

MIT Open Access Articles

The Anthropology of Potentiality in Biomedicine

The MIT Faculty has made this article openly available. **Please share** how this access benefits you. Your story matters.

Citation: Taussig, Karen-Sue, Klaus Hoeyer, and Stefan Helmreich. "The Anthropology of Potentiality in Biomedicine." *Current Anthropology* 54, no. S7 (October 2013): S3–S14. © 2013 The Wenner-Gren Foundation for Anthropological Research

As Published: <http://dx.doi.org/10.1086/671401>

Publisher: University of Chicago Press, The

Persistent URL: <http://hdl.handle.net/1721.1/95832>

Version: Final published version: final published article, as it appeared in a journal, conference proceedings, or other formally published context

Terms of Use: Article is made available in accordance with the publisher's policy and may be subject to US copyright law. Please refer to the publisher's site for terms of use.





CHICAGO JOURNALS



The Anthropology of Potentiality in Biomedicine: An Introduction to Supplement 7

Author(s): Karen-Sue Taussig, Klaus Hoeyer, and Stefan Helmreich

Source: *Current Anthropology*, Vol. 54, No. S7, Potentiality and Humanness: Revisiting the Anthropological Object in Contemporary Biomedicine (October 2013), pp. S3-S14

Published by: [The University of Chicago Press](#) on behalf of [Wenner-Gren Foundation for Anthropological Research](#)

Stable URL: <http://www.jstor.org/stable/10.1086/671401>

Accessed: 04/03/2015 15:41

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



The University of Chicago Press and Wenner-Gren Foundation for Anthropological Research are collaborating with JSTOR to digitize, preserve and extend access to *Current Anthropology*.

<http://www.jstor.org>

The Anthropology of Potentiality in Biomedicine

An Introduction to Supplement 7

by Karen-Sue Taussig, Klaus Hoeyer, and Stefan Helmreich

At the beginning of the twenty-first century, potentiality serves as a central concept in the life sciences and in medical practices. This special issue of *Current Anthropology* explores how genes, cells, bodies, and populations as well as technologies, disciplines, and research areas become imbued with potential. We suggest that anthropologists of the life sciences and biomedicine should work reflexively with the concept of potentiality and the politics of its naming and framing. We lay out a set of propositions and emphasize the moral aspects of claims about potentiality as well as the productivity of the ambiguity involved when dealing with that which does not (yet and may never) exist. We suggest that potentiality is both an analytic—one that has appeared explicitly and tacitly in the history of anthropology—as well as an object of study in need of further attention. To understand contemporary meanings and practices associated with potentiality, we must integrate an awareness of our own social scientific assumptions about potentiality with critical scrutiny of how the word and concept operate in the lives of the people we study.

At the beginning of the twenty-first century, potentiality serves as an orienting concept in the life sciences, in medical practices, and in social policy related to these endeavors. Investments in ideas about potential, which have a storied history reaching back to ancient Greek philosophy, have shaped the conceptualization and practice of work in today's biomedicine; the idiom of "potential" is widely used to describe human capacities, to imagine particular human futures, and to warn against undesirable outcomes. Since the inauguration of the Human Genome Project (HGP) in the late 1980s, we have witnessed a reconfiguration of expectations about knowledge and technologies in the field of biology and biomedicine. On June 26, 2000, President Clinton hosted a White House press conference to announce the completion of a "first draft" of the human genome. At that event, genome scientist Craig Venter spoke explicitly about this work in terms of its "potential," saying, "The genome sequence represents a new starting point for science and medicine, with potential impact on every disease" (White House, Office of the Press Secretary

2000). On the same day, the British molecular biologist Michael Dexter, then director of the United Kingdom's Wellcome Trust, declared that "this is the outstanding achievement not only of our lifetime, but in terms of human history. I say this, because the Human Genome Project does have the potential to impact on the life of every person on this planet" (BBC 2000).

In public representations and contemporary scientific research, it is said that gene therapy has the potential to intervene in genetic conditions; genetic testing has the potential to reveal aspects of individual pasts and futures; pharmacogenomics has the potential to deploy new knowledge of human biological variation to develop personalized medicine tailored to the specific susceptibilities of particular individuals; stem cells have the potential to regenerate human tissue to treat spinal cord injuries, diabetes, or Alzheimer's disease; and not yet identified organisms have the potential to yield novel and useful genetic sequences.¹ Indeed, at the White House press conference, President Clinton stated that "in the coming years, doctors increasingly will be able to cure diseases like Alzheimer's, Parkinson's, diabetes and cancer" (White House, Office of the Press Secretary 2000). Potentiality suffuses con-

Karen-Sue Taussig is Associate Professor in the Department of Anthropology at the University of Minnesota (395 Hubert H. Humphrey Center, 301 19th Avenue South, Minneapolis, Minnesota 55455, U.S.A. [taussig@umn.edu]). **Klaus Hoeyer** is Associate Professor in the Department of Public Health at the University of Copenhagen (Øster Farimagsgade 5, Room 10.0.09, 1014 Copenhagen K, Denmark). **Stefan Helmreich** is Professor in the Anthropology Program at the Massachusetts Institute of Technology (77 Massachusetts Avenue, Room E53-335Q, Cambridge, Massachusetts 02139-4307, U.S.A.).

1. See, e.g., Diamantidis et al. (2011), Di Maio et al. (2012), Hwang et al. (2004), Neumann, Noda, and Kawaoka (2009), Vogel (2012), and Vieira and Riley (2013). Also see Altman (2000), a review of a talk by Francis Collins, then director of the HGP and now director of the US National Institutes of Health, in which Collins, on the eve of the completion of the "first draft" of "the human genome," previewed the kinds of claims Venter would eventually make regarding cancer and predicted many of these outcomes.

ceptualizations of life everywhere in biomedicine: in the lab, in the clinic, in social policy, among the public at large, and in the politics at work across all of these domains.

In biomedicine, potentiality generally is articulated—either by explicit naming or implicit framing or both—as a hopeful idiom through which to imagine the benefits of new medical interventions. Such visions are also often premised on disrupting the negative potentials of life—for example, various types of genetic mutations, deleterious microbes, unwanted cell growth and death, and injury and aging. At the same time, the hopeful visions so commonly articulated in biomedicine exist simultaneously with those related to increasing anxiety about the negative potentials of life in the context of food safety, biosecurity, biological weapons, and armed conflict (Chen and Sharp, forthcoming; Masco 2010, forthcoming; Vigh 2011). The constant reiteration of potential thus interacts with utopian and dystopian visions of the future of humanness framed as much in terms of limiting as realizing potentials.

As a conceptual apparatus, potentiality does complex work: to imagine or talk about potential is to imagine or talk about that which does not (yet and may never) exist. It provides an epistemic space filled with unknowns, and nevertheless “potentials” figure in the most casual and accepted manner in our everyday speech, in scientific inquiries, and also in anthropological texts. It is a term rarely explained. Given its ubiquity, the notion of potentiality is remarkably underanalyzed. In some respects, potentiality can be understood as the partner to, or flip side of, “risk”—also defined as a set of possibilities—though it has yet to be theorized in the same way.

This issue of *Current Anthropology* emerged out of a 2011 Wenner-Gren international symposium dedicated to exploring ideas and practices related to potentiality in the life sciences and medical practices and their associated social policies. Symposium participants asked whether and how such ideas and practices work toward realizing particular human futures while foreclosing others.² Participants were well aware, of course, that related concepts—for example, plasticity or latency—circulate in today’s biomedicine. Potentiality, however, strikes us as an unusually explicit and pervasive trope.

Based on ethnographic fieldwork in China, Vietnam, Brazil, the United States, the United Kingdom, Denmark, Sri Lanka, and India as well as on theoretical, philosophical, and historical analyses, the essays here investigate the effects of claims about potentiality in diverse contexts. In this introduction,

2. Initially Taussig invited Hoeyer and Mette Nordahl Svendsen to join her in proposing a symposium on the theme of potentiality and humanness in the context of the life sciences. The three of us developed the theme, and we are indebted to Svendsen for contributions surely reflected in this essay. Time constraints led Svendsen to continue as a participant, contributing a paper, rather than as a convener. During the symposium, Helmreich introduced the idea of interrogating potential as a keyword in the tradition of Raymond Williams; we asked Helmreich to join us as a coauthor to develop this work for inclusion here.

we begin by describing three distinct meanings commonly associated with potentiality, discussing how these interact with ideas around “humanness” in today’s biomedicine. We then discuss how potentiality has operated, and yet may operate, both as an analytic and as an object of study in anthropology. To give some historical context for this endeavor, we next offer a short “keyword” approach to the modern history of potentiality, seeking to place natural science and social science usages in a broader cultural history. If one were to do a comprehensive conceptual entry, one would seek to locate the epistemic space covered by potential in order to discern how the concept might be accessed in other vocabularies (e.g., in the anthropology of hope, the sociology of expectations, studies of risk imaginaries). A short section following the keyword segment outlines part of this space in contemporary social science, simultaneously pointing to the particularity of potentiality as term and idea. Finally, we introduce the common themes of the papers.

Potentiality and Humanness

In a range of texts—popular, scientific, anthropological—potentiality is used to denote very different things but tends to be employed with such straightforwardness that one hardly notices slippages in its meaning. We identify three meanings of potentiality.³ The first denotes a hidden force determined to manifest itself—something that with or without intervention has its future built into it. The second refers to genuine plasticity—the capacity to transmute into something completely different. The third suggests a latent possibility imagined as open to choice, a quality perceived as available to human modification and direction through which people can work to propel an object or subject to become something other than it is.⁴

It is a sign of the complexity of the concept of potentiality that an embryo, for example, can be understood in terms of all three of these articulations. In the first, a human embryo might be viewed as having built into it a potential future as a human. In the second, stem cells within that same embryo might be understood as having plastic potential to differentiate into any cell in an imagined future body, including malignant tumors and brain disorders. In the third, biomedical researchers might view the same cells as objects having the potential to become specific kinds of cells or organs, requiring

3. We thank Emily Martin for calling our attention to the multiple meanings of potentiality early in our exploration of the concept at a session Hoeyer, Svendsen, and Taussig organized for the 2008 meetings of the American Anthropological Association.

4. We note the social power of ideas about choice. In the United States, e.g., choice powerfully correlates with ideas about freedom and autonomy and is central both to debates about abortion and to the dynamics of prenatal testing for genetic anomalies. In her work on amniocentesis, Rayna Rapp (1999) reminds us that renderings of choice too often obscure the power dynamics that shape what kinds of choices are available and which ones are acceptable in any given context.

only a social or individual decision or choice to act as a resource for the health of its source body or for other bodies.

Each articulation reflects its own moral and political order and promise. We can observe how easily one meaning slides into another, so that a claim about potential as a hidden force resting in, say, human biology becomes subject to a (necessary) action or even choice. Once a fetus is understood—by individuals, social consensus, and/or social policy—as a potential child, for example, a set of obligations relating to bringing it to delivery easily follows (Morgan 2013). By slipping from “hidden force” to “choice,” claims about potential may come to constitute calls for action (see also Zhu 2013). Though presented as insights into “nature,” they work as vehicles for politics.

In biomedical practices, potentiality indexes a gap between what is and what might, could, or even should be. Such a gap opens up an imaginative space of magic and mystery in which future-building activities related to animating bodies and extending life in new ways loom large (Crapanzano 2004: 15). Our aim is to understand the contemporary production and uses of this imaginative space of potentiality and their effects in relation to humanness. We understand humanness as predicated on the figure of “species,” a product of a social taxonomy that, nevertheless, is taken to be a category of nature even as that “nature” is understood to be formed and reformed by “culture” (Strathern 1992).⁵ The co-constitution of organic life forms and social forms of life (Helmreich 2009) has become, with the expansion of knowledge associated with the HGP and the emergence of new biotechnologies, a productive process to examine for anthropologists who are interested in the shifting relations between nature and culture, between life and death, and among subjectivity, science, capital, and citizenship.⁶

The imaginative gap indexed by potentiality both produces and depends on a view of life as plastic, susceptible to forming and reforming. As such, potentiality is both a prism and a quality, simultaneously having discursive and material dimensions. In her study of cell culture, a set of activities and techniques that provides the essential foundation for moving and manipulating cells in contemporary biotechnological practices, Hannah Landecker (2007) argues that “biotech-

nology changes what it is to be biological” (223; see also Franklin 2007). Such a change has resulted in strawberries containing a frost-resisting gene from an arctic fish (Firsov and Dolgov 1998), transgenic bulls whose female offspring produce milk with a form of lactoferrine similar to that in human milk (Taussig 2004), and Dolly, the sheep produced through somatic cell nuclear transfer (a form of cellular intervention often referred to as “cloning”; Franklin 2007; Wilmut et al. 1997). The ability to move cells across species boundaries upends assumptions about the stability of species forms as given in nature.

Some time ago, Lynn Morgan (1989) illustrated that what might be granted “humanness” in one society would not be in another. In one vivid example, Morgan points out that nothing can convince the Arunta of central Australia that the remains of an early miscarriage bear any relation to a human being. The anthropological literature is rich with examples of flexibility regarding those entities that might be included in the category of human. Some of the most well known include ghosts whom Nuer women might marry (Evans-Pritchard 1951) and animals such as cassowaries (Bulmer 1967), which the Karam of the New Guinea highlands consider kin (brothers and sisters), or peccaries, which for the Wari of lowland Brazil contain ancestor spirits (Conklin 2001). These examples illuminate how the boundaries of humanness are understood and created through social action.

Contemporary biomedicine accentuates the porous boundaries around human species’ being by highlighting the increasingly explicit flexibility of the substances called on to concretize “life” as well as the scales (genetic, cellular, organismic, ecological) at which vitality may manifest. Our attention is called to how the boundaries of humanness—both in its physiological and conceptual senses—get recreated and rereified even as they get moved, complicated, expanded, and explicitly socialized. Landecker (2007) ends her book suggesting that “once we . . . grasp . . . how altering biology changes what it is to be biological, we may be more prepared to answer the social questions that biotechnology is raising: What is the social and cultural task of being biological entities—being simultaneously biological things and human persons—when ‘the biological’ is fundamentally plastic?” (235). The essays in this issue of *Current Anthropology* illuminate how diverse people are managing the task of being simultaneously biological things and human persons in relation to medical technologies premised on the plasticity of the biological.

Potentiality as Analytic and as Object of Study

In English, “potentiality” has etymological roots in the concept of power. It comes from the Late Latin *potentia*, which has meanings including “force,” “power,” and “lord” or “possessor,” and, from earlier Latin, *potens* or *potence*, also having connotations to do with the powerful, possible, and capable

5. All the same, humanness breaches multiple boundaries—e.g., in relation to the monstrous, the animal, the spiritual, and the merely material (Bolton 2008).

6. This is now a large and growing literature. Franklin (1995) offers an early review essay on work in this area. Kaufman and Morgan (2005) review related literature on the beginnings and ends of life. More recently, Helmreich (2011) and Hoeyer (2013) each provide extensive lists representative of the breadth of this literature. Consider also that the theme for the 2010 annual meetings of the Society for Cultural Anthropology was “Natureculture: Entangled Relations of Multiplicity.” The theme for the society’s meetings in 2012 was “Life and Death: A Conversation.” At the 2011 annual meetings of the American Anthropological Association in Montreal, the society organized a session titled “The Human Is More than Human: Interspecies Communities and the New ‘Facts of Life’: A Conversation with Dorion Sagan.”

(Onions 1966). The link to power directs our attention to the fact that framing something in terms of potential is a political act. Below, we argue that articulations of potential typically enact politics by working on and through morality, by making claims on us to do something.

Potentiality in our view operates as both an analytic with a long history and a contemporary place in anthropology as well as an object of study. As an analytic, we find in contemporary sociocultural anthropology a refined sensitivity toward emergence, how the societies and phenomena we study are contested and dynamic, always in a process of becoming (e.g., Fischer 2003; Simpson 2013) and thus oriented toward the future (Gammeltoft 2013). This viewpoint influences the questions we ask. Potentiality as an analytic implies working from a classic anthropological awareness that things could be other than they are. Today, such notions often serve as an implicit companion to expectations of and hopes for continued change (Biehl and Locke 2010). A world in a process of becoming cannot be captured in universal formulas.

From Franz Boas's (1962 [1960], 1982 [1940]) articulation of the flexibility of the human form and Ruth Benedict's (1989 [1934]) argument that humans "are plastic to the moulding force of the society into which they are born" (254), anthropologists have been key participants in creating the grounds on which the human body is viewed as a site of possibility. In Margaret Mead's preface to Benedict's 1934 *Patterns of Culture* (1989 [1934]), she suggests that Benedict apprehends particular cultures as emerging from people "having selected from the great arc of human potentialities" (xii). Benedict (1989 [1934]) herself writes, "No individual can arrive even at the threshold of his potentialities without a culture in which he participates" (253). In this articulation, potentialities are the underdetermined reservoir of human possibility. A key context for Benedict's framing was a United States in which the unity of humankind was held under suspicion by a racialized and racist order, which Benedict and other Boasians contested by positing a human biology that is flexible (though see Visweswaran 1998, which argues that such contestations ironically sometimes serve to shore up a "biology" outside "culture"). After Benedict, potentiality appears in anthropology only occasionally. As the unity of humankind is taken for granted, interest in potentialities continues increasingly to be pitched on the side of "culture." From Mary Douglas and Victor Turner to Vincent Crapanzano, anthropologists have pointed to the intriguing power and creativity of the in-between and unknown. Turner (1982), for example, named the "liminal" as the site of "pure potentiality" (44).

After what seems to be a brief gap, potentiality as an active analytical concept is reemerging in anthropological work addressing a range of social domains. In such cases, understandings of potential appear to be associated with attempts to explore how humans deal with that which is not in existence.⁷

7. See, e.g., Alain Pottage and Martha Mundy's (2004) discussion of the making of property, which is organized around a potentiality/actuality

In interpreting this work we draw on a long-standing phenomenological tradition emphasizing the intersubjective experience of the unknown (Jackson 1996, 1998). The question for us is how closer attention to potential as an analytic can help us better understand these worlds. As an analytic, potentiality allows us to reflect on features of the human condition, including various enactments, contestations, and modulations of human agency.

Looking at potentiality as an object of study, we find it to be a term that people use in everyday life, both to name what they take to be empirical processes and to frame what they theorize as the phenomenology of the world. When we as anthropologists study articulations of potential encountered in our field sites, we are approaching something named as an empirical object of concern and theorization for the people about whom we write.⁸ This approach requires we be awake to how potentiality may be very differently configured across diverse cultural traditions. During our discussions at the symposium, Jianfeng Zhu brought the meanings embedded in Chinese articulations of potential to our attention. "Potentiality," she explained, may be translated into Mandarin in a couple of ways, both of which also have ideas of power embedded in them. In one case it can be used to indicate potential power (*qian li*), while in the other it refers to potential possibility (*qian zai keneng xing*). In both cases the central logographic character, *qian* (潜), is an image of the sun hiding under water. Zhu suggests that the concept thus "implies that a great force is hiding somewhere, waiting to emerge" (Zhu 2013). Zhu explained that when translated as "potential power," the concept has a positive connotation, while when translated as "potential possibility," it indicates something negative.

In Western biomedicine, emphasis is frequently placed on

dyad originally developed by Aristotle. Also working with a potentiality/actuality dyad, William Mazzarella (2010) uses potentiality in thinking about the effects of information and computing technologies. In her study of economics and religion in the global flows of credit between a rural Chinese village and its migrants, Julie Chu (2010) describes potentiality as "that zone of indeterminacy where one must confront the hazards involved in translating desires into projects worth pursuing" (5). Sharon Kaufman, Ann Russ, and Janet Shim explore the pressures and obligations produced in the context of kidney transplantation, where "the decision making of all involved responds to" the potentials created by transplant medicine (Kaufman, Russ, and Shim 2006:85), a point Kaufman (2013) develops further. Henrik Vigh (2011) discusses how negative potential structures action in communities haunted by long-term conflicts in differing ways.

8. In a recent essay, Mette Svendsen (2011) set out to theorize the mechanisms through which patients and clinic workers in a Danish in vitro fertilization clinic imbue embryonic stem cells with certain potentials while disrupting others through shifts in meaning and trajectories. Her analysis highlights the blurring of the various modes of approaching potentiality we have described. Borrowing the concept of the blank figure from Michel Serres (1991), she describes how such shifts make the politics of potentiality into a genuine anthropological object of study. While beginning with the object of terms used by those she encountered in the field, she develops an analytic understanding of potentiality as a game of politics building on perceptions of genuine plasticity.

the idea that phenomena understood as part of nature—genes, cells, organs, bodies—contain “potential,” a hidden force residing inside the gene, cell, etc., awaiting the right technological intervention in order to be realized. In such contexts researchers often seem to describe themselves as simply “discovering” or “realizing” a natural potential without recognizing the role of human action or choice.

In an early discussion of the HGP, Hans-Jörg Rheinberger (1995) argued that the perspective ushered in with recombinant DNA technologies is one characterized by the idea of “rewriting life” in which its “medical impact is potentially unlimited” (249). Such a perspective intensified with the cloning of Dolly, which, as Sarah Franklin (2001) has argued, did not simply prove that it was possible to clone a sheep but, rather, did away with the notion of the biologically impossible itself. Emily Martin (2013) discusses another recent apparition of potentiality in the biosciences with her critique of resonances between contemporary neurobiology and the recent emergence of “affect theories” in the humanities, which strip potential of a social address, as if there existed a presocial reservoir of “natural potential.” Martin invites us to ask empirical questions about how cells, bodies, experimental systems, model organisms, persons, situations, research agendas, political programs, or even countries or regions become imbued with a sense of potential and how potentiality comes to be portrayed as a presocial “natural” fund.

We suggest that people appear to ascribe potentiality to those things they believe can be manipulated (or they desire to manipulate) and not to those perceived as being beyond human control (or seen as not in need of change). Thus, the ascription of potential depends on what is understood as both feasible and desirable, whether it is located in a nature that can be manipulated to sustain life through organ transplantation (Kaufman 2013) or in the social where inequalities or other differences can be exploited to make some bodies more available than others for medical research (Petryna 2013), for reproduction in transnational gestational surrogacy (Vora 2013), or for gamete donation (Simpson 2013).

If early anthropology saw human nature as rife with potential (Benedict 1989 [1934]; Boas 1962 [1960], 1982 [1940]), and a midcentury thinker such as Turner leaned more toward “culture” as the site of potential, today those of us engaging biomedicine witness a strange return to “nature,” but a nature conceived as having potentials that can only be realized through culture. To study potentiality as an empirical object in these sites, then, can provide a route to renewed reflexivity along with a better understanding of the implications of how people think about human capacities and where they are located. To study potentiality as an empirical process or object is to explore the articulations and practices through which potential operates as both a quality and a prism for understanding for those social actors who inhabit the domains we study.

Toward Potentiality as Keyword

In 1976, Raymond Williams’s *Keywords* documented the histories of keywords in social theory, charting the transforming meanings of such words as “nature,” “hegemony,” and “culture” (cf. Keller and Lloyd 1992; see also Helmreich and Roosth 2010). What would a keyword entry for “potentiality” look like? Following Williams, it would start with the *Oxford English Dictionary* (OED):

1. a. A capacity, a possibility; an instance of the latent capacity for development of a person, thing, etc., in which the quality of having potential is embodied.

Such an entry would then look at earlier appearances of the term, for example:

1587 J. Bridges *Def. Govt. Church of Eng.* xv. 1261 Solemne and subtill relations of abilities, potentialities, actualities, and essenties.

1690 J. Locke *Ess. Humane Understanding* ii. xxiii. 138 In this looser sense, I crave leave to be understood, when I name any of these Potentialities amongst the simple Ideas, which we recollect in our Minds, when we think of particular Substances.

1872 H. Spencer *Princ. Psychol.* (ed. 2) II. viii. vi. 586 In the joy of liberty regained there are massed together the potentialities and gratifications in general.

1875 *Encycl. Brit.* II. 522/1 The seed is the potentiality of the plant.

1879 T. H. Huxley *Hume* iii. 85 The conversion, by unknown causes, of these innate potentialities into actual existences.

A proper history of potentiality in the biosciences would reach back to Aristotle (who haunts the above extracts, too), tracking the long legacy of his vision of “potency” in such texts as *On the Generation of Animals* (1979), in which he gave potential a gendered valence as a masculinized force of creation (as seed, as form; see Delaney 1986). Skipping centuries ahead, we encounter Charles Darwin, who, writing of artificial selection in *On the Origin of Species* asked, “can the principle of selection, which we have seen is so potent in the hands of man, apply in nature?” (1964 [1859]:80). Darwin here describes human agency as potent and then wonders whether “nature” might also be so potent. Note that in Darwin, “the biological” is not itself potent but is a substance acted on by the potent force of natural selection.

During later decades, however, potency has been transposed onto the very substance of biological matter, particularly cells and genes (and see the OED’s 1875 entry, above, which offers that “the seed is the potentiality of the plant”). If potentiality was once thought of as “relations of abilities” (see also Dewey 1916, chap. 4), it is interesting to consider when and how it became a feature that things harbor in and of themselves. Recent discussions of “pluripotent,” “totipotent,” and “omnipotent” stem cells, for example, often portray cells in this way. In 1965 James Thomas Dove wrote *Hematopoietic Po-*

potentiality of the *Lymphocyte* (Dove 1965), setting the conditions for some of today's conversation. Stephen Jay Gould in *The Mismeasure of Man* (1981) endorses a view of human biology as flexible, coming down on the side of "biological potentiality" against "biological determinism." Fast-forward to the HGP and its October 1990 inception, which identified the potential of the project with the potentiality of genes themselves. Note, however, that the meaning of "potential" now shifts somewhat, moving away from the flexibility flagged by Gould to a more deterministic, constrained quality. In the early days of the HGP, Walter Gilbert became infamous for a talk in which he held up a compact disc holding gene sequence data and said, "This is you" (see Dreyfuss and Nelkin 1992:319). Gilbert (1992) explicitly turned to philosophy for ideas about potential, suggesting that new knowledge would lead to a "change in our philosophical understanding of ourselves." He argued that

We look upon ourselves as having an infinite potential. To recognize that we are determined, in a certain sense, by a finite collection of information that is knowable will change our view of ourselves. . . . As a consequence of the advance of our biological knowledge . . . we will understand *deeply* how we are assembled, dictated by our genetic information. (Gilbert 1992:96, emphasis in the original)

Here we see Gilbert worrying about potential being limited by genetic information while also promoting a project intended to develop the knowledge perceived as necessary to create DNA-based therapies to transform such potential. Indeed, in the same essay he discusses how "the possession of a genetic map and the DNA sequence of a human being will transform medicine"; it will, Gilbert tells us, facilitate "the ability to develop a medicine tailored to the individual: drugs without side effects" and to "discover specific drugs that identify and turn off . . . receptors on specific cells" involved in neurological conditions; he imagines "replacement medicines that will supply natural components of the body to enhance a natural function of the body" (Gilbert 1992:94–95). What at first glimpse looks like a limiting of potential actually rhetorically positions potential as at first present in nature, then worked on by culture, and then returned, in enhanced form, to nature (via imagined but not yet existing technologies; cf. Rabinow 1996).

Hot on the heels of this articulation comes the reintroduction of potentiality as flexibility—now veering back into a fully social register. Anxiety among proponents of the HGP that social concerns might get in the way of efforts to unlock the potential they ascribed to genes led the National Institutes of Health and the Department of Energy to establish the Ethical, Legal and Social Implications (ELSI) programs attached to the HGP. The potential in genes comes to be thought about in terms of human choice and therefore as an ethical issue: "While this information would have the potential to dramatically improve human health, it would also raise a

number of complex ethical, legal and social issues."⁹ The ELSI effort was deeply informed by a historical sensibility that recalled how earlier anxieties about genetic research had led to the 1975 Asilomar conference on recombinant DNA, in which participants' worries about potential hazards (temporarily) limited research (Berg et al. 1975; Mendelsohn 1984; Weiner 2000). In contrast to the anxieties articulated at Asilomar, in which potential hazards concerned things and processes biological (in the risk of new and potentially dangerous biological forms escaping the lab and researchers' control), with ELSI the potential hazard was sited in the zone of the social, in the risk of social practice deleteriously affecting the uses of science (see, e.g., Watson 1992). The establishment of ELSI allowed HGP researchers to use "ethics" to reassure the public that any concerns they might have were being attended to (Hoeyer and Tutton 2005). Here we see how potential has, in its most prevalent contemporary forms, several rhetorical characteristics. We note in particular that risk discourses are negative, creating anxiety and demands for control. Potential is more ambiguous; it has a moral valence, appearing boundless and suggesting possibility, danger, and desire all at once (or in turn). It opens a different kind of space.

This leaning toward a moral reading of biological potential betrays a changing understanding of biology, of nature, as increasingly malleable. "Potentiality" becomes a term with which one articulates worries and not just hopeful prospects, and it becomes linked to political decision and deliberation rather than the immanent mechanisms of nature (e.g., natural selection). Fast-forward still further to the late twentieth century and we get to the dizzyingly potent realm of stem cells and the practice of cloning with, again, "potentiality" for good and ill.

Meanings from outside biomedical practices are important, too, entering as they do into technical language by dint of the fact that language travels across the science/culture membrane with some fluidity (see Keller and Lloyd 1992). If we look at usages of "potentiality" that circulate before the 1960s, most come from philosophy—commentaries on Aristotle, Aquinas, and work by Whitehead, Heidegger, and Sartre, followed more recently by Agamben (2000) as well as Deleuze and Guattari (2001). In 1956, Richard Rorty writes his dissertation "The Concept of Potentiality" (Rorty 1956). Hannah Arendt in *The Human Condition* (1958) concerns herself with potential as emergent from human social action, a wellspring of possibility that only appears when a collective can act.

After 1960, the concept of potentiality edges into usage in psychology, continuing from there into articulations in the "human potential" movement, sited at such locales as the Esalen Institute, a California retreat dedicated to spirituality and education that emerged from Bay Area countercultural interest in Eastern religion (see Anderson 2004 [1983]). Potentiality then becomes strongly associated with self-help

9. <http://www.genome.gov/25520330>.

movements (“realizing” one’s potential becomes the edict of the age). Around the same time, references to potentiality reappear in connection with social and community possibilities. “Potentiality” circulates in African American politics with increasing frequency in the 1960s and 1970s; leveraged from earlier sociological reflections on the “potentiality of the Negro,” the word becomes part of the civil rights struggle, articulated in such publications as *Black World/Negro Digest* (1942–1976), particularly in the late 1960s.

Finally, a history of potency, potential, and potentiality in biomedicine would be incomplete if one only followed the word. One also would want to track the conceptual history in the mode advocated by historian Reinhart Koselleck (2002) or after the example of Staffan Müller-Wille and Hans-Jörg Rheinberger (2007), who use the term “epistemic space” to refer to a zone of conceptual opening. In their book *Heredity Produced* (Müller-Wille and Rheinberger 2007), the authors ask not only after the word “heredity” but the concept, which they hope to be able to discern in a variety of “prebiological” contexts. They locate heredity as an abstraction that emerges during histories of colonial movement, travel, and exchange, which unground people, animals, and plants from fixed geographies and thereby produced the question of what stays “the same” as organisms travel from one setting to another. We cannot trace a similar history for potentiality within the limits of this introduction, but this quick tour illuminates the need to consider the historically specific conceptual space taken by the biological sciences in current iterations of potentiality. When anthropologists study articulations of potentiality, when potentiality becomes an empirical object in this sense, this awareness is keenly needed. We also need to build on insights already gained in other vocabularies, such as uncertainty, hope, futures, promises, and expectations, to which we now turn.

Potentiality Engaged in Other Vocabularies

The conceptual space of potentiality partly overlaps with that of uncertainty, an idea frequently explored in medical anthropology. In her essay on genetics and Alzheimer’s, Margaret Lock (2005) nods to E. E. Evans-Pritchard, suggesting a similarity between cutting the throat of a chicken and taking a genetic test to divine the future. Lock’s argument reminds us that uncertainty is an enduring topic in medical anthropology, where embodied affliction creates existential anxieties in face of futures made uncertain in unexpected ways (see also, e.g., Farmer 1999; Whyte 1998). However, as Gibbon (2013) illustrates in her paper on genetic testing, there is a difference between approaching the unknown as uncertainty and as potentiality: by exploring people’s entanglements with the unknown, Gibbon opens a space for exploring competing projects, including new ones, emerging through the quest to eliminate an initial uncertainty.

A number of medical anthropologists have focused on the way uncertainties produce “hope” on the part of those ex-

periencing ill health and for the clinicians who treat them (e.g., Good 2001; Good et al. 1990, 1994). For Cheryl Mattingly (2010), hope offers a paradox of possibility and limits as families seek positive outcomes for their desperately ill children. This phenomenon of hope, she argues, fuels the imagination of diverse social actors—individuals and families bearing embodied afflictions, clinicians, researchers, financial investors—as they seek to produce and make sense of knowledge and technologies that offer different kinds of futures (see also Jackson 2002; Lee 2013; Zhu 2013). Jennifer Johnson-Hanks (2005) alerts us to the influence of socioeconomic disparities on our phenomenological experience of future and planning: people around the globe are allowed very different scope for planning. As suggested by Mattingly, Whyte, and others, uncertainty is inescapable, and when faced with uncertain outcomes on matters of vital importance, we might share a dependence on hope as a particular way of knowing (Miyazaki 2004).

“Promise” and “expectation” also have been taken up in various ways by scholars working to understand how such ideas work in the life sciences. In his review of this literature, Richard Tutton points to Cynthia Selin, who states that “those creatures of the future tense”—promise, expectation, speculation, vision, hope, prophecy and anticipation—have become the subject of analysis across the field of STS [Science and Technology Studies] in the past two decades” (Tutton 2011: 412). Tutton identifies two primary constellations of this work: one, emanating from a group working primarily in the United Kingdom, including himself, focusing on what has been named the sociology of expectations; and another, represented by scholars from North America, focusing more on the concept of promise. For Tutton, the sociology of expectations suggests that “expectations can . . . be understood as ‘wishful enactments’ of . . . desired futures, which have a vital relational quality, brokering relationships between actors so that expectations can become mutually shared guides for action” (Tutton 2011:413).¹⁰ In the United States, the focus on the “promissory” creates more explicit links to capitalism and financial markets as in Charis Thompson’s (2005) conception of promissory capital in the travel of reproductive material, Joe Dumit’s (2003) articulation of “venture science,” Kaushik Sunder Rajan’s (2005) focus on “biocapital,” and Mike Fortun’s (2008) analysis of *Promising Genomics* in Iceland (Tutton 2011:413). Recently, Rayna Rapp has shown in relation to pediatric research how the ability to raise expectations—and thus funds—can be a proof of knowledge value in its own right in the sense that a team’s acquisition of funding acts as leverage in its next bid: “The marvelous tools that their team’s creativity and potent funding orchestrate into existence are a legacy that supports future investigations” (Rapp 2011:666). Promises about potentials, it seems, need not be actually realized to pave the way for the expansion of institutions ded-

10. On the sociology of expectations, see also Nik Brown (2003), Nik Brown and Mike Michael (2003), and Borup et al. (2006).

icated to stewarding such potential, as Timmermans and Buchbinder (2013) illustrate in regard to unrealized potential in promises made about newborn screening programs that have, nevertheless, continued to expand.

This literature on possibility, promises, and expectations has offered key insights into the politics of naming and framing the future, but each of these concepts focuses on the ways futures are presented in definite and knowable terms. Ideas about potentiality typically retain a larger degree of ambiguity and therefore involve a slightly different form of politics. Promises, for example, relate to people making them: a person making a promise should keep it. Potentiality is more diffuse. It makes moral claims on others to act. If the HGP or a biobank has the potential to transform medicine, then funding the HGP and donating one's cells and medical information to a biobank become moral obligations (e.g., Schaefer, Emanuel, and Wertheimer 2009). Svendsen and Koch (2013), Lee (2013), Montoya (2013), Morgan (2013), and Timmermans and Buchbinder (2013) all point to the need to understand the political exploitation of these moral claims. We also want to suggest that the salience of the concept of potentiality comes, in part, from its resilience. Even as promises and expectations continually recede onto the horizon, a commitment to potential provides the grounds upon which renewed promises may be made and new expectations produced.

Both the United States' focus on promises and the United Kingdom's emphasis on expectations can be said to take an outsiders' view on the future visions of scientists, whereas parallel literatures such as the sociology of futures and the sociology of hope in contrast seek to broaden the scope to include more fundamental phenomenological aspects of human engagements with the impending. As a concept, potentiality allows the analyst to be informed by these diverse traditions and focus in new ways on dealings with the unknown as both a prism and a quality with a resilient politics through which moral claims are made.

Themes/Topics/Overview

The papers in this collection are organized into four sections reflecting long-standing anthropological concerns: what we name "politics," "economics," "relatedness," and "the human condition." In each of these domains, we see ideas about potential at work. We note that just as these domains typically intersect, so too the papers speak to more than one of them. Cutting across the four themes we have articulated, the papers also offer insights into other analytical domains, including time, space, power, inequality, labor, sacrifice, and scale. We also note that a number of the authors explicitly engage philosophy but that they do so in quite different ways.

Politics: Naming and Framing

The papers from Lynn Morgan (2013), Stefan Timmermans and Mara Buchbinder (2013), Jianfeng Zhu (2013), and Michael Montoya (2013) all speak directly to issues related to what we call the politics of potentiality. Here we see how naming and framing something in terms of potential has political effects in the world. Morgan (2013), Timmermans and Buchbinder (2013), and Zhu (2013) approach potentiality as an object of study, illuminating the broad political dynamics of biomedicine well beyond the lab and clinical practice. Morgan (2013) argues that potentiality is a tool used by Catholic moral philosophers to argue for the moral standing of embryos. Such voices, she points out, are amplified in public forums such as congressional testimony involving ethical questions not just related to abortion but also to knowledge and technologies connected to cloning, stem cell research, and in vitro fertilization that have materialized and made visible entities that may be variously viewed in terms of potential.

Examining policy related to the expansion of routinized newborn genetic screening programs, Timmermans and Buchbinder (2013) draw on Peirce's distinction between potential and actualization to illustrate how repeated claims of the potential of the technology to improve human health can overrule lack of evidence of actualization. Their project raises profound questions about how medical and technological potential are understood not only in the context of newborn genetic screening but in other contexts—such as those elaborated by Gammeltoft (2013), Gibbon (2013), and Zhu (2013)—in which genetic tests also are used to predict the future.

The idea that biomedical technologies offer insight into the future is at the heart of Zhu's (2013) examination of the routinized maternal fetal serum screening implemented as part of contemporary Chinese population policies. In Zhu's (2013) analysis we see a shift in Chinese State focus from population size—in the one-child policy that is such a preoccupation in the West—to a concern with population quality in which the concern is the health and capacities of a specific baby. Along with this shift comes a shift from state to individual in terms of responsibility for harnessing the "right" potentials.

Montoya (2013) takes a quite different approach, engaging potentiality as an analytic to examine the political dynamics of a low-income minority community in Southern California that received a multimillion dollar grant to promote a "healthy community." His paper raises important questions about which bodies, communities, and populations are seen as having potential and of what kind as well as about the politics of inclusion and exclusion in visions of the future. Illuminating the shortcomings of etiological models of health and illness that are located in a politics that fails to account for the array of factors that shape well-being, Montoya (2013) argues for a form of anthropology that dares a positive en-

agement with the politics of potentiality by influencing how futures are envisioned.

As a group, these papers illustrate the politics of naming and framing potentiality at the intersections of humanness and medical technologies. From political contestation over understandings of the beginning of individual life and its potentials (Morgan 2013) and over shaping collective life through public health and population policies (Timmermans and Buchbinder 2013; Zhu 2013) to the engaged attempt to influence such policies (Montoya 2013), these papers make explicit the politics at work in the everyday practices of imagining and working toward or against various forms of humanness in and through contemporary biomedicine.

Economics, Inequality, and the Allocation of Potential

The economy is woven through claims about new medical technologies and the practices with which they are associated. The next set of papers focuses on those aspects of economically motivated deliberation in which inequality and the allocation of resources and care shape conditions for enhancing or limiting potential. Identifying a “tyranny of potential” as the cultural work of potentiality in the arena of organ transplantation, Kaufman (2013) powerfully illustrates how the ability to redistribute vitality transforms potential into moral obligations both to give and to pursue living at all cost.

In conversation with Kaufman’s (2013) idea of the cultural work of potentiality, Petryna (2013) examines global health and the struggle for what she calls a right to recovery. Medical practice, Petryna (2013) reminds us, is premised on a belief in the potential for recovery. In her analysis we see the contradictions that emerge when the work of international clinical trials raises hopes of potential recovery for those enrolled in such trials but sometimes fails to deliver.

Lee (2013) focuses on the direct-to-consumer genomics company 23andMe, where we see echoes of earlier claims about the potential of new genetic knowledge in the company’s claim that they “believe there is a significant untapped potential for the entire health care world to engage consumers in research and in their own health.” In Lee’s (2013) analysis we see how widespread commitments to such potential merges with the market and neoliberal ideas about investing in one’s self to produce a corporate oracle where one may learn about one’s genetic past and future potentials.

In short, economy and prioritization are intertwined with issues of inequality, and these papers illustrate how potentiality claims provide an ambiguous epistemic space for negotiations about fairness. Kaufman (2013) points to the tyranny of too much, Petryna (2013) to the perils of too little, and Lee (2013) to the difficulties of maneuvering in a space of boundlessness, all in all illustrating the diversity of the economic space that is at stake in perceptions of potentiality.

Relatedness

Many new medical technologies provoke questions of relatedness in the sense of connections among people and among people and things (Carsten 2000). The essays by Robert Simpson (2013), Kalindi Vora (2013), Sahra Gibbon (2013), Mette Nordahl Svendsen and Lene Koch (2013), and Carrie Friese (2013) engage relatedness, taking us to classical anthropological themes here viewed through the prism of potentiality. These authors approach potentiality as objects in their field sites. In their papers they highlight how remaking relatedness through assisted reproductive technologies, genetic testing, and/or the production, use, and care of research organisms standing in as models for humans are shot through with ideas and practices involving dealings with the unknown and attempts to establish control.

Examining reproductive potential in the context of infertility among Sinhalese Buddhists in Sri Lanka and Pakistani Muslims in the United Kingdom, Simpson (2013) points to tensions between the apparent technological simplicity of assisted reproduction and the challenges people confront as they seek to realize reproductive potential that is consonant with their cultural values while also ensuring that they do not create undesired relationships.

Vora investigates the phenomenon of transnational gestational surrogacy in India, an example of stratified reproduction (Colen 1995), where European, American, Israeli, and other first world couples seek solutions to infertility through commissioning the reproductive potential of poor Indian women. She returns our attention to how global economic inequalities construct potential as resting in less fortunate others while its realization is seen as a matter of choice for those in more privileged positions. In so doing, Vora’s (2013) analysis illustrates the labor involved in producing human relatedness, highlighting who benefits and who loses in such efforts to realize reproductive potential.

Gibbon (2013) examines the expansion of breast cancer genetics in Brazil. She focuses on how cancer genetics is co-produced with the multiple forms of potentials relating to health and ancestry based on both selective understandings of the past and creative makings of the future. Thereby she shows how a technology does not embody one particular potential but is made to do different things depending on context. Anxieties, risks, hopes, and aspirations mix as patients seek to understand their future health in part through making certain aspects of their family history explicit.

With Svendsen and Koch (2013) we see a different model of relatedness at work premised on the evolutionary relatedness of humans and pigs. Here again we hear echoes of early claims about potential in their citation of researchers’ claims that the genome sequence of the pig “extends the potential of the pig as a biomedical model” (Groenen et al. 2012:393). Conducting fieldwork in a laboratory where fetal piglets are imbued with potential to act as substitutes for the preterm infant in need of treatment, Svendsen and Koch

(2013) illustrate how specific understandings of humanness and moral worth create relations between species through ritualized sacrifice.

Friese (2013) continues this exploration of species relatedness in a lab where researchers link the care of laboratory animals with care of future patients. She shows how materializing the potentials perceived in animal models requires care and focuses on how scientists explicitly integrate care into their practices to create translatable findings. In elaborating the specifics of the laboratory practices she observes, Friese (2013) illuminates the practical moral work involved in efforts to realize desired potentials.

This group of papers illustrates how malleable bonds may be as they take shape through political-scientific and moral boundary work undertaken to imbue gametes and technologies (Simpson 2013), poor Indian women and commissioning Western parents (Vora 2013), as well as living research materials (Friese 2013; Svendsen and Koch 2013) with potential.

The Human Condition

Working across scales, from the electrical energy of cells to deep psychological processes and fetal imaging, the papers from Helmreich (2013), Martin (2013), and Gammeltoft (2013) offer insights into how potential is at work in diverse renderings of the human condition. Helmreich (2013) leverages potentiality from object to analytic, exploring the material and rhetorical power of ideas about potential energy in cardiologists' and neurologists' attention to electromagnetic activity in heart and brain cells and complexes. He highlights the temporal aspect of potential in iterative repetitive processes such as heartbeats or rhythmic neural activity, and he wonders whether the "body electric" might offer new or complementary ways for medical anthropologists to think about embodiment and the human condition.

Delving into the histories of anthropology and experimental psychology, Martin (2013) engages potentiality as an object. She excavates a history of psychological experiments in which anthropologists, psychologists, and physicians worked to develop a synthetic view of human capacities and contrasts such views to those of contemporary theorists in both neuroscience and the humanities for whom the social is considered virtually irrelevant to human perception and who construe potentiality as a nonsocial reservoir into which they should have privileged insight.

Gammeltoft (2013) uses philosophical insights to strengthen potentiality as both an analytic and an object of study. Gammeltoft (2013) illustrates how sonograms are used in Vietnam to evaluate fetal potential in relation to a troubled past involving, among other things, poisonous warfare chemicals and to the potential of the nation. Engaging Martin Heidegger's understanding of the human condition as always already structured in an orientation to the future, Gammeltoft (2013) argues that the "potentiality for Being" must be rig-

orously understood in temporal terms of a future that is not only imagined but also remembered, and thereby she provides a narrative powerfully illustrating the "potential of ethnography" called for in Martin's (2013) paper.

These three papers invite us to think about potentiality as a vocabulary that may produce a new imaginary space for rethinking humanness (Helmreich 2013), to critique potentiality claims and the ways they may be used to strip articulations of the human condition of sociality (Martin 2013), and to consider potentiality as a combined analytic and object of study through which we may understand basic features of the human condition (Gammeltoft 2013).

Anthropology and Potentiality

Potentiality suffuses contemporary life sciences and medical practice. Drawing on ethnographic fieldwork in diverse settings as well as theoretical, historical, and philosophical analysis, the essays in this issue of *Current Anthropology* offer insights into many manifestations of the dynamics through which potentiality is engaged in everyday life. They offer views into how invocations of potential in these domains shape and are shaped by evolving perceptions of humanness.

Based on our discussions during the symposium and our reading of these papers, we suggest that in order to engage potentiality productively, it is important to reflect on tacit assumptions embedded in our analytic; to see how the naming and framing of that which is not (yet and may never be) present produces and works through dynamics of power; and to understand power dynamics in light of phenomenologies of agency that materialize in people's dealings with the unknown. We assert that a successful study of potentiality should achieve three objectives: it should be reflexive; it must bring in the social and understand local specificity, keeping clear of universalisms while illuminating what possibilities it facilitates and what options it forecloses; and it must give room for subjectivity. The essays assembled here respond to these multiple demands.

Acknowledgments

We thank the Wenner-Gren Foundation for Anthropological Research for supporting the symposium that led to this collection of papers. Leslie Aiello, the foundation's president, and Laurie Obbink, who coordinates the foundation's symposium program, were unstintingly thoughtful and generous in helping to develop and facilitate the remarkable intellectual environment in which the symposium occurred. Leslie Aiello, Laurie Obbink, and Daniel Salas provided invaluable assistance in shepherding this special issue of *Current Anthropology* into existence. We are indebted to the anonymous reviewers whose reflections and suggestions strengthened our essay. Mette Nordhal Svendsen provided invaluable input into the early conversations that led to the symposium. Finally, we

thank all of the contributors to the symposium for contributing to a lively and collegial intellectual conversation about potentiality, humanness, and contemporary biomedicine.

References Cited

- Agamben, Giorgio. 2000. *Potentialities: collected essays in philosophy*. Stanford, CA: Stanford University Press.
- Altman, Lawrence K. 2000. Reading the book of life: the doctor's world; genomic chief has high hopes, and great fears, for genetic testing. *New York Times*, June 27, science sec. <http://www.nytimes.com/2000/06/27/science/reading-book-life-doctor-s-world-genomic-chief-has-high-hopes-great-fears-for.html?ref=francisscollins>.
- Anderson, Walter Truett. 2004 (1983). *The upstart spring: Esalen and the human potential movement: the first twenty years*. Old Tappan, NJ: Addison Wesley.
- Arendt, Hannah. 1958. *The human condition*. Chicago: University of Chicago Press.
- Aristotle. 1979. *On the generation of animals*. A. L. Peck, trans. Cambridge, MA: Harvard University Press.
- BBC. 2000. What they said: genome in quotes. *BBC News*, June 26, science/nature sec. <http://news.bbc.co.uk/2/hi/science/nature/807126.stm>.
- Benedict, Ruth. 1989 (1934). *Patterns of culture*. Boston: Houghton Mifflin.
- Berg, Paul, David Baltimore, Sydney Brenner, Richard O. Roblin III, and Maxine F. Singer. 1975. Summary statement of the Asilomar conference on recombinant DNA molecules. *Proceedings of the National Academy of Sciences of the USA* 72(6):1981–1984, doi:10.1073/pnas.72.6.1981.
- Biehl, João, and Peter Locke. 2010. Deleuze and the anthropology of becoming. *Current Anthropology* 51(3):317–351.
- Boas, Franz. 1962 (1960). *Anthropology and modern life*. New York: Norton.
- . 1982 (1940). *Race, language and culture*. Chicago: University of Chicago Press.
- Bolton, C. 2008. Introduction: the limits of “the limits of the human.” In *Limits of the human*. F. Lunning, ed. Pp. xi–xvi. Minneapolis: University of Minnesota Press.
- Borup, Mads, Nik Brown, Kornelia Konrad, and Harro van Lente. 2006. The sociology of expectations in science and technology. *Technology Analysis and Strategic Management* 18(3/4):285–298.
- Brown, Nik. 2003. Hope against hype: accountability in biopasts, presents and futures. *Science Studies* 16(2):3–21.
- Brown, Nik, and Mike Michael. 2003. A sociology of expectations: retrospectively prospecting and prospecting retrospects. *Technology Analysis and Strategic Management* 15(1):3–18.
- Bulmer, Ralph. 1967. Why is the cassowary not a bird: a problem of zoological taxonomy among the Karam of the New Guinea highlands. *Man*, n.s., 2(1): 5–25.
- Carsten, Janet, ed. 2000. *Cultures of relatedness: new approaches to the study of kinship*. Cambridge: Cambridge University Press.
- Chen, Nancy N., and Lesley Sharp, eds. Forthcoming. *Biosecurity and vulnerability*. Santa Fe, NM: School for Advanced Research Press.
- Chu, Julie Y. 2010. *Cosmologies of credit: transnational mobility and the politics of destination in China*. Durham, NC: Duke University Press.
- Colen, Shellee. 1995. “Like a mother to them”: stratified reproduction and West Indian childcare workers and employers in New York. In *Conceiving the new world order: the global politics of reproduction*. Faye Ginsburg and Rayna Rapp, eds. Pp. 78–102. Berkeley: University of California Press.
- Conklin, Beth. 2001. *Consuming grief: compassionate cannibalism in an Amazonian society*. Austin: University of Texas Press.
- Crapanzano, Vincent. 2004. *Imaginative horizons: an essay in literary-philosophical anthropology*. Chicago: University of Chicago Press.
- Darwin, Charles. 1964 (1859). *On the origin of species*. Facsimile edition. Cambridge, MA: Harvard University Press.
- Delaney, Carol. 1986. The meaning of paternity and the virgin birth debate. *Man*, n.s., 21(3):494–513.
- Deleuze, Gilles, and Felix Guattari. 2001. *A thousand plateaus*. London: Athlone.
- Dewey, John. 1916. *Democracy and education: an introduction to the philosophy of education*. New York: Macmillan.
- Diamantidis, Alexandros D., James R. Carey, Christos T. Nakas, and Nikos T. Papadopoulos. 2011. Population-specific demography and invasion potential in medfly. *Ecology and Evolution* 1(4):479–488.
- Di Maio, Sabina, Giuseppe Polizzotto, Enrico Di Gangi, Giusy Foresta, Giuseppe Genna, Antonella Verzera, Antonio Scacco, Gabriele Amore, and Daniele Olivia. 2012. Biodiversity of indigenous *Saccharomyces* populations from old wineries of south-eastern Sicily (Italy): preservation and economic potential. *PLoS ONE* 7(2):e30428, doi:10.1371/journal.pone.0030428.
- Dove, James Thomas. 1965. *Hematopoietic potentiality of the lymphocyte*. Cleveland, OH: Western Reserve University.
- Dreyfuss, R., and Dorothy Nelkin. 1992. The jurisprudence of genetics. *Vanderbilt Law Review* 45(2):313–348.
- Dumit, Joe. 2003. A pharmaceutical grammar: drugs for life and direct-to-consumer advertising in an era of surplus health. Department of Anthropology, University of California, Davis.
- Evans-Pritchard, E. E. 1951. *Kinship and marriage among the Nuer*. Oxford: Oxford University Press.
- Farmer, Paul. 1999. *Infections and inequalities: the modern plagues*. Berkeley: University of California Press.
- Firsov, A. P., and S. V. Dolgov. 1998. Agrobacterial transformation and transfer of the antifreeze protein gene of winter flounder to the strawberry. *Acta Horticulturae (ISHS)* 484:581–586. http://www.actahort.org/books/484/484_99.htm.
- Fischer, Michael. 2003. *Emergent forms of life*. Durham, NC: Duke University Press.
- Fortun, Mike. 2008. *Promising genomics: Iceland and deCODE genetics in a world of speculation*. Berkeley: University of California Press.
- Franklin, Sarah. 1995. Science as culture, cultures of science. *Annual Review of Anthropology* 24:163–184.
- . 2001. Culturing biology: cell lines for the second millennium. *Health* 5(3):335–354.
- . 2007. *Dolly mixtures: the remaking of genealogy*. Durham, NC: Duke University Press.
- Friese, Carrie. 2013. Realizing potential in translational medicine: the uncanny emergence of care as science. *Current Anthropology* 54(suppl. 7):S129–S138.
- Gammeltoft, Tine M. 2013. Potentiality and human temporality: haunting futures in Vietnamese pregnancy care. *Current Anthropology* 54(suppl. 7): S159–S171.
- Gibbon, Sahra. 2013. Ancestry, temporality, and potentiality: engaging cancer genetics in southern Brazil. *Current Anthropology* 54(suppl. 7):S107–S117.
- Gilbert, Walter. 1992. A vision of the grail. In *The code of codes: scientific and social issues in the Human Genome Project*. Daniel Kevles and Leroy Hood, eds. Pp. 83–97. Cambridge, MA: Harvard University Press.
- Good, Mary-Jo D. 2001. The biotechnical embrace. *Culture, Medicine and Psychiatry* 25(4):395–410.
- Good, Mary-Jo D., Byron Good, Cynthia Schaffer, and Stuart E. Lind. 1990. American oncology and the discourse on hope. *Culture, Medicine and Psychiatry* 14(1):59–79.
- Good, Mary-Jo D., Tseunetsugu Munkata, Yasuki Kobayashi, Cheryl Mattingly, and Byron Good. 1994. Oncology and narrative time. *Social Science and Medicine* 38(6):855–862.
- Gould, Stephen J. 1981. *The mismeasure of man*. New York: Norton.
- Groenen, M. A., A. L. Archibald, H. Uenishi, C. K. Tuggle, Y. Takeuchi, M. F. Rothschild, C. Rogel-Gaillard, et al. 2012. Analyses of the pig genomes provides insight into porcine demography and evolution. *Nature* 491:393–398.
- Helmreich, Stefan. 2009. *Alien ocean*. Berkeley: University of California Press.
- . 2011. What was life? *Critical Inquiry* 37(4):671–696.
- . 2013. Potential energy and the body electric: cardiac waves, brain waves, and the making of quantities into qualities. *Current Anthropology* 54(suppl. 7):S139–S148.
- Helmreich, Stefan, and Sophia Roosth. 2010. Life forms: a keyword entry. *Representations* 112:27–53.
- Hoeyer, Klaus. 2013. *Exchanging human bodily material: rethinking bodies and markets*. Dordrecht, Netherlands: Springer.
- Hoeyer, Klaus, and Richard Tutton. 2005. “Ethics was here”: studying the language-games of ethics in the case of UK Biobank. *Critical Public Health* 15(4):385–397.
- Hwang, Woo Suk, Young June Ryu, Jong Hyuk Park, Eul Soon Park, Eu Gene Lee, Ja Min Koo, Hyun Yong Jeon, et al. 2004. Evidence of a pluripotent human embryonic stem cell line derived from a cloned blastocyst. *Science* 303(5664):1669–1674, doi:10.1126/science.1094515.
- Jackson, Michael. 1996. Phenomenology, radical empiricism, and anthropological critique: an introduction. In *Things as they are: new directions in phenomenological anthropology*. Michael Jackson, ed. Pp. 1–50. Bloomington: Indiana University Press.

- . 1998. *Minima ethnographica: intersubjectivity and the anthropological project*. Chicago: University of Chicago Press.
- . 2002. Biotechnology and the critique of globalism. *Ethnos* 67(2):141–154.
- Johnson-Hanks, Jennifer. 2005. When the future decides: uncertainty and intentional action in contemporary Cameroon. *Current Anthropology* 46(3):363–377.
- Kaufman, Sharon R. 2013. Fairness and the tyranny of potential in kidney transplantation. *Current Anthropology* 54(suppl. 7):S56–S66.
- Kaufman, Sharon R., and Lynn M. Morgan. 2005. The anthropology of the beginnings and ends of life. *Annual Review of Anthropology* 34:317–341.
- Kaufman, Sharon R., Ann Russ, and Janet Shim. 2006. Aged bodies and kinship matters: the ethical field of kidney transplant. *American Ethnologist* 33(1):81–99.
- Keller, Evelyn Fox, and Elisabeth Lloyd, eds. 1992. *Keywords in evolutionary biology*. Cambridge, MA: Harvard University Press.
- Koselleck, Reinhart. 2002. *The practice of conceptual history: timing history, spacing concepts*. Todd Presner, Kerstin Hehnke, and Jobst Welge, trans. Palo Alto, CA: Stanford University Press.
- Landecker, Hannah. 2007. *Culturing life: how cells became technologies*. Cambridge, MA: Harvard University Press.
- Lee, Sandra Soo-Jin. 2013. American DNA: the politics of potentiality in a genomic age. *Current Anthropology* 54(suppl. 7):S77–S86.
- Lock, Margaret. 2005. Eclipse of the gene and the return of divination. *Current Anthropology* 46(suppl. 5):S47–S70, doi:10.1086/432452.
- Martin, Emily. 2013. The potentiality of ethnography and the limits of affect theory. *Current Anthropology* 54(suppl. 7):S149–S158.
- Masco, Joseph. 2010. Bad weather: on planetary crisis. *Social Studies of Science* 40(1):7–40.
- . Forthcoming. *The theater of operations: national security affect from the Cold War to the War on Terror*. Durham, NC: Duke University Press.
- Mattingly, Cheryl. 2010. *The paradox of hope: journeys through a clinical borderland*. Berkeley: University of California Press.
- Mazzarella, William. 2010. Beautiful balloon: the digital divide and the charisma of new media in India. *American Ethnologist* 37(4):783–804.
- Mendelsohn, Everett. 1984. “Frankenstein at Harvard”: the public politics of recombinant DNA research. In *Transformation and tradition in the sciences: essays in honor of I. Bernard Cohen*. Everett Mendelsohn, ed. Pp. 317–335. Cambridge: Cambridge University Press.
- Miyazaki, Hirokazu. 2004. *The method of hope: anthropology, philosophy, and Fijian knowledge*. Palo Alto, CA: Stanford University Press.
- Montoya, Michael J. 2013. Potential futures for a healthy city: community, knowledge, and hope for the sciences of life. *Current Anthropology* 54(suppl. 7):S45–S55.
- Morgan, Lynn M. 1989. When does life begin? a cross-cultural perspective. In *Abortion rights and fetal “personhood.”* Edd Doerr and James Prescott, eds. Pp. 89–107. Long Beach, CA: Centerline.
- . 2013. The potentiality principle from Aristotle to abortion. *Current Anthropology* 54(suppl. 7):S15–S25.
- Müller-Wille, Staffan, and Hans-Jörg Rheinberger, eds. 2007. *Heredity produced: at the crossroads of biology, politics, and culture, 1500–1870*. Cambridge, MA: MIT Press.
- Neumann, Gabriele, Takeshi Noda, and Yoshihiro Kawaoka. 2009. Emergence and pandemic potential of swine-origin H1N1 influenza virus. *Nature* 459(7249):931–939.
- Onions, C. T., ed. 1966. *Oxford dictionary of English etymology*. Oxford: Oxford University Press.
- Petryna, Adriana. 2013. The right of recovery. *Current Anthropology* 54(suppl. 7):S67–S76.
- Pottage, Alain, and Martha Mundy. 2004. *Law, anthropology, and the constitution of the social: making persons and things*. Cambridge: Cambridge University Press.
- Rabinow, Paul. 1996. *Essays on the anthropology of reason*. Princeton, NJ: Princeton University Press.
- Rapp, Rayna. 1999. *Testing women, testing the fetus: the social impact of amniocentesis*. New York: Routledge.
- . 2011. Chasing science: children’s brains, scientific inquiries, and family labors. *Science, Technology, and Human Values* 36(5):662–684.
- Rheinberger, Hans-Jörg. 1995. Beyond nature and culture: a note on medicine in the age of molecular biology. *Science in Context* 8(1):249–263.
- Rorty, Richard. 1956. The concept of potentiality. PhD dissertation, Yale University, New Haven, CT.
- Schaefer, G. Owen, Ezekiel J. Emanuel, and Alan Wertheimer. 2009. The obligation to participate in biomedical research. *Journal of the American Medical Association* 302(1):67–72, doi:10.1001/jama.2009.931.
- Serres, Michel. 1991. *Rome: the book of foundations*. Felicia McCarren, trans. Stanford, CA: Stanford University Press.
- Simpson, Bob. 2013. Managing potential in assisted reproductive technologies: reflections on gifts, kinship, and the process of vernacularization. *Current Anthropology* 54(suppl. 7):S87–S96.
- Strathern, Marilyn. 1992. *After nature: English kinship in the late 20th century*. Cambridge: Cambridge University Press.
- Sunder Rajan, Kaushik. 2005. *Biocapital: the constitution of postgenomic life*. Durham, NC: Duke University Press.
- Svendsen, Mette N. 2011. Articulating potentially: notes on the delineation of the blank figure in human embryonic stem cell research. *Cultural Anthropology* 26(3):414–437.
- Svendsen, Mette N., and Lene Koch. 2013. Potentializing the research piglet in experimental neonatal research. *Current Anthropology* 54(suppl. 7):S118–S128.
- Taussig, Karen-Sue. 2004. Bovine abominations: genetic culture and politics in the Netherlands. *Cultural Anthropology* 19(3):305–336.
- Thompson, Charis. 2005. *Making parents: the ontological choreography of reproductive technologies*. Cambridge, MA: MIT Press.
- Timmermans, Stefan, and Mara Buchbinder. 2013. Potentializing newborn screening. *Current Anthropology* 54(suppl. 7):S26–S35.
- Turner, Victor. 1982. *From ritual to theatre: the human seriousness of play*. New York: Performing Arts Journal Publications.
- Tutton, Richard. 2011. Promising pessimism: reading the futures to be avoided in biotech. *Social Studies of Science* 41(3):411–429.
- Vieira, Joaquim M., and Paul R. Riley. 2013. Chemical genetics and its potential in cardiac stem cell therapy. *British Journal of Pharmacology* 169(2):318–327, doi:10.1111/j.1476-5381.2012.01928.x.
- Vigh, Henrik. 2011. Vigilance: on conflict, social invisibility, and negative potentiality. *Social Analysis* 55(3):93–114.
- Visweswaran, Kamala. 1998. Race and the culture of anthropology. *American Anthropologist* 100(1):70–83.
- Vogel, Gretchen. 2012. Potential egg stem cells reignite debate. *Science* 335(6072):1029–1030.
- Vora, Kalindi. 2013. Potential, risk, and return in transnational Indian gestational surrogacy. *Current Anthropology* 54(suppl. 7):S97–S106.
- Watson, James D. 1992. A personal view of the project. In *The code of codes: scientific and social issues in the Human Genome Project*. Daniel Kevles and Leroy Hood, eds. Pp. 164–173. Cambridge, MA: Harvard University Press.
- Weiner, Charles. 2000. Recombinant DNA, policy, Asilomar. In *Encyclopedia of ethical, legal, and policy issues in biotechnology*. Thomas Murray and Maxwell Mehlman, eds. Pp. 909–914. New York: Wiley.
- White House, Office of the Press Secretary. 2000. “Remarks by the president, Prime Minister Tony Blair of England (via satellite), Dr. Francis Collins, director of the National Human Genome Research Institute, and Dr. Craig Venter, president and chief scientific officer, Celera Genomics Corporation, on the completion of the first survey of the entire human genome project,” June 26. http://www.ornl.gov/sci/techresources/Human_Genome/project/clinton2.shtml.
- Whyte, Susan Reynolds. 1998. *Questioning misfortune: the pragmatics of uncertainty in eastern Uganda*. Cambridge: Cambridge University Press.
- Wilmot, I., A. E. Schnieke, J. McWhir, A. J. Kind, and K. H. Campbell. 1997. Viable offspring derived from fetal and adult mammalian cells. *Nature* 385(27):810–813.
- Zhu, Jianfeng. 2013. Projecting potentiality: understanding maternal serum screening in contemporary China. *Current Anthropology* 54(suppl. 7):S36–S44.