” (2004), and “Objectivity” (with Peter Galison, 2007). She has also coedited “Biographies of Scientific Objects” (2000), “The Moral Authority of Nature” (2003), and “Thinking with Animals: New Perspectives on Anthropomorphism” (2005).

1 Jorge Luis Borges, “The Lottery in Babylon,” *Collected Fictions*, trans. Andrew Hurley (New York: Penguin, 1998), 104.

2 John Rawls, *A Theory of Justice* (Cambridge, Mass.: Harvard University Press, 1971), 7.

Yet like all polar opposites, Borges's lottery and Rawls's veil of ignorance are plotted along the same conceptual axis. Both envision life in terms of chances – and moreover, chances that are symmetrically distributed. The Borgesian Babylon may be nightmarishly chaotic, but the lottery that rules it is fair. Everyone has been proconsul; everyone has been a slave. Fairness – not prosperity, not happiness, not achievement – is also the fundamental intuition that undergirds Rawls's imagined social contract. Our society may be poor or rich, barbaric or highly cultivated, light-hearted or melancholy, but whatever its resources and aspirations, we are all in it together. Ideally, you and I should have the same prospects, the same number of tickets in the lottery, the same life chances. If not everyone becomes proconsul, not everyone a slave, it is only because Rawls has qualified his distribution of life chances as “initial” rather than lifelong. At least at the beginning of life, every infant in a Rawlsian society should have an equal chance of becoming (to update the possibilities) president or street person. It is, of course, Rawls's hope and claim that precisely this symmetry of possibilities – not benevolence or charity – will motivate all members of society to ameliorate the condition of the worst off: this could happen to you, or to your children.

There is nothing self-evident about conceiving of life as a kind of many-sided fair die, rolled at every birth or at intervals almost as regular as the drawings of the Babylonian lottery (e.g., the neighborhood one happens to grow up in, the schools one attends, the well- or ill-starred marriage, the healthy or ailing children). On the contrary, most societies have imagined lives as ordered from birth (or perhaps even before), whether by inexorable fate, the cycle of

reincarnation, or divine providence. The life of Oedipus was foretold, as was that of Jesus. Lesser lives, though not dignified by oracles or prophecies, were also thought to unfurl according to some global plan. These lives are hardly fair – why should Oedipus, much less all of Thebes, be punished for crimes he committed unwittingly? – but they are just, according to an ideal of justice that is cosmic rather than individual. No doubt fairness is as ancient and universal a human value as justice, but the notion that they coincide is historically and culturally rare, and perhaps distinctively modern.

This is not to say that the role of chance in human affairs has not been recognized and thematized in many cultures besides our own. The wheel of fortune is a very old motif, carved into the stonework of medieval cathedrals and flamboyantly rendered in Renaissance paintings. With each spin of the wheel, kings and beggars trade places. In some traditions, including ancient Judaism and early medieval Christianity, chance mechanisms like the cast of dice or the drawing of lots were used for divination; in others, such as Hinduism, the gods themselves gamble.

But chance *per se* is never normative in these examples. Fortuna is a powerful goddess, but it is Justitia who commands the moral high ground. Philosophy consoled the much-tried Roman scholar and statesman Boethius by revealing that true wisdom lay in spiritual indifference to the caprices of fortune (in his case, imprisonment and impending execution on a trumped-up charge of treason): in Boethius's allegory, Dame Philosophy bests Fortuna, wheel and all. The use of dice, lots, and other aleatory devices to plumb God's will when a consequential decision loomed (see, for example, Numbers 33:54 or Proverbs 16:33)

was frowned upon by theologians at least since Augustine, precisely because such expedients forced God to rush in in order to contravene chance: a “temptation of God.” And the gambling Hindu gods routinely cheated, the stakes being too high to leave the game’s outcome to chance. In all cases, chance is invoked only to be overcome – by philosophical transcendence, divine intervention, or plain old stacking the deck. Life is full of contingencies, fortune and misfortune. But life itself is not, should not be, conceived as a chance, a life chance in a colossal lottery. As the narrator of Borges’s short story about the Babylonian lottery observes: “I have known that thing the Greeks knew not – uncertainty.”³

How did the metaphor of life chances come to be so irresistible, at least for modern societies like our own? And what does the symmetric distribution of such chances have to do with justice? The first question is historical, the second philosophical. But they illuminate one another, or so I shall argue. The intuition that justice depends on equalizing individual life chances depends crucially on the conceptualization of life in terms of chances – rather than as destinies, fates, providences, grace, or works. Life chances are not synonymous with chaos: a lottery has a well-defined structure specified by explicit rules. But life chances fall short of a plan, whether laid out for the individual or the cosmos. To think of one’s life in terms of life chances is to admit, however reluctantly, ineluctable contingency. A fistful of lottery tickets cannot guarantee the prize with certainty; sometimes a single ticket suffices to win the jackpot. Life chances presume a world of statistical regularities, orderly but not determined.

Like all statistical regularities, life chances apply in the first instance to populations, not individuals. The paradigmatic way of assessing life chances is the table of mortality, which plots many deaths as a function of some other variable: age, sex, profession, lifestyle, or any number of other factors thought to influence longevity. The table of mortality serves as the basis for estimating the most fundamental of all life chances – life expectancy. Thanks to the World Health Organization, we are accustomed to reading about life expectancy as a function of nationality – for example, 73.0 years for a newborn in Sweden versus 25.9 years for one in Sierra Leone. But nationality is only one of many possible groupings into which life chances may be parsed. Epidemiologists may prefer grids that divide the world up into city and country dwellers or the thin and the fat; sociologists draw the lines according to income level, sex, race, or level of parental education. Furthermore, life chances pertain not only to quantity but also to quality of life: enjoyment of civil liberties, safety from violence, access to the beauties of nature and art. However defined and assessed, life chances apply to *categories* of people.

The conceptual preconditions for thinking in terms of life chances are therefore twofold: the notion of statistical regularities, and the belief in the existence of homogeneous categories of people to which the regularities apply. Neither is intuitive. Long after statistics began to be systematically collected in the eighteenth and nineteenth centuries, first concerning births and deaths and eventually concerning everything from crime rates to volume of trade, their regularity continued to be a source of astonishment to mathematicians, social thinkers, and the lay public alike. How amazing that almost the same number

3 Borges, “The Lottery in Babylon,” 101.

of Englishmen committed suicide annually, year in, year out; ditto for the number of letters that landed each year in the Parisian dead letter office.⁴ How could such eventualities, each so entangled in a myriad of particular circumstances, become so predictable when regarded *en masse*? Whereas we tend nowadays to be struck by the gap between the statistical regularity that applies to a group and the actual fate of a particular member of that group (e.g., the chain smoker who lives to a ripe old age free of lung cancer or heart disease or any of the other ailments strongly correlated with tar and nicotine), nineteenth-century writers on statistics pondered the apparent contradictions between individual free will and the iron determinism of statistical 'laws.' How could the suicide of, say, Goethe's young Werther really be his own decision, if the suicide rates remained constant for decades on end? That is, their attention was arrested by the regularities, then so novel and surprising, whereas ours is snagged by the exceptions, now so contrary to our expectations.

The belief in the homogeneity of populations was, if anything, still more hard-won. In order for a national census to make sense, it is the nation – not, for example, the three Old Regime orders of clergy, aristocracy, and commoners – that must be accepted as the primary unit of social classification. There is no point in counting the members of a statistical reference class unless one is first convinced that they in fact possess enough commonalities to constitute a class, as opposed to a miscellany. The word 'constitute' is used here advisedly: the decision to create (or destroy) such

category-cementing homogeneities was often a matter of political will, as in the case of the U.S. Constitution. Article I, Section 2, dictated that a national census be taken every decade in order to determine the number of representatives each state may elect to the lower house of Congress, thereby calling into being a homogeneous class of those with a right to political representation (if not to suffrage, as in the case of free but disenfranchised women). In stipulating the fraction (three-fifths) for which each slave would count in the census, the same article also proclaimed the limits of homogeneity. It is no accident that the gathering of state statistics on a large scale coincides historically with the French and American Revolutions and the concerted nation building of the first half of the nineteenth century, both of which re-defined the categories of putative homogeneity and heterogeneity. Nevertheless, the rubrics under which various national governments collect statistics remain quite diverse, sometimes to the point of incommensurability (a major headache for European Union or United Nations statisticians charged with devising a collective scheme for all member states).⁵

Even categories of 'natural' homogeneity may be devilishly difficult to discern, as epidemiologists well know: does it make more difference to life expectancy, for example, if one (a) is female, (b) is a vegetarian, or (c) lives next to a large oil refinery? The crisscrossing influences of natural and political categories (who has no choice but to live next to the oil refinery?) can be mind-bogglingly complex. Moreover, the political constitution of categories, as in the Ameri-

4 Theodore M. Porter, *The Rise of Statistical Thinking, 1830 – 1900* (Princeton, N.J.: Princeton University Press, 1986), 151 – 170.

5 Alain Desrosières, *The Politics of Large Numbers: A History of Statistical Reasoning*, trans. Camille Naish (Cambridge, Mass.: Harvard University Press, 1998), 236 – 278.

can case, can have long-lived consequences for every aspect of life chances, including the so-called natural ones of morbidity and mortality. Race continues to be a relevant category in American medical journals, just as caste might be in India, despite recent attempts to deconstitute these categories.⁶ If politically constituted categories are woven into the fabric of daily life – jobs, neighborhoods, diet, schools, medical care, pollution levels, even laws – they can transmute social homogeneities into bodily ones. Whether categories are defined by race, class, caste, religion, ethnic group, or sex, they are fraught with consequences for health as well as happiness.

Once the ideas of statistical regularities and homogeneous reference classes to which they apply are firmly in place, it is possible to conceive of biographies in terms of life chances and society as a vast lottery, even if it functions ‘imperfectly or secretly.’ Depending on the circumstances in which one happens to be born – in times of peace or war, feast or famine, as boy or girl, prince or pauper – one’s life chances will rise or fall. This way of thinking has become habitual; we know at a glance from the statistics how the life chances of infants with the same birthday will differ, depending on whether they are born in the Congo or in Taiwan, on a farm or in a metropolis, to literate or illiterate parents. We can also play the game retrospectively: history teachers know that the quickest way to cure students of a Miniver-Cheevy-esque romanticism about times of yore is to show how overwhelmingly more probable it was that any given person taken at random in medieval Europe would have been a drudging peasant rather than a gallant knight or damsel (a

calculation of life chances conveniently ignored by most fantasy computer games of the “Dungeons and Dragons” sort).

It is worth pausing a moment to measure the moral magnitude of this relatively recent conceptual change, the advent of life chances. When an individual or family is repeatedly beset by major misfortunes, most, perhaps all, cultures consider this a matter requiring explanation and justification: Why must Job suffer? Where is the justice in his terrible trials? More pointedly, what has he in particular done to deserve such torments? In a culture accustomed to thinking in terms of life chances, it is a violation of probabilities that prompts these questions. A woman whose husband had died at age thirty-five from a rare form of leukemia describes her reaction when her eight-year-old daughter was diagnosed with the same fatal disease as a “reverse lottery moment”: “When the doctors told me – using that phrase, ‘millions to one against,’ along with others such as, ‘No other reported cases in the world,’ and, sadly, gently, ‘The outlook isn’t good’ – I started screaming as if drowning out the words would stop them from being real.”⁷ Conversely, the more probable the affliction, according to the calculus of life chances, the less pondering about its meaning, although the suffering is in no way diminished. Members of a culture schooled in thinking about life chances certainly retain notions of just desserts – why do bad things happen to good people, and vice versa? – but the intensity with which the question is posed is now modulated by degrees of probability.

This acquired habit of thinking in terms of differential life chances does

6 Ian Hacking, “Why Race Still Matters,” *Dædalus* 134 (1) (Winter 2005): 102 – 116.

7 Lindsay Nicholson, “It Could Be You,” *The Guardian*, May 27, 2006.

not in itself, however, imply an associated sense of injustice concerning their distribution: it requires a further step in reasoning and feeling not just to register that life chances differ, but also to wax indignant over that fact. It is not difficult to imagine and indeed to instantiate societies that take differential life chances for granted or that offer a rationale for them. An individual may be rewarded or punished for deeds in a previous life, or the well-ordered cosmos may require a great chain of being, in which every creature knows its place, high or low, in the hierarchy. In *The Republic*, Plato defines justice as exactly this sort of hierarchical order, in which the brazen, silver, and golden classes each fulfills its appointed tasks. Liberal visions of meritocracy permit much more social mobility than Plato's ideal society did, but also accept stratification in life chances as inevitable, perhaps even desirable. How does inequality in life chances, especially initial life chances, come to be seen as a scandal?

Key to presuppositions about equality, including equality of initial life chances, is a slow but steady process of philosophical generalization about the nature of personhood: who can be a person, and what does being a person imply in terms of rights and duties? This is a fascinating and convoluted history that has proceeded by fits and starts, with several episodes of retrogression, and that is by no means concluded. The metaphysical foundations of personhood have repeatedly shifted, from the possession of a rational soul (wielded by sixteenth-century theologians at the University of Salamanca as a mighty argument against the Spanish crown's putative right to exercise dominion over the lives and property of the indigenous peoples in conquered New World territories) to rights guaranteed by Nature (as claimed by the

"*Droits de l'homme et du citoyen*" propagated by the French Revolution in 1789) to intrinsic human dignity (as invoked by the United Nations Declaration of Human Rights of 1948). They are probably shifting once again, in the context of debates over the rights of animals, forests, and perhaps the entire planet.

However motley the metaphysics of personhood, the direction of its evolution, when viewed over centuries, has been unambiguously expansive. Ever more people (and perhaps other beings as well) have been granted the status of full moral persons. The broadening of suffrage rights in the political realm has roughly paralleled this process: first property-owning white males, then all white males, then all males, then males and females. Arguments concerning personhood are admittedly more complex and subtle than those concerning suffrage: there is more to being a moral person than the right to vote. But both moral and political arguments have proceeded in tandem, along the track paved by analogical reasoning: if x is like y in all essential respects, then whatever rights are accorded to x should in justice be accorded to y . Once the analogy is acknowledged, inequality becomes indefensible.

Of course, everything hinges on the meaning of 'essential' in these analogical arguments. The overall tendency – again, a simplification of a long, halting, and meandering historical development – has been to abstract one individuating trait after another from the definition of essential personhood. Although some of these particulars may seem now to inhere in a social group rather than in an individual, they have historically been felt to be intrinsic to their possessors: noble blood, Jewish faith, French citizenship. This is still more the case for characteristics commonly understood

to inhere in individuals: myopia, mathematical genius, red hair, a pleasing baritone, six toes on one foot. None of these traits, and millions more like them, now count as essential to personhood. Personhood stands opposed both to the cultural and biological dimensions along which individuality is currently defined. On the one hand, there are the cultural components of identity, which are as various as the cultures that form them: ethnicity, sexuality, religion, region. On the other, there are the genetic endowments that are recombined with every act of sexual reproduction. Personhood deliberately ignores all of them as irrelevant to the moral self (though not to almost any other kind of self).

What is the essence that is left when all the individual contingencies of identity are subtracted? This is a matter still fiercely debated: A capacity for reason? An ability to feel sympathy for other persons? A central nervous system? However, if ever, the debate is resolved (and if history is any guide, any resolution is likely to be temporary), the result will be to insist on the strict moral equality of all genuine persons, regardless of what defining essence they are all thought to share. This conclusion holds for utilitarian as well as for deontological ethics: whether one believes that all persons are ends in themselves or that the good of the few can under some circumstances be sacrificed for the good of the many, no one kind of person counts for more, is a higher end than any other. Personhood is at once the most inclusive and the least homogeneous of human reference classes, but it is also the most important, at least as far as justice is concerned. We persons are all in this together: under these circumstances, fairness and justice converge.

Statistical regularities, homogeneous reference classes to which the regulari-

ties refer, and the ethically paramount and ever more capacious reference class of personhood: these are the conceptual preconditions not only for thinking in terms of life chances but also for using life chances as a tool to think about justice. It should be noted that the lottery ensures equal chances, but not equal lives. Indeed, to use a lottery to achieve fairness only makes sense if the lots – in this case, the kinds of lives actually led – are of unequal desirability. If human life is something like a lottery, then everyone ought to have a fair chance, an equal chance.

But *should* human life be something like a lottery? Who would want to live in Borges's Babylon? The discovery of statistical regularities has drawn some of Fortuna's sting: no life is certain, but neither is any life entirely uncertain. The same probabilities that make the modern insurance industry profitable also dampen the wilder oscillations of life chances, at least at the level of large reference classes. What might be called steady life chances – ones that are highly skewed (i.e., so large or small as to be all but certain in practice) and display little variation over long periods – are characteristic of orderly societies. Predictability in and of itself need not be desirable: steady life chances may be grim (e.g., seasonal storms that every year destroy lives and homes) as well as gladsome (e.g., a high probability that all children will survive to adulthood). Nonetheless, it is a characteristic aspiration of modern societies to increase predictability by subjecting ever more aspects of human life to planning and, if possible, to control. The chanciness of life chances is under sustained attack.

Although the ideal served by these concerted attempts to eradicate contingencies has yet to be articulated with the force and clarity of Borges's lottery

or Rawls's "original position," its outlines can already be discerned. Not only equality of life chances, but equally stable life chances for all would be its goals. In liberal polities, stability will be equated with individual control; in more étatist regimes, some centralized authority will hold the reins. Obviously, the decision as to who does the controlling, and how, will be politically and socially hugely consequential. But the main point here is the indomitable will to control, to straiten statistical regularities into near-certainties, however this goal is achieved. If 'transparency' has become the cardinal political virtue in modern democracies, 'control' is well on its way to becoming the chief desideratum of the personal realm. It is as if the ancient Aristotelian preference for activity over passivity had joined forces with the Kantian creed of autonomy over heteronomy to advance the triumph of control over contingency: lives should no longer be allowed to happen; they should be 'proactively' chosen and arranged, from cradle (or before) to grave (or after). Just as the appearance of new forms of insurance betokens a magnified sense of responsibility (e.g., insurance against property damage caused by one's children, now common in some European countries), so new possibilities of control expand the sphere of deliberation. Yet however impressive the current possibilities for control over the happenstances of life may be, they are dwarfed by the public appetite for still more control over ever more accidents, from the trivial (the shape of one's nose) to the momentous (the sex of one's child).

There are so many accidents with consequences so obviously grievous for those who must suffer them that it is impossible not to sympathize with efforts to control their incidence and effects. Among these are epidemics,

disasters both natural and manmade, war, and poverty. Because of the happy fact that at least some of the world's population is spared these scourges, it becomes part of the program to equalize life chances to try to eliminate or at least reduce the risks for everyone else. But the zeal for control has spread beyond woeful accidents to *all* accidents. To exercise 'control over one's life' has become perhaps the paramount goal of the well-off, well-educated, and well-placed minority who have already fared better than most in life's lottery. It is a slogan emblazoned on the covers of self-help manuals and built into the design of international hotel chains and restaurants, which advertise their uniformity. For those who yearn for control, to be surprised, however innocuously, is to be ambushed by life. Their ambitions resemble those of the ancient Stoics and Epicureans only in part. The ancient philosophical sects sought to overcome chance by cultivating indifference, *ataraxia*, to everything then subject to the caprices of Fortuna. In contrast, the modern cult of control is anything but indifferent to what Fortuna dispenses and instead seeks to stop the wheel, once and for all.

These efforts are most in evidence in the realm of new reproductive technologies, because remarkable advances in biology have not only made new techniques of control possible, but also presented the process of reproduction as a game of chance for the unborn, analogous to the lottery of initial life chances for newborns. Since the discovery of the structure of DNA and the deciphering of genetic codes, sexual reproduction has come to be understood as a bold experiment in accelerated evolution. Instead of manufacturing progeny identical to their parents by mitosis, as many microorganisms do, organisms that reproduce sex-

ually vary the genotype with each new conception. Each offspring is therefore a surprise, a new (and, given the enormous number of possible combinations of genes, probably also unique) individual. Variations produced by the occasional mutation are richly supplemented by the diversity of each successive generation; natural selection thereby has more materials to work on. In his aptly titled book *The Game of Possibilities*, biologist François Jacob described sexual reproduction among humans as “one of the principal motors of evolution”: “Diversity is one of the great rules of the biological game. In the course of generations, those genes that form the patrimony of the species unite and separate to produce those combinations, each time ephemeral and each time different, which are individuals.”⁸ Life itself is a grand lottery.

Jacob took a dim view of cloning and indeed of all attempts to reduce diversity, cultural as well as biological, because they impoverished species ‘patrimony.’ Less diversity brings an increase in collective risk (e.g., of being wiped out by a virus to which no one happens to be immune) and also in general monotony. But for those who consider chance itself to be a scandal, to formulate reproduction in terms of life chances is to invite attempts at control, inevitably less inventive and various than the play of combinations and permutations would be.

The party of control may well retort: why should natural processes dictate human choices? Isn’t anxiety about cloning or designer babies simply another version of the naturalistic fallacy, setting up Nature (writ large) as the standard of the Good, the True, and the

Beautiful? Worse, isn’t the revulsion sometimes evoked by genetic technologies just the reactionary reflex that opposes all change, the same reflex that once resisted smallpox inoculation and birth control? There is some merit to these arguments. But countervailing arguments must be weighed as well. Even those who reject naturalism in morals may uphold biodiversity on utilitarian and aesthetic grounds: if the results of elective cosmetic surgery to date are any indication, human control over the genotype is more likely to narrow than broaden the spectrum of variety. And even those who do not believe in providence may nonetheless find cause for rejoicing as well as regret in the contingencies doled out by the life lottery. Many events can throw the best-laid plans into disarray: a move, an illness, a love affair, a death, and, above all, the birth and care of a child, that great randomizer of human affairs. Some contingencies may end in sorrow, others in joy, but almost all result in the discovery of something not known and not felt before. To query control is to query the reach of the human imagination and foresight. Can we, will we, rival the ingenuity, the novelty, the surprises of chance? Can we simulate the power of contingency to teach, to test, and to enlarge experience – can any educational curriculum replace a curriculum vitae?

The project of equalizing and improving life chances is a noble one and still a long way from completion, as a glance at tables of life expectancy worldwide suffices to show. But it should not be confused, as it too often is, with the elimination of chance in life. Fairness does not imply certainty. The moral repugnance for contingency runs deep: chance severs the link between past and present, intention and outcome, virtue and reward, vice and punishment. Above all,

⁸ François Jacob, *Le jeu des possibles* (Paris: Fayard, 1981), 127–128; my translation.

chance seems to empty life of meaning: better to believe in an angry god than a senseless streak of bad luck. Yet chance can also act as a catalyst to the making of new meanings, both for individuals and whole cultures. New orders – philosophical, political, artistic, scientific – are invented to encompass the contingencies history has thrown up. Chance disrupts tidy lives, unsettles habits – and taps unplumbed resources, both personal and social.

There is no getting around the fact that chance always implies risk. Some contingencies will be tragic, with outcomes not even Dr. Pangloss could redeem. The urge to control is an understandable and often laudable response to real danger. In its ancient version, the will to control was turned inward on the self: to conquer fear meant cutting ties of yearning and affection for anything and anyone subject to the vicissitudes of chance. The modern version is turned outwards toward the world, but it too is driven by fear. Strangely, the spectacular successes of some modern societies in making many aspects of life more secure has only made their citizens that much more fearful. For decades, experts and politicians have discussed the nature and level of acceptable risk, with all parties in tacit agreement to the assumption that an ideal society would be as risk-free as possible. If risks were to be tolerated, it was only because they were either inevitable or the cost of avoiding still more dreaded risks, and in both cases the compromise was a matter for regret. According to the conventional wisdom of risk management, the only good risk is no risk.

A debate has yet to be joined about how much chance, how much risk, is not only tolerable but necessary and desirable for a life of learning and discovery. Which life chances are unbearable – lots no one should have to draw – and which

ones can be borne for the sake of experience and experiment? All-or-nothing outcomes – either everything under control or everything left to chance – are nonstarters. The debate must assay possibilities, probabilities, and desirabilities with a jeweler's balance.

This would also have to be a debate about the philosophy of fear, traditionally the most unphilosophical of the passions. Accepting life chances entails more than demanding a fair chance in a lottery, whether Borgesian or Rawlsian. We would also have to accept – not eradicate – a modicum of fear. But perhaps fear selectively and candidly confronted would take on a different aspect from the panicky, inchoate fear that robs us of reason and humanity. David Hume shrewdly observed that in situations of perfectly balanced uncertainty (fifty-fifty chances of a positive or negative outcome), fear preponderates over hope.⁹ His observation still holds true for some of the most secure societies with the most favorable and equally distributed life chances humanity has ever known – these are precisely the societies that create and consume a dazzling array of insurance policies.¹⁰ The ability to calculate risk, even to control it, has not tipped the balance in favor of hope. On the contrary: the most secure societies seem by and large to be the most timorous, the most cowed by the prospect of future danger, whether probable or improbable. Will facing up to fear as the price of chance restore hope to its at least equal rights in our expectations?

9 David Hume, *A Treatise of Human Nature* [1739], ed. L. A. Selby-Bigge (London: Oxford University Press, 1968), II.iii.9, 447.

10 Lorraine Daston, *Classical Probability in the Enlightenment* (Princeton, N.J.: Princeton University Press, 1988), 182 – 187.

Anthony Kenny

The beginning of individual human life

When did I begin? When does any individual human being begin? At what stage of its development does a human organism become entitled to the moral status and legal protection that we give to the life of a human adult? Is it at conception, at birth, or somewhere between the two?

The three alternatives – at conception, at birth, or between – do not in fact exhaust the possibilities. Plato, and some Jewish and Christian admirers of Plato, thought that individual human persons existed as souls before the conception of the bodies they would eventually inhabit. This idea found expression in the Book of Wisdom, where Solomon says, “I was a boy of happy disposition: I had received a good soul as my lot, or rather, being good, I had entered an undefiled

body.” Clement of Alexandria records an early Christian notion that the soul was introduced by an angel into a suitably purified womb.

In addition to those who thought that the individual soul existed before conception, there have been those who thought that the individual body existed before conception, in the shape of the father’s semen. Onan, in Genesis, spilled his seed on the ground; Jewish tradition saw this act not only as a form of sexual pollution but as an offense against life. Thomas Aquinas, in a chapter on “the disordered emission of semen” in the *Summa contra Gentiles*, treats both masturbation and contraception as a crime against humanity, second only to homicide. Such a view is natural in the context of a biological belief that only the male gamete provides the active element in conception, so that the sperm is an early stage of the very same individual as eventually comes to birth. Masturbation is then the same kind of thing, on a minor scale, as the exposure of an infant. The high point of this line of thinking was the bull *Effraenatam* of Pope Sixtus V (1588), which imposed an excommunication, revocable only by the Pope himself, on all forms of contraception as well as on abortion. But the view that masturbation is a poor man’s homicide

Anthony Kenny, a Foreign Honorary Member of the American Academy since 2003, is Emeritus Fellow of St. John’s College, Oxford. He is the author of numerous publications, including “The Five Ways: St. Thomas Aquinas’ Proofs of God’s Existence” (1969), “The Metaphysics of Mind” (1989), “What is Faith?” (1992), “What I Believe” (2006), and the four-volume “A New History of Western Philosophy” (2003 – 2007).

© 2008 by the American Academy of Arts & Sciences

cannot survive the knowledge that both male and female gametes contribute equally to the genetic constitution of the offspring.

At the other extreme are those who maintain that it is not until some time after birth that human rights arise. In pagan antiquity, infanticide was broadly accepted. No sharp line was drawn between infanticide and abortion, and as a method of population control, abortion was sometimes regarded as inferior to infanticide, since it did not distinguish between healthy and unhealthy offspring.

In our own time a number of secular philosophers have been prepared to defend infanticide of severely deformed and disabled children. They have based their position on a theory of personality that goes back to John Locke. Only persons have rights, and not every human being is a person: only one who, as Locke puts it, “has reason and reflection, and considers itself as itself, the same thinking thing, in different times and different places.” Very young infants clearly do not possess this degree of self-awareness, and hence, it is argued, they are not persons and do not have an inviolable right to life.

Defenders of infanticide are still mercifully few in number. It is more common for moralists to take the rejection of infanticide as a starting point for the evaluation of other positions. Any argument used to justify abortion, or in vitro fertilization (IVF), or stem cell research must undergo the following test: would the same argument justify infanticide? If so, then it must be rejected.

The central issue, then, is to record, and decide among, the three alternatives with which we began: should we take individual human life as beginning at conception, at birth, or at some point in between?

Some familiar texts from the Bible suggest that we should opt for conception as the beginning of the life of the individual person. “In sin did my mother conceive me,” sang the Psalmist.¹ Job cursed not only the day on which he was born but also “the night that said ‘there is a man-child conceived.’”² Since 1869 it has been the dominant position among Roman Catholics, even though for most of the history of the Catholic Church it was a minority view.

It has been much less common to regard personality and human rights as beginning only at the moment of birth. One important rabbinic text allows abortion up to, but not including, the time when a child’s head has emerged from the womb. Some Stoics seem to have taught that the human soul enters the body when a baby draws its first breath, just as it departs when a man draws his last.

Through most of Western European history, however, the majority opinion has been that individual human life begins at some time after conception and before birth. In the terminology that for centuries seemed most natural, the ‘ensoulment’ of the individual could be dated at a certain period after the intercourse that produced the offspring. Most Christian thinkers believed that the human soul was directly created by God and infused into the embryo when the form of the body was completed, which was generally held to occur around forty days after conception.

Aquinas held a particularly complicated version of this consensus position. He did not believe that individual human life begins at conception; the developing human fetus, for him, does not count

1 Psalm 51:5.

2 Job 3:3.

as a human being until it possesses a human soul, and that does not happen until some way into pregnancy. For him, the first substance independent of the mother is the embryo living a plant life with a vegetative soul. This vegetable substance disappears and is succeeded by a substance with an animal soul, capable of nutrition and sensation. Only at an advanced stage is the rational soul infused by God, turning this animal into a human being. Early-term abortion, therefore, though immoral on other grounds, is not murder.

The whole process of development, according to Aquinas, is supervised by the father's semen, which he believed remains present and active throughout the first forty days of pregnancy. For this biological narrative, Aquinas claimed, on slender grounds, the authority of Aristotle. At this distance of time, it is difficult to see why Aquinas's teaching on this topic should be accorded great respect.

A survey of the history of the topic makes it abundantly clear that there is no such thing as *the* Christian consensus on the timing of the origin of the human individual.³ There was, indeed, a consensus among all denominations until well into the twentieth century that abortion was sinful and that late abortion was homicide. There was no agreement on whether early abortion was homicide. However, those who denied that it was homicide still regarded it as wrong because it was the destruction of a potential, if not an actual, human individual. There was again no agreement on whether the wrongfulness of early abortion carried over into the

3 Such a survey has been carried out with great care by David Albert Jones in his book, *The Soul of the Embryo* (London: Continuum, 2004), to which I am greatly indebted for much historical information.

destruction of semen prior to any conception. Even within the Roman Church, different Popes can be cited in support of each option.

If we hold that individual human life begins somewhere between conception and birth, then we must ask further questions. What, in the course of pregnancy, is the crucial moment? Is it the point of formation (when the fetus has acquired distinct organs), or is it the point of quickening (when the movements of the fetus are perceptible to the mother)? Can we identify the moment by specifying a number of days from the beginning of pregnancy?

Unfortunately, the question at issue is often posed in the confused form: "When does life begin?" If this means, "At what stage of the process between conception and birth are we dealing with living matter?" the answer is obvious: at every stage. At fertilization, egg and sperm unite to form a single cell – that is, a living cell just as the egg and sperm were themselves alive before their fusion. But this question is clearly irrelevant to determining the moral status of the embryo: worms and rosebuds are equally indubitably alive, but no one seeks to give their lives the protection of the law.

So perhaps we should reformulate the question: "When does human life begin?" Here, too, the answer is obvious but inadequate: the newly formed conceptus is a human conceptus, not a canine or leonine one, so in that sense its life is a human life. But equally the sperm and the ovum from which the conceptus originated were human sperm and human ovum; but no one nowadays wishes to describe them as human beings or unborn children. If asked, "When does life begin?" we must respond with another question, "When does the life of *what* begin?"

Sometimes the question is framed not in terms of life, but in terms of animation or personhood. Thus it is asked: “When does the soul enter the body?” or “When does an embryo become a human person?” Modern discussions of the morality of abortion or of the status of the embryo often shy away from these questions, regarding them as matters of theology or metaphysics. Thus, the Warnock Committee, whose report on human fertilization and embryology paved the way in England for the legalization of experimentation on embryos, observed that some people thought that if we could determine when an embryo becomes a person, we could also decide when it might, or might not, be permissible to undertake scientific research on embryos. The committee did not agree:

Although the questions of when life or personhood begins appear to be questions of fact, susceptible of straightforward answers, we hold that the answers to such questions in fact are complex amalgams of factual and moral judgments. Instead of trying to answer these questions directly we have therefore gone straight to the question of *how it is right to treat the human embryo*.

But a philosopher writing on these matters cannot evade, as a politician or a committee may, the question of personhood. It is indeed a metaphysical question when personhood begins: to answer it we must deploy concepts that are fundamental to our thinking over a wide range of disciplines, such as those of actuality and potentiality, identity and individuation.

The question about personhood is the same as the question about life, rightly understood. For “When does life begin?” must mean “When does the life of the individual person begin?” The question is a philosophical one, but in order

to answer it one does not need to appeal to any elaborate philosophical system, or to quasi-theological concepts such as the soul. As is the case so often in philosophical perplexity, what is needed is not recondite information, or elaborate technicalities, but reflection on truths that are obvious, and for that reason easily overlooked.

If a mother looks at her daughter, six months before her twenty-first birthday, she can say with truth: “If I had had an abortion twenty-one years ago today, I would have killed you.” Each of us, looking back to the dates of our birthdays, can say, “If my mother had had an abortion six months before that date, I would have been killed.” Truths of this kind are obvious, and can be formulated without any philosophical technicality, without any smuggled moral judgments.

Taking this as our starting point, it is easier to find our way through the moral maze. Let us consider first fetuses, and then embryos. Those who defend abortion on the grounds that fetuses are not human beings, or human persons, are arguing, in effect, that they are not members of the same moral community as ourselves. But truths of the kind that we have just illustrated show that fetuses are identical with the adult humans who are the prime examples of members of the moral community.

It is true that a fetus cannot yet engage in moral thinking or the rational judgment of action that enables adults to interrelate morally. But neither can a young child or a baby, and this temporary inability does not give us the right to take the life of a child or a baby. It is the long-term capacity for rationality that makes us accord to the child the same moral protection as to the adult, and which should make us accord the like respect to whatever has the same long-term capacity, even before birth.

To be sure, human actions with regard to beings that are not members of the human moral community may nonetheless be good or bad. Those who believe in God do not think of Him as on morally equal terms with us, and yet regard humans as having a duty to worship Him. Nonhuman animals are not part of our moral community, and yet it is wrong to be cruel to them. But the moral respect we owe to children, and, if I am right, should accord to fetuses, is something quite different from the circumspection proper in our relation with animals. For the individual who is now a fetus or a child will, if all goes well, take his or her place with us, as the animal never will, as an equal member of the moral community. As Kant might say, that individual will become a fellow-legislator in the kingdom of ends.

I have claimed it as an obvious truth that a fetus six months from term is the same individual as the human child and adult into which, in the natural course of events, it will grow after birth. This seems true in exactly the same sense as it is true that the child is the same individual as the adult into which it will grow, all being well, after adolescence. But if we trace the history of the individual from the fetus back toward conception, matters cease to be similarly obvious.

Many people do not seem aware of the difficulty here. In 1985, the Warnock Committee's report recommended the legalization of experimentation on pre-implantation embryos; the committee's recommendation was put into effect by the Human Embryology and Fertilization Act of 1990. In a parliamentary debate triggered by the report, one Member of Parliament, Sir Gerald Vaughan, had this to say in opposition to experimentation on embryos:

It is unarguable that at the point of fertilization something occurs which is not present in the sperm or the unfertilized ovum. What occurs is the potential for human life – not for life in general, but life for a specific person. That fertilized ovum carries the structure of a specific human being – the height, the color, the color of his or her eyes, and all the other details of a specific person. I do not think that there can be any argument against that. The fact that the embryo at that stage does not bear a human form seems to me to beg the issue and to be quite irrelevant. It carries the potential, and, just as the child is to the adult human, so the embryo must be to the child.

Sir Gerald concluded that human rights were applicable to an embryo from the moment of conception.

It is undoubtedly true that contained in the conceptus is the blueprint for "the structure of a specific human being." But to establish the conclusion that an embryo has full human rights, a different premise is needed, namely, that the conceptus contains the structure of an individual human being. A specific human being is not an individual human being.

This is an instance of a general point about the difference between specification and individuation. The general point is that nothing is ever individuated merely by a specification of its properties, however detailed or complete this may be – as it is in the case of the DNA of an embryo. It is always at least logically possible that there could be two or more individuals answering to the same specification; any blueprint may be used more than once. Two peas in a pod may be as alike as you please: what makes them two individuals rather than one is that they are two parcels of matter, not necessarily that they differ in description.

In the case of human beings, the possibility of two individuals answering to the same specification is not just a logical possibility: it is realized in the case of identical twins. For this reason, an embryo in the early days after fertilization cannot be regarded as an individual human being. The single cell after fusion is totipotent, in the sense that from it develop all the different tissues and organs of the human body, as well as the tissues that become the placenta. In its early days a single embryo may turn into something that is not a human being at all, or something that is one human being, or something that is two people or more.

It is important to be on guard here against an ambiguity in the word 'identical': there is a difference between specific identity and individual identity. Two things may be identical in the sense that they answer to the same specification, and yet not be identical in the sense that they are two separate things, not a single thing. When we say that Peter and Paul are identical twins, we mean that they are alike in every specific respect, not that they are a single individual.

Between an embryo and an adult, there is not an uninterrupted history of a single individual life, as there is linking fetal life with the present life of an adult. There is indeed an uninterrupted history of development from conception to adult, as there is equally an uninterrupted history of development back from the adult to the origination of each of the gametes that fused at conception. But this is not the uninterrupted history of an individual. For each of the gametes might, in different circumstances, have fused to form a single conceptus; and the conceptus might, in different circumstances, have turned into more or less than the single individual that it did in fact turn into.

Naturally, all development, if it is to proceed, depends on factors in the environment: an adult may die if diseased and a child may die if not nourished, just as an ovum will die if not fertilized and an embryo will die if not implanted. But though children and adults may die, they cannot become part of something else or turn into someone else. Fetus, child, and adult have a continuous *individual* development that gamete and embryo do not have.

The moral status of the embryo, and the question of whether its destruction is homicide, was and is important. If it is not homicide, then the rights and interests of human beings may legitimately override the protection that in normal circumstances should be extended to the early embryo. The preservation of the life of the mother, the fertilization of otherwise barren couples, and the furthering of medical research may all, it may be argued, provide reasons to override the embryo's protected status.

The line of argument I have outlined was found convincing in the United Kingdom, not only by the Warnock Committee but also by the later Harries Committee.⁴ These committees made a significant contribution to the debate by offering a *terminus ante quem* for the origin of individual human life – one that was much earlier in pregnancy than the forty days set by the pre-Reformation Christian consensus. Experimentation on embryos, they thought, should be impermissible after the fourteenth day. The Warnock Committee's reasons were well summarized in the House of Commons by the then-Secretary of

⁴ *Report of the Committee of Inquiry into Human Fertilization and Embryology* (London: HMSO, 1984); *Report of the House of Lords Select Committee on Stem Cell Research* (London: HMSO, 2002).

State for Health, the Rt. Hon. Kenneth Clarke:

A cell that will become a human being – an embryo or conceptus – will do so within fourteen days. If it is not implanted within fourteen days it will never have a birth The basis for the fourteen day limit was that it related to the stage of implantation which I have just described, and to the stage at which it is still uncertain whether an embryo will divide into one or more individuals, and thus up to the stage before true individual development has begun. Up to fourteen days that embryo could become one person, two people, or even more.⁵

Those Catholics who insist that individual human life begins at conception reject this ethical reasoning. An embryo, from the first moment of its existence, has the potential to become a rational human being, and therefore should be allotted full human rights. To be sure, an embryo cannot think or reason or exhibit any of the other activities that define rationality: but neither can a newborn baby. The protection that we afford to infants shows that we accept that potentiality, rather than actuality, determines the conferment of human rights.

Undoubtedly, whatever Aquinas may have thought, there is an uninterrupted history of development linking conception with the eventual life of the adult. However, the line of development from conception to fetal life is not the uninterrupted history of *an individual*. In its early days, as Kenneth Clarke indicated, a single zygote may turn into something that is not a human being at all, or something that is one human being, or something that is two people or more. Fetus, child, and adult, on the other hand, have a continuous individual development

that gamete and zygote do not have. To count embryos is not the same as to count human beings, and in the case of twinning there will be two different human individuals, each of whom will be able to trace their life story back to the same embryo, but neither of whom will be the same individual as that embryo.

Those who argue for conception as the moment of origin stress that before fertilization we have two entities (two different gametes), and after it we have a single one (one zygote). But the moment at which one entity (a single embryo) splits into two entities (two identical twins) is equally a defining moment. While in the vast majority of cases twinning does not actually take place, the strongest element in the Catholic position is the emphasis it places on the ethical importance of potentiality. It is the potentiality of twinning, not its actuality, that gives reason for doubting that an early embryo is an individual human being.

In my view, the balance of the arguments leads us to place the individuation of the human being somewhere around the fourteenth day of pregnancy. But there are two sides to the reasoning that leads to that conclusion. If the course of the embryo's development gives us good reason to believe that before the fourteenth day it is not an individual human being, it gives us equally good reason to believe that after that time it *is* an individual human being. If so, then late abortion is indeed homicide – and abortion becomes 'late' at an earlier date than was ever dreamt of by Aquinas.

Since most abortion in practice takes place well after the stage at which the embryo has become an individual human being, it may seem that the philosophical and theological argument about the moment of ensoulment has little

⁵ *Hansard*, vol. 73, col. 686.

*Anthony
Kenny
on
life*

practical moral relevance. That is not so. If the life of an individual human being begins at conception, then all practices that involve the deliberate destruction of embryos, at whatever stage, deserve condemnation. That is why there has been official Catholic opposition to various forms of IVF and to scientific research involving stem cells. But if the embryo, in its earliest days, is not yet an individual human being, then it need not necessarily be immoral to sacrifice it to the greater good of actual human beings who wish to conceive a child or reap the benefits of medical research.

Robert P. George

Embryo ethics

If we were to contemplate killing mentally handicapped infants to obtain transplantable organs, no one would characterize the controversy that would erupt as a debate about organ transplantation. The dispute would be about the ethics of killing handicapped children to harvest their vital organs. We could not resolve the issue by considering how many gravely ill people we could save by extracting a heart, two kidneys, a liver, etc., from each mentally handicapped child. Instead, we would have to answer this question: is it right to relegate a certain class of human beings – the handicapped – to the status of objects that can be killed and dissected to benefit others?

By the same token, strictly speaking ours is not a debate about stem cell research. No one would object to the use of pluripotent stem cells in biomedical

research or therapy if they could be obtained from non-embryonic sources, or if they could be acquired by using embryos lost in miscarriages.¹ The point of

¹ It appears that we will soon be able to obtain embryonic stem cells, or their equivalent, by means that do not require the destruction of human embryos. Important successes in producing pluripotent stem cell lines by reprogramming (or ‘de-differentiating’) human somatic cells have been reported in highly publicized papers by James A. Thomson’s research group, “Induced Pluripotent Stem Cell Lines Derived from Human Somatic Cells,” *Scienceexpress*, www.sciencexpress.org/22 November 2007/ 10.1126science.1151526, and Shinya Yamanaka’s research group, “Induction of Pluripotent Stem Cells from Adult Fibroblasts by Defined Factors,” *Cell* (published online, November 20, 2007). Citing these successes, Ian Wilmut of Edinburgh University, who is credited with producing Dolly the sheep by cloning, has decided not to pursue a license granted by British authorities to attempt to produce cloned human embryos for use in biomedical research. According to Wilmut, embryo-destructive means of producing the desired stem cells will be unnecessary: “The odds are that by the time we make nuclear transfer [cloning] work in humans, direct reprogramming will work too. I am anticipating that before too long we will be able to use the Yamanaka approach to achieve the same, without making human embryos.” Wilmut is quoted in Roger Highfield, “Dolly Creator Ian Wilmut Shuns Cloning,” *Telegraph.co.uk*, November 16, 2007. For a survey of possible non-embryo-destructive methods of obtain-

Robert P. George is McCormick Professor of Jurisprudence and director of the James Madison Program in American Ideals and Institutions at Princeton University. He is coauthor of “Body-Self Dualism in Contemporary Ethics and Politics” (2008) and “Embryo: The Case for Human Life” (2008). He is a member of the President’s Council on Bioethics and formerly served on the United States Commission on Civil Rights.

© 2008 by the American Academy of Arts & Sciences

controversy is the ethics of deliberately destroying human embryos to produce stem cells. The threshold question is whether it is right to kill members of a certain class of humans – those in the embryonic stage of development – to benefit others.

Supporters of embryo-destructive research insist, however, that human embryos are not human beings – or if they are human beings, that they are not yet ‘persons.’ It is therefore morally acceptable, they say, to ‘disaggregate’ them for the sake of research aimed at finding cures or treatments for juvenile diabetes and other horrible afflictions.

At the heart of the debate over embryo-destructive research, then, are two questions: is a human embryo a human being, and, if so, what is owed to an embryonic human as a matter of justice?

I will say nothing about religion or theology. This is not a tactical decision; rather, it reflects my view about how to think about the dispute over killing human embryos. It is sometimes said that opposition to embryo-destructive research is based on a controversial theology of ‘ensoulment.’ But one need not engage questions of whether human beings have spiritual souls in considering whether human embryos are human beings. Nor must one appeal to any theology of ensoulment to show that there is a rational basis for treating all human beings – including those at the embryonic stage – as creatures possessing intrinsic worth and dignity.²

ing pluripotent stem cells, see The President’s Council on Bioethics, “White Paper: Alternative Sources of Pluripotent Stem Cells,” May 2005, available at www.bioethics.gov.

2 It is worth pointing out that contrary to a common misunderstanding, the Catholic

We should resolve our national debate over embryo-destructive research on the basis of the best scientific evidence as to when the life of a new human being begins, and the most careful philosophical reasoning as to what is owed to a human being at any stage of development. Religious conviction can motivate us to stand up and speak out in defense of human life and dignity. And religious people should never hesitate to do that. But we need not rely on religious authority to tell us whether a human embryo is a new living member of the species *Homo sapiens* or whether all human beings – irrespective of not only race, ethnicity, and sex but also age, size, stage of development, and condition of dependency – possess full moral worth and dignity. The application of philosophical princi-

Church does not try to draw *scientific* inferences about the humanity or distinctness of the human embryo from *theological* propositions about ensoulment. It works the other way around. The theological conclusion that an embryo is ‘ensouled’ would have to be drawn on the basis of (among other things) scientific findings about the self-integration, distinctness, unity, determinateness, etc., of the developing embryo. Contrary to another misunderstanding, the Catholic Church has not declared a teaching on the ensoulment of the early embryo. Still, the Church affirms the rational necessity of recognizing and respecting the dignity of the human being at all developmental stages, including the embryonic stage, and in all conditions. For a clear statement of Catholic teaching and its ground, see the document *Donum Vitae*, issued by the Congregation for the Doctrine of the Faith on February 22, 1987, http://www.vatican.va/roman_curia/congregations/cfaith/documents/rc_con_cfaith_doc_19870222_respect-for-human-life_en.html: “[T]he conclusions of science regarding the human embryo provide a valuable indication for discerning by the use of reason a personal presence at the moment of this first appearance of a human life: how could a human individual not be a human person?” (Section 5, I, 1, para. 3)

ples in light of facts established by modern embryological science is more than sufficient for that task.³

The adult human being that is now you or me is the same being who, at an earlier stage, was an adolescent and, before that, a child, an infant, a fetus, and an embryo.⁴ Even in the embryonic stage, you and I were undeniably whole living members of the species *Homo sapiens*. We were then, as we are now, distinct and complete – though, in the beginning, developmentally immature – human organisms. We were not mere parts of other organisms.

A human embryo is not something different *in kind* from a human being, like a rock, or a potato, or a rhinoceros. A human embryo is a human individual in the earliest stage of his or her natural

3 My point here is not to make light of, much less to denigrate, the important witness of many religious traditions to the profound, inherent, and equal dignity of all members of the human family. Religious conviction can, and many traditions do, reinforce ethical propositions that can be rationally affirmed even apart from religious authority.

4 Thus, “recollecting (at her birth) his appreciation of Louise Brown [the first IVF baby] as one or two cells in his petri dish, [Robert] Edwards [said]: ‘She was beautiful then and she is beautiful now.’” John Finnis, “Some Fundamental Evils in Generating Human Embryos by Cloning,” in Cosimo Marco Mazzoni, ed., *Etica della Ricerca Biologia* (Florence: Leo Olschki, 2000), 116. Edwards and his coauthor, Patrick Steptoe, accurately described the embryo as “a microscopic human being – one in its very earliest stages of development.” Robert Edwards and Patrick Steptoe, *A Matter of Life* (London: Hutchinson’s, 1981), 83. The human being in the embryonic stage of development is “passing through a critical period in its life of great exploration: it becomes magnificently organised, switching on its own biochemistry, increasing in size, and preparing itself quickly for implantation in the womb.” *Ibid.*, 97.

development.⁵ Unless severely damaged or deprived of a suitable environment, an embryonic human being will, by directing his or her own integral organic functioning, develop himself or herself to each new stage of developmental maturity along the gapless continuum of a human life. The embryonic, fetal, infant, child, and adolescent stages are just that: *stages* in the development of a determinate and enduring entity – a human being – who comes into existence as a single-celled organism (zygote) and grows, if all goes well, into adulthood many years later.⁶

5 Keith Moore and T. V. N. Persaud, in *The Developing Human: Clinically Oriented Embryology*, perhaps the most widely used embryology text, make the following unambiguous statement about the beginning of a new and distinct human individual: “Human development begins at fertilization when a male gamete or sperm (spermatozoon) unites with a female gamete or oocyte (ovum) to form a single cell – a zygote. This highly specialized, totipotent cell marked the beginning of each of us as a unique individual.” Keith Moore and T. V. N. Persaud, *The Developing Human: Clinically Oriented Embryology* (Philadelphia: Saunders/Elsevier, 2008), 15 (emphasis added).

6 A human embryo (like a human being in the fetal, infant, child, or adolescent stage) is not a ‘prehuman’ organism with the mere potential to become a human being. No human embryology textbook known to me presents, accepts, or remotely contemplates such a view. Instead, leading embryology textbooks assert that a human embryo *is* – already and not merely potentially – a new individual member of the species *Homo sapiens*. His or her potential, assuming a sufficient measure of good health and a suitable environment, is to develop by an internally directed process of growth through the further stages of maturity on the continuum that is his or her life. Nor is there any such thing as a ‘pre-embryo.’ That concept was invented, as Lee Silver pointed out in his book *Remaking Eden* (New York: Avon Books, 1997), 39, for political, and not scientific, reasons.

By contrast, the gametes whose union brings into existence the embryo are not whole or distinct organisms. Each is functionally (and genetically) identifiable as *part* of the male or female (potential) parent. Moreover, each gamete has only half the genetic material needed to guide the development of an immature human being toward full maturity. They are destined either to combine with an oocyte or spermatozoon and generate a new and distinct organism, or simply to die. When fertilization occurs, they do not survive; rather, their genetic material enters into the composition of a new organism.

But none of this is true of the human embryo, from the zygote and blastula stages onward. The combining of the chromosomes of the spermatozoon and of the oocyte generates what human embryology identifies as a new, distinct, and enduring organism. Whether produced by fertilization, Somatic Cell Nuclear Transfer (SCNT), or some other cloning technique, the human embryo possesses all of the genetic material and other qualities needed to inform and organize its growth.⁷ The direction of its growth is not extrinsically determined, but is in accord with the information

7 A cloned human embryo is not a subhuman organism. Cloning produces a human embryo by combining what is normally fused and activated in fertilization, that is, a properly epigenetically disposed human genome and the oocyte cytoplasm. Cloning, like fertilization, generates a new and complete, though immature, human organism. Cloned embryos therefore ought to be treated as having the same moral status, whatever that might be, as other human embryos. I respond to the arguments of my colleague on the President's Council on Bioethics, Paul McHugh, who claims that cloned embryos are not human beings but "clonotes," in the latter half of Robert P. George and Patrick Lee, "Acorns and Embryos," *New Atlantis* 7 (2005): 90–100.

within it.⁸ Nor does it merely possess organizational information for maturation; it actively uses that information in an internally directed process of development. The human embryo, then, is a whole and distinct human organism – an embryonic human being.

If the embryo is not a complete organism, what can it be? Unlike the spermatozoa and the oocytes, it is not merely a part of a larger organism, namely, the mother or the father. Nor is it a disordered growth or gamete tumor, such as a complete hydatidiform mole or teratoma.

Someone might say that the early embryo is an intermediate form, something which regularly emerges into a whole human organism but is not one yet. But what could cause the emergence of the whole human organism, and cause it with regularity? As I have already observed, from the zygote stage forward the development of this organism is *directed from within*, or by the organism itself. So, after the embryo comes into being, no event or series of events occur that we could construe as the production of a new organism – that is, nothing extrinsic to the developing organism itself acts on it to produce a new character or a new direction in development.⁹

A supporter of embryo-destructive research might concede that a human

8 The first one or two divisions, in the first thirty-six hours, occur largely under the direction of the messenger RNA acquired from the oocyte. Still, the embryo's genes are expressed as early as the two-celled stage and are required for subsequent development to occur normally. See Ronan O'Rahilly and Fabiola Mueller, *Human Embryology and Teratology* (New York: John Wiley & Sons, 2000), 38.

9 For a fuller explanation, see Patrick Lee and Robert P. George, "The First Fourteen Days of Human Life," *New Atlantis* 13 (2006).

embryo is a human being in a biological sense, yet deny that we owe human beings in the early stages of their development full moral respect, such that we may not kill them to benefit more fully developed human beings who are suffering from afflictions.

But to say that embryonic human beings do not deserve full respect, one must suppose that not every human being deserves full respect. And to do that, one must hold that those human beings who warrant full respect deserve it not by virtue of *the kind of entity they are*, but, rather, because of some acquired characteristic that some human beings (or human beings at some stages) have and others do not, and which some human beings have in greater degree than others do.

This position is untenable. One need not be *actually* or immediately conscious, reasoning, deliberating, making choices, etc., in order to be a human being who deserves full moral respect, for plainly we should accord people who are asleep or in reversible comas such respect. But if one *denied* that human beings are valuable by virtue of what they are, and required an additional attribute, it would have to be a capacity of some sort, and, obviously, a capacity for certain mental functions.

Of course, human beings in the embryonic, fetal, and early infant stages lack immediately exercisable capacities for mental functions characteristically carried out by most human beings at later stages of maturity. Still, they possess these very capacities *in principe vel radice*, that is, in radical or 'root' form. Precisely by virtue of the kind of entity they are, they are from the beginning actively developing themselves to the stages at which these capacities will (if all goes well) be immediately exercisable. Although, like infants, they have

not yet developed themselves to the stage at which they can perform intellectual operations, it is clear that they are *rational animal organisms*.¹⁰ That is the *kind* of entity they are.

Here, it is important to distinguish two senses of the 'capacity' for mental functions: an immediately exercisable capacity, and a basic natural capacity, which develops over time. We have good reason to believe that the second sense, and not the first, provides the basis for regarding human beings as ends in themselves, and not as means only – as subjects possessing dignity and human rights, and not as mere objects.

First, the developing human being does not reach a level of maturity at which he or she performs a type of mental act that other animals do not perform – even animals such as dogs and cats – until at least several months after birth. A six-week-old baby lacks the *immediately exercisable* capacity to form abstract concepts, engage in deliberation, and perform many other characteristically

10 For an entity to have a rational nature is for it to be a certain type of substance; *having a rational nature*, unlike, say, being tall, or Croatian, or gifted in mathematics, is not an accidental attribute. Each individual of the human species has a rational nature, even if disease or defect blocks its full development and expression in some individuals. If the disease or defect could somehow be corrected, it would perfect the individual as the kind of substance he is; it would not transform him into an entity of a different nature. Having a rational nature is, in Jeff McMahan's terms, a "status-conferring intrinsic property." So my argument is not that every member of the human species should be accorded full moral respect based on the fact that the more mature members have a status-conferring intrinsic property, as McMahan interprets the "nature-of-the-kind argument." See his "Our Fellow Creatures," *The Journal of Ethics* 9 (2005): 355 ff. Rather, my proposition is that having a rational nature is the basis for full moral worth, and every human individual possesses that status-conferring feature.

human mental functions. If we owed full moral respect only to those who possess immediately exercisable capacities for characteristically human mental functions, it would follow that six-week-old infants do not deserve full moral respect.¹¹ Therefore, if we may legitimately destroy human embryos to advance biomedical science, then logically, subject to parental approval, the body parts of human infants should also be fair game for scientific experimentation.¹²

Second, the difference between these two types of capacity is merely a difference between stages along a continuum. The immediately exercisable capacity for mental functions is only the development of an *underlying* potentiality that the human being possesses simply by virtue of the kind of entity it is. The capacities for reasoning, deliberating, and making choices are gradually brought toward maturation, through gestation, childhood, adolescence, and so on. But the difference between a being that deserves full moral respect and a being that does not (and can therefore legitimately be killed to benefit others) cannot consist only in the fact that while both have some feature, one has *more* of it than the other. A mere *quantitative* difference cannot by itself provide a justification

11 Clear-headed and unsentimental believers that full moral respect is due only to those human beings who possess immediately exercisable capacities for characteristically human mental functions do not hesitate to say that young infants do not deserve full moral respect. See, for example, Peter Singer, "Killing Babies is Not Always Wrong," *The Spectator* 16 (September 1995): 20–22.

12 Not long ago, Peter Singer was asked whether there would be anything wrong with a society that bred children for spare parts on a massive scale. "No," was his reply. See "Blue State Philosopher," *World Magazine*, November 27, 2004.

for treating entities in radically different ways.¹³

Third, the acquired qualities proposed as criteria for personhood, such as self-consciousness or rationality, come in an infinite number of degrees. If human beings are worthy of full moral respect only because of such qualities, and those qualities come in varying degrees, humans should possess rights in varying degrees. The proposition that all human beings are created equal would be relegated to the status of a myth: since some people are more rational than others (that is, have developed that capacity to a greater extent than others have), some people would be greater in dignity than others, and the rights of the superiors would trump those of the inferiors.¹⁴

So it cannot be the case that some human beings and not others are intrinsically valuable by virtue of a certain de-

13 Michael Gazzaniga has suggested that the embryo is to the human being what Home Depot is to a house, i.e., a collection of unintegrated components. According to Gazzaniga, "it is a truism that the blastocyst has the potential to be a human being. Yet at that stage of development it is simply a clump of cells An analogy might be what one sees when walking into a Home Depot. There are the parts and potential for at least 30 homes. But if there is a fire at Home Depot, the headline isn't 30 homes burn down. It's Home Depot burns down." Quoted as "Metaphor of the Week" in *Science* 295 (5560) (March 1, 2002): 1637. Gazzaniga gives away the game, however, in conceding, as he must, that the term 'blastocyst' refers to a *stage of development* in the life of a determinate, enduring, integrated, and, indeed, self-integrating entity. If we must draw an analogy to a Home Depot, then it is the gametes (or the materials used in cloning to generate an embryo), and not the embryo, that constitute the "parts and potential."

14 This conclusion would follow regardless of the acquired quality we chose as qualifying some human beings (or human beings at some developmental stages) for full respect.

gree of development. Rather, *all* human beings are intrinsically valuable (in the way that enables us to ascribe to them equality and basic rights) because of the *kind* of being they are.

Since human beings are intrinsically valuable and deserve full moral respect by virtue of *what* they are, it follows that they are intrinsically and equally valuable *from the point at which they come into being*. Even in the embryonic stage of our lives, each of us was a human being and, as such, worthy of concern and protection. Embryonic human beings, whether brought into existence by union of gametes, SCNT, or other cloning technologies, should be accorded the respect given to human beings in other developmental stages.¹⁵

I wish to turn now to some arguments that advocates of embryo-destructive research have advanced to cast doubt on the proposition that human embryos deserve to be accorded full moral status.

In defending research involving the destruction of human embryos, Ronald Bailey, a science writer for *Reason* magazine, developed an analogy between embryos and somatic cells in light of the possibility of human cloning.¹⁶ Bailey claims that every cell in the human body has as much potential for development as any human embryo. Embryos therefore have no greater dignity or higher moral status than ordinary somatic cells. Bailey observes that each cell in the hu-

man body possesses the entire DNA code; each has become specialized (as muscle, skin, etc.) because most of that code has been turned *off*. In cloning, those previously deactivated portions of the code are reactivated. So, Bailey says, quoting Australian bioethicist Julian Savulescu, “if all our cells could be persons, then we cannot appeal to the fact that an embryo could be a person to justify the special treatment we give it.” Since plainly we are not prepared to regard all of our cells as human beings, we should not regard embryos as human beings.

Bailey’s analogy between somatic cells and human embryos collapses, however, under scrutiny. The somatic cell is something from which (together with extrinsic causes) a new organism can be *generated* by the process of somatic cell nuclear transfer, or cloning; it is certainly not, however, a distinct organism. A human embryo, by contrast, already is a distinct, self-developing, complete human organism.

Bailey suggests that the somatic cell and the embryo are on the same level because both have the ‘potential’ to develop to a mature human being. The kind of ‘potentiality’ possessed by somatic cells that might be used in cloning differs profoundly, however, from the potentiality of the embryo. A somatic cell has a potential only in the sense that something can be done to it (or done with it) so that its constituents (its DNA molecules) enter into a distinct whole human organism, which is a human being, a person. In the case of the embryo, by contrast, he or she already is actively – indeed dynamically – developing himself or herself to the further stages of maturity of the distinct organism – the human being – he or she already is.

True, the whole genetic code is present in each somatic cell; and this code can

15 For a more complete presentation of this argument, see Patrick Lee and Robert P. George, “The Wrong of Abortion,” in Andrew I. Cohen and Christopher Wellman, eds., *Contemporary Debates in Applied Ethics* (New York: Blackwell Publishers, 2005), 13–26.

16 Ronald Bailey, “Are Stem Cells Babies?” available at <http://www.reason.com/rb/rb071101.html>.

guide the growth of a new entire organism. But this point does nothing to show that a somatic cell's potentiality is the same as a human embryo's. When scientists remove the nucleus of an ovum, insert the nucleus of a somatic cell into the remainder of the ovum, and give it an electric stimulus, they are doing more than merely placing the somatic cell in an environment hospitable to its continuing maturation and development. They are generating a wholly distinct, self-integrating, entirely new organism – an embryo, in other words. The entity – the embryo – brought into being by this process is radically different from the constituents that entered into its generation.

Somatic cells, in the context of cloning, then, are analogous not to embryos, but to the gametes whose union results in the generation of an embryo in the case of ordinary sexual reproduction. You and I were never either a sperm cell or an ovum. Nor would a person who was brought into being by cloning have once been a somatic cell. To destroy an ovum or a skin cell whose constituents might have been used to generate a new and distinct human organism is not to destroy a new and distinct human organism – for no such organism exists or ever existed. But to destroy a human embryo is precisely to destroy a new, distinct, and complete human organism – an embryonic human being.¹⁷

17 Lee and I replied to Bailey in a series of exchanges on *National Review Online* here: 1) (Our critique) <http://www.nationalreview.com/comment/comment-george072001.shtml>; 2) (Bailey's response) <http://www.nationalreview.com/comment/comment-bailey072501.shtml>; 3) (Our response) <http://www.nationalreview.com/comment/comment-george073001.shtml>.

We have responded to similar arguments recently advanced by Lee Silver in his book *Challenging Nature* here: 1) (Our critique) <http://article.nationalreview.com/?q=OTNiYWM2Zj>

Michael Gazzaniga, a psychologist and neuroscientist at the University of California, Santa Barbara, has proposed a different argument. While agreeing that a human embryo is an entity possessing a human genome, he has suggested that a 'person' comes into being only with the development of a brain. Prior to that point we have a human organism, but one lacking the dignity and rights of a person.¹⁸ We may therefore legitimately treat human beings in the earliest stages of development as we would treat organs available for transplantation (assuming, as with transplantable organs, that proper consent for their use is given, etc.).

In presenting his case, Gazzaniga observes that modern medicine treats the death of the brain as the death of the person – authorizing the harvesting of organs from the remains of the person, even if some physical systems are still functioning. If a human being is no longer a person with rights once the brain has died, then surely a human being is not yet a person prior to the development of the brain.

This argument suffers, however, from a damning defect. Under prevailing law and medical practice, the rationale for brain death is not that a brain-dead body

iYwVlN2IyMzFjOWYwMDZmMTc4MzU2MGU=; 2) (Silver's response) <http://article.nationalreview.com/?q=Mjg2Y2RkNDM1MzlkMGMyMjI3NjhkYmEoZTRjOTgyZDE=>; 3) (Our response) <http://article.nationalreview.com/?q=MjNmZmYyN2NhNjFkYWYWRhNmExMDA2YzhiMDY5YzMyYTI=>; 4) (Silver's second response, followed by our second response) <http://article.nationalreview.com/?q=ZDk5ZTE4MjBiMDFmZjcoM2EyNjEoMDC2ZjA4YmRmN2U=>.

18 President's Council on Bioethics, Session 5 meeting, January 18, 2002, transcript available at <http://bioethics.gov/transcripts/jan02/jan18sessions5.html>.

is a living human organism but no longer a person. Rather, brain death is accepted because the irreversible collapse of the brain is believed to destroy the capacity for self-directed integral organic functioning in human beings who have matured to the stage at which the brain performs a key role in integrating the organism. In other words, at brain death a unitary organism is believed no longer to exist.¹⁹ By contrast, although an embryo has not yet developed a brain, it is clearly exercising self-directed integral organic functioning, and so it is a unitary organism. Its capacity to develop a brain is inherent and progressing, just as the capacity of an infant to develop its brain sufficiently for it actually to *think* is also intrinsic and unfolding.

Unlike a corpse – the remains of what was once a human organism but is now dead, even if particular systems may be artificially sustained – a human organism in the embryonic stage of development is a complete, unified, self-integrating human individual. It is not dead but very much alive, even though its self-integration and organic functioning are not brain-directed at this stage. Its future lies ahead of it, unless it is cut off or not permitted to develop its inherent capacities. Therefore, defenders of embryonic human life insist that the embryo is not a ‘potential life,’ but is rather a life *with potential*. It is a potential *adult*, in the same way that fetuses, infants, children, and adolescents are potential adults. It has the potential for agency, just as fetuses, infants, and small

children do. Just like human beings in the fetal, infant, child, and adolescent stages, human beings in the embryonic stage are already, and not merely potentially, human beings.²⁰

In an essay in the *New England Journal of Medicine*, Harvard political theorist Michael Sandel claimed that human embryos are different *in kind* from human beings at later developmental stages. This argument truly takes us to the heart of the matter: is a human embryo a human being? At its core is this analogy:

Although every oak tree was once an acorn, it does not follow that acorns are oak trees, or that I should treat the loss of an acorn eaten by a squirrel in my front yard as the same kind of loss as the death of an oak tree felled by a storm. Despite their developmental continuity, acorns and oak trees are different kinds of things.

He maintains that just as acorns are not oak trees, embryos are not human beings.

Sandel’s argument begins to go awry with his choice of analogates. The acorn is analogous to the embryo, and the oak tree (he says) is analogous to the human being. But in view of the developmental continuity that science fully establishes and Sandel concedes, the proper analogate of the oak tree is the *mature* human being, viz., the adult. Sandel’s analogy has its apparent force because we feel a sense of loss when a mature oak is felled – assuming it is a magnificent or beautiful oak. But while it is true that we do not feel the same sense of loss at the de-

19 Recent research has raised questions about whether ‘brain death’ is always equated with the irreversible loss of integral organic functioning. See D. Alan Shewmon, “The Brain and Somatic Integration: Insights into the Standard Biological Rationale for Equating ‘Brain Death’ with Death,” *The Journal of Medicine and Philosophy* 26 (2001): 457–478.

20 Lee and I have replied to other arguments that identify the human ‘person’ as the brain or brain activity, and the human ‘being’ as the bodily animal, in Robert P. George and Patrick Lee, “Dualistic Delusions,” *First Things* 150 (2005).

struction of an acorn, it is also true that we do not feel the same sense of loss at the destruction of an oak *sapling*. But clearly the oak tree does not differ in kind from the oak sapling.

This example shows that we value oak trees not because of the kind of entity they are, but because of their magnificence. The magnificence of an oak tree reflects either accidental properties or instrumental worth; a mature tree provides our house with shade and is aesthetically pleasing to behold. Neither acorns nor saplings are magnificent, so we do not experience a sense of loss when they are destroyed. If oak trees were valuable by virtue of the *kind* of entity they are, then it would follow that it is just as unfortunate to lose an acorn as an oak tree.

But the basis for our valuing human beings is profoundly different from the basis for valuing oak trees. As Sandel concedes, we value human beings precisely because of the *kind* of entities they are. Indeed, that is why we consider all human beings to be equal in basic dignity and human rights. We most certainly do not believe that especially magnificent human beings – such as Michael Jordan or Albert Einstein – are of greater *fundamental* worth and dignity than human beings who are physically frail or mentally impaired. We would not tolerate the killing of a handicapped child or a person suffering from, say, brain cancer in order to harvest transplantable organs to save Jordan or Einstein.

And we do not stand for the killing of infants, *which on Sandel's analogy would be precisely analogous to the oak saplings whose destruction we do not necessarily regret*. Managers of oak forests freely kill saplings, just as they might destroy acorns, to ensure the health of the more mature trees. No one gives it a second thought. This is precisely because we do not value mem-

bers of the oak species – as we value human beings – because of the *kind* of entity they are. If we did value oaks in this way, then we would have no less reason to regret the destruction of saplings, and possibly even acorns, than that of mature oak trees. Conversely, if we valued human beings in a way analogous to the way we value oak trees, then we would have no grounds to object to killing human infants or even mature human beings who are ‘defective.’

Sandel's defense of human embryo-killing on the basis of an analogy between embryos and acorns collapses the moment one brings into focus the profound difference between the basis on which we value oak trees, and that on which we ascribe value to human beings. We value oaks for their accidental properties and their instrumental worth. But we value human beings because of the intrinsic worth and dignity they possess by virtue of the kind of entity they are.²¹

I now consider a final objection. Some have claimed that the phenomenon of monozygotic twinning shows that the embryo in the first several days of its gestation is not a human individual. The suggestion is that as long as twinning can occur what exists is not yet a unitary human being, but only a mass of cells – each cell being totipotent and allegedly independent of the others.

It is true that if a cell or group of cells is detached from the whole at an early stage of embryonic development, the detached part can become an organism with the potential to develop to maturity as distinct from the embryo from which it was detached. But this does nothing to show that before detachment the cells

21 Lee and I responded to Sandel in George and Lee, “Acorns and Embryos.”

within the human embryo constituted only an incidental mass.²²

Consider the parallel case (discussed by Aristotle) of the division of a flatworm. Parts of a flatworm have the potential to become a whole flatworm when isolated from the present whole of which they are a part. Yet no one would suggest that prior to the division of a flatworm, the original flatworm was not a unitary individual. Likewise, at the early stages of human embryonic development, before specialization by the cells has progressed very far, cells or groups of cells can become whole organisms if they are divided and exist in an appropriate environment after the division. But that fact does not in the least indicate that prior to the twinning event, the embryo is other than a unitary, self-integrating, actively developing human organism. It certainly does not show

that the embryo is a mere “clump of cells.”

Based on detailed studies of other mammals, it is highly likely that in the first two weeks, the cells of the developing embryonic human being already manifest a degree of specialization and differentiation. From the beginning, even at the two-celled stage, the cells of mouse embryos differ in their developmental fates; they will ultimately contribute to distinct tissues within the embryo.²³ By the four-celled stage, there are clear molecular²⁴ and developmental²⁵ differences between cells of the developing mouse. At no time is the embryo a mere ‘ball of cells,’ i.e., a collection of homogeneous cells that do not function together as an organismic whole.

Now some people have claimed that the human embryo does not become a human being until implantation, be-

22 William Hurlbut of Stanford University has pointed out that “[m]onozygotic twinning (a mere 0.4 percent of births) does not appear to be either an intrinsic drive or a random process within embryogenesis. Rather, it is a disruption of normal development by a mechanical or biochemical disturbance of fragile cell relationships that provokes a compensatory repair, but with the restitution of integrity within two distinct trajectories of embryological development.” He goes on to explain that “the fact that these early cells retain the ability to form a second embryo is testimony to the resiliency of self-regulation and compensation within early life, not the lack of individuation of the first embryo from which the second can be considered to have ‘budded’ off. Evidence for this may be seen in the increased incidence of monozygotic twinning associated with IVF by Blastocyst Transfer. When IVF embryos are transferred to the uterus for implantation at the blastocyst stage, there is a two- to tenfold increase in the rate of monozygotic twinning, apparently due to disruption of normal organismal integrity.” *Human Cloning and Human Dignity: An Ethical Inquiry*, Report of the President’s Council on Bioethics, Washington, D.C., July 2002, personal statement of William Hurlbut.

23 For example, the plane of cleavage of the zygote predicts which cells will contribute to the inner cell mass and which will contribute to the trophectoderm; B. Plusa et al., “The First Cleavage of the Mouse Zygote Predicts the Blastocyst Axis,” *Nature* 434 (7031) (March 17, 2005): 391–395; R. L. Gardner and T. J. Davies, “The Basis and Significance of Pre-Patterning in Mammals,” *Philosophical Transactions of the Royal Society B: Biological Sciences* 358 (2003): 1338–1339; J. Rossant and P. P. Tam, “Emerging Asymmetry and Embryonic Patterning in Early Mouse Development,” *Developmental Cell* 7 (2004): 155–164.

24 M. E. Torres-Padilla et al., “Histone Arginine Methylation Regulates Pluripotency in the Early Mouse Embryo,” *Nature* 445 (7124) (January 11, 2007): 214–218; J. A. Stanton, A. B. Macgregor, D. P. Green, “Gene Expression in the Mouse Preimplantation Embryo,” *Reproduction* 125 (2003): 457–468.

25 K. Piotrowska-Nitsche et al., “Four-Cell Stage Mouse Blastomeres Have Different Developmental Properties,” *Development* 132 (3) (February 2005): 479–490.

cause (they assume) the embryo cannot establish a basic body plan until it receives external maternal signals at implantation. Only then is it a self-directing human organism. According to this view, these signaling factors somehow transform what was hitherto a mere bundle of cells into a unitary human organism.

However, embryologists argue about whether any such maternal signaling actually occurs. As Hans-Werner Denker observed, it was once assumed that in mammals, in contrast to amphibians and birds, polarity in the early embryo depends upon some external signal, since no clear indications of bilateral symmetry had been found in oocytes, zygotes, or early blastocysts.²⁶ But this view has been revised in the light of emerging evidence: “[I]ndications have been found that in mammals the axis of bilateral symmetry is indeed determined (although at first in a labile way) by sperm penetration, as in amphibians. Bilateral symmetry can already be detected in the early blastocyst and is not dependent on implantation.”

Denker refers specifically to the work of Magdalena Zernicka-Goetz and her colleagues at Cambridge University, and that of R. L. Gardner at Oxford University, which show that polarity exists even at the two-celled stage. In contrast, Davor Solter and Takashi Hiragi of the Max Planck Institute for Immunobiology in Freiburg argue that in the early embryo (prior to compaction and differentiation into inner cell mass and trophoblast), external factors determine the fate of each cell, rather than an internal

polarity.²⁷ In other words, the issue is not definitively settled. However, whichever of the two is true, it is less than candid for anyone to assert the older view without acknowledging that credible scientists from leading universities have published research contradicting it in major peer-reviewed scientific journals.

Moreover – and here is the most important point – even if it is the case that polarity does not emerge until a maternal signal is received at implantation, that would *not* provide any evidence that such a signal transformed a bundle of cells into a unitary, multicellular human organism. Just as the lungs begin to breathe at birth only in response to certain external stimuli, so it would make sense (if the older view is true) that differentiation into the rudiments of the distinct body parts (basic bilateral polarity) would begin only in response to some external stimuli. And this is exactly how embryology texts interpreted such signals, even prior to the publications of Zernicka-Goetz and Gardner and their teams.

There is much evidence that the human embryo is from the first day onward a unitary organism, and never a mere bundle of cells. Development in the embryo is complex and coordinated, including compaction, cavitation, and other activities in which the embryo is preparing itself for implantation.

And here is the clearest evidence that the embryo in the first two weeks is not a mere mass of cells but a unitary organism: if each cell within the embryo before twinning were independent, there would be no reason why each would not develop on its own. Instead, these allegedly independent, noncommunicating

26 Hans-Werner Denker, “Early Human Development: New Data Raise Important Embryological and Ethical Questions Relevant for Stem Cell Research,” *Naturwissenschaften* 91 (1) (2004): 21 ff.

27 See Gretchen Vogel, “Embryologists Polarized Over Early Cell Fate Determination,” *Science* 308 (May 6, 2005).

cells regularly function together to develop into a single, more mature member of the human species. This fact shows that the cells are interacting from the very beginning (even within the zona pellucida, before implantation), restraining them from individually developing as whole organisms and directing each of them to function as a relevant part of a single, whole organism continuous with the zygote. The evidence indicates that the human embryo, from the zygote stage forward, is a unitary human organism.²⁸

Supporters of embryo-destructive research have advanced other arguments against the proposition that human embryos are embryonic human beings bearing basic dignity and full moral worth. I have focused in this essay on the strongest arguments against my position and laid aside the weaker ones, such as those proposing to infer something of moral relevance from the fact that human embryos are tiny and not yet sentient; or from the fact that a high percentage of human embryos are naturally lost early in pregnancy; or from the claim that people typically either do not grieve for the loss of embryos in early miscarriages, or grieve but not as intensely as they do for children who die later in gestation or as infants.

If there is a valid argument to show that human embryos are something other than human beings in the embryonic stage of development, or that embryonic human beings lack the basic dignity and moral worth of human beings in later developmental stages, it is one of the arguments I address here. I have given my reasons for believing that none of

these arguments can withstand critical scrutiny.

The debate about the value of embryonic human life is sure to continue. But if that debate is informed by serious attention to the facts of embryogenesis and early human development, and of the profound, inherent, and equal dignity of human beings, then we, as a nation, will ultimately reject the deliberate killing of embryonic humans, regardless of the promised benefits.

This does not necessarily mean we must sacrifice such benefits. Scientists have already made tremendous progress toward the goal of producing fully pluripotent stem cells by non-embryo-destructive methods. If such methods are pursued with vigor, the future might see the promise of stem cell science fulfilled, with no stain on our national conscience.

28 Lee and I presented this information in George and Lee, "The First Fourteen Days of Human Life."

Nikolas Rose

*The value of life: somatic ethics
& the spirit of biocapital*

What is the value of life?¹ This may seem a pretentious or a philosophical question. But it is the subject of much contemporary discussion. In August 2006, England's National Institute for Clinical Excellence (NICE), which advises on medicines available on the National Health Service (NHS) in England, ruled against two treatments for late-stage bowel cancer – Genentech's Avastin and ImClone Systems' Erbitux. Although these treatments were widely available in a number of countries, NICE declared that their use was not "compatible with the best use of NHS resources."

NICE estimated that treatment with Avastin would cost £17,665.65 a patient,

Erbitux £11,739. On average, these treatments extend the lives of those with terminal bowel cancer by five months. NICE made its judgment using a model that estimates the costs per 'quality adjusted life year' (QALY) gained, and set a 'willingness to pay' cap of £30,000 per QALY. Each of the treatments exceeded that limit. Many cancers sufferers and their supporters contested this decision. It was, they said, a question of the value placed on their lives, the value of five months of life.

What, then, is the value of life? A Google search for 'the value of life' turns up 417,000 pages in 0.22 seconds. Among them, *Brainy Quote of the Day* gives us Michael de Montaigne's wise words: "The value of life lies not in the length of days, but in the use we make of them." But more generally, what one sees in these pages is an instructive intertwining of the ethical and the economic. Of course, many of the Google hits lead to the deliberations of bioethicists; in fact, *The Value of Life* is the title of a book by the prominent British bioethicist John Harris. But for those of us who are not bioethicists, current debates

Nikolas Rose is James Martin White Professor of Sociology and director of the BIOS Centre for the Study of Bioscience, Biomedicine, Biotechnology and Society at the London School of Economics. His numerous publications include "Governing the Soul: The Shaping of the Private Self" (1989), "Inventing Our Selves: Psychology, Power and Personhood" (1996), "Powers of Freedom: Reframing Political Thought" (1999), and "The Politics of Life Itself: Biomedicine, Power, and Subjectivity in the Twenty-First Century" (2006).

© 2008 by the American Academy of Arts & Sciences

¹ This paper draws on Nikolas Rose, *The Politics of Life Itself* (Princeton, N.J.: Princeton University Press, 2006).

over the value of life provide one way to explore the nature of contemporary biopolitics.

First in the Google listing is the Pope, or rather, the late Pope John Paul's encyclical letter of 1995, "*Evangelium Vitae: On the Value and Inviolability of Human Life*." In it, the Pontiff declares the incomparable worth of the human person, and expresses concern about the increase in threats to the life of individuals and peoples, especially where life is weak and defenseless. He is particularly troubled by the new threats opened up by biomedical progress; he believes that certain sectors of the medical profession, authorized by the state, are endangering the lives of the weakest, often with the free assistance of health-care systems.

The late Pope represents only one pole of the bioethical debate that now rages over the question of whether life can be subject to judgments of value – or, whether different forms of life can or should be valued differently. Could one ever legitimately say, 'My life has no value'? Could a life be of such little value that it might be a life not worth living, a life that should be ended?

That little phrase, 'life not worthy of life,' admittedly carries chilling overtones. It evokes the German debates on euthanasia that preceded the murderous eugenic regime in Germany from 1900 to 1945, so movingly analyzed in Michael Burleigh's book *Death and Deliverance*. And yet, today, it seems we cannot avoid this issue, especially at the start or end of life – in cases of severely disabled neonates maintained on life support, or those suffering from a painful and terminal disease who wish for physician-assisted suicide.

What is important for my analysis is not the answers given, but the way the

question itself is posed. Today, it is increasingly framed in terms of dignity. The U.K.'s Voluntary Euthanasia Society, for example, recently changed its name to Dignity in Dying. The value of life here seems to exist in a kind of transactional space between the claim that existence itself has some intrinsic value, and the claim that value should attach, not to life as vitality, but to life as a subjective state – to the 'dignity' of those who live it.

Second in Google's hierarchy are the economists, for whom life *can* certainly be given a precise value. Value of life, here, is usually calculated with the classical economic measure of 'willingness to pay.'

Since there are few ways to test how much individuals are, in reality, willing to pay for their life, health-care spending stands as the most popular proxy, in measuring the value accorded to increased longevity. One example of this calculation is evident in a paper by Robert Hall and Charles Jones, with the title "The Value of Life and the Rise of Health Care Spending." They point out the rise in the United States in the proportion of resources devoted to health care: "The share was 5.2 percent in 1950, 9.4 percent in 1975, and 15.4 percent in 2000. Over the same period, health has improved. The life expectancy of an American born in 1950 was 68.2 years, of one born in 1975, 72.6 years, and of one born in 2000, 76.9 years." Set the additional investment against the additional years of life, and one has a measure of the implicit value Americans attribute to life.

Others try to calculate the potential societal benefits, in financial terms, for reductions in mortality and morbidity. Kevin Murphy and Robert Topel estimate that, for the United States, "reduced mortality from heart disease alone

has increased the value of life by about \$1.5 trillion per year since 1970 Even a modest 1 percent reduction in cancer mortality would be worth nearly \$500 billion.”²

Something similar is happening when health economists use measures like the QALY to evaluate the costs of disease or the benefits of treatments: it is an imperfect yet seemingly necessary technology to enable tragic choices, translating impossible moral judgments about suffering into a technical and calculable form.

Other experts estimate the value of life in terms of the money people are prepared to invest to reduce small risks of death.³ The U.S. Department of Transportation, in a paper prepared just after September 11, calls this amount the ‘value of a statistical life’:

A defined value of life has been pursued by governmental agencies here and abroad for over thirty years. It is regarded as an essential element of cost-benefit analysis to guide public policy in the areas of regulation and investment in health and safety. Some measure is necessary to ensure prudent management of public and private resources. Although saving an identifiable life is often regarded as a moral imperative on which no monetary value can be placed, *prevention of every possible accidental death would be intolerably costly in terms of both money and the quality of life*. The term “value of a statistical life” (VSL) is widely used to emphasize that value is placed, not on a particular life, but on safety measures

that reduce the statistically expected number of accidental fatalities by one [emphasis added].⁴

In a related but different economic frame, one finds the debates over the compensation given by the government to victims of disaster. When the U.S. Air Force killed and injured a number of people in bombing the Chinese Embassy in Belgrade in May 1999, the U.S. government agreed to pay \$4.5 million in damages, which amounted to about \$150,000 per victim. On the other hand, when a U.S. Marine jet hit aerial tramway cables in Italy in 1998, the United States gave close to \$2 million to each Italian victim. Even this disparity in the value of life pales when one learns that when a U.S. gunship attacked and strafed four villages in Afghanistan in 2003, killing sixty people, the Karzai regime offered the Afghan wedding victims about \$200 on behalf of each individual killed.⁵

In the United States itself, the next of kin of each person who died in the September 11 attacks received some \$2 million, sparking an angry debate in the United States about the respective compensation to the victims of Hurricanes Rita and Katrina, and to the families of troops who have died in Iraq. Life, it seems, can be given a monetary value in compensation for its loss, yet that valuation depends upon the citizenship of those who have lost it, and the financial and political resources of those who contest that loss.

2 Kevin M. Murphy and Robert H. Topel, “The Value of Health and Longevity,” NBER Working Paper 11405, June 2005, <http://www.nber.org/papers/W11405> (accessed March 20, 2006).

3 For example, W. Kip Viscusi, “The Value of Life,” *New Palgrave Dictionary of Economics and the Law*, 2nd ed., 2005, <http://ssrn.com/abstract=827205>.

4 <http://ostpxweb.dot.gov/policy/EconStrat/treatmentoflife.htm#1> (accessed March 12, 2006).

5 <http://www.cursor.org/stories/afghandead.htm> (accessed March 12, 2006).

The lawyers come third in Google's listings. A host of papers dealing with the value of life considers the ways in which the courts measure compensation in wrongful death suits, where relatives sue doctors or others to recover damages from someone they hold responsible for a death. This is a fertile market for lawyers in the United States, judging from the numerous pages posted by law firms encouraging individuals to make such claims.

However, in the United States at least, such claims making has taken a different turn – in the form of claims for wrongful birth or wrongful life. Willy and Cynthia Fields won damages of \$1.7 million for the wrongful birth of their severely handicapped daughter Jade, on the basis that their doctor failed to pick up the signs of abnormality (in an ultrasound scan of the fetus) that would have prompted them to have an abortion.⁶ This was a wrongful birth case, in which *parents* take action against a medical practitioner for failing to uncover information in genetic screening or counseling that would have enabled the mother to have her pregnancy terminated. Perhaps wrongful life cases are even more telling, for here the damaged, disabled, or terminally ill *child*, through his or her legal representatives, sues for having been allowed to be born – for example, a child with Tay-Sachs, condemned to a short life filled with suffering before an inevitable death. In effect, the child is claiming to have been damaged by having been allowed to live at all – for being condemned to a life not worth living. Of course, these cases are about raising money, for lawyers, for parents, for children; sometimes they are merely routes to obtaining the resources nec-

essary to provide care. But they reveal something about our contested politics of life.

On the one hand, then, all human life has a value beyond price, and every life is of equal value. And yet we know that in practice, some forms of life are judged more valuable than others. Every session of genetic counseling, every act of amniocentesis, and perhaps even every piece of cosmetic surgery embodies just such a premise: some forms of life, some ways of living, are worth more than others, and sometimes people are willing to pay for them. Every actuarial calculation for an insurance premium, every decision about health-care provision, is also based on such a presupposition.

My Google search did not really capture a fourth dimension – that of capital. By this, I mean the practice of expressing the value of a life – of an individual, family, lineage, nation, population, race, species or diversity of species – in terms of genetic or human capital.

The phrase 'genetic capital' was, perhaps, first used by modern-day proponents of eugenics, such as the authors of *The Bell Curve*, who drew on the more respectable use of the notion in evolutionary biology.⁷ Some transhumanists have now taken up the phrase to argue for a new kind of eugenics for improving the genetic capital of the nation.

Sarah Franklin has suggested that it was first in the area of stockbreeding that the idea of genetic capital took shape – the capital that was not so much in each member of the flock but in the heritable characteristics of the lineage.⁸

7 Richard J. Herrnstein and Charles Murray, *The Bell Curve: Intelligence and Class Structure in American Life* (New York: Free Press, 1994).

8 Harriet Ritvo, "Possessing Mother Nature: Genetic Capital in the Eighteenth Century,"

6 <http://www.cbsnews.com/stories/2003/06/19/60minutes/main559472.shtml>.

The idea of a kind of value inherent in the hereditary quality of one's stock originated before modern genetics. But in its modern form one can see it in an invitation issued by the Kansas-based Decatur Beef Alliance in 2000: "The Alliance gives progressive cattlemen a way to cash in on their genetic capital and their management expertise Any cattleman with superior genetic cattle meeting the [defined] live animal specifications . . . can get involved."⁹

The idea of genetic, or biological, capital has now become central to the language of those seeking to protect the planet and its biodiversity. Thus, in January 2006, *The Hindu Times* reported S. Kannaiyan, chairman of the National Biodiversity Authority of India, as saying, "Biodiversity represents the very foundation of human existence; yet, by our heedless actions, we are eroding this biological capital at an alarming rate."¹⁰

The idea of genetic capital resonates with that of human capital, which has emerged in the writings of Chicago School economists such as Gary Becker, for whom all choices that individuals make about matters like education or medical care are seen as investments in their own human capital. This notion of human capital links to the ways in which, in advanced liberal ethics, each individual is urged to live his life as a kind of enterprise to maximize lifestyle

in John Brewer and Susan Staves, *Early Modern Conceptions of Property* (New York: Routledge, 1996).

9 "An Invitation to Join the Decatur Beef Alliance" (speech, Commercial Agriculture Producer's College, Oberlin, Ky., November 14, 2000), <http://agebb.missouri.edu/commag/inst/decbeef.htm>.

10 <http://www.thehindu.com/2006/01/16/stories/2006011600810200.htm> (accessed March 20, 2006).

or potential, to become a kind of entrepreneur of oneself and one's family.

What is one to make of this intertwining of economic and ethical concerns, these complicated relations among different registers of value? What can it tell us, if anything, about contemporary biopolitics?

Certainly the practice of medicine has become infused with these ways of thinking about the value of life.¹¹ Belief in the value of a healthy life, and of one's right to control and shape that life, has become central to the ethical self-management of many individuals and families, and underlay many challenges to the paternalistic power that doctors exercised over their patients. Attempts to 'empower' the recipients of medical care, to emphasize 'active citizenship,' and to transform patients into 'consumers' were underpinned, in part, by the hope that each individual would act to protect and enhance the value of their own life and that of their family, because they were committed to a secular value of health.

From another direction, the practice of medicine has become saturated with issues of financial value. This phenomenon is evident, not just in the growth of private health insurance and the commoditization of health it entails, but also in the regulation of prescriptions or reimbursements for medical activity by health management organizations (HMOs) and National Health Services. As we have seen, these organizations base many of their judgments on the cri-

11 Richard Horton, editor of the influential medical journal *The Lancet*, provides an overview of some of the key issues; R. Horton, *Health Wars: On the Global Front Lines of Modern Medicine* (New York: New York Review of Books, 2004).

teria of value for money, and the costs and benefits of different forms of medical intervention captured in measures such as QALY.

Further, medical knowledge, indeed medical truth itself, has become subject to intense capitalization. Basic and applied biological research – whether conducted in biotech companies or in universities – has become bound up with the generation of intellectual property, and illness and health have become major fields for corporate activity. This is largely because contemporary molecular biomedicine requires the investment of resources over long periods – for equipment, laboratories, clinical trials, and regulatory compliance – before it can achieve a return. Increasingly, such investment comes from venture capital provided to private corporations, who also seek to raise funds on the stock market. Hence, biomedicine has become subject to all the exigencies of capitalization, such as the obligations of profit and the demands of shareholder value.¹²

A path-dependent perspective on biomedical truth is necessary here. Biotech companies do not merely apply or market scientific discoveries: the pharmaceutical industry has been central to research on neurochemistry, the biotech industry to research on cloning, and ge-

nomical corporations to the sequencing of the human genome.¹³ In contemporary biomedicine, the laboratory, the factory, and the stock market are interlinked. Where funds are required to generate candidates for truth in biomedicine, and where the allocation of such funds depends upon a calculation of financial return, commercial investment shapes the very direction, organization, problem space, and solution effects of biomedicine as well as the basic biology that supports it. In an era in which biotech enterprises such as Genentech proclaim that they are “in business for life,” biopolitics has become bioeconomics.¹⁴

13 I have argued elsewhere that images of the development of scientific disciplines that portray a path from the laboratory to society, described in the language of ‘application,’ are misleading, especially in those domains that have what Michel Foucault termed a “low epistemological threshold.” The psychological sciences, for example, were ‘disciplined’ around their fields of application – in industry, the schoolroom, the military, the courtroom – and only later established in the university. Nikolas Rose, *The Psychological Complex: Psychology, Politics and Society in England, 1869 – 1939* (Boston: Routledge & Kegan Paul, 1985). The impact of military priorities and funding should not be underestimated, in even the most apparently theoretical of disciplines such as mathematics.

14 The collection edited by Sarah Franklin and Margaret Lock made significant advances in our understanding of biocapital, pointing to the new hybrids of knowledge, technology, and life involved in patenting, sequencing, mapping, purifying, branding, marketing, and publicizing new life forms: these studies contributed to my own less ethnographic approach to these issues; S. Franklin and M. Lock, eds., *Remaking Life and Death: Toward an Anthropology of the Biosciences* (Santa Fe, N.M.: School of American Research Press, 2003). I am grateful to Franklin for letting me read her own development of these ideas in advance of publication; S. Franklin, *Dolly Mixtures* (Durham, N.C.: Duke University Press, 2006).

12 Once more I must stress that there is nothing novel in itself in close relations between industrial corporations and the development of scientific research, outside and inside universities. The image of scientific knowledge as developing within the sequestered space of the university laboratory, funded by public moneys, detached from commercial imperatives, mobilized only by Mertonian norms of disinterestedness applies, if at all, only to a few disciplines during an exceptional period in the mid-twentieth century. Novelty, today, lies in the particular configuration taking shape around the life sciences.

Catherine Waldby initially proposed the term ‘biovalue’ to characterize the ways that bodies and tissues derived from the dead are redeployed to enhance the health and vitality of the living.¹⁵ The Organization for Economic Cooperation and Development developed a similar idea in its ‘foresight’ exercise to explore the potential of economic activity that “captures the latent value in biological processes.” More generally, we can use the term to refer to the many ways in which qualities or capacities inherent in vitality have become a potential source for the production of value.

We should not overstate the novelty of these developments. Humans long ago put the vital properties of the natural world into service, with the domestication of animals and plants. They turned these properties into technologies when they, for example, harnessed the milk-producing capacities of cows and the silk-producing capacities of silkworms for the generation of biovalue.¹⁶ Contemporary projects to embody human desires and aspirations within living entities – organisms, organs, cells, molecules – in order to extract a surplus – be it food, health, or capital – can be traced to these early events.

15 C. Waldby, *The Visible Human Project: Informatic Bodies and Posthuman Medicine* (New York: Routledge, 2000).

16 In volume 3 of *Capital*, Marx points to the significance of the capitalization of cattle and sheep breeding in enabling capital to become an independent and dominant force in agriculture. Franklin argues that the cloning of Dolly the sheep – made possible by the investment of venture capital in the hope of creating transgenic ‘bioreactor’ sheep to produce marketable enzymes for treating human diseases – binds the oldest definitions of capital as ‘stock’ to the newest forms that it takes in contemporary biocapital. Human aspirations become literally ‘embodied’ in living capitalizable entities; *ibid.*

Yet something has changed. The very emergence of the language of bioeconomics brings into existence a new space for thought and action. The bioeconomy has appeared as a space to be mapped, managed, and understood; it needs to be conceptualized as a set of processes and relations that can be known and theorized, that can become the target of programs that seek to increase the power of nations or corporations by acting within and upon that economy.

The normalization of the term ‘biocapital’ is one indicator of this new turn. March 2005 saw the third annual conference of BioCapital Europe in Amsterdam – an event for pharmaceutical and biotech companies across Europe.¹⁷ In Australia, around the same time, the state of Queensland established a AU\$100 million biocapital fund to establish globally enduring biobusinesses. In May 2005, BioSpace, a leading online information source for the biotech and pharmaceutical industry, published the fifth edition of *BioCapital*, which showcases a variety of biopharmaceutical companies located within the Mid-Atlantic region; it includes an interactive BioCapital Hotbed map that also highlights research institutes, non-profit organizations, and universities within the area.¹⁸ Moreover, ‘biocapi-

17 The conferences of BioCapital Europe enable biotech companies to present themselves to venture capitalists, institutions, and other biotech and pharmaceutical companies looking for investment opportunities within the biotechnology market. See www.biocapitaleurope.com (accessed November 25, 2005).

18 See http://www.biospace.com/news_story.aspx?StoryID=20035520&full=1 (accessed November 25, 2005). There are now many such Hotbed Maps, which can be found at <http://www.biospace.com/biotechhotbeds.aspx> (accessed November 26, 2005). The original 1985

tal' is used in the title of numerous investment and consultancy organizations worldwide. Marxists and post-Marxists may disagree about whether biocapitalism is a novel mode of production, but they cannot dispute the existence and significance of *biocapital* as a way of thinking and acting.

Projects to govern the bioeconomy sometimes involve surprising alliances between political authorities and promissory capitalism.¹⁹ A number of 'strong state' bioeconomies – most famously illustrated in Iceland and Sweden – decided to license private companies to undertake the genetic sequencing of their populations and to combine this with publicly held genealogical and medical records, in the hope that they would be able to identify the genomic bases of common complex disorders. In the case of deCODE in Iceland these hopes were

not fulfilled, at least in the short term.²⁰ UmanGenomics in Sweden sought to use bioethical shields to insulate itself from some of the criticisms; but it too found that its business model was not viable.²¹

The 'ex-socialist state' bioeconomies, such as Lithuania and Estonia, emerged from Soviet domination with comprehensive medical and genealogical records, together with relatively stable populations and some unusually prevalent medical conditions: these seemed to provide a favorable point of entry to a future in which biotechnology would generate employment, boost industry, and promote both public and shareholder value.²²

Meanwhile, 'developing state' bioeconomies have turned claims about

The value of life: somatic ethics & the spirit of biocapital

Biotech Bay™ Map for the San Francisco Bay Area hangs on permanent display in the Smithsonian Institution's National Museum of American History. BioCapital was first launched in 1996.

19 Franklin and Lock, in 2003, attributed the term 'promissory capitalism' to Charis Thompson's then-unpublished work on what she termed "the biotech mode of (re)production"; S. Franklin and M. Lock, "Animation and Cessation: The Remaking of Life and Death," in Franklin and Lock, eds., *Remaking Life and Death: Toward an Anthropology of the Biosciences*. See C. Thompson, *Making Parents: The Ontological Choreography of Reproductive Technologies* (Cambridge, Mass.: MIT Press, 2005), especially chap. 6. The idea that speculative, risk, and venture capital depend upon issuing promissory notes against the hope of future returns has long had a central place in studies of the rise of capitalist economies. I draw on arguments made in my Clifford Barclay Memorial Lecture at the London School of Economics and Political Science in February 2005.

20 G. Palsson and P. Rabinow, "Iceland: The Case of a National Human Genome Project," *Anthropology Today* 15 (5) (1999): 14; H. Rose, *The Commodification of Bioinformation: The Icelandic Health Sector Database* (London: Wellcome Trust, 2003). See also <http://sunsite.berkeley.edu/biotech/iceland/new.html>. In a press release of August 2, 2005, deCODE Genetics put a brave face on their progress but nonetheless reported losses in their second quarter. See <http://www.decode.com> (accessed August 11, 2005).

21 A. Abbott, "Sweden Sets Ethical Standards for the Use of Genetic 'Biobanks,'" *Nature* 400 (July 1999): 3; K. Høyer, "Conflicting Notions of Personhood in Genetic Research," *Anthropology Today* 18 (5) (2002): 9–13; K. Høyer, "'Science is Really Needed That's All I Know.' Informed Consent and the Non-Verbal Practices of Collecting Blood for Genetic Research in Northern Sweden," *New Genetics and Society* 22 (3) (2003): 229–244; A. Nilsson and J. Rose, "Sweden Takes Steps to Protect Tissue Banks," *Science* 286 (1999): 894; S. Rosell, "Sweden's Answer to Genomics Ethics (letter)," *Nature* 401 (September 16, 1991).

22 For the Estonian Genome Project, see <http://www.geenivaramu.ee/index.php?show=main&lang=eng>.

the diversity of their populations into exploitable resources. Thus, in China (which has emphasised gene testing, biobanking, and stem cells) and India (which points to the diversity of its gene pool, developed pharmaceutical industry, CROs, and ‘good subjects’ for trials), local and national state authorities have focused on the development of biotech as a driver of economic development, inward investment, and international competitiveness.

Many Western and other First World economies have also stressed their potential competitive advantage in what enthusiasts like to term ‘the knowledge-based bioeconomy.’ In 2003, the U.K. House of Commons Trade and Industry Committee *Report on Biotechnology* identified biotechnology, especially biomedicine, as a key economic driver. It estimated that, in 2002, the U.K. biotechnology industry had a market capitalization of £6.3 billion, accounting for 42 percent of the total market capitalization of European biotechnology, with pharmaceutical biotechnology as the dominant branch.²³

In the United States, Ernst & Young reported that the biotech sector, in 2003, was a \$33.6 billion industry, with a total of 1,466 companies, 318 of which were public.²⁴ It also revealed that “in Australia . . . total revenues among publicly traded companies increased 38 percent from \$666 million in 2001 to \$920 million in 2002. The number of . . . people employed in the industry jumped 24 percent from 5,201 to 6,464.” And in Japan, the “government anticipates the nation’s biotech workforce will surge to

1 million by 2010, an enormous increase over the estimated 70,000 today. Government officials plan to double their investment in biotechnology in the next five years.”²⁵

This is not simply another case of predatory Western capitalism plundering the resources of the poor. A report of a U.K. government mission to India in 2003 was headed with a quote from then-Indian Prime Minister Atal Behari Vajpayee: “Biotechnology is a frontier science with a high promise for the welfare of humanity.” At that time India had 160 biotechnology companies with combined revenues of \$150 million, driven by developments in the health-care sector; the industry was expected to grow to \$4.5 billion by 2010 and to generate a million or more jobs.

In China, the government spent about \$180 million building a biotech industry from 1996 to 2002. By December 2006, total R&D spending in China exceeded that of Japan for the first time, and China became the world’s second-highest R&D investor after the United States: spending by central government in 2006 reached 71.6 billion RMB, or almost \$10 billion, a considerable portion of which was directed to biotechnology and biomedicine. Government funds were directed to basic science, leaving the spin-out to the clinic and the manufacturing to the growing private biotech industry. And before the Hwang debacle, the Stem Cell Research Centre in South Korea had guaranteed government funding of \$7.5 million for ten years.

In each region, political investment to support the development of the biotechnology sector is driven, in part, by fears of losing out in an intensively com-

23 See U.K. House of Commons Trade and Industry Committee, *Report on Biotechnology*, 2003.

24 Ernst & Young, *Resilience: America’s Biotechnology Report*, 2003.

25 Ernst & Young, *Beyond Borders: Global Biotechnology Report*, 2003.

petitive global bioeconomy. Ernst & Young's *Global Biotechnology Report 2005: Beyond Borders* argues that "from Malaysia to Michigan, governments are developing strategic plans with ambitious goals for biotech" and points out that "the global industry raised a whopping \$21.2 billion in 2004" from private capital for early-stage development.

Yet even this was not enough to meet the challenge of finding early-stage capital.²⁶ The global biotechnology industry's revenues grew by 17 percent in 2004, to \$54.6 billion, but it was still making net losses of \$5.3 billion, and many companies seeking to raise funds from IPOs did not obtain the valuations they sought and suffered falls in share prices. Times were 'challenging,' especially in Europe and the United States, partly because of developments in regulation and legislation: the U.S. debates over the ethics of stem cell research, and the tendency of key policymakers to "scrutinize research agreements between academic medical centers, clinicians and biotech/pharmaceutical companies," and to question "potential conflicts of interest."²⁷

The Asian biotech sector meanwhile continues to grow aggressively ("biotech companies in the region increased their top-line revenues by 36 percent in 2004"), although they too face 'challenges': worries over IP protection have hampered investment from Western

companies, and governments and non-biotech industrial conglomerates have to provide the capital that, in the West, would be raised in other ways.²⁸

Nevertheless, the allure of biocapital remains strong. Politicians in countries across the globe continue to foster the growth of a biotech sector and to seek a niche in this global bioeconomy by emphasizing the features that make them particularly attractive, whether these be genetically stable populations, a skilled and cheap labor force, or a range of significant diseases. They attempt to map the potential of this biotechnological revolution through exercises in foresight, and formulate strategies to develop it: targeted research funding, technology transfer, support for start-up and spin-out firms, tax breaks for research and development, low regulatory hurdles, and much more. These local intensifications of biocapital are linked into transnational circuits of capital, knowledge, researchers, techniques, and also material artifacts – tissues, cell lines, reagents, DNA sequences, organs, and the like. Such circuits of vitality are not themselves new – consider the long-standing practices of ethnobotanical collections of seeds and plants, or of the exchange of biological material and model organisms such as fruit flies, which were central to modern genetics.²⁹ But today, a kind of disembedding has occurred. Molecularization strips tissues, proteins, and molecules of their specific affinities – to a disease, to an organ, to an individual, to a species – and

26 And, especially in the United States, one should not neglect the "opportunities and challenges in biodefense" following the terrorist attacks of September 11, 2001: Department of Health and Human Services spending on biodefense increased almost fourteenfold from 2001 to 2005, and the Bioshield Act of 2004 earmarked £5.6 billion for U.S. countermeasures against pathogens.

27 Ernst & Young, *Beyond Borders: Global Biotechnology Report*, 2005, 35.

28 *Ibid.*, 67.

29 M. J. Balick and P. A. Cox, *Plants, People and Culture: Science of Ethnobotany* (New York: Scientific American Library, 1996); R. E. Kohler, *Lords of the Fly: Drosophila Genetics and the Experimental Life* (Chicago: University of Chicago Press), 1994.

enables us to regard them as manipulable and transferable units, which we can move from place to place, from organism to organism, from disease to disease, from person to person.

Vitality has been decomposed into a series of distinct and discrete objects that can be rendered visible, isolated, decomposed, stabilized, frozen, banked, stored, commoditized, accumulated, exchanged, and traded across time and space, organs and species, and diverse contexts and enterprises, in the service of bioeconomic objectives. Whether it is the transfer of genes, and their properties (e.g., luminescence, salt tolerance), from one species to another; the transfer of treatments from one disease to another; or the transfer of tissues, blood plasma, kidneys, and stem cells, molecularization is conferring a new mobility on the elements of life, enabling them to enter new circuits – organic, interpersonal, geographical, and financial.

And along with this ‘flattening’ goes another – the attempt to flatten the transnational circuits themselves, to construct one of those level playing fields, in which standardized intellectual-property regimes, forms of ethical governance, standards and regulations, and information allow distinct and widely separated economic actors to trade with one another, and yet upon which each local actor seeks to gain competitive advantage.

Max Weber famously argued that there was an ‘elective affinity’ between a certain religious ethic of worldly asceticism that he saw in Calvinism and the early emergence of capitalism in Europe and North America. His thesis has been the subject of extensive debate, interpretation, and empirical refutation. But it was grounded in his more profound insight that central to the ways in which

human beings conduct their lives is a ‘soteriology’: a way of making sense of one’s suffering, of finding the reasons for it, and of thinking of the means by which one might be delivered from it.

I suggest our own soteriology increasingly takes a somatic form. Human beings identify and interpret much of their unease in terms of the health, vitality, and morbidity of their bodies; they judge and act upon their soma in their attempts to make themselves not just physically better, but also to make themselves better persons. This is what I call a ‘somatic ethic.’

Is there a relationship between the birth of the bioeconomy and the emergence of the living biological body as a key site for the government of individuals – as the contemporary locus for so much of our unease and discontents, as the site of hope and potential overcoming? What are the links between the modern salience of biocapital and the ethical work that human beings are doing upon themselves in the name of health, longevity, and vital existence?

To address this, we need to distinguish this sense of ethics from that entailed in the idea of bioethics. Bioethics can operate as a legitimation device within the regulatory technologies of government, as they deal with highly controversial issues of life and its management.³⁰ It can serve to insulate researchers from criticism, and from the detailed examination of the nature and consequences of their activities, by bureaucratizing the processes whereby they obtain ‘ethical clearance’ for what they do. Crucially,

30 B. Salter and M. Jones, “Human Genetic Technologies, European Governance and the Politics of Bioethics,” *Nature Reviews Genetics* 3 (10) (2002): 808–814; B. Salter and M. Jones, “Biobanks and Bioethics: The Politics of Legitimation,” *Journal of European Public Policy* 12 (4) (2005): 710–732.

bioethics also provides the essential ethical guarantees that enable elements – tissues, cells, eggs, sperm, embryos, body parts – to move legitimately around the circuits of biocapital so that they can be combined and recombined in settings from laboratory to clinic. Franklin coined the term ‘ethical biocapital’ to draw attention to the way in which biotech corporations themselves now seek to internalize these ethical considerations in their business models and their artifacts. Bioethics thus often seems to arise from an alliance between those who want or need an ethical warrant for their commercial or scientific activities – whether they be pharmaceutical companies or those whose careers depend upon research with human subjects – and those who see here a potential locus for grants, recognition, a professional vocation, and a public role – philosophers, theologians, ethicists, and others. And as some critics claim, there are certainly moments when bioethicists, and the clean bill of health they can offer, seem to be for sale: when bioethicists, in taking subsidies for their educational activities, accepting grants, and acting as consultants to biotechnology and pharmaceutical companies, may have betrayed the trust vested in them, legitimating the unacceptable at the cost of human lives.³¹

But alongside the urge to critique, we need to attend to what this demand for bioethics manifests. Perhaps, at the simplest level, we need to distinguish between two general senses in which the biological and the ethical are intertwined. On the one hand stand those practices and ways of thinking that

might more accurately be termed ‘biomorality,’ whose aim is to develop principles, and promulgate codes and rules, as to how research or clinical work in biomedicine might be conducted. At a time when the somatic, the bodily, the ‘bio,’ have become so central to our forms of life, we should not be surprised that one response is to try to discipline these difficulties: to find some algorithms to adjudicate them, to standardize procedures for the potentially conflictual decisions concerning them. In this way, problematic issues can be transformed into technical questions: Have the proper procedures been followed? Have the proper permissions been obtained? Is confidentiality assured? Has informed consent been obtained? Bioethics, here, like accountancy, legal regulation, and so forth, has indeed become an essential part of the machinery for governing the bioeconomy; for facilitating the circuits of biological material required for the generation of biocapital; and for supervising all those practices in which life itself is the object, target, and stake.

But I am more interested here in another sense in which we can think of the ethics of the bio. This concerns the ethical considerations deemed relevant by participants – not just patients and their families, but also researchers, clinicians, regulators, and even those working in the world of commerce – in their actual conduct in relation to the dilemmas they face and the judgments they must make. Many detailed ethnographies of biosocial communities demonstrate the ways in which today’s biological citizens are reformulating their own answers to Kant’s three famous questions: What can I know? What must I do? What may I hope? We also see this in studies of the ethos of the authorities and professionals enmeshed in contemporary vital pol-

31 C. Elliot, “When Pharma Goes to the Laundry: Public Relations and the Business of Medical Education,” *Hastings Center Report* 34 (5) (2004): 18–23.

itics, in those working in and for commercial biotechnology and pharmaceutical companies, and perhaps even in those investors whose concerns seem purely financial. While they may have their own share of cynicism, pragmatism, ambition, greed, and rivalry, they are also searching for, assembling, and inventing ways in which they might evaluate, adjudicate, and justify the decisions they must make when human vitality is at stake.

It is this sense that is closest to my notion of a somatic ethic. I use 'ethic' here to refer to ways of understanding, fashioning, and managing ourselves in the everyday conduct of our lives.³² If our ethic has become, in key respects, somatic, this is because it is our soma – our genome, our neurotransmitters, our 'biology' – that is given salience. It is also because the authorities that articulate the rules for living now include not merely doctors and health promoters, but so many other somatic experts: genetic counselors, support groups, projects for the public understanding of genetics, and bioethicists. And it is because the forms of knowledge that are shaping our understandings of ourselves are themselves increasingly 'biological' – medical, of course, but also coming more directly from genomics and neuroscience, in their popular presentations, their scientific elaborations, and in the hybrid forms they take within lay discourses of everyday life. Finally, it is because our expectations for our lives –

32 I have discussed the way of thinking about ethics and self-technologies developed by Michel Foucault and Giles Deleuze elsewhere: G. Deleuze, *Foucault* (Minneapolis: University of Minnesota Press, 1988); M. Foucault, *The History of Sexuality*, vol. 2, *The Use of Pleasure* (London: Penguin, 1985); N. Rose, *Inventing Our Selves: Psychology, Power, and Personhood* (New York: Cambridge University Press, 1996).

our hopes for salvation, for the future – are themselves shaped by considerations about the maintenance of health and the prolongation of earthly existence.

The management of health and vitality, once derided as narcissistic self-absorption, has now achieved unparalleled ethical salience. The tensions between the intensifying demand for the products of the bioeconomy – organs, embryos, pharmaceutical products, and the like in the West – and the inequities and injustices of the local and global economic, technological, and biomedical infrastructure required to support such a somatic ethic seem to me to be a constitutive feature of contemporary biopolitics – and one in which the differential value of life is very much at stake.

What I have tried to do, in a schematic and provisional manner, is to sketch the somatic ethical economy, which perhaps has an elective affinity with a certain form of capital – biocapital – and with the capitalization of life itself. To paraphrase Max Weber, we do not have to decide between a materialistic and a spiritualistic interpretation of these developments.³³ Somatic ethics and biocapital have been locked together since birth. For only where life itself has achieved such ethical importance, only where the technologies for maintaining and improving it can represent themselves as more than merely the corrupt pursuit of profit and personal gain, only when they can place themselves in the service of health and life, is it possible for biocapital to achieve such a hold on our economies of hope, imagination, and profit. In this sense, I suggest, somatic ethics is intrinsically linked to the spirit of biocapital.

33 M. Weber, *The Protestant Ethic and the Spirit of Capitalism* (London: George Allen & Unwin Ltd., 1930), 183.

John Broome

What is your life worth?

What is your life worth to you? ‘Everything,’ you might say, since if you lose your life you lose everything. On the other hand, Epicurus’s answer appears to have been ‘nothing’:

Become accustomed to the belief that death is nothing to us. For all good and evil consists in sensation, but death is deprivation of sensation So death, the most terrifying of ills, is nothing to us, since so long as we exist death is not with us; but when death comes, then we do not exist. It does not then concern either the living or the dead, since for the former it is not, and the latter are no more.¹

Epicurus seems to be saying that death does you no harm. If that is so, continuing to live does you no good.

When I asked what your life is worth to you, I meant, more precisely: how good is it for you to continue living?

John Broome is White’s Professor of Moral Philosophy at the University of Oxford and a Fellow of Corpus Christi College, Oxford. His books include “Weighing Goods: Equality, Uncertainty and Time” (1991), “Ethics Out of Economics” (1999), and “Weighing Lives” (2004). He holds a Leverhulme Major Research Fellowship.

© 2008 by the American Academy of Arts & Sciences

Conversely, what harm would be done to you by not continuing to live? What would you lose by dying? I disagree with both of the extreme answers ‘everything’ and ‘nothing.’ My answer takes a middle course. I shall come to it after first rejecting the extremes. On the face of it, ‘nothing’ is the less plausible of the two, but it has the most interesting arguments in its favor. I shall start with that one.

Most of us find the answer ‘nothing’ implausible because we take it for granted that dying is terrible. It may even be an imposition on Epicurus to read him as answering ‘nothing.’ He may not mean to say that death does us no harm – I shall come to that. But he does supply materials that can be used to construct a case for that view. I shall make this case as persuasive as I can, but in the end I shall argue that it fails.

The goodness of life has two components: quality and quantity. You might think that the quantity of life does not matter at all, but only its quality. Indeed,

¹ Epicurus, “Letter to Menoeceus,” in Whitney Oates, ed., *The Stoic and Epicurean Philosophers: The Complete Extant Writings of Epicurus, Epictetus, Lucretius, Marcus Aurelius* (New York: Random House, 1940), 30–31.

this is exactly what most of us do think about the goodness of life in another context. One way of adding to the quantity of life in the world is by having more babies; that way, more life is lived in total. But most of us do not favor increasing quantity this way. We are concerned for the quality of life of the people who live, but we are not concerned to increase the number of people who live. When the Chinese government instituted its one-child policy, its aim was to improve the quality of life of the Chinese. Another consequence of the policy is that there are fewer Chinese than there would have been without it, but the government did not think of this reduction in quantity as a bad thing, to be set against the gain in quality. Most of us would have agreed.

Moreover, this attitude we commonly have toward the number of people can be supported by an argument. Suppose a couple are thinking of having a child, but eventually decide not to. As a result, there is less life in the world than there would have been. Is this reduction in quantity a bad thing? Well, who is harmed by it? No one. No one is harmed by not being brought into existence. It is not as though there is some child who suffers the misfortune of not existing; there is simply no child, so no one is harmed. Consequently, we might plausibly think, no harm is done. We might conclude it cannot be a bad thing to reduce the quantity of life in this way.

This argument needs to be slightly qualified. Perhaps some people will be worse off as a result of the child's non-existence. Perhaps, say, the child would have grown up to make a great contribution to civilization. But if we set aside indirect effects of this sort, the argument has some force.

Bringing more people into the world is one way of increasing the quantity of

life. Extending the lives of people who are already in the world is another. Epicurus shows us that a similar argument can be used in this context too. We can ask a parallel question about the quantity of a single person's life. Previously we asked who is harmed by not being created; now let us ask at what time a person is harmed by dying. Suppose you might have lived longer, but you actually die now. Is that a bad thing for you? Well, when are you harmed by your early death? At no time. As Epicurus says, you are not harmed at any time before your death, since so long as you exist "death is not with [you]." And you are not harmed at any time after your death, since at no time after your death do you exist. Since there is no time when you are harmed, we might conclude you are not harmed at all.

You may say there is indeed a time when death harms you: the time when you die. You could be making either of two points. The first is that the process of dying is often terrible. This does mean your death harms you in one way, but not in a way that is relevant to the question I am asking. The question is: what is the benefit to you of continuing to live? Conversely, what harm would be done to you by not continuing to live? The terribleness of the process of dying is not a part of the answer to this question. Cutting your life short does not necessarily harm you in this way, because your dying may be terrible whether it occurs at the end of a long life or a short one. So we can set aside this aspect of the badness of death.

The second point you might be making is this: if death harms you, we know automatically that the harm occurs at the time of your death, since it is your death that does the harm. But we must distinguish the time when a harm is caused from the time when it is suffered.

If I drop a banana peel on the road, and you later slip on it and hurt yourself, your harm is caused when I drop the peel, but it is not suffered until you fall. Epicurus asks when the harm of death is suffered, not when it is caused. The answer is that it is not suffered at any time. If there were any harm, it would be caused at the time you die, but that is another matter. We can set aside this point too.

Once those two points are set aside, we should agree that there is no time when death harms you. We learn this truth from Epicurus. Epicurus apparently draws the further conclusion that, because there is no time when death harms you, it does not harm you at all. To arrive at that conclusion he needs to make the further assumption that you cannot be harmed unless you are harmed at some time. Is that a good assumption?

Once again, Epicurus supplies us with material that at first seems to support it. He says that “all good and evil consists in sensation”: the only sort of good that can come to us is a good sensation, and the only sort of bad is a bad sensation. This is a version of what is nowadays called ‘hedonism.’ It is contentious, and one way of responding to Epicurus is to deny it. But denying hedonism is also contentious, and I do not need to do it. Instead, I shall show that, even if we grant Epicurus’s hedonism, it does not truly support the claim that you cannot be harmed unless you are harmed at some time.

Let us assume, then, like Epicurus, that all good and evil consists in sensation. Since all sensations occur at particular times, we can conclude that all goods and evils occur at particular times. The goodness or badness of your life is made up of good and bad things, all of which

occur at particular times in your life. But the notions of *benefit* and *harm* are different from the notions of *good* and *bad*, and just because all goods and bads occur at particular times, it does not follow that all benefits and harms do.

Benefit and *harm* are comparative notions. If something benefits you, it makes your life better than it would have been, and if something harms you, it makes your life worse than it would have been. To determine whether some event benefits or harms you, we have to compare the goodness of your life as it is, given the event, with the goodness it would otherwise have had. The comparison is between your whole life as it is and your whole life as it would have been. We do not have to make the comparison time by time, comparing each particular time in one life with the same time in the other. So even if the goodness of your life is made up of good and bad things that all occur at particular times, there is no need for the comparison between lives to be made up of benefits and harms that can all be attached to particular times.

Take an analogy. Suppose the text of a book is cut before it is published. The last chapter is excised, but all the earlier chapters are left intact. Then six thousand words (say) are cut from the book, yet no words are cut from any page in the book. This is so even though every word in the book appears on a particular page. Moreover, had the book been published in the longer, uncut version, every word in the longer book would have appeared on a particular page. The number of words cut from the book is determined by comparing the whole book as it is, with the whole book as it would have been had it not been cut. It is not determined by comparing any particular page with that page as it would have been.

Similarly, shortening your life may harm you even though there is no time when it harms you. To determine whether it harms you, we compare the goodness of the shorter life you have, taken as a whole, with the goodness of the longer life you would have had, taken as a whole. If we believe Epicurus's hedonism, the goodness of the shorter life is made up of the good and bad sensations that occur within it. The goodness of the longer life includes all those sensations, and also all the good and bad sensations you would have had in later life had you not died. If your life is going well, these extra sensations would have been predominantly good ones. So the longer life would have been better than the shorter one. You are therefore harmed by the shortening of your life. But there is no time when you suffer this harm, just as, when the book is cut, no page in the book loses any words.

Epicurus's hedonism actually implies that death normally harms you. Epicurus thinks it implies the opposite, but he is mistaken. He is right that there is no time when death harms you, but it does not follow that death does not harm you. It may harm you, even though it harms you at no time.

I speak of 'Epicurus's argument,' but Epicurus may not mean to argue that death does not harm you. He says "death is nothing to us," but he may mean simply that you should not mind dying. He may think that dying can harm you, but that even so you should not mind it.

How could that be so? If dying will harm you, surely you should mind it. Not necessarily. It depends on what you care about. Dying will harm *you*, but maybe you should not care about what happens to *you*. You are a person, with a life that extends from when you come into existence to when you go out of ex-

istence. Caring about what happens to you involves caring about the whole of that life. But why should you care about that? For instance, what if you cared about just what happens to you in the present, rather than in your entire life? What you care about may change from time to time. Why should you not, at each particular time, care about just what happens to you at that particular time?

This needs to be put carefully. You probably care about what happens to other people besides yourself, but you probably care in a different way about what happens to you yourself. Call this sort of care 'self-care.' The suggestion is that you should attach your self-care, not to what happens to the person you are, with the whole of your life, but just to what happens to you in the present.

This is what Wittgenstein means when he uses the expression "living in the present." He points out: "For life in the present there is no death. Death is not an event in life."² So long as you care only about what happens to you in the present, rather than about yourself as a whole, you will never encounter death among the things you care about. Your death does not occur during your life, so for you it is never in the present. Possibly Epicurus is making a similar point.

I am not concerned here with the correct interpretation of Epicurus. I am interested in how good it is for you to continue living. This is a question about the good of *you*, the person you are, who has a whole life. It is not about what you should care about at any particular time. Does dying – ceasing to live – harm *you*? I asked whether we could find in Epicurus's remarks any reason for thinking it does not. His remarks provide the mate-

2 Ludwig Wittgenstein, *Notebooks, 1914 – 1916* (Oxford: Blackwell, 1961), 75.

rials for an argument, but in the end the argument fails. This does not mean that dying actually does harm you. It only means we have no reason so far to think it does not.

Now I come to the opposite answer, 'everything,' to the question 'What is your life worth to you?' The idea behind it is that when you die, you will have nothing, so by dying you lose everything.

It can be quickly disposed of. It is not true that by dying you lose everything. That conclusion is supposed to follow from the premise that, when you die, you will have nothing. But although this premise is true, it is true only in a peculiar way. Consequently, it does not support the conclusion that you lose everything when you die.

The premise that you will have nothing when you die is true because you will not exist after your death, not because you will exist but have nothing. In the same peculiar way, it is true that Pegasus has no wings, since Pegasus does not exist. In the same way too, it is true that Nelson now has no left arm; it is true because, being dead, Nelson now does not exist.

Think some more about Nelson's arms. Before attacking Santa Cruz de Tenerife, Nelson had a right arm. Afterward he did not. We can conclude that he lost his right arm in the attack. Before his death at the Battle of Trafalgar, he had a left arm. Afterward he did not. But we cannot conclude that he lost his left arm at Trafalgar. He did not lose it there; it remained attached to his body. What happened at Trafalgar instead is that Nelson ceased to exist. It therefore became true in the peculiar way that he afterward had no left arm. But, although his left arm lost its owner, its owner did not lose his left arm.

To say you lose something at a particular time normally implies that you exist both before and after the time. Since you do not exist both before and after your death, it is not true that you lose everything by dying. 'Everything' is not the right answer to the question of what your life is worth to you.

However, we can ask what you lose by dying in a way that does not imply you exist both before and after your death. We do not have to answer the question by comparing what you have after your death with what you had before it. We can instead compare what you have, given that you die at a particular time, with what you would have had if you had not died then. When we think this way, 'what you have' does not refer to what you have at a particular time, but to what you have in your whole life together. Understood this way, what you lose by dying is not everything. You lose just a part of the longer life you would have led, had you not died when you did. Death ends your life; it does not take it away.

The answer 'everything' encourages the idea that your life is infinitely valuable to you. But no one's life has infinite value. How could it? Our human lives are finite in length, and during them we can experience and achieve only a finite number of things. What you lose by dying is the finite difference between a longer life and a shorter one.

What do you gain by continuing to live? Conversely, what do you lose by dying? The answer is the difference between the value of your life if you continue to live, and the value of your shorter life if you die. The right answer to the question lies between the extremes of 'everything' and 'nothing,' or between 'infinity' and 'zero.' It is 'something.'

But 'something' is not good enough; we need to know how much. Excluding

What is your life worth?

the two extremes puts us into the domain of quantities. A person's life has some value. What? Furthermore, once we abandon the extremes, we should expect different lives to have different values. Presumably the value of a life depends in some way on its length and its quality. How?

We need a quantitative answer to the question of what a life is worth because important decisions hang on it. Decisions are constantly being made that affect the lengths of people's lives. Some are on a small, individual scale; others on the scale of the whole world. On a small scale, all of us regularly make decisions that shorten or lengthen our lives. Statistically, each doughnut you eat shortens your life. Is it worth it? That is something you probably do not want to think about, and you are probably wise not to. But in other circumstances, you will want to make the calculation. If you have a terminal illness, you will need to decide at what point to give up treatment aimed at extending your life, and accept only palliative care. You may think carefully about that. Your decision may depend on your judgment of the value of extending your life – for instance, on whether you have a book to finish or a child to look after.

You will be weighing the quantity of your life against its quality. You may need to do this explicitly for yourself only in rare and tragic circumstances. But when the decision is for other people, you will need to be more careful. You can be cavalier about your own doughnuts, but not about other people's lives. Governments in particular make decisions that affect the lengths of many people's lives, and they should think carefully about the value of those lives.

Governments often have to weigh some people's lives against others, and weigh the quality of lives against the

quantity of lives. Take the provision of health care. Some treatments (such as hip replacements) improve the quality of people's lives without extending them; some (such as heart replacements) extend lives. When a government sets priorities among different sorts of treatment, it must weigh the quality of life against the quantity of life. It needs to set values on people's lives.

On a much larger scale, we must decide what to do about global warming, which threatens to kill huge numbers of people. It will kill them in natural disasters, in heat waves, and by extending the range of tropical diseases; and it will kill them in marginal areas of the world by making them poorer – poverty is a killer. By reducing our emissions of greenhouse gases, we can reduce the number of people who will be killed. But to do that we shall have to sacrifice some of the quality of our lives. What sacrifices should we make? What reduction in the quality of our lives in the present is worthwhile for the sake of extending the quantity of people's lives in the future? Again, we need to set a value on people's lives, and weigh quality against quantity.

The value of lives is not the only thing at issue in these decisions. When some people's lives are weighed against others, fairness also has a central place. To make this clear, I shall give an example in two parts. First, suppose a doctor can save a patient's life, and can do so using either of two treatments. One will leave the patient in good health. The other will equally well save her life, but leave her blind. Obviously, the doctor should choose the first of these treatments. That is because it will probably do more good than the second. Life with sight is generally better than life without. This is a truth we should not shrink from; nothing else explains why the doctor should

choose the first treatment rather than the second. Since there is only one patient in this first part of the example, fairness is not a consideration. The goodness of the result is the only thing that matters.

Now the second part. Suppose a doctor has two patients who each have a fatal sickness. She has enough resources to save only one of them; the other will die. One of the patients is in good health apart from her present sickness, but the other is blind. Which should the doctor save? This time the answer is not obvious. More good will probably be done by saving the sighted patient – we have already recognized that life with sight is generally better than life without. But just because more good will probably be done, it does not follow that this is the right thing for the doctor to do. It would be dreadfully unfair to the blind patient to let her die just because of her blindness. Fairness is another consideration that is just as important as doing the most good. The doctor needs to find a way of being fair. Choosing between the patients by some random lottery might be a way to do it.

So goodness is not the only consideration, but it is a central one. Therefore, to make vital decisions properly, we have to consider the value of people's lives. We need a proper account of the value of life, and we need to go through the process of intellectual debate that will eventually bring a good account into the public domain. The spur is that, until lives are valued well, they will be valued badly. Because the value of people's lives affects many decisions, governments already make their own valuations, and they generally do so badly.

Governments usually take their method from economics, which has a ready-made way of attaching a value to any-

thing. Economists value things on the basis of the preferences of individuals, which are revealed by their willingness to pay. They calculate a value for human life from people's willingness to pay to extend their lives, or from their willingness to pay to reduce risks to life. This method avoids the need to have any proper account of the value of life. That is left to the people. People make their own judgments about the value of their lives, and express them through their willingness to pay. The economist is spared the bother.

Values for willingness to pay are in practice gleaned from such data as the premium that workers must be paid to induce them to take on dangerous jobs, or from questionnaires that ask people what they would be willing to pay to make their lives safer. The values that emerge vary widely, and are in some cases incoherent. In one study, people's willingness to pay for a large reduction in risk was no more than their willingness to pay for a small reduction.³ This is not surprising. It is wishful thinking to imagine that people's willingness to pay in these circumstances derives from any coherent view about the value of their lives. It is a difficult task to assign a value to your life. In practice, when you take on a dangerous job, or answer a questionnaire, you are not likely to have made a proper judgment about the value of your life. Your willingness to pay will probably be haphazard; it is not likely to reveal a real judgment.

Valuing lives by willingness to pay is in practice not done even to the standards of good economics. Willingness to pay is measured in terms of money. There is

3 M. W. Jones-Lee, G. Loomes, and P. R. Phillips, "Valuing the Prevention of Non-Fatal Road Injuries: Contingent Valuation vs. Standard Gambles," *Oxford Economic Papers* 47 (1995): 676 – 695.

no harm in that: we need to compare the value of lives with the value of other things, and we need some common unit of value. Money is as good as any. But we have to recognize that money does not have the same value to one person as to another. Money is worth less to the rich than to the poor, who require it to satisfy their urgent needs. It is worth less to someone who is nearer death than it is to someone who is not so near; if you are expecting to die soon, you will not have many uses for your money. So if an old person is willing to spend more on extending her life than a young person is, that may not be because her life is more valuable. It may be because money is less valuable to her. If an American is willing to pay fifteen times more to extend her life than a Bangladeshi is, that does not mean her life is fifteen times more valuable.

This is an elementary point, but it is ignored within the practice of valuing human life. The Office of Management and Budget instructs federal agencies to set a higher value on a year of a senior citizen's life than on a year of a young person's life. Its explanation is that old people are likely to have accumulated savings to spend on their health.⁴ Its thinking must be that, since an old person has saved up more money, she is likely to be willing to pay more to extend her life, and this shows that a year of her life is more valuable. But actually it simply shows she has more money. One report of the Intergovernmental Panel on Climate Change seriously suggested valuing Americans at fifteen times the value of Bangladeshis.⁵ So long as willingness

4 Office of Management and Budget, "Circular A-4: Regulatory Analysis," September 17, 2004, sec. E.

5 Intergovernmental Panel on Climate Change, *Climate Change 1995*, vol. 3, *Economic and Social*

to pay is used in this foolish manner, it would be better not to use it at all.

When economists do better cost-benefit analysis than this, they have methods of correcting for money's different values to rich and poor people.⁶ But they have as yet no way to correct for its different values to those near death and to those who are further away. In order to make that correction, they would first need a proper account of the value of life.

A different branch of economics has already developed an account of its own. Health economists regularly value people's lives in terms of quality-adjusted life years (QALYs), and their work strongly influences practical decision making in health care. They take the view that the value of a life is given by its length in years, adjusted by a factor that is supposed to measure its quality. There are many difficulties in implementing this theory in detail, but it is sensible in broad terms.

I am not saying it is correct. My purpose is not to defend any particular theory of the value of a life. The benefit of extending life, and conversely the harm done by shortening it, is the difference in value between a longer life and a shorter life. This is the first step toward a theory. It tells us that what we need is a theory of the value of a whole life.

But I shall not go further than that. My purpose is only to argue that we need a theory. Many people are disturbed by the idea of fixing a concrete value on human life. But we need to do it.

Dimensions of Climate Change (New York: Cambridge University Press, 1996), 195–198.

6 See Jean Dreze and Nicholas Stern, "The Theory of Cost-Benefit Analysis," in Alan J. Auerbach and Martin Feldstein, eds., *Handbook of Public Economics*, vol. 2 (Amsterdam: North-Holland, 1987), 909–989.

Shai Lavi

How dying became a 'life crisis'

The controversy over euthanasia is one indication of America's fascination with biopolitical issues at the intersection of life and death.¹ Most states prohibit physicians from actively assisting patients to hasten death, but recognize a patient's right to withdraw unwanted life-support machinery ('passive euthanasia'). Currently, Oregon is the only state that deviates from this standard: under its 1995 Death with Dignity Act, physicians may prescribe lethal medication to patients for self-administration ('physician-assisted suicide'), but may not inject the lethal dose themselves ('active euthanasia').

Legal regulation notwithstanding, euthanasia continues to stir public debate. The recent case of Terry Schiavo reminded us that despite clear-cut legal resolutions, public opinion may still express unease with even the mild form of passive euthanasia. At the same time, the

not-too-distant publicity surrounding Dr. Kevorkian, the Michigan pathologist who offered death to his patients, revealed that even a convicted felon can attract public sympathy.

Like the controversy over abortion, the euthanasia debate is conceptualized as a conflict between the sanctity of life and freedom of choice. Proponents of euthanasia fight for the 'right to die' in the name of patient autonomy, while opponents of euthanasia claim that freedom has its limits, and that other values, primarily the 'sanctity of life,' must trump individual rights. This conflict commonly boils down to where precisely one draws the line on the euthanasia spectrum: between active euthanasia, on the one side, and the continuation of medical treatment in all but futile cases, on the other.

This framework reflects a relatively recent, post-World War II mindset and ignores the roots of the euthanasia debate that date back to the nineteenth century. Too much reflection has been devoted to justifying different positions within the debate, and too little to figuring out why euthanasia became such a hotly debated issue to begin with. The

Shai Lavi teaches law and sociology at Tel Aviv University. His book, "The Modern Art of Dying: A History of Euthanasia in America" (2005), won the 2006 Distinguished Book Award from the American Sociological Association, Section on Sociology of Law.

© 2008 by the American Academy of Arts & Sciences

¹ To S. H. The author would like to thank Joshua Price for his insightful comments.

response – too readily available – that euthanasia is a logical, if highly controversial, solution to the contemporary problem of dying is hardly satisfying. It merely gives rise to another question: why and how did dying become such a problem for us?

We can trace the modern crisis of dying to a cultural transformation that predates both the medical and legal advancements of the twentieth century²: the medicalization of the deathbed. Associated with this phenomenon are the hastening of death and the prolongation of life. Both reflect a new way of experiencing dying and a new will to master death, shared by physician and patient. Thus, the question of freedom at the deathbed is not about how much or how little choice the terminal patient has, but rather how dying became a matter of choice in the first place.

Put differently, if euthanasia reflects a crisis in dying, it is because the framework in which euthanasia and other end-of-life choices are made has not enhanced the patient's freedom, but rather has undermined a more fundamental sense of freedom, which has little to do with the notion of having options. The following case offers a glimpse into the predicament facing the dying patient today.

While in her early fifties, Sandra, an art historian, began complaining of

headaches, sudden memory lapses, and visual impairment. A family physician referred her to a neurologist who suspected a brain tumor, which the CT and MRI scans confirmed. She had *glioblastoma multiforma* (GBM), a common and highly aggressive type of brain cancer that has no known cure. Her tumor – “the cypress growing in my head,” as she called it, alluding to one of Erich Kästner's children stories – was already five millimeters long and classified as grade 4, the most abnormal and hardest cancer to treat. All that the medical statistics could offer her was three months.

Within a week, Sandra was no longer able to walk on her own and became dependent on her only child, some friends, and paid help. Her doctors ruled out surgery since the tumor was located between the two hemispheres of her brain. They recommended a combination of radiation and chemotherapy instead. The physicians explained that the treatment would slow down the tumor's development and triple her life expectancy.

For a while she played with the idea of letting go, refusing any treatment that would prolong her dying without having any curative value. Underlying this wish was a detectable sense of cold rage against the medical establishment, which could not offer any real cure but still insisted on putting her through the medical ordeal.

Her son searched the Web for second opinions and found a physician in Texas who was willing to perform the surgery despite the high risk. In the meantime, a close friend introduced her to a survivor who was still alive and active eight years after being diagnosed with a similar type of brain cancer. He introduced her to an unconventional treatment, preached the power of mind over body, and recommended a diet of weeds. She ended up accepting the radiology and chemother-

2 Several studies of the history of euthanasia have appeared recently: Ian Dowbiggin, *A Merciful End: The Euthanasia Movement in Modern America* (New York: Oxford University Press, 2003); N. D. A. Kemp, *Merciful Release: The History of the British Euthanasia Movement* (New York: Manchester University Press, 2002); Shai Lavi, *The Modern Art of Dying: A History of Euthanasia in the United States* (Princeton, N.J.: Princeton University Press, 2005).

apy not so much because she trusted the conventional doctors as much as she did not have the energy to fight them.

In the coming months, her life would be 'saved' once and again on a weekly basis. After radiology and chemotherapy had their turn, she underwent a newly licensed immunological treatment, accompanied by homeopathic treatment aimed at strengthening her immune system. Her physical condition fluctuated, at times allowing her to resume certain of her previous activities and even begin a new writing project. On other days, she suffered from terrible headaches, seizures, and some known medical complications such as thrombosis, which completely debilitated her.

Most of the time, she set her mind on coping with daily life: adhering to the strict schedule of radiology, chemotherapy, medication, and physiotherapy, while maintaining some kind of 'normal' life to distract herself from all of the above. But talk about a 'final exit' was there from the beginning and resurfaced every time it seemed like conventional medicine had nothing more to offer. With the help of a lawyer, she drafted a living will in which she requested to be disconnected from life-support machinery if she entered a persistent vegetative state. To her closest friends, she lamented not living in Oregon or, even better, in the Netherlands, where physician-assisted suicide is legal. Not that she would actually kill herself, but some comfort lay in knowing she had a last resort.

Sandra's story is not exceptional. It includes the basic components of the crisis facing mid-life terminal patients,³ and

demonstrates how euthanasia may present itself as a way of dying. Her story allows us to examine critically the most common explanation of the modern crisis of dying and to achieve a new understanding of the emergence of euthanasia as its solution.

The most popular account of the modern crisis of dying places its origin in the latter half of the twentieth century, when the capacity of medicine to prolong life expanded dramatically. Chronic diseases (e.g., cancer, heart disease, and Alzheimer's) replaced the acute ailments of the nineteenth century (e.g., pneumonia, influenza, and other plagues) as the main causes of death. The growing use of antibiotics, surgery, and other technological advances, including life-sustaining machinery, had transformed mortality statistics. But extending life had the unintended but inevitable consequence of prolonging dying and suffering.

Meanwhile, according to the familiar story, the professional ambition of doctors to employ advanced medical treatment began to override the immediate interests of the dying patient. Many physicians considered the death of a patient to be a failure and launched battles on all medical fronts against an invincible enemy. A cultural and psychological denial of death augmented this phenomenon. A doctor would not even tell a patient that she was dying, a vow of secrecy shared by the patient's family and friends.

All of this allegedly changed in the 1960s, with the rise of patient rights, and in the 1970s, with the public discussion of the right to die. Euthanasia was understood to be a response to the growing intrusiveness of medical treatment

3 For other accounts of a medicalized death, see Sharon Kaufman, *And a Time to Die: How American Hospitals Shape the End of Life* (New

York: Scribner, 2005); Marilyn Webb, *The Good Death: The New American Search to Reshape the End of Life* (New York: Bantam Books, 1997).

in the imperious setting of the modern hospital. The struggle for a right to die was seen as a challenge to the medical profession's monopoly over the treatment of the dying, and a transfer of power from physician and family to the dying patient herself. Euthanasia, in other words, empowered dying patients and offered them an alternative to the medical dictum to prolong life indefinitely. They could now decide to fight death or to embrace it.

The growing recognition of a right to die also attested to the decline in the taboo surrounding death. Today, the dying patient must be informed of his medical condition, and he must express prior consent to treatment. For proponents of euthanasia, the second half of the twentieth century stands for the triumph of human choice over the domination of medical technology and conservative values. For its opponents, the rise of euthanasia marks the degradation of traditional values and the dangers of freedom run amok. Both sides agree that the hastening of death and the right to die stand in opposition to prolonging life and valuing its sacredness.

Sandra's story, however, reveals that the desire for euthanasia does not necessarily emerge as a reaction to the medical prolongation of life. Euthanasia, for her, is not a solution to an overly medicalized death, but another medicalized way to face death. Along with the decisions to undergo intrusive medical care or to withhold medical treatment, and to follow the advice of mainstream doctors or that of alternative medicine, she juggles in her mind the possibilities of fighting death or shortening life. These should be seen as different tactics in one overall scheme, best described as the wish of the modern patient, with the aid of the medical profession, to master the time and manner of death.

The underlying crisis that Sandra is facing has little to do with lack of choice. Her predicament stems from the unresolved tension between the medical efforts directed at achieving greater control over dying, whether through treatment or euthanasia, and the inherent futility of this effort. The history of euthanasia may help further illuminate how the modern wish to master death stems from, and in the final analysis leads to, a fundamental attunement of helpless rage.

Common perceptions notwithstanding, euthanasia is not a late-twentieth-century response to the intrusiveness of earlier medical interventions. The first euthanasia debate in the United States took place in the 1870s and preceded both the technological and legal developments so commonly associated with it. In 1870, Samuel D. Williams, a British businessman, made this proposition:

In all cases of hopeless and painful illness it should be the recognized duty of the medical attendant, whenever so desired by the patient, to administer chloroform – or such other anaesthetic as may be and by supersede chloroform – so as to destroy consciousness at once, and put the sufferer to a quick and painless death; all needful precautions being adopted to prevent any possible abuse of such duty; and means being taken to establish beyond the possibility of doubt or question that the remedy was applied at the express wish of the patient.⁴

Following his proposal, Iowa and Ohio made the first attempts to legalize euthanasia in 1906.⁵ This was a time when

4 Quoted in Charles B. Williams, "Euthanasia," *Medical Record* 70 (1894).

5 Lavi, *The Modern Art of Dying*, 93–95. For a somewhat different approach, see Jacob M.

most Americans still died a death unmediated by medical technology at home and were little concerned with the issue of patient rights. Still, these early proposals share with many contemporary proposals, if not the letter of the law, then its spirit.

To understand why the euthanasia debate emerged as early as the 1870s, we must first recognize the medicalization of dying as a cultural rather than technological transformation. This process evolved during the mid-nineteenth century. The most apparent manifestation of the medicalization of death took place when the doctor replaced the priest as master of ceremonies. Prior to the medicalization of death, it was common for doctors to withdraw their care from an incurable patient, leaving the dying in the trustworthy hands of the attending family, friends, and clergy. Many physicians held to the simple belief that if they could do nothing to cure the patient, they had no reason to stay at the bedside. Thus, they would willingly step aside to allow the performance of deathbed rites.⁶

By the mid-nineteenth century, this widespread practice of abandoning the deathbed of an incurable patient had become unacceptable. One might hypothesize that the growing presence of the physician at the deathbed was a consequence of developments in medical technology and in the capability of physicians to cure acute illnesses. This hypothesis loses its explanatory force once

we recall that nineteenth-century medicine had made no real progress in its capacity to treat the dying patient. With the exception of the replacement of opium with its alkaloid, morphine, in the second half of the nineteenth century, the ability of the medical profession to treat terminal patients was no different during most of the nineteenth century than it had been during the previous century. Not until far into the twentieth century did radical changes take place in medicine's power to relieve pain and prolong life.⁷

What then was the source of this new professional calling that hailed the doctor to the deathbed? What could the physician possibly offer to a patient whose condition was by definition helpless? It is this paradox – the duty to provide care in the absence of any possible cure – that gradually began to dominate the medical treatment of the dying patient in the nineteenth century and continues to do so today. Physicians at the time began to believe that irrespective of their power to cure or to alleviate suffering, they had a responsibility to hold out some, even if very limited, course of action to the dying patient, to help her overcome a sense of helplessness. At times, this responsibility was more important than any particular medicine that the physician could supply the patient. This was especially true at the deathbed, when no real cure could be offered, only a promise of hope stemming from a modern rage against the perceived impotency of dying.

Early attempts to codify professional medical ethics heralded this new duty of the medical profession. Thomas Percival, one of the first medical ethicists in the early nineteenth century, declared

Appel, "A Duty to Kill? A Duty to Die? Rethinking the Euthanasia Controversy of 1906," *Bulletin of the History of Medicine* 78 (2004): 610–634.

6 Shai Lavi, "Euthanasia and the Changing Laws of the Deathbed: A Study in Historical Jurisprudence," *Theoretical Inquiries in Law* 4 (2) (2003): 729–761.

7 See, for example, Sherwin B. Nuland, *How We Die: Reflections on Life's Final Chapter* (New York: A. A. Knopf, 1996).

it the responsibility of the physician to “minister hope and comfort” to the dying. Another such etiquette read: “Let me here exhort you against the custom of some physicians, who leave their patients when their life is despaired of, and when it is no longer decent to put them to further expense Even in cases where his skill as a physician can be of no further avail, his presence and assistance as a friend may be agreeable and useful both to the patient and to his nearest relations.”⁸

The new disposition of hope was more than a mere psychological state or attitude of physician and patient; it colored the entire regime of caring for the dying. This modern sensibility replaced the older ‘hope’ that characterized the traditional deathbed: the Christian belief in redemption, which had prevailed in earlier American *ars moriendi*.⁹ In fact, under the new regime, the old ministers of hope, as harbingers of death, were kept away from the deathbed. But as modern medicine clearly could not offer the promise of an otherworldly salvation, physicians opted for a more tangible and limited hope: not the promise of a world to come, but a this-worldly guarantee that as long as life persisted, something could always be done for the dying patient.¹⁰

The turn to worldly hope did not resolve the paradox facing the medical doctor, but rather encapsulated it. Modern medicine found itself in the impos-

sible position of simultaneously offering the verdict of hopelessness and the promise of hope. Both the modern physician and patient were caught between the fatality of the prognosis, knowing that nothing could prevent the approaching death, and the wish never to stop pursuing some course of action. The option ‘simply’ to await death gradually became unthinkable.

The history of the nineteenth-century medicalization of the deathbed can be told by pointing to different variations on this desire for hope in the face of hopelessness. This disposition gave rise to a variety of medical protocols for treating the dying, and it is in this context that euthanasia, too, emerged.

‘Heroic medicine’ offered one kind of hope.¹¹ This school of medical practice was founded in the late eighteenth century, and was associated in America with the work of Benjamin Rush. Rush believed in the power of medicine to cure patients even in the most critical conditions. Rush and his followers held out the hope of full recovery, and its efficacy depended on the use of extreme and dangerous means. Heroic medicine, a highly respectable practice at the time, included bloodletting, purging, vomiting, and blistering. In the course of the nineteenth century most of these methods became obsolete and the school lost much of its reputation, but one may recognize its imprint even today in high-risk surgeries and experimental medical treatments.

A second variation on the theme of hope was the nonorthodox medical practitioners, or ‘quacks,’ as their rivals

8 John Gregory, *Lectures on the Duties and Qualifications of a Physician* (London: Alex. Smellie, 1805), 37.

9 On the *ars moriendi* tradition, see David William Atkinson, *Renaissance and Baroque Studies and Texts*, vol. 5, *The English Ars Moriendi* (New York: P. Lang, 1992).

10 Lavi, *The Modern Art of Dying*, 44–61.

11 On ‘heroic medicine’ and other schools of medical practice in nineteenth-century America, see James H. Cassedy, *Medicine in America: A Short History*, *The American Moment* (Baltimore: Johns Hopkins University Press, 1991).

labeled them. One of the deceitful strategies of the quack doctor was to give a discouraging diagnosis of the patient's condition, and then match it with an excessive confidence in the powers of the drugs that he could provide. Either the patient would recover, in which case his medication would prove effective, or the patient would expire, in which case his predictions would prove accurate. The medical establishment strongly opposed such charlatanism and drew clear boundaries between true physicians and imposters. These efforts led to the creation of the American Medical Association in 1847 and to the official certification of doctors. The battle, however, was never completely settled, and the demand for hope beyond the limits of the medical establishment is prevalent.

The hope offered by mainstream physicians of the mid-nineteenth century, one which continues to dominate today's hospitals, was distinguishable from both heroic medicine and nonorthodox treatment. This third variation of worldly hope was promoted in the second half of the nineteenth century by 'conservative medicine.'¹² Founding figures of this school include Oliver Wendell Holmes, Sr., and Worthington Hooker. The group sought to lay new foundations to medical practice based on the limited and verifiable power of medicine. These physicians strongly objected to empty promises and unproven remedies. Their position was not based on the moral objection that the end (a hopeful patient) could not justify the means (deceit). In their mind, the *kind* of hope that the physician was expected to minister to the dying patient was differ-

ent from the kind provided by his rivals. The task of the physician was not merely to create a feeling of hope but to secure one based on the real healing powers of medicine. Hooker describes this hope:

The hope of the physician should be an intelligent hope. It should be based upon just and definite conclusions. It should be discriminating, and should be varied in its degree according to the character of each individual case Hope may thus be indulged in relation to the different stages of a case, without regard to the final event of it, which may be so distant and so clouded in doubt that no calculations can be made in regard to it This in many cases is much better than to come to him every day with the simple expression of the hope that he will at length recover. In the tedium of his confinement if it be a long one, he soon tires of looking far ahead to the bright field of convalescence, but finds relief in the time and spots lighted up of hope by the way – the oasis thus made in the desert of sickness.¹³

Hooker's notion of "intelligent hope" expressed the modest megalomania that distinguished the medical practices of the latter half of the nineteenth century from heroic medicine in the first half. It acknowledged the limitations of the medical profession but turned them into a virtue. It is the only hope that the medical profession can guarantee with confidence, and it is the only hope that really matters for the dying patient.

To this growing list of hopes at the disposal of the dying patient, we must add now the hope in the form of the medical hastening of death. It may be somewhat surprising to add euthanasia to this list.

How dying became a 'life crisis'

12 Martin S. Pernick, *A Calculus of Suffering: Pain, Professionalism, and Anesthesia in Nineteenth-Century America* (New York: Columbia University Press, 1985), 22.

13 Worthington Hooker, *Physician and Patient* (New York: Baker and Scribner, 1849), 345 – 346.

After all, what hope could there be in death? But once we see that the other medical treatments offered to the dying patient suffered from the same internal tension between limited hope and desperate hopelessness, the connection becomes clear. The medical hastening of death became a last resort to the problem of dying, a limited hope of mastery in the face of a hopeless condition.

Holmes recognized how thin the line separating the medical prolongation of life and the medical hastening of death. “No human being,” he wrote, “can rest for any time in a state of equilibrium where the desire to live and that to depart just balance each other.” As long as the patient is in good mind and hopeful, he will not be bothered by inconveniences. But when hope of cure or improvement are gone, “every incommodity stares out at him, each one of them packing up his little bundle of circumstances and calling him to move to his new home, even before the apartment is ready to receive the new bodily tenant.”¹⁴

Though Holmes was by no means advocating euthanasia, his telling metaphor demonstrates how the modern impatience toward awaiting death gave rise to the medical hastening of death. Proponents of euthanasia believed that death should follow as soon as hope was gone. If medicine cannot create hope, it should hasten death. The modern deathbed thus became, simultaneously, the place where all hope is lost and the place where a final effort to overcome helplessness includes the hastening of death.

Dying has become a crisis in contemporary America not because of the grow-

ing number of terminally ill patients, nor because dying is now a more painful and prolonged process. The problem of dying dates back to the late nineteenth century – to the medicalization of death, and more specifically to the emergence of a wish for an intelligible hope in the face of a hopeless existence.

The solutions available to the dying patient today are, in principle, the same as the ones Americans had in the late nineteenth century: heroic, alternative, and conservative prolongation of life, and active hastening of death. In the end, none of these solutions have the power to overcome the crisis of dying. In fact, Sandra’s case and its historical precedents demonstrate how these ‘solutions’ form the setting in which the contemporary crisis of dying takes place. The absence of freedom has little to do with limitations on the freedom of choice, and much to do with the futile attempt to subject dying to choice. The ethical significance of euthanasia is revealed in the hubris of modern man’s desire to master death, the crushing of this will, and its enagement once it faces the limited solace offered by medicalized mastery.

An imagined interlocutor may challenge this bleak depiction of the modern condition. Is there no alternative to the paradox facing the dying patient? Is there no Alexandrian sword that can cut this Gordian knot? If the crisis of dying is a result of the endless attempts to master death, can the dying patient not adopt an alternative mindset of accepting death rather than attempting to control it? Can contemporary patients not await death as was the old religious custom of the *ars moriendi* tradition, which offered guidance to the dying patient and her surroundings in the last article of life? Or, to raise a more contemporary solution, is the hospice not pre-

¹⁴ Oliver W. Holmes, cited by E. P. Buffet, “Pleasures of Dying,” *New Englander and Yale Review* 55 (1891): 240–241.

cisely this kind of alternative of accepting death in an attempt to counter the process of medicalization?

The existence of alternative ways of dying need not be foreclosed. In the private realm, in *pianissimo*, good deaths are still possible.¹⁵ But for the majority of the population, medicalized death – whether in the hospital, nursing home, hospice, or even private home – remains the rule. The challenge of the medicalization of death borders the insurmountable. A simple refusal to accept medical treatment is hardly a solution. Remember Sandra. Such refusal is immediately interpreted by the medical profession as well as by surrounding family and friends as a loss of hope, as a passive withdrawal from the world, as resentful rather than powerful. The challenge before the dying patient remains how to await death not out of despair nor out of vanity. In the words of Nietzsche on death, “One must turn the stupid physiological fact into a moral necessity. *So to live, that one has also at the right time one’s will to death!*”¹⁶

It may seem that the right to die and the legalization of euthanasia fulfill Nietzsche’s advice, but as we have seen, euthanasia today stands for hope in facing dying rather than an acceptance of death. A more appropriate account of the modern condition can be found in Kafka’s reflections on the will to die. Referring to himself and thinking no doubt of modern man, he wrote: “You, who can’t do anything, think you can

bring off something like that? How can you even dare to think about it? If you were capable of it, you certainly wouldn’t be in need of it.”¹⁷

How dying became a ‘life crisis’

15 Max Weber, *From Max Weber: Essays in Sociology*, ed. H. H. Gerth and C. Wright Mills (New York: Oxford University Press, 1946), 155.

16 Compare Friedrich Nietzsche, *Will to Power*, trans. Walter Kaufmann (New York: Vintage Books, 1968), sec. 916. I owe this revised translation to Philippe Nonet.

17 Franz Kafka, as cited in D. J. Enright, ed., *The Oxford Book of Death* (New York: Oxford, 1983), 96.

Jeff McMahan

Eating animals the nice way

Many people are opposed to factory farming because of the terrible suffering it inflicts on animals, yet see no objection to eating animals that are killed painlessly after having been reared in conditions that are at least no worse, and are perhaps even better, than typical conditions in the wild. Let us refer to this latter practice, in which animals are reared for human consumption but in humane conditions, as ‘benign carnivorism.’ When philosophers discuss the morality of this practice, they sometimes argue that, unlike animals killed by hunters, animals that are raised to be killed and eaten would never have existed if we had not created them in order to eat them. If benign carnivorism enables these animals to have contented lives that they would otherwise not have had, it seems better for the animals as well as for the people who get to eat them. How, then, could such a practice be objectionable?

Those who object to eating factory-farmed animals but accept benign car-

Jeff McMahan is Professor of Philosophy at Rutgers University and author of “The Ethics of Killing: Problems at the Margins of Life” (2002).

© 2008 by the American Academy of Arts & Sciences

nivorism generally believe that while animal suffering matters, animal lives do not – or at least not as much. They think that there is a strong moral reason not to cause animals to suffer, and even to try to prevent them from suffering, but not a comparably strong reason not to kill them, or to ensure that they have longer rather than shorter lives.

One possible basis for this view is the difference between how well off and how badly off it is possible for animals to be. Although animals are incapable of the depths of psychological misery to which most human beings are susceptible, their capacity for physical suffering rivals our own. Yet their highest peaks of well-being are significantly lower than those accessible to most human beings. While some animals – dogs, for instance – experience exuberant joy more readily and frequently than many adult human beings do, animals lack other dimensions of well-being that are arguably more important, such as achievement, creativity, deep personal relations, knowledge, aesthetic appreciation, and so on.

There is another, possibly even more important, reason why animal lives matter less than animal suffering. Not only do animals’ future lives promise less in terms of both quality and quantity of

good than those of most human beings, but animals are also less strongly connected to themselves in the future in the ways that make it rational to be concerned about an individual's future well-being for that individual's own sake now. Because they are not self-conscious, or are self-conscious only to a rudimentary degree, they are incapable of contemplating or caring about anything more than the immediate future. They do not, therefore, have desires or intentions or ambitions for the future that would be frustrated by death.¹

Yet the lives of animals must matter to some extent – that is, animals must have an interest in living to experience the goods that lie in prospect for them. In particular, the goods that an animal's future life could contain must matter enough to justify allowing the animal to endure a certain, even considerable, amount of suffering. For if an animal's avoidance of suffering were significantly more important than its living to experience the goods that its future life could contain, then it would be better *for the animal* to be painlessly killed before it could undergo any suffering at all.

But this is implausible. It can be better for an animal to endure a certain amount of suffering if the good experiences it might have afterward would be sufficient to outweigh the suffering. We all acknowledge this when we submit our pets – just as we submit ourselves – to painful but life-saving medical treatments.

The upshot of these reflections is that there is reason to be skeptical of the widespread view that the prevention of

suffering among animals is much more important than the extension of their lives. This is not to deny that there is a significant difference between persons and animals in this respect. The goods that are characteristic of human life are so much higher than those characteristic of animal life that it is rational for us to tolerate substantially more suffering in order to continue to live than it would be acceptable to make an animal endure in order to save its life. But the goods of an animal's life weigh against the evils in the same way that goods and evils weigh against one another in the life of a person. It is just that animal goods are lesser goods, and therefore have less weight.

According to some advocates of benign carnivorousness, it is precisely because the lives of animals raised in humane conditions are good that the practice is not only permissible but desirable. If the lives the animals have are good, and if they would not have existed at all without the practice, then at the very least benign carnivorousness cannot be worse for them. And since eating animals that have been humanely raised and painlessly killed may be better for people than having to go without meat altogether, the practice would be, at a minimum, better for some and worse for none – or, as economists say, Pareto optimal. But it may even be better for everyone affected, animals included. (Here I ignore the larger question of whether meat-eating is worse for people because it involves an inefficient use of the world's resources.)

While the case for benign carnivorousness is often stated this way, these claims are misleading. The claim that benign carnivorousness would not be worse for the animals that it would cause to exist is, strictly speaking, trivially true, while the claim that it would be better for them is necessarily false. This is because 'worse'

1 For discussion of the relevance of psychological continuity within a life to the ethics of killing, see Jeff McMahan, *The Ethics of Killing: Problems at the Margins of Life* (New York: Oxford University Press, 2002), 39 – 43, 69 – 82.

and 'better' are comparative terms, and one element in each implied comparison is never existing at all.

Consider the claim that it is not worse for an animal to be caused to exist. This is not a substantive claim. It is instead true as a matter of logic, since it is *incoherent* to suppose that an animal's being caused to exist could be *worse* for it. Because 'worse for' is comparative, the claim that it is worse for an individual to be caused to exist implies that it would have been *better for that individual* not to have been caused to exist – that is, never to have existed at all. But there cannot be anyone for whom it is better never to exist.

Similarly, to say that it is better for an animal to be caused to exist implies that it would have been worse for that same animal never to have existed. But again, there cannot be anyone for whom it is worse never to exist. In one clear and relevant sense, there *are* no individuals who never exist.

It is thus true, even of an animal whose life involves nothing but unrelieved agony, that it is not *worse* for it to exist.² It can certainly be *bad* for that animal to exist, and to have been caused to exist. 'Bad' is noncomparative. We can say that a life is bad if its bad aspects outweigh the good. And it can be bad for an animal to be caused to exist with a life that is bad – as is generally the case of animals that are factory farmed.

Just as it can be bad to be caused to exist with a life that is bad, so it can be good to be caused to exist with a life that is good. Since benign carnivorousness by

2 Or, rather, not worse for it than never to exist. It does seem that to exist can be better or worse for an individual than to cease to exist. Contrary to what Epicurus once claimed, we can make sense of the idea that there is someone for whom ceasing to exist is worse, or better, than continuing to exist.

definition aims to cause animals to exist with lives that are good – in which the good elements outweigh the bad – it is plausible to say that the practice is good for the animals it causes to exist, even if the ultimate aim is to make them available for human consumption. While the practice also involves painlessly killing them, and while killing them is bad for them, and worse for them than allowing them to continue to live, the practice as a whole is still good for them, since their lives are good and otherwise they would not have existed at all.

Benign carnivorousness is, moreover, a continuing practice. When some animals are painlessly killed for consumption, others are caused to exist in their place. The practice thus yields a continuous bounty of contented animals and contented diners.

Before considering some objections to benign carnivorousness, we should pause to summarize and review the ideal conditions of the practice.

- The animals would have lives worth living. They would be well fed, protected from predators, allowed the free exercise of their natural instincts, and at least as well-off overall as their counterparts living in the wild.
- They would not have existed if not for the practice of benign carnivorousness. Moreover, it is not just that the *particular* animals would not otherwise have existed; it is that far *fewer* animals with lives worth living would have existed in the absence of the practice.
- The animals would be allowed to live a considerable portion of their natural life span before being painlessly killed.
- Although killing the animals might deprive them of several years of life, the amount of good they would thereby lose is comparatively slight.

- The significance of the loss the animals suffer must be discounted for the relative absence of psychological unity in their lives.
- Those that are painlessly killed are replaced by new animals with lives that are equally good.
- The pleasure that people get from eating the animals is in general greater than the pleasure these people would have gotten from eating foods derived entirely from plants.

The question now is whether a practice that has these features, or at least many of them, is morally permissible.

One obvious point is that no one would invoke the logic of the argument just given to justify a parallel practice involving *persons*. Imagine that the world's population has reached a point at which people have agreed to adopt a policy of replacement – that is, people may have a child only when someone dies, so that total population does not increase. Suppose further, however, that there remains a chronic shortage of donor organs and that many people continue to die for want of an organ transplant. In these conditions, people might agree to allow a certain number of people to be born above the limit, provided that they will be painlessly killed at the age of fifty in order to make their organs available for transplantation. Even though these people would have lives well worth living and would never have existed had we not caused them to exist to be able to use their organs, and even if the benefits to the recipients of their organs would be significantly greater than the harm the victims would suffer (perhaps because their organs would be given only to recipients under the age of thirty), this practice would clearly be wrong.

It would be wrong presumably because persons have rights that constrain others from using them in certain harmful ways even when the practice that involves using them in these ways would not be bad for them, and might even be good for them overall. It would not matter that we had brought these people into existence only on the condition that we could kill them at the age of fifty. Once they become persons, they have a right not to be killed. It would be irrelevant that it was good for them to exist and that they would never have existed had we not caused them to exist specifically in order to kill them for their organs.

If animals had the same rights as persons, those rights would provide a decisive objection to benign carnivorousness. But it is hard to believe that killing an animal is morally objectionable for the same reasons and to the same degree as killing a person. Of course, human intuitions about the moral status of animals are so contaminated by self-interest and irrational religious belief as to be almost wholly unreliable. Yet even most people who have become vegetarians or vegans for moral reasons would accept the permissibility of killing an animal if what was at stake were as important as saving the life of a person. This would be true even if the animal were one of the higher primates. Suppose, for example, that the painless killing of a single chimpanzee could save the lives of two five-year-old children by making its organs available for transplantation. Although virtually no one believes that it could be permissible to kill one five-year-old child in order to use her organs to save two other five-year-olds, most of us believe that it would be permissible to kill the chimpanzee, and could produce arguments to show that this belief is not speciesist but is based on morally significant intrinsic differences between chimpanzees and

normal five-year-old human beings. But if this robust intuition that xenotransplantation can be permissible is right, then animals do not have the rights that we, as persons, have.

It might be that animals have rights, but rights that are weaker than those of persons. If so, an animal's rights might be overridden when it is necessary to kill it to save the life of a person, but not when the only purpose that would be served by killing it is to enable someone to enjoy the taste of meat. This view is, however, hard to reconcile with the nature of rights. A right of a given type – in this case, a right not to be killed – is generally held to be invariant in strength among all those who possess it. A theory that allowed the strength of rights of a given type to vary with the strength of the interests they protect would hardly differ in substance from a theory enjoining respect for interests.

It might be, of course, that we attribute equal rights to all human beings in order to articulate a conception of human equality. And it is compatible with human equality that animals could have weaker rights of variable strength. But this view could be true only if species membership were relevant to the possession of rights, which I have argued elsewhere is not the case.³

So if, as I believe, xenotransplantation could be permissible, it seems that the explanation of why it may be wrong to harm or kill animals for lesser reasons derives from a requirement of respect for their *interests*. An appeal to rights is necessary only when a principle requiring respect for interests cannot account for the moral reasons we seem intuitively to have. And these reasons seem to arise only in our dealings with individuals that have not only interests but also

certain higher cognitive and emotional capacities, such as self-consciousness, autonomy, and rationality.

If I am right that animals do not have the rights that protect persons from certain forms of harmful using, we cannot reject benign carnivorousness on the grounds on which we would rightly reject a practice that would cause *people* to exist in order to use them later in harmful ways.

Suppose, then, we consider benign carnivorousness in terms of the interests at stake. Consider an animal whose flesh could provide one meal each for twenty people. How might the human and animal interests compare? It seems that we have to compare the animal's interest in continuing to live – a function of both the amount of good that its life would contain were it not killed, and the degree to which it would be psychologically connected to itself in the future – with twenty people's interests in the pleasure they would get from eating the animal.

It is important to stress that the people's interest is *not* in having the pleasure of eating meat rather than having no pleasure at all; it is instead in the *difference* in pleasure between eating meat and eating food derived from plants. Given comparable investments in the procurement and preparation of the two types of food, this difference is likely to be slight. Note also that the time that a person spends tasting meat during a normal meal is not much longer than a few minutes. It therefore seems unlikely that the interests that twenty people each have in experiencing a few minutes of slightly greater pleasure could outweigh all the good that an animal's life might contain over several years, even when that good is heavily discounted for the absence of significant psychological continuity within the animal's life.

3 See McMahan, *The Ethics of Killing*, 203–217.

Some people will no doubt think: 'How typical, and predictable, that an academic philosopher would scorn, or affect to scorn, the pleasures of eating. For most people, the pleasures of eating, particularly in a social context, are among the great goods of human life.'

But those who press this point undermine their own case. It does seem that, for many people, meals and snacks are among the few intervals of pleasure that enliven their otherwise quotidian lives. Yet anyone who has ever lived with dogs, horses, or other animals knows that many animals also take great pleasure in eating. There is a reason why eating is often referred to as an 'animal pleasure,' in contrast, for example, to the pleasure of listening to a symphony. Thus, if we add up the differences in pleasure that twenty people would get at one meal from eating meat rather than food derived from plants, and compare that total pleasure with the pleasures that the animal would get from several years of eating several times a day (not to mention the other pleasures its life would contain), it is scarcely credible to suppose that the people's interests could outweigh those of the animal.

It may seem that we have lost sight of the important point I highlighted earlier: that the animals that would be eaten in a practice of benign carnivorousness would owe their existence to the practice. They would have many meals, and therefore much pleasure, but only if people were to bring them into existence in order to eat them. Surely, one might argue, we ought to take this fact into consideration in assessing how the practice of benign carnivorousness bears on both human and animal interests.

There are, however, no animal interests that favor instituting a practice of benign carnivorousness. No individual, ani-

mal or otherwise, has an interest in being caused to exist. Interests arise only once an individual exists; therefore, to cause an individual to exist cannot be to satisfy any interest of that individual. It may be *good* for animals to be caused to exist by the practice of benign carnivorousness; but that is compatible with there being no reason to have the practice that is grounded in animals' *interests*.

If, therefore, we evaluate the practice of benign carnivorousness by reference to the interests it affects, it is at the point at which animals that have been raised humanely are about to be painlessly killed that the most important question arises – namely, whether the killing can be justified by reference to the interests that are at stake. I have argued that in general it cannot. The animals' interest in continuing to live outweighs the human interest in eating them. That those who now want to kill the animals had earlier caused them to exist – an act that was good for them – is, at this point, irrelevant. One cannot plausibly claim that in killing them one would be depriving them only of what one gave them in the first place. That justification would allow parents to kill their children. Whatever good the practice has bestowed on animals up to this point cannot be cited as credit from which the killing can now be debited.

The argument for having a practice of benign carnivorousness appeals to two considerations: the human interest in eating meat, and whatever *impersonal* reasons one might have to cause animals to exist with lives that would be good for them. In general, we assign little or no weight to impersonal reasons to cause individuals to exist. We do not, for example, accept that there is a significant moral reason to cause a new person to exist simply on the ground that the person's life would

be good.⁴ It would be surprising if we thought there were *any* impersonal reason to cause animals to exist simply on the ground that their lives would be good.

(There is, however, a deep, unresolved problem here. Although we deny that there is a significant impersonal reason to cause individuals to exist because their lives would be good, we accept that there is a significant impersonal reason not to cause individuals to exist if their lives would be bad. These intuitions are entirely compelling: while there is no moral pressure to have children, or to breed animals, *just* because they would be happy, there *is* strong moral pressure not to cause people to exist if their lives would be utterly miserable. To my knowledge, no one has offered a satisfactory explanation of this puzzling asymmetry.)

The defender of benign carnivorousness might concede that while there is no strong positive case in favor of the practice, such a case is unnecessary. All that is necessary is that the practice be permissible. Our interest in having it will then supply the motivation to implement it. Yet considerations of interests suggest that it is in fact *not* permissible. Given the interests at stake, we cannot justify the killing that is involved in benign carnivorousness.

Two lines of argument are open to the proponent of benign carnivorousness at this point. First, suppose we have caused certain animals to exist and raised them humanely in order to eat them. We have reached the point at which we planned

⁴ That is our intuition in current conditions. But this intuition may reflect a deeper belief that good lives have a diminishing marginal impersonal value. If the human race were on the verge of extinction, we would have a very strong reason to cause new people to exist.

to kill and eat them, but now realize that their interest in continuing to live outweighs our interest in eating them. What is the alternative to killing them? If we now refrain from killing them, are we morally required to continue feeding and caring for them until they die naturally?

If we are *not* required to continue to provide for them, it seems that we must be permitted to release them into the wild. But animals that are bred for human consumption are, like domesticated pets, largely incapable of surviving in the wild. Even the most hardened animal-rights activists usually favor the painless killing of domesticated animals for whom no home can be found. They regard it as a form of euthanasia, since animals unsuited to life in the wild are likely to suffer from hunger and disease before being painfully killed by a predator or an automobile. But if it is better for domesticated animals to be painlessly killed than to be allowed to suffer a slow and miserable death in the wild, it seems permissible after all to kill animals raised as part of the practice of benign carnivorousness. But if we can permissibly kill them, why can we not eat them once they are dead?

What is questionable here is the assumption that one can cause an individual to exist for purposes of one's own without acquiring responsibilities. To cause an individual to exist in a vulnerable and dependent condition is arguably to make oneself liable to certain duties of care. It seems wrong to cause an individual that is incapable of surviving in the wild to exist and then to abandon it in the wild. One must either refrain from causing it to exist or else arrange for it to have the care it requires once it exists.

The second line of argument open to the defender of benign carnivorousness in-

volves distinguishing between the practice as a whole and the act of killing in particular. One can argue that, while killing the animals is bad for them, and worse for them than enabling them to continue to live, the practice as a whole, which includes the act of killing, is good for them. It seems a mistake to allow the evaluation of one component of the practice to determine the value of the practice as a whole. Perhaps we should regard the practice as a whole as the appropriate unit of moral evaluation, and consider the act of killing only insofar as it is a component of the practice.

Debates about both punishment and nuclear deterrence have familiarized us with the idea that the rationality or morality of an act can be determined by the rationality or morality of a strategy or policy in which it is embedded. Some philosophers have argued that if it is permissible to threaten a potential criminal with punishment by programming a device that will automatically punish him if he commits a crime, then it must also be permissible to disaggregate the automatic punishment strategy into its constituent parts by separately threatening punishment and then fulfilling the threat if it is defied. The permissibility of each component is thought to follow from the permissibility of the strategy as a whole.

But this reasoning is mistaken. It can be permissible to bring about a series of effects through a single act, and yet not be permissible to bring about each of the effects through a series of acts. This becomes clear when we consider a parallel argument about nuclear deterrence. Suppose that we could permissibly program an automatic nuclear retaliatory device to annihilate an enemy country if it strikes us first, provided that programming the device would have a high probability of deterring a nuclear first strike that would otherwise be highly proba-

ble. We could also permissibly *threaten* a country with retaliatory annihilation to deter a nuclear first strike. But if this threat were to fail and the enemy country were to launch a first strike, it could not possibly be permissible at that point to fulfill our threat by annihilating the enemy country when doing so would serve no purpose whatsoever. This shows that the permissibility of individual acts is determined by the considerations that favor them at the time of action and cannot be derived from the desirability of the larger practices in which they are embedded.

My rejection of this defense of benign carnivorousness suggests, perhaps surprisingly, that a different form of benign carnivorousness could be permissible. The argument for punishment cited above begins with an example of a single act – the programming of an automatic punishment device – that has two effects: strengthening the deterrence of offenses and imposing a risk of retaliatory harm. The legitimate deterrent aim may justify the risk, thereby making the single act permissible, *even* when it results in the actual infliction of harm.

The problem with the argument is that it does not follow that if each effect were the result of a different act, both acts would be justified. Just as our actual practice of punishment involves two distinct acts – threatening punishment and inflicting it – so benign carnivorousness, as conceived by its proponents, involves both causing animals to exist and then later causing them to cease to exist. But what if we could bundle both these effects into a single act, in the way that making a threat and fulfilling it are bundled together in the programming of the automatic punishment device?

Here is how it might work. Suppose that we could create a breed of animals

genetically programmed to die at a comparatively early age, when their meat would taste best. We could then have a practice of benign carnivorism that would involve causing such animals to exist, raising them for a certain period in conditions in which they would be content, and then simply collecting their bodies for human consumption once they died. Such a practice would not be bad for the animals and would arguably be good for them, since they would have lives worth living and would not have existed at all if not for the practice. And the practice would not involve doing anything to them that would be against their interests, such as killing them.

Note that the practice would not cause the animals to live shorter lives than they might otherwise have had. *Other* animals with a different genetic nature might have been caused to exist instead, and these animals might have lived longer. But none of the animals caused to exist by the practice could have lived longer than they did (unless we also had an antidote to the genetic modification – but for the sake of argument, let us assume that we would not).

This form of benign carnivorism escapes the objection I pressed against the more realistic form that many people have advocated. Yet notice that again a parallel practice involving persons would not be permissible. Again imagine that we have adopted a rigid policy of forcing the birth rate to track the death rate. But we are now considering bringing a limited number of people into existence above the replacement level, but only to use their organs to solve the problem of organ shortages. In this version of the example, however, they would not have to be killed on reaching the age of fifty. They would instead be genetically programmed to die with healthy organs at that age.

I doubt that anyone would find this proposal attractive. And it is not obvious that we could explain the difference between this practice and the parallel form of benign carnivorism by reference to people's rights. For the objection to causing such people to exist does not seem to be that it would violate their rights. Although some defenders of rights might disagree, it would not be wrong to have such a child, when *any* child one might have could inherit a genetic defect that would prevent him from living beyond the age of fifty. Nor would having such a child be permissible only because the procreative rights of the parents would override the rights of the child. Rather, there does not seem to be any right to a possibility of living beyond fifty. So the objection to causing people to exist who would be pre-programmed to die at age fifty must, it seems, be impersonal and comparative in character. That is, it seems wrong to cause such people to exist only because we could cause other people to exist instead who would not have the genetic limitation, despite the fact that causing these *different* people to exist would not address the problem of organ shortages.

One might argue that the objection to this parallel practice involving human beings cannot be simply that it would have been better to cause other people who could have lived longer to exist instead. In the circumstances, it would in fact be *worse* overall to cause such people to exist, since their existence would exacerbate the population problem without solving the organ shortage problem. The real objection, one might argue, concerns equality. The genetically preprogrammed people we might cause to exist would be our moral equals, but we would have deliberately ensured that their lifelong well-being would be lower than that of most other people. To create

a distinct group of people with reduced longevity would be inegalitarian.

Note that this objection also takes an impersonal form. If the inequality created by causing the new people to exist is objectionable, it is not because it is worse, or bad, for the worse-off people. Because these people's lives would be well worth living, it is, if anything, good for them to exist. Inequality that is not worse for anyone may well be morally objectionable, but it is not objectionable enough in this case to explain our sense that it would be wrong to cause these people to exist with a genetically predetermined limit to their longevity.

One other possible explanation is that to cause these people to exist would be to *use* them for the sake of others. Yet that objection may not apply if our policy was never to use such people's organs without their freely given consent. Some might refuse. But we could create just enough for it to be statistically predictable that there would be enough volunteers to solve the problem of organ shortages.

In the hypothetical example, it seems wrong, intuitively, to cause people to exist with a genetically determined maximum life span of fifty years. But it is not clear why exactly this is wrong. This leaves open the possibility that the explanation of why it is wrong, whatever it may be, will apply as well to the second form of benign carnivorousism.

Yet there seems to be an interesting difference between causing human beings to exist who are preprogrammed to die prematurely and causing animals to exist that are preprogrammed to die in good health at a certain age. Suppose that in each case the preprogramming was a result of a random mutation rather than of human choice. If some human beings were found to have a gene that caused them to die at age fifty no matter

their state of health, most people would support efforts to eliminate this gene via voluntary selection. That is, most people would favor making it possible for potential parents to have themselves or their embryos screened for the gene in order to prevent the birth of people who would have it. Certainly we would not welcome the presence of this gene because it would help make more organs available for transplantation.

But if we found a naturally occurring strain in some animal species whose members were genetically determined to die prior to the onset of age-related deterioration, we might welcome this discovery as making possible a practice of benign carnivorousism that would not require either the killing or the genetic modification of the animals we would consume. There would, it seems, be no more reason to eliminate the gene than there is to try to increase the life spans of shorter-lived species to match those of longer-lived species. This, at any rate, is the common intuition. Whether it is to be trusted is another matter.

The only form of benign carnivorousism that is possible now – raising animals humanely and killing them painlessly – seems morally unjustifiable because the interest the animals would have in not being killed would decisively outweigh the interest people would have in killing and eating them. It does not, however, seem morally objectionable to eat an animal that has died of natural causes, which suggests that it could be permissible to use techniques of genetic modification, when they become available, to create animals that would die naturally on a predictable schedule and in good health. It is hard to see what could be wrong with this practice, though a parallel practice involving human beings would not be permissible, which casts

some doubt on the permissibility of the practice involving animals.

We might go further and imagine a version of benign carnivorism based on genetically modifying animals so that they would not only die in a healthy state on a predictable schedule but also enjoy longer lives than their unmodified counterparts. This possibility, however, highlights a problem that afflicts all the variants of benign carnivorism we have considered – namely, that because the animals would be raised in humane conditions and would live for more than just a short period, we would have to invest more in each animal than we currently do in factory-farmed and intensively reared animals. This greater investment would force the unit price up and cause economies of scale to decline. Meat would become a luxury available on a regular basis only to the rich. While this outcome would be objectionable on grounds of equality, it might not be so bad on balance, since decreased consumption of meat would very likely improve the health and longevity of the general population. Almost any shift away from the ways in which meat is currently produced and consumed would be better for both animals and people.⁵

5 I am grateful to Joshua Knobe for stimulating conversation, and to Derek Parfit for extensive and illuminating written comments on an earlier draft of this article.

Adrian Woolfson

Synthetic life

In 1540, the German cartographer Sebastian Münster published the first accurate map of the African subcontinent. Contrary to the Ptolemaic view – in which Africa, Antarctica, and part of Asia formed a single southern land mass known as *Terra Incognita* – Africa emerged as a discrete entity in Münster’s representation. Improvements in shipping and navigational techniques, such as triangulation and calculation of longitude, made this map possible. These methods enabled transoceanic voyagers to locate their positions in the absence of landmarks, thus facilitating the exploration of new areas.

Münster’s map was also remarkable for its unusual depiction of Africa’s wildlife. In his exposition, the Dark Continent teemed not only with conventional creatures like elephants and parrots, but also with mythical ones such as one-eyed Monoculi. The incorporation of imaginary beasts suggests Münster’s

anticipation of the synthetic future of life, and indeed his tacit appreciation of the fact that material existence represents only a fraction of natural and artificial possibility.

In the spirit of Münster, it is possible to explore the idea of compiling a ‘library of all possible creatures,’ a database of DNA sequences of all species, past, present, and future. With this database, we may be able someday to recreate extinct species and even create entirely new ones.

Like Münster’s rudimentary yet imaginative map of Africa, the library – also called ‘DNA Sequence Space’ – has a distinct mathematical reality. But in contrast to conventional terrestrial domains, this space is boundless, and so appears on first inspection to defy cartographical representation or even rational exploration. Fortunately, like the corporeal continent that underwrites Münster’s accurate but nevertheless fanciful depiction, at least a small portion of this apparently limitless landscape can be mapped. This is significant, as it is this region that – much like the former coalfields of the industrial North England – may most economically yield rich seams of potential life. What we need, though, is a method of predicting the location of these ‘coalfields,’ which contain the

Adrian Woolfson is CEO of ProteinLogic and teaches medicine at the University of Cambridge. He is the author of “Life Without Genes” (2000) and “An Intelligent Person’s Guide to Genetics” (2004).

© 2008 by the American Academy of Arts & Sciences

mathematical structures that are able, in principle, to encode processes of life, as well as the means of deciphering them.

Navigating the contours of this complex, rugged, and tortuous mathematical terrain is onerous and not without its own dangers. But its exploration and eventual mapping will ultimately be far more important than the discovery of the Americas, Antarctica, or any other continent. For within this vast and mostly uncharted Borgian space, all life's possibilities may be found: the morphological secrets of existing life as well as of every potential living thing. The moment we complete this project, life will become dissociated from the natural evolutionary processes that have shaped it from its inception. New artificial modes of creation will then supplement, perhaps even supplant, such conventional historical mechanisms.

Having sketched the nature of the project, its complexity, and its potential impact, I would like to trace an outline for its execution. Like the peripatetic mariners that navigated the Earth's uncharted oceans without the luxury of maps, we will hardly be able to achieve success in a task of this magnitude without an armory of appropriate technological innovations – the sextants and longitudes of our day. Fortunately, a selection is already close at hand.

But before we can go over the steps in creating this database, we must first acknowledge that this expansive mathematical edifice is not metaphysical. Instead, it is grounded in mathematical Platonism, which recognizes the immutable and eternal mathematical reality of logical propositions. In this case, the logical propositions pertain to the description and construction of organisms, whether living, extinct, or never before

realized. A simple thought experiment can help illustrate this idea.

Imagine, for instance, a creature that is half tiger and half dog. Now imagine that this tiger-dog becomes extinct. The fact that the tiger-dog once existed means that, in principle, a genome sequence capable of computing it exists. Thus, the potential to construct this creature predated its existence and indeed persists beyond its extinction. But even if the tiger-dog had never existed, the possibility of its existing at some point in the future would have remained intact.

It turns out that a tiger-like dog did once exist in Tasmania until only very recently. A visitor to the Hobart Zoo in 1933 might have marveled at the last living example of the Tasmanian tiger, also known as the Thylacine or *Thylacinus cynocephalus*. This curious and somewhat unlikely creature resembled a large, short-haired dog with a tail reminiscent of a kangaroo's. Its yellow-brown coat had a distinctive striped pattern, as did its rump and tail. These markings gave the Thylacine its tiger-like appearance. Concerned about the loss of domestic animals to this successful predator, the Van Diemen's Land Company put a bounty on the Thylacine around 1830. Numbers of the Thylacine declined rapidly, and before long, the species was close to extinction. The Hobart Zoo Thylacine was the last-known captive example; and despite occasional reports of sightings in the wild, the Thylacine is now thought to be extinct. All that remains is a disparate collection of photographs, skeletons, and a short grainy black-and-white film in which the Hobart Zoo Thylacine is seen pacing frenetically back and forth in a painfully inadequate and featureless enclosure.

In what sense might we describe an extinct Thylacine as having a timeless

Platonic reality in mathematics that transcends the existence of any individual example? A few samples of preserved Thylacine flesh and bone persist in museum collections around the world. Indeed, a team headed by Don Coggan of the Evolutionary Biology Unit at the Australian Museum managed to recover intact DNA from some specimens. The fact that the attempt met with only limited success reflects the poor state of the starting material, rather than any intrinsic obstacle to the resurrection of this extinct organism.

Had the DNA been better preserved, it would have been possible, at least in theory, to reconstruct a Thylacine genome in its entirety. We could then have placed the reconstructed genome into an appropriate egg, either natural or artificial, which we might have then used to generate some or all of the structural and functional characteristics of a historical Thylacine. Naturally, some features might not have been encoded in its DNA. Its cry, for example, was probably transmitted through cultural rather than genetic means. Such aspects of the historical Thylacine are therefore likely to be irretrievable. This is not to say, though, that we could not infer the broad features of these types of characteristics.

Once we can create a physical facsimile of an extinct Thylacine by amplifying and pasting together fragments of DNA recovered from the flesh of a formerly living example, it becomes clear that natural material is not a prerequisite for such activities. Indeed, if a DNA sequence that corresponded exactly or closely to that of a historical Thylacine were discovered by chance in DNA Sequence Space, this purely artificial sequence might just as readily provide the genomic substrate for the generation of a facsimile Thylacine.

From here, it follows that, like the Thylacine, which once existed and has subsequently become extinct, there must be countless other creatures that have not had the chance to exist and for which we could find perfectly plausible DNA sequences. We might discover such sequences mathematically on a computer or define them artificially from first principles.

The history of life on Earth has simply been too short to realize more than a fraction of the wealth of possibilities contained within DNA Sequence Space. The exploration of this space by natural processes like natural selection has furthermore been subject to constraints and historical contingencies. These have ensured that the history of life on Earth, like a river snaking through an unpredictable and perilous mountain landscape, has taken a well-prescribed, narrowly defined, and ultimately highly constrained pathway. In some cases, we have overlooked potential creatures simply because we had no easily accessible route by which to reach them. In others, chance events may have extinguished rivulets of life, ensuring that we neither explored in the first instance nor revisited certain regions of DNA Sequence Space.

Once we have established the framework of this grand enterprise, we must first address the technological issue of how to compile a sufficient – or better, exhaustive – database of DNA sequences. This task requires sequencing the genomes of all known living things and of any recoverable genetic material from extinct creatures. Sequencing is the process that deciphers a genome's unique combinatorial string of four different DNA building blocks. This string chemically encodes the core information that directs the assembly and operation of

living things. This information basically translates into the proteins that underpin the structure and function of all known life on Earth.

Whereas current sequencing technologies are able to decipher the genomes of small organisms like yeast and bacteria in a matter of months, a complete inventory of the genomes of all known species, many of which are far larger, will require significant improvements in DNA sequencing technology. Without such innovations, a task of this magnitude is both unrealistic and untenable. Such technological advances, however, are forthcoming; and it is easy to imagine a time in the near future when we will be able to obtain complete genome sequences of any complexity within a matter of minutes, or even instantaneously.

The compilation of an exhaustive database will also necessitate an extensive trawl of every available niche and microenvironment, so as to capture as many examples of the different species on Earth as is practically possible. But once we have obtained a database of genome sequences ranging from the most insignificant Amazonian beetle and obscure microorganism to antelopes and zebras, we will be able to begin searching for predictive architectural features that facilitate the interrogation and subsequent interpretation of target unknown sequences.

Following the successful compilation of an extensive, and ideally complete, DNA sequence database, we will need to establish a universal algorithmic machine capable of computing the structure and function of any organism from the abstract mathematical notation of its genomic structure. For example, if we fed the genomic sequence of a giraffe into this hypothetical machine, it should recognize that the inputted sequence

represents a giraffe-like creature, or simply, a giraffe. Similarly, when we enter the genomic sequence of a flamingo, the machine should conclude that the sequence belongs to a pink, long-necked bird – or better, it should infer that this is a flamingo.

Preferably, the algorithm should predict not just the morphology of the organism, but its biochemistry and behavior as well. And a truly universal algorithmic engine should be capable of computing with a certain degree of accuracy the morphological structure of any organism, even if the sequence is artificial or the organism has never formally existed.

The construction of this universal algorithmic machine is materially contingent on the successful completion of the DNA sequence database. Only then will the algorithmic machine have exposure to enough sequences for it to be adequately trained. Success in this domain thus depends on the maturation of the science of comparative genomics, namely, the process by which the features of the genome of one species are systematically compared with the features of another. Ideally, the discovery of structural genomic patterns correlating with specific macroscopic features, such as a fin or a wing; microscopic features, such as the architecture of a liver sinusoid as opposed to that of connective tissue; and molecular features, such as a metabolism based upon oxygen as opposed to hydrogen cyanide, will be performed *in silico* by specialized machine code capable of automatically discerning such fundamental relationships.

Once we have a machine able to compute the likely structure – both internal and external – of the organism the sequence represents, we will need to develop a search engine that can navigate DNA Sequence Space efficiently, and sys-

tematically compute every possible sequence housed within the space. In this way, we could, in principle, get descriptions of the sequences of all actual and potential living things. After the exhaustive exploration and testing of a significant portion of DNA Sequence Space, we could then use the information to form a comprehensive 'Life Map.' It would contain all of the inferred biological possibility extracted from a circumscribed region of DNA Sequence Space. Although the majority of the creatures unearthed in this process would not exist or have existed, we would assign each potential organism a coordinate on this map.

The next issue to address is whether it is possible to translate the abstract logic of synthetic genomes into the molecular hardware of living creatures. In the case of simple synthetic organisms that mimic the fundamental features of their natural asexual counterparts, generating artificial cells capable of accommodating the artificial genomes should suffice. In the case of more complex synthetic organisms that mimic the features of sexually reproducing organisms, however, we will have to develop a way to construct artificial eggs so as to enable the information in synthetic genomes to be read.

The development of a predictive algorithm able to compute DNA sequences of uncertain provenance leads logically to the possibility of a methodology capable of both designing and constructing new genomes from first principles. Using such constructional principles, we should be able to generate organisms with entirely new properties, some or all of which may never have been encountered in the natural world, either individually or in combination. The introduction of such novel properties may

have many benefits, including, for example, advances in medicine, improvements in food and energy production, and the colonization of hostile environments both on Earth and elsewhere.

But it is also necessary to recognize the inevitable occurrence of 'impossible' creatures within mathematical space. Although morphologically plausible, such creatures would be incapable of initiating or sustaining a life process. For example, imagine a DNA sequence that encodes an oak tree the height of the Empire State building. Such an organism might be morphologically plausible, but it is unlikely to function at the physiological level. Other creatures, though on first inspection appearing sustainable, might on closer reflection be shown to be incapable of existence within the parameters of physics and chemistry. A butterfly with wings the size of tennis courts might survive in a weightless environment, but it is unlikely to fly when exposed to the gravitational pull of the Earth. This is not to say, though, that such creatures might not flourish in some as yet unidentified alternative world.

Synthetic life might, in fact, employ software and hardware technologies different from the DNA 'software' and protein 'hardware' that have formed the informational and structural substrates for life probably from its inception. Although evolution by natural selection has chosen these technologies as the core technologies of all life, it is possible to imagine alternative technologies that might form the basis of the essential informational and structural chemistry of living things someday. But to discover such creatures we may need to hunt in places other than DNA Sequence Space.

Besides these physical constraints, we must acknowledge limitations to the computability of DNA sequences. The

entirety of this enterprise is predicated on the assumption that the class of logical propositions representing the structure and function of living things is computable, at least in principle. Although this is likely to be the case many times, we should not be greatly surprised when things occasionally turn out differently. The intrinsic noncomputability of certain sequences has two principal components. The first is an exclusively mathematical consequence issuing from Gödel's theorem: there are likely to be 'undecidable' logical propositions that cannot be shown definitively to be either true or false. And just as there are logical propositions whose solutions defy computation, there are likely to be genomes and aspects of living things that are similarly not computable.

Second is the fact that the DNA sequence alone does not contain all the important components of the information of living things. The phenomenon of genomic imprinting is responsible for silencing some genes by selective 'epigenetic' chemical modification, in a process known as methylation. The loss of such essential information by the representation of a sequence isolated from its methylation imprint might in some or many instances render interpretation impossible.

This insurmountable constraint prescribes a finite limit to the mathematical space we can navigate. It is possible to imagine, though, that we might one day overcome this inability to incorporate epigenetic factors by the mathematical construction and subsequent exploration of an 'Epigenetic Space.' This is an even more complex computational task, however, and may consequently, at least for the time being, be unattainable.

Despite these constraints, it should be possible to commence what is likely to

be the greatest enterprise of the twenty-first century. With the basic universal algorithmic machine and synthetic tool kit in place, humanity will at that point enter a new age of mathematical cartography: the constructional, and principally computational, science of synthetic life will enable the delineation of qualitatively different types of maps than those created by conventional cartographers. These new virtual maps will allow us to catalog the creatures that, like Ebenezer Scrooge's Christmas ghosts, inhabit both the past, present, and future, and which populate the knotted and twisted mathematical landscapes of the 'library of all possible creatures' – a single definitive and exhaustive inventory of all living possibility.

It is impossible to predict the consequences of innovations within the field of synthetic life, and of the paradigmatic shift from natural life that is generated by historical processes of natural selection, to synthetic life that is designed *in silico* and subsequently constructed from first principles. The end of natural selection as the principal agent of speciation will be an unprecedented milestone in human existence. Needless to say, the consequences will be far-reaching, as the distinction between natural and artificial will become nothing more than a historical curiosity. Indeed, the question as to whether something is natural or artificial might itself become quite absurd (in a manner reminiscent of the question mooted by Alan Turing of whether it might be possible to demonstrate that a machine able to convince us that its behavior is the product of conscious awareness is actually capable of conscious awareness).

This technological transition depends, at least for the time being, on the preservation of the natural world and on the systematic documentation of all its con-

tents. This absolute dependence on the extraction of genetic information from multiple and diverse genomic sequences highlights the importance of every single species on Earth, however obscure and apparently irrelevant. It consequently demonstrates *par excellence* the importance of preserving our environment and each of the niches within it, and of maintaining an archival example of every known species on Earth in a genomic Noah's Ark. This biological zoo of genomic material holds the key to the exploration of the mathematical zoo, upon which the continuation of the human species, and indeed all life, may one day depend.

Poem by Ted Richer

Anon

Love.

I am.

Anonymous.

When I write:

...yf my love wer in my armys

and I yn my bed agayne

To you.

Thus.

Love.

I am.

Anonymous.

When I write:

...if my love were in my arms

and I in my bed again

To you.

Thus.

Love.

I am.

Anonymous.

When I write:

To you.

Thus.

Love.

I am.

Anonymous.

When I write.

Thus.

Love.

I am.

Anonymous.

Ever.

And.

Anon.

Ted Richer teaches at the Massachusetts College of Art in Boston. He is the author of "The Writer in the Story and Other Figurations" (2003). His poems have also appeared in such journals as "Agni," "Literary Imagination," the "Harvard Review," and the "James Joyce Quarterly."

© 2008 by Ted Richer

Fiction by Chris Abani

Three Letters, One Song & A Refrain

This red string is for you, Mama

Dear Mama,

This is a kind of letter, though I am writing most of it in my heart, for you, for me, for a time when I can speak it. This torn and bloodied sheet should be enough, but words bring clarity.

My first thought after it happened was that I should wash the sheet. I should take it home and wash the shame from it. But something stayed my hand. I was afraid to take the sheet at first, afraid of him. For what seemed like a long time, I couldn't look at him. But it couldn't have been that long because his shadow

on the floor didn't move. When I looked, his eyes didn't meet mine. I guessed he was about forty. Maybe it was his greying hair. There are many stories in the camp about men like this. Ordinary men who because we are at their mercy here in Thailand, far from our home in Burma, take advantage of us like this. A rage blacker than any mud I have seen came over me, and I grabbed the sheet. At first I meant to strangle him with it but hesitated when I saw him stir, saw the hate in his eyes return. Instead I swallowed the bitter taste in my mouth and stuffed the sheet into the small raffia bag I had brought. You must take me back to the camp now, I said. You must take me home.

On the ride back, I sat shakily on the back of his motorcycle; the wind was like ice on my skin. I knew it wouldn't be long before the rain came. I had nothing to cover myself with. The man was wearing a yellow rain slicker that ensured he would stay warm and dry. I had no choice but to wrap myself in the sheet, I thought. I pulled one end of the bloodstained cloth out of my bag. It fluttered in the wind like a red sail, and I felt revulsion for myself and the man fill me. But I couldn't use it as a wrap. It would have felt more like a funeral shroud. I stared at it for a moment. There were two loose threads tickling my wrist.

Chris Abani's prose includes the novels "Masters of the Board" (1985), "GraceLand" (2005), and "The Virgin of Flames" (2007), and the novellas "Becoming Abigail" (2006) and "Song for Night" (2007). His poetry collections are "Kalakuta Republic" (2001), "Daphne's Lot" (2003), "Dog Woman" (2004), and "Hands Washing Water" (2006). He is an associate professor at the University of California, Riverside, and the recipient of the PEN USA Freedom-to-Write Award, the Prince Claus Award, a Lannan Literary Fellowship, a California Book Award, a Hurston/Wright Legacy Award, and the PEN Hemingway Book Prize.

© 2008 by Chris Abani

When I got home, I plucked them. One red string I tied around a flower and hid in the bamboo rafters; the other I tied around my wrist. This is the old way, Mama.

As we rode on that unstable motorcycle, I shoved the cloth back into the raffia bag and instead wrapped my arms around the body of the man who had just raped me. For balance: for safety. The first drop of cold wetness hit me, and I thought, let it rain, that is better than wrapping death around me.

It is still raining, Mama. The way it does here. One drop first and then sheets all at once. I used to play as a child in the rain back home. Do you remember? There is something primitive about this rain. It feels right.

I know we are Christians now, but if I had money, I would set a date for the great sacrifice and have the priest kill a boar and a white chicken as I confess my sins to the Lords of Land and Water. But I *can* tie my wrist. I still remember what you taught me, even here, even here without you. This red string is for you.

Letter to a vengeful angel

Dear Boy,

I don't know your name otherwise I would use it. So I call you boy, because that is what you are. A child: no different from me and also, like me, one who carries the burden of our people's hate. I think of you as an angel because from the bottom of that ditch where we hid from your patrol, a line of soldiers not far from me, the sun, bright through the rain, looked like an angel's wing spread over them. And you, the youngest one, followed a few steps behind. You stopped when you saw me, and there alone, framed against the fan of sun-

light, you looked like an angel. I knew you could see me; I knew because your gun was pointed at me and you were crying. I never knew soldiers could cry. But you were crying.

That is why I am writing this unspoken letter in my heart to you, and believe that because you were crying you will hear me. I have often wondered why you spared me. Was it to spare yourself the consequences of my death? Or was it because you looked deep enough into my eyes, and saw something that kept you from pulling the trigger?

I feel pity for you even though soldiers like you have treated us like animals because we are Karen. I am Karen, my mother taught me to say even as a child. To say it like this – *ko ren*. Like the fish? I asked; and she said, Why not? Our ancestors crossed the Gobi, the river of running sand to come to our homeland.

It was raining when the first soldiers came, raining and night darker than water in a well. At first we thought the mortars were thunder, the flash of tracer bullets lightning. But it was soldiers like you, and soon everything was noise and fire and smoke. People running, screaming, as bullets cut through us like sticks through wet rice paper. That's when I lost my mother. I saw my father begging for our lives as we ran out the back of the hut and into the jungle. I saw as they cut him down like a weed. And then I ran deep into the rain and the dark wet steaming jungle and lost both of them.

And in the morning, I walked out of the jungle into the burning skeleton of my village. Most of the villagers were back, and they had buried nearly all the dead. I walked to the edge of the hill, the one that falls down into the valley. From up there I used to pretend I could see the whole world, and a river whose name I have forgotten. That morning, it was just a deep ravine with a river.

I couldn't find my parents or our house at first and probably never would have if I hadn't found our neighbor's son, twelve like me, sitting on the floor by the remains of his home. Both his parents were dead, too, leaving him with his baby sister. I forgot myself at this sight. I tried to take the baby from him, but he fought me, so all day I sat next to him as he rocked her, letting her suckle at his nipple. Together we stared into the distance. It was hours before I realized the baby had died. Later, before dark, the elders gathered the survivors, and we all left for the safety of the jungle, sure the soldiers would return.

I cannot remember much about that time in the jungle hiding. Only little things, like a bird flashing by, red and rude against the jungle walls so green and dark they could have been the face of night. Staring with surprise at my reflection in a clear pool: eyes that held irises so black, a square face that made me look like a boy, and a smile that my mother used to say was like a butterfly landing on her palm. I can't find that smile anywhere, anymore.

One morning, a few days into the jungle, I woke to a woman wailing over her dead dog, and it wasn't long before other mourners joined her. They weren't crying for her dog, though. Many had lost family and their own pets. And they were crying not only because it was safe to mourn this way but also because they loved their pets. It is a sad sight: a rainy dark jungle and a woman crying over a dead dog.

I remember pulling leeches from my skin with a joy that was hard to describe. When they popped off they left a bleeding wound, red against my dark olive skin, a wound that stung. It felt good, that stinging. It felt good to feel something. We ate what we could find: worms, grubs, bananas, and even in-

sects, but no meat. It was always raining so hard we couldn't cook anything.

We couldn't even make a fire to keep us dry, to keep warm by, and soon, our clothes began to rot on us. As they rotted, we got rashes and sometimes sores. By the third week we had all lost our shame. We went to the toilet within sight of each other, men and women. It was simply safer – or felt safer – to be no further than a quick glance from each other. My period came on that trek through the jungle. I had no rags to staunch it like I had seen my mother do, so I let it run down my leg.

The rain took it all.

My mother used to say that rain here pours like a blessing, like a thick veil that parts to reveal the bride's face. But nearly every day, when this rain parted, it was not a bride's face that was revealed but a long line of soldiers, like you, like death, marching toward us, and we would always scatter with a practiced silence and hide. Six weeks after we first went to hide in the jungle, we were found by a group of Karen guerillas. They led us out of the jungle. Warned us about the paths and showed us how to avoid the mines. They led us to a refugee camp.

I feel bad because I pity you – boy, soldier – because it feels like a betrayal of my people, and of my dead parents. But maybe this is how I will relearn my beauty. If you are still alive, boy, I hope you find yours.

A song for the camp

Sing with me.

Camp: rickety shelters we would never have put our animals in, packed in tight rows like the pretend houses children might build; hunger; narrow streets running through this shanty-

town, each a river of filth and shit even the dogs avoid; hunger; scavenging the already barren countryside by the river for food; hunger; sickness, diarrhea; hunger; rain and more rain; hunger. It is hard to hold onto all that we were before we came here.

Sing with me.

I was so young when my mother left me, but I can remember the verse of Karen poetry she sang as she cooked, mixing her grief in with the food. Perhaps this is why I remember it so well:

God took the foam of water
It becomes banyan's flower
Foam of water god's taking
Keh tau weh ler kler ah klee
It becomes a banyan's seed

Sometimes I want to be the banyan seed, to hold all of Buddha's enlightenment in my heart. I heard about Jesus and the angels in this camp, and sometimes I want to be an angel. When I see hungry children like me wandering around, shoulder blades sharp as wings, I want to fly. Between my house in this camp and the one next to it is just enough space for me to spread my arms. Every day I place my arms against the wood beams of the two houses and hold them there, pushing up against each beam with all my strength. When I step out and hold my arms down, they rise into wings by themselves, and it feels like flying, and I love it because it is the best secret ever, like an angel. And I can be free, but not afraid.

A letter to my rapist

Dear Rapist,

I wasn't afraid when you came on your motorcycle to hire someone to clean your house. I wasn't afraid because I

was hungry. I had heard stories of men like you, men who prey on the weak and needy, but I wasn't afraid because whatever else you might do to me, it is better than waiting for the slow death of starvation here. And there is always the chance that you will be a good man, that you will have work and food for me.

I try to tell myself that it wasn't my fault. That if death comes to you wearing a safe face it is hard to run. We rode for a long time until we came to a hut in the middle of some rice fields. You parked your motorcycle and pulled me off. I am coming, I said, running to catch up. I had brought a small brush and rags in my raffia bag to clean with. It was a small hut and I would do a good job and be paid well. I was saving to go back to school. Once inside the hut, you pushed me onto the small mattress with a dirty white sheet in the corner and tore my clothes. I didn't understand until I felt the pain.

Surely you must have seen my fear in my eyes. I was barely thirteen; I had almost no breasts, no pubic hair; and I had been bleeding for only a few months. You must have seen the child I was in my eyes. How were you able to turn away?

I want to curse you. I want to curse you until your manhood shrivels up. I want to curse your unborn children and your wife and your mother and your father and your life. I want you to die. This is true. No one will ever see it on my face, or hear these words from me, but I want you to die.

It rained the whole ride back to the camp. I felt it on my head, and I bent back and felt the cool water run off my face like tears, and I thought that in the end this is what it is like to be a woman here. We are seen only when men want the banyan seed between our legs; until then, we are composed of shadows. Nothing more.

Did you know that I had enough rage to kill you even as I held onto you to keep from falling off your motorcycle? Did you feel the power of my eyes in your back? Perhaps not. I am not very expressive. Like my mother before me, I have learned to hide everything deep in my heart.

You dropped me off in the mud pit that is the entrance to the camp. Before you roared off on your motorcycle, I reached out and scratched your face. A deep red line appeared. I did it to mark you, so that you would not forget me. You stopped, a shout on your lips, but you hesitated. I followed your gaze. By the river to the left I saw a line of women bent in the rain like a long sad caterpillar. I knew what they were doing. Searching for food, for some root they somehow missed the day before or the day before that. They rose as one, like a wave behind me, their eyes locked on you. You fled before all those ravenous eyes, ready to devour you.

I will be free of you.

I am free of you.

Refrain for my mother

Hear me sing.

I must wash this sheet, Mama.

I return to the gate of the camp, days later, sheet clutched under my arm. The line of women are there again, bent to their labor.

I pluck a red string off the sheet and hold it up to the wind. Here, Mama, take the red string, I say. And then I walk toward the women who are always by the river, wondering if I look like a ghost as I move through the grey light. The women look up for a minute as I approach; then, as one, they dip back to the ground, fingers sifting the mud.

They don't look up as I walk into the river.

Phyllis D. Coley

*on turning green
into gold*

Anthropogenic effects on the climate and biodiversity of our planet are among the most troubling and perhaps irreversible threats facing scientists, policy-makers, and citizens. Yet many scientists are reluctant or unsure of how to apply their expertise in basic science to these pressing real-world problems. A dozen years ago I would certainly have counted myself as one of these. I had spent twenty-five years studying how rainforest trees defend their leaves against hungry, diverse, and abundant leaf-feeding insects. With my husband and collaborator Thomas Kursar, I found that mature leaves are well defended by high fiber,

Phyllis D. Coley, a Fellow of the American Academy since 2006, is professor of biology at the University of Utah. In addition to publishing numerous articles in scientific journals, she designed a drug discovery program in tropical forests with the goal of linking economic development and conservation. Coley has received many honors, including a Guggenheim Fellowship in 1989.

© 2008 by the American Academy of Arts & Sciences

making the leaves tough and low in nutrients. As a consequence, most herbivores consume tender, young leaves. Although leaves are young and expanding for only two to three weeks of their two- to three-year lifespan, 85 percent of damage in a leaf's lifetime occurs during this small window.

Thus natural selection strongly favors age-specific defenses. Our work showed that for survival, young leaves depend heavily on toxic compounds, which are recycled once the leaf stops growing and lays down tough, fibrous cell walls. The specialization of leaf-feeding insects on young leaves also means that insects must have evolved complex adaptations for finding this ephemeral resource and for detoxifying or circumventing the chemical arsenal within.

But as we studied these fascinating interactions, the rainforests of the world were disappearing at an alarming rate. Frequently, we would not only read about the accelerating pace of deforestation (and hence loss of species and ecosystem services), but also be confronted by the destruction of beautiful sites where we had once worked. We felt unprepared to do anything, but we thought that perhaps we could use our ecological knowledge about plant defenses to design a better drug discovery program – often called bioprospecting. Humans have long used plant toxins as medicines, and even today, 50 percent of prescription drugs were discovered in or modified from natural products. Plant compounds have been particularly effective for cancer treatments and remain a promising source of potential pharmaceuticals.

We hoped that bioprospecting might be an ecologically gentle but financially productive use of forests that could encourage their protection. But conventional bioprospecting projects faced two

formidable problems. One was the difficulty of finding active compounds, and the second was returning meaningful benefits to the source country. To address the first issue, we proposed collecting young leaves, as we hypothesized that they would have more promising lead compounds than mature leaves. Bioprospecting endeavors typically gather mature leaves because they are more common; however, our work showed that mature leaves rely primarily on toughness and tannins, two defenses with little therapeutic use. The collection of young leaves did in fact improve our results by an order of magnitude.

Providing immediate and meaningful benefits to the host country was the second major hurdle. In return for the export of raw leaves to the United States or Europe, countries receive, on average, royalties of 1 to 3 percent if a drug makes it to the market. But the chance of producing a marketable drug is much less than 1 in 100,000 samples tested. And even if a country were to hit the jackpot, it would take seven to twelve years for the revenue flow to appear. As a result, alternatives that provide immediate economic benefits, such as logging and cattle ranching, appear more attractive.

Because of the uncertainty of royalties, we had to explore other ways to create benefits that would provide the host countries an incentive to protect their forests. We proposed moving as much of the drug discovery process to the source country as possible. Over 45 billion dollars are spent annually on the drug discovery process, yet essentially all of this occurs in the developed world. While only a few dozen drugs emerge annually from this enormous pyramid of drug discovery research, a large number of research programs at universities and small biotechnology firms are supported directly or indirectly by funds

from pharmaceutical companies and governments. An estimated one-third of these funds support the type of research that could currently be accomplished in developing countries.

Moving this research to the source countries would not only create jobs dependent on intact rainforests, but would also provide valuable opportunities for enhancing scientific infrastructure and education. This move would assure immediate and lasting benefits whether or not a drug ever made it to market. The measure of success would not be whether one discovers a drug, but whether one is a player in the process of drug discovery. Until now, developing nations had not even been players.

We spent several frustrating years trying to convince funding agencies that despite the fact that we had no experience in drug discovery, we had a novel approach to bioprospecting that would aid conservation and economic development within biodiverse nations. Finally, with the help of a novel program at the National Institutes of Health – The Fogarty International Center’s International Cooperative Biodiversity Groups – our large group of Panamanian and U.S. scientists was able to make the dream a reality. We chose Panama because we had focused our research there for decades. It is also politically stable and at the center of the world’s most diverse hotspot for vascular plants.

In the nine years since the project’s inception and with a modest funding rate of approximately \$500,000 a year, we have established an effective program in Panama primarily carried out by Panamanians (www.icbgpanama.org). As the majority of the research activities had not been underway in Panama prior to the project, considerable funds were invested in equipment and training. For example, project funds played a major

role in establishing a chemistry laboratory at the University of Panama that has successfully purified active compounds, the majority of which are only found in the young leaves. The infrastructure improvements required the purchase of simple items such as chairs and air conditioners, as well as more sophisticated equipment such as high-pressure liquid chromatographs and the country's first nuclear magnetic resonance instrument. These improvements have been key, as it is only when scientists have local access to such resources that research and training become truly effective. Moreover, both students and principal investigators have been able to travel abroad to learn new techniques.

For the first time, Panamanian scientists established bioassays for a number of tropical diseases (malaria, American sleeping sickness, and leishmaniasis), and used three cancer cell lines and assays with the aphid and the whitefly. These tropical disease assays had to be modified so that they could be accomplished in a developing nation. Typically, these bioassays use radioactive materials, which are expensive and difficult to obtain and dispose of in many countries. This novel technology has already been freely shared with scientists from Bolivia, Madagascar, Colombia, Switzerland, and Peru. A novel assay for dengue is currently under development. New sources in nature, such as marine organisms and endophytic fungi, are also being explored. Additional funds would allow the establishment of vertebrate models in Panama, a key advance allowing testing for toxicity and efficacy of several promising leads active in the tropical disease screens.

How has this program helped Panama? Most apparently, it has provided economic benefit to Panama by creating jobs, perhaps more than would have re-

sulted from alternative, destructive uses such as logging and cattle ranching. Furthermore, these bioprospecting research opportunities have increased the ability of Panamanian scientists to publish regularly in high-quality international journals, making them more competitive in attracting additional international funding for their research, even though such funding is not widely available.

With this rise in publishing has also come an increase in educational opportunities in Panama. In the nine years of the project, almost one hundred student assistants have participated in research published in international journals. This experience has allowed them to compete successfully for admission to foreign graduate institutions. To date, seven students are abroad in doctorate programs and seventeen in master's programs. Of course, our hope is that they will return to contribute to science and conservation in Panama. In our experience, international agencies provide little support for the training and repatriation of scientists. Unless young scientists can obtain good training and also be enticed to return to their countries, developing countries will be slow at best to establish the capacity to solve their problems.

Less tangibly but equally important, the project has instilled in Panamanians greater knowledge of and pride in their country's exceptional biodiversity and their scientists, who are making important discoveries to cure national health problems. As a primarily Panamanian endeavor, the project is viewed by the public, the press, and the government as a boon to Panama, rather than as biopiracy. To maintain transparency and to spread the word about the value of biodiversity, the Panamanian students and principal investigators give dozens of talks annually to schools, farmers and fishermen, government officials and

foreign visitors. The demographic that the bioprospecting project engages is also broader than those targeted by most conservation efforts – typically rural and forest communities. Little international attention has focused on engaging the urban community, despite the fact that it could be a powerful voice for policies favoring conservation. Our bioprospecting project has broad appeal to the urban audience.

The greater national interest in biodiversity has allowed us to share our inventories of plant species in protected areas, and our experience with database design, with Panama's Interior Department, advice which they solicited to assist with their mandate of managing protected areas. The visibility of the project was also instrumental in helping the government of Panama apply for and receive World Heritage Status for one of its national parks, a jewel with an uncertain future. Naturally, the Panamanians now have a greater voice at the table regarding decisions about conservation. And in contrast to developers, extractive companies, and farmers, bioprospectors will argue for preserving forest and marine habitats.

By providing direct financial benefits in terms of jobs, enhancing educational and research experiences, creating a local voice for conservation, and raising national interest and pride in the remarkable biodiversity that exists in this small country, we are hoping to help promote the long-term conservation of these valuable resources. Their future is primarily in the hands of Panamanians, and it is therefore critical that the Panamanians receive and recognize the benefits that accrue from sustainable use of their wildlands.

Our learning curve in this project has been nearly vertical. Despite our naiveté, we established a research and training

program to promote human health, conservation, and economic development. We view these efforts as the beginning, as the program in Panama clearly works and can be an example for other countries. Regardless of the area of one's professional training, there are undoubtedly aspects that could be usefully applied to managing our planet. Although curiosity-driven research is extraordinarily appealing and may be the reason most of my generation gravitated toward our professions, now is the time to raise our noses from the microscope and stick them into world affairs. It is not only rewarding and challenging but critical.

Don Harrán

*on a Jewish musical
Renaissance*

The title of this essay is best framed as a question: Did the Jews have a musical ‘renascence’ in the Renaissance? It is impossible to answer it without asking a host of others: What is meant by Renaissance? How valid is the term as a chronological or conceptual marker in present-day humanist scholarship? How does it apply to music? Is it relevant to Jewish scholarship – was there in fact a ‘Jewish Renaissance’? Does it include music composed by Jews? And even more fundamentally, what is ‘Jewish music’ and how does it differ, if at all, from ‘music composed by Jews’?

Don Harrán is Artur Rubinstein Professor Emeritus of Musicology at The Hebrew University of Jerusalem. He is the author of numerous books and has published widely in musicological and interdisciplinary journals on sixteenth- and seventeenth-century Italian and Italo-Jewish musical topics. In 1999 he received the Michael Landau Prize for Scholarly Achievement in the Arts, and in 2006 was named Knight (Cavaliere) of the Order of the Star of Italian Solidarity.

© 2008 by the American Academy of Arts & Sciences

That the literature contains no definitive responses to these admittedly trying questions dispenses me – to my relief – from wrestling with them here. But not completely: in order to continue, I shall have to come up with as many if not clear-cut, at least quick-cut, responses as reveal the assumptions behind the discussion. They are as follows: yes, for the sake of argument, let us agree that there was a Renaissance; and that it denotes some sort of ‘renewal’; and that thus construed, it pertains, in certain ways, to Jewish culture in the later fifteenth to early seventeenth centuries; and that one can detect it in sacred and secular ‘art music,’ by which I mean, in the present case, music for two or more voices composed by Jews in Italy from the later sixteenth century on for use in the synagogue and often private Jewish or non-Jewish settings.

Here is where the semantic problems begin: when written in Hebrew and meant for the synagogue or specifically Jewish celebrations (within the community or separate households), such music might rightly be called ‘Jewish art music.’ But when written in Italian and meant for nonreligious festivities in the courts, in public, or in the residences of the more affluent Jews, it should probably be called ‘art music by Jews, though not necessarily for Jews.’ Either variety is to be distinguished from the traditional types of Jewish song heard in the synagogue for reciting prayers or reading Scriptures. Nothing about them was ‘Renaissance’ or ‘artistic’; rather they perpetuated a medieval oral practice. Nor were the works of art music meant to replace them: their performance in the synagogue was occasional.

We can glean evidence for a Jewish Renaissance in art music from two sources: Hebrew writings on music and the music itself. Their locus – until the later seven-

teenth century – was Northern Italy, particularly Mantua and Venice.

While Christians excelled in the most sophisticated forms of musical composition from the twelfth century on, the Jews were inactive. Excluding a few songs of the thirteenth-century *trouvère* Mahieu Le Juif and minnesinger Süsskind of Trimberg, both of whom, under pressure, converted to Christianity and hence ‘don’t count,’ there was no art music among the Jews until the Mantuan Davide Sacerdote *ebreo*, by profession a moneylender, published a collection of Italian madrigals in 1575. A few others followed him, most notably Salamone Rossi *ebreo*, who, employed by the Mantuan court mainly as a violinist, published thirteen collections between 1589 and 1628. By all counts, this was an astounding number for a Jewish composer, the more so since his competition at the court was, for many years, the famed Claudio Monteverdi. These collections include madrigals, *madrigaletti*, *canzonette*, instrumental works (dances, *sinfonie*, sonatas), and his Hebrew “Songs of Solomon” (1623), the first known publication of its kind.

Then, all of a sudden, the flurry of Jewish composing activity came to a halt. One may have heard art music in Italian synagogues thereafter, but its composers were usually not Jews. Rather, they were Christians commissioned by Jews to write music for special events. Italy had no Jewish composers to speak of until the nineteenth century.

The evidence for a renewal of art music among Jewish composers inheres in the works themselves. But for the interpretation of these works as connecting with something specifically Renaissance, one must turn to earlier and coeval Hebrew writers. Of the various points they make or imply, several seem to sustain the notion of a Jewish musical rena-

science. It was not the Greeks who invented music, one reads, but the Hebrews. The Greeks attributed its beginnings to Pythagoras, but for the Mantuan rabbi Judah Moscato (d. circa 1594) they erred. Moscato referred, for a proof-text, to Genesis 4:21–22. There we read about Jubal as “the father of everyone holding a lyre [a metonym for string instruments] and an aulos [the same for wind instruments]” and his half-brother Tubalcain as “an instructor of every artificer in brass and iron [brass and percussion instruments].”

Art music may have flourished in the Ancient Temple, but it had long since been forgotten. Samuel Archivolti (d. 1611), a leading rabbi and scholar, lamented its loss and yearned for its return. “Woe for us,” he wrote,

for ever since we wandered from our country because of our sins, the voice of Jacob has diminished, and during our exile songs and dances in Israel [viz. among the Jews] have ceased. What good is it for me to long for them if, among us, there is nobody who knows something about the music of Zion? Who will explain to us its proportions and great charms? Who will guide us in its paths? As it is, it has been put to rest in our sleep and all its muses are abandoned.

Exile and wanderings had taken their toll. “The events of our foreign habitation and restless running,” we are told by Archivolti’s pupil, the Venetian rabbi Leon Modena (d. 1648), “are dispersed over the lands and the vicissitudes of life abroad were enough to make the Hebrews forget all knowledge and lose all intellect.”

It irked the Jews that they fell short of the Christians in the arts and sciences. When David Provenzale (d. after 1572) and his son Abraham (d. 1602) petitioned the Mantuan Jewish authorities

in 1564 to inaugurate a Jewish “university,” they described the Christians “among whom [they] lived as ever increasing in wisdom, understanding, knowledge, and the arts.” The Jews, by contrast, were “isolated, desolate, poor, most unsightly, like lost sheep or a flock without a shepherd.” Education was to remedy the situation. “Why should we be inferior,” the petitioners wondered, “to all other peoples who have scholarly institutions and places fit for instruction in law and the sciences?” (Their request, by the way, was denied.)

The Hebrew writers claimed that the Christians had taken music, once the glory of the Jews, to turn it to their own glory. Immanuel ha-Romi (d. circa 1335) was even blunter: not taken, but stolen. “What will the science of music say to Christians?” he asked in his *Notebooks*, then answered (on music’s behalf): “I was stolen, yes stolen from the land of the Hebrews.” In his own day, he acknowledged the “complete absence of this science from among [his] people.”

Some of the writers discerned a new beginning in the later sixteenth century. But clearly the Jews could not revive something that had disappeared. Instead, they imitated the music of their neighbors. “Their ears picked up a trace of it [their own music] from their neighbors, as the remnant of a city [ancient Jerusalem] in these generations,” Modena observed. Eventually, the Jews became more proficient in writing art music, and there emerged a composer, Salamone Rossi, who was so outstanding that Modena, his greatest supporter, said of him: “He alone is exalted nowadays in this science.” He expanded on Rossi’s achievement in an encomiastic poem (in nineteen distiches, of which I quote three):

- 6 After the glory of the [Hebrew] people was dimmed completely for many days and many years,
- 7 he [Salamone] restored its crown [viz. music] to its original state as in the days of Levi’s sons [officiating] on the platforms [of the Temple].
- 8 He set the words of David’s psalms to *musika* [art music] with cheerful tunes, then saw to having the works printed.

Strangely, the beginnings of Jewish sacred art music were based on Christian models. The Jews appear to have followed these models in their first, hesitant attempts to introduce polyphony into the synagogue in 1604, in Ferrara. Having been trained in the “science of music” by a teacher, some six to eight singers, Modena reports, stood up and performed “songs and praises, hymns, and melodies in honor of the Lord, observing the ordering and relation of the various voices according to the aforementioned science.” Two decades later, Rossi composed his Hebrew sacred songs by adapting them to the procedures of Italian secular music, as employed in his early madrigals. “He worked and labored to add from his secular to his sacred works,” for he did not think it unworthy “to honor the One who favored him [with musical talents] by using that [knowledge of music] with which he had been favored.” So, except for their Hebrew text, Rossi’s sacred songs were outwardly Italian. It goes without saying that his and other Jewish composers’ secular works were Italian to the core.

And yet the Hebrew songs were authentically Hebrew. Why? Because the Jews reappropriated from the Christians what they believed was theirs to start with. In a massive treatise on the An-

cient Temple, Abraham Portaleone (d. 1612) – otherwise renowned as a physician and medical scholar – conceived of its music, which he called “rational song” (*ha-shir ha-mahshavi*), as “a science of varying pitches that, woven together [to form intervals], appear in succession and are so properly calculated in their combination as to offer the ear a pleasant and clear song with a good and sweet melody.” He then proceeded to describe its varying melodies, rhythms, voices, and instruments by reference to contemporary Italian art music.

In practicing music *all’italiana*, the Jews, after having been indolent for centuries, were ‘reviving’ their own music in all of its original, albeit imagined, refinement. Even so, it was something new in their own time. Rossi described his Hebrew songs – which he composed “according to the science of song and art music [*musika*] for three, four, five, six, seven, and eight voices” for the one purpose of “thanking God and singing to His exalted name on all sacred occasions” – as “a new thing in the land.” So did his spokesman Modena, who said that, by publishing them, the composer “is beginning something that [ever since the Ancient Temple] did not exist as such in Israel [viz. among the Jews].” Until then, Jewish song had been practiced in the synagogue. But it was not art music. The big difference between them is that the former was monophonic while the latter was contrived as “rational song” for multiple voices.

Rossi characterized his Hebrew works as ‘orderly’ – “I made them through *se-der*.” *Seder* is literally ‘order,’ though a better translation is ‘counterpoint,’ meaning the coordination of different voice parts to form a harmonious complex. The term was complemented by others, to indicate that the music was not casual in its content, but calculated,

ergo ‘rational.’ Moscato, Portaleone, and Modena spoke variously of *yaḥas* (relationship), ‘*erekh* (regulation), *ḥibbur* (composition), *haskamah* (agreement, viz. consonance), *she’ur* (proportion), *derekh* (procedure), or more specifically *darkhei ha-musika* (the conventions of art music).

The implied antonym was ‘disorderly,’ which appears to have been what the Christians thought about synagogue song. One of them remarked on the “extreme discordance in the confusion of so many voices of every variety of ages,” namely, adults down to the smallest children, singing together. Another held that the only thing the Jews get right in intoning their ritual is the “timing and pronouncing of the *Amen*.” Modena was ashamed: “Will we, who were once masters of *musika* [art music] in our prayers and hymns [in times of old], now become a laughingstock to the nations, for them to say that no longer is science in our midst?” By recuperating their ancient patrimony, the Jews would prove that they could compete with their neighbors in composing art music. There would be no reason to ridicule them for ignorance, or to quote Modena’s poem again:

- 13 No more will bitter words about the
Jews
be uttered, in a voice of scorn, by the
haughty.
- 14 They will see that full understanding is
as much a portion
of theirs as of others who flaunt it.
- 15 Though weak in [dealing] blows, in
sciences
they are a hero, as strong as oaks.

Modena clearly hoped that others would continue this ‘new’ beginning for art music among the Jews. “You should teach them [Rossi’s “Songs”] to your children,” he writes,

for them to understand the science of music, with the knowledgeable man passing it on to the student, as was said of the Levites [who originally were instructed in music by David]. I am convinced that from the day these works are published, those who learn it [the science of music] will multiply in Israel [viz. among the Jews] in order to sing to the magnificence of our God by using them and others like them.

– the implication being that there *were* “others like them.” So Rossi was not alone in producing these works. There is even evidence that Modena himself might have composed his own. But his prediction of their immediate influence was overly optimistic: it was not until the Emancipation of the Jews in mid-nineteenth-century Italy that the synagogue more regularly incorporated new works of polyphonic song in its prayer services.

Reading the language of the commentators, and weighing it against the practical remains, one senses that art music composed by Jews enjoyed a Renaissance (of sorts), and was perceived as a Renaissance (of sorts), in early modern Italy. As the Old Testament foreshadowed the New, so ancient Hebrew music was typologized by Hebrew writers as the *fons et origo* of Christian music. The Jews had no other way to revive their sonic heritage than to work back through Christian examples to what they considered rightfully theirs in its historical primacy and admirably theirs in its artistic distinction. By identifying with their past, they found the courage to compose art music in the present. But not for long: a new Dark Age of increasing socioeconomic repression was soon to descend upon them, only to obliterate any signs of renewal.

AMERICAN ACADEMY
OF ARTS & SCIENCES

President

Emilio Bizzi

Chief Executive Officer

Leslie C. Berlowitz

Chair of the Academy Trust and Vice President

Louis W. Cabot

Treasurer

John S. Reed

Secretary

Jerrold Meinwald

Editor

Steven Marcus

Librarian

Robert C. Post

Vice President, Midwest

John Katzenellenbogen

Vice President, West

Jesse H. Choper

Dædalus Board of Editors Committee

Steven Marcus, *Chair*, Joyce Appleby, Russell Banks, Stanley Hoffmann, Donald Kennedy, Martha C. Nussbaum, Neil J. Smelser, Rosanna Warren, Steven Weinberg;
ex officio: Emilio Bizzi, Leslie C. Berlowitz

Committee on Publications

Jerome Kagan, *Chair*, Jesse H. Choper, Denis Donoghue, Jerrold Meinwald;
ex officio: Emilio Bizzi, Steven Marcus, Leslie C. Berlowitz

Inside back cover: Tomb of Cappucin monks in the Roman catacombs, in a photograph from the nineteenth century. Etruscans had buried their dead in underground chambers, a practice revived by early Christians; after 380, when Christianity became the state religion of Rome, the dead were increasingly buried in church cemeteries. See Shai Lavi on *How dying became a 'life crisis,'* pages 57 – 65: “The problem of dying dates back . . . to the emergence of a wish for an intelligible hope in the face of a hopeless existence.” Image © Bettmann/Corbis.



coming up in Dædalus:

on nature Leo Marx, William Cronon, Cass Sunstein, Daniel Kevles, Bill McKibben, Harriet Ritvo, Gordon Orians, Camille Parmesan, Margaret Schabas, and Philip Tetlock & Michael Oppenheimer

on cosmopolitanism Martha C. Nussbaum, Margaret C. Jacob, A. A. Long, Pheng Cheah, Darrin McMahon, Helena Rosenblatt, Samuel Scheffler, Arjun Appadurai, Rogers Smith, Peter Brooks, and Craig Calhoun

plus poetry by C. D. Wright &c.; fiction by Wesley Brown, Alix Ohlin &c.; and notes by Richard Kraut, Ian Ayres, Charles Stanish, Barbara Finlayson-Pitts, William Kirby &c.