

For an ethics of promising, or: a few kind words about James Watson

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ABSTRACT *This essay questions some of the limits that both science studies and bioethics have assumed in their engagements with technoscience, and genomics in particular. It argues that these disciplines have privileged an “ethics of suspicion” regarding technoscience, and argues that this is ill-suited to promissory sciences such as genomics. The essay begins to develop elements of an “ethics of friendship” toward genomics, using examples from toxicogenomics and behavioral genetics, to suggest what an ethics of promising might involve.*

To breed an animal *with the right to make promises*—is not this the paradoxical task that nature has set itself in the case of man? is it not the real problem regarding man?
(Friedrich Nietzsche, überbioethicist, 1956)

When I first began researching and writing about the Human Genome Project in the United States (Fortun, 1993), I was fairly confident that I knew what was going on, a knowledge summarized only a bit too crudely as: nothing particularly new. Despite some interesting and important science, some noteworthy institutional and financial shifts, and a slew of ‘implications’ yet to unfold in the domains of ethics, clinics, and the law, I read the future then pretty much in terms of reproducing the past: more genetic reductionism, more biologization of human conditions better understood as ‘social’ or at least not simply ‘genetic’, more stigmatization (or worse) of the ab-normal. Enacting my own type of reductive analysis, I sublated the future into the past, and understood the many promises then being made about genomics and its future as little more than ‘hype’.

And there was indeed plenty of hype, or ‘overpromising’, to go around: codes to be decoded, blueprints of ‘what it means to be human’ to be drawn precisely, ‘books of life’ to be read, diseases to be cured—in a word, the ‘holy grail’ of biology to be grasped and quaffed. Obviously, such rhetoric needed to be deconstructed if not deflated, so it’s not so much that critics of genomics like me were

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wrong, but that our readings were limited. My way of now summarizing that set of limitations is: I did not remain open to the promise, to a future still to come—maybe—that would not simply repeat the past and present.

That future, now past and present, came under the sign of what Evelyn Fox Keller calls ‘the funny thing that happened on the way to the holy grail’, in which the ‘extraordinary progress’ we’ve made with our infrastructure for manipulating genes ‘has become less and less describable within the discourse that fostered it. The dogmatic focus on gene action called forth a dazzling armamentarium of new techniques for analyzing the behavior of distinct gene segments, and the information yielded by those techniques is now radically subverting the doctrine of the gene as sole (or even primary) agent’ (Keller, 1995, pp. 21–2). I will have more to say about such radical subversions of biological concepts later in this essay. For now I only note that at least one promise made by proponents of the HGP had indeed been kept, albeit somewhat funnily: our understanding of genes, their actions, and their interactions has been transformed, and remarkably so.

Trying to be more open and attuned to the ambiguities, contradictions and powers of promising in the worlds of genomics, I was initially intrigued and hopeful when in 1998 a completely unheard of genomics company, deCODE Genetics, and its completely unheard of CEO and founder, Kári Stefansson, burst onto the Icelandic and genomic landscapes. *Cool*, I thought: *genomics start-up in nation on margins of global bio-economy tries to enter a game dominated by US and European enterprises*. Six years of researching, speaking on, and writing about deCODE as a particularly volatile case study of the volatile commercial genomics sector in a volatile time, the intensely speculative economy of the late 1990s, has certainly tempered my original optimism. Here is a case so chock-full of false and broken promises, unbridled arrogance, intellectual and financial dishonesty, questionable science, and ugly politics, that I can confidently make the ‘forward-looking statement’ that Kári Stefansson has the *least* right to make promises of any genomics company CEO I know (Fortun, 2001; Fortun, forthcoming).

So it’s not like I’m naïve about the potential hollowness or deceptiveness of promises. But it’s precisely because promising is always open to such ‘infelicities’, as J.L. Austin (1962) has put it, that I think inventing an ethics of promising is so vital for our future engagements with genomics. Indeed, it’s the deCODE case more than any other that convinced me not only of the extremely troubling but also the extremely laudable character of promising, as a fundamentally paradoxical and human act. The rhetoric of the promise is everywhere in genomics, and it’s all too easy and all too tempting to dismiss or overlook the real paradoxes of promising, and either take such statements at face value, or dismiss them as ‘mere hype’. Promising cannot be reduced to either empty hype, or to formal contract, but occupies the uncertain, difficult space in between. The promise and related statements involving the future—speculations, hope, hype, and what the US Securities and Exchange Commission calls ‘forward-looking statements’—may be volatile, but they are also absolutely necessary, to every economy and to every science, but especially to an emergent technoscience like genomics. As

Nik Brown (2003, p. 20) has elucidated in his own analysis of promising genomics, in the 'community of promise' that is genomics it is 'impossible to fully disentangle present hype from future reality'.

How can science studies scholars work on and within these 'communities of promise', when acts of promising exceed any habitual intellectual relationship, most notably skepticism, at which we may have become particularly adept? That can only be an experimental question whose final outcome must remain, like its genomic counterpart, promised. Such a breeding experiment, and its paradoxes, are what I want to address in this essay. The breeding experiment is one we need to run on ourselves, enhancing the next generation of bioethicists and bioscientists with some new concepts and some new ethics of promising, which will be closely tied to what I think of as an ethic of friendship with the sciences.

To begin figuring out what an ethic of promising in the study of genomics would look and feel like, let me start with some recent testimony from an STS scholar before the US Congress. The subject was a new one, nanotechnology, but the question was the old one: what is to be done? Addressing the question of an ethics appropriate to nanotechnology required some additional testimony concerning the ethics of ethicists, social scientists, and humanists who deal with science and technology. Congress should take care 'to avoid the drift toward moral and political triviality', cautioned this STS scholar, by *not* encouraging or facilitating the emergence of a new class of ethical experts. Referencing the recent history of bioethics, he outlined the ethical shortcomings of today's science ethicists:

I would not advise you to pass a Nanoethicist Full Employment Act, sponsoring the creation of a new profession. Although the new academic research in this area would be of some value, there is also a tendency for those who conduct research about the ethical dimensions of emerging technology to gravitate toward the more comfortable, even trivial questions involved, avoiding issues that might become a focus of conflict. The professional field of bioethics, for example, (which might become, alas, a model for nanoethics) has a great deal to say about many fascinating things, but people in this profession rarely say 'no'.

Indeed, there is a tendency for career-conscious social scientists and humanists to become a little too cozy with researchers in science and engineering, telling them exactly what they want to hear (or what scholars think the scientists want to hear). Evidence of this trait appears in what are often trivial exercises in which potentially momentous social upheavals are greeted with arcane, highly scholastic rationalizations. How many theorists of 'intellectual property' can dance on the head of a pin? (Winner, 2003)

Encoded here are a number of subtle ethical admonitions toward fellow STS scholars: concern yourself with big, 'momentous' matters rather than (thrice-stated) 'trivial' ones; maintain firm positions and beliefs at all times, and avoid 'drifting' or 'gravitating'; speak clearly and plainly, avoiding anything

‘arcane’; seek conflict, and eschew ‘comfort’. It’s almost as if ‘momentous social upheavals’ demand no expertise, no experimental querying, but simple political will and conviction. But the ethical admonition that most interests me here is the one that prescribes a proper relationship between the STS scholar—at least those conscious about such trivialities as a career—and the scientist: no coziness allowed. While perhaps not quite as serious a moral infraction as ‘fraternizing with the enemy’, coziness is clearly something with only negative consequences, a seduction into scholasticism, sycophantism, or some combination thereof.

I would argue that, despite some exaggeration, this is indeed the dominant figuration of the relationship between technoscience scholar and technoscientist in the field that names itself ‘STS’. The ethical relationship between these two figures, from the STS scholar’s perspective, should revolve around suspicion, antagonism, opposition, conflict, distrust, and similar terms, tropes, and affects.

That’s not a very promising ethos, in my book, and for two reasons. First, the list leaves out a whole set of different affects—excitement, enjoyment, surprise, interest—are ‘indispensable to well-nourished intellectual critique’, as Elizabeth Wilson (2000, p. 38) reminded readers of a recent issue of *Hypatia* dedicated to feminism and science. Writing in the same journal issue and in a similar vein, Isabelle Stengers asks what it is that made technoscience scholars forget this different set of more affirmative affects crucial to critical work:

We’ve learnt that crimes can be committed in the name of science, just as happens in the name of faith. However the question is to know whether it is the crimes—the mutilations which occur ‘in the name of objectivity’, the reductions ‘in the name of science’—which made us forget how to laugh. Or are the crimes and the spirit of seriousness [in science studies] *both* inseparable dimensions of the same story? (Stengers, 2000, p. 42)

This essay presents some empirical and theoretical interventions devoted to the promise that an aesthetic, ethic, and politics of promising holds for science, and for science studies. The promise is one kind of a different relationship among scientists and those of us who study science, a relationship that might produce new knowledge and other forms of activity, one of which would be laughter.

Stengers goes on to diagnose the absence of humor in studies of the sciences as one symptom of, using the terms of the philosophical clinician Gilles Deleuze, the ‘majoritarian’ tradition in STS. The majoritarian (but not necessarily the majority) tradition of science studies diagnosed by Stengers predicates itself on a politics of judging, achieved through an ethic of critique based on the superior knowledge of the ‘social’ analyst, and both productive of and dependent on an aesthetic of oppositional sobriety. One of the more pathologically virulent forms of this majoritarian condition goes under the heading of ‘normativity’, in which the science analyst feels him- or herself called upon to correct the ethical, political, and social failures, erasures, or perversions of the sciences and their practitioners. Such a ‘cure’, Stengers suggests, while perhaps no worse than the pathology for

which it seeks to be a corrective, nevertheless spins something of ‘the same story’ that the sciences themselves tell or enact.

Second, these tropes of non-coziness are especially ill-suited to promissory sciences like genomics, where the future is volatile and emergent. In that kind of science, to quote Stengers (2000, p. 42) again, ‘there’s an incessant reinvention of the world at work. . . I don’t want to be called on to see it as the simple, monotonous, and hopeless effects of the force of purely social relations’.

Rather than the monotonous reiteration of the unwavering power of ‘the social’ driving an ethics of oppositional critique and an ethics of suspicion, promissory science is better approached from an ethics of promising, an admittedly experimental question that will require cultivating more positive affects, such as friendship. To begin testing the parameters of this potential affinity between science and science studies, or between scientists and we ethicists, historians, anthropologists, sociologists, and political scientists, I thought I would try to say a few kind words about James Watson.

For the entire winter and spring of 2003, when I was drafting the talk that formed the basis of this essay, I was bombarded with nearly daily recountings of the Watson-Crick 50th anniversary. Since I was again teaching *The Double Helix* in my ‘Century of the Gene’ class, and supplementing it with Brenda Maddox’s wonderful new biography of Rosalind Franklin (Maddox, 2002), I was particularly sensitive to the lies, half-truths, and distortions that were being fobbed off as history, almost always with Watson’s willing participation. So in the midst of this smoldering criticism I decided to try to find some grounds or at least pretext of friendship between me and Honest Jim.

In the conventional historiography of the Human Genome Project in the US, Watson is credited with originating the Ethical, Legal, and Social Issues (ELSI) program. Watson has done his share to promote this perspective¹, but the clearest statement is found in Robert Cook-Deegan’s book, *The Gene Wars*: ‘The decision to commence a program to anticipate the social implications of genome research was made by James D. Watson alone, without conferring with anyone else at NIH’ (Cook-Deegan, 1994, p. 237).

Regardless of the truth of such a fairly reductive claim, some observers noted the apparent incongruity here. Upon hearing Watson discuss this commitment to ethical-social research at a speech in December 1988, Cook-Deegan himself noted that Watson’s ‘public image as an *enfant terrible* did not meld well with support for careful deliberation and expenditure outside science’ (*ibid.*, p. 163) Journalist Stephen Hall observed in an article extolling Watson’s career and his involvement in ‘the human genome project’, that ‘of all the hats Watson will wear as genome project leader, none would appear more ill-fitting at first, or more important, than that of moral ombudsman’ (Hall, 1990, p. 47).

But Jonathan Weiner (2000), in his book on *Drosophila* genetics, *Time, Love, and Memory*, gives us a slightly different Watson and a slightly different history. Watson, in Weiner’s sketch, ‘likes to entertain his luncheon partners, the presidents of nations and corporations, with war stories of the bureaucratic or bureaucratic life, and he likes to strike a cynical tone’. So when asked why he decided

or at least championed a decision made elsewhere to create and fund the ELSI program, he answers in this context in quite different terms than the ones we've seen mentioned above: 'To preempt the critics' (Weiner, 2000, p. 169). 'Ethicists are a mixed lot', Watson goes on to say, 'generally not worrying about their own problems, just somebody else's problems'.

Consider also the remarks Watson made in a roundtable discussion about genomics several years ago, in interaction with the philosopher of science Nancy Cartwright:

Nancy Cartwright: The views around this table about what we should do about aborting fetuses with blue eyes or Down's syndrome are irrelevant. What we need is a mechanism for taking these decisions in a serious and informed way. At present, the decisions are taken in a haphazard way.

James Watson: Do you want a committee of wise women like yourself telling other women what to do? You want a pseudo-consensus which, in practice, takes the decision away from individual parents.

Cartwright: I want a serious study and serious public discussion.

Watson: You mean: more social science crap. (Mulgan, 2000, p. 28)

These are only a few outrageous Watsonisms from a lifetime of outrageous Watsonisms. But can we work the paradox, and find ourselves in both outrage and in agreement? Much of the social science about genomics is crap, and it's often tiring reading it. Ethicists *are* a mixed lot, and my only hesitation in advancing the full-bore critique of bioethics that sorely needs to be done is the fact that 'bioethicists are taking a beating these days', as Carl Elliot has observed, and I am loathe to kick a profession when it's down.

Indeed, I would note, as Bioethnographic Data Point #1, that there was some mild bioethicist-beating going on at the 2004 CESAGen Conference where this essay originated as a talk. In addition to my own serious critiques played shamelessly for laughs, I was present at two other sessions in which the good name of bioethics was slandered, prompting one bioethicist to rise and demand a halt to the insults.

These insults are themselves a mixed lot, with unusual shapes and unexpected affinities across political and intellectual differences. One shape of the bioethical insult is, as gestured toward previously, the one to be found coming from parts of STS—that 'people in this profession rarely say "no"'. Interestingly, this diagnosis that comes from STS's liberal-left of the bioethicist's lack of moral backbone is reproduced, meme-wise, in the conservative-right diagnosis of Frances Fukuyama. In the closing pages of *Our Posthuman Future*, Fukuyama (2002) bemoans that 'many bioethicists have become nothing more than sophisticated (and sophistic) justifiers of whatever it is the scientific community wants to do, having enough knowledge of Catholic theology or Kantian metaphysics to beat back criticisms coming from anyone who might object more strenuously'. And Fukuyama further echoes the backbone-lack critique advanced by Winner when he goes on to add that 'in any discussion of cloning, stem-cell research, germ-line engineering,

and the like, it is usually the professional bioethicist who can be relied on to take the most permissive position of anyone in the room. But if the ethicist isn't going to tell you that you can't do something, who will?' (Fukuyama, 2002, p. 204).

Here in this cross-spectrum critique of bioethics, spinelessness becomes indistinguishable from a kind of licentiousness that results from permissiveness ('rarely say "no"')—the 'coziness' for which Winner signaled his disdain. More fundamentally, both Winner and Fukuyama trope the bioethicist's most fundamental and characteristic act as one of saying 'no'. Bioethics, from this perspective, is only ever supposed to be about stricture; it's unthinkable outside the terms of negation and limitation. Indeed, bioethicists are a kind of last line of moral defense in a profligate and wanton economy: if they don't say no, no one will. A science like genomics centered on promising is supposed to be met with a bioethics centered on refusing.

Like Fukuyama, I am all for a bioethics with proportionately fewer priests (by which I include Kantians along with the Catholic theologians). But the more systemic problem is not that bioethics doesn't know how to say no; in fact, it's that it doesn't know how to say yes. To the extent that it can affirm anything at all, bioethics can only affirm a present set of values, or a future predicated on a present set of values. Let's go further, and agree with Watson that bioethics needs to be preempted, although not necessarily in the way Watson thought. Bioethics demands to be preempted, not to render criticism toothless, predictable, or containable, but so that it can begin to think and do something other than Just Say No.

Bioethics demands to be preempted, because genomics demands the same thing of itself. Genomics was invented, projected via the Human Genome Project, to preempt the genetics of the past. Life scientists enthusiastically produced a new life science that is now overwhelming them (many model organisms seem to take great pleasure in being overwhelmed) with data, with new interpretive possibilities, and with the sense that they indeed created something more than they intended. Watson was one of those who promised to preempt the genetics of the 1980s, and in many ways they indeed delivered.

This essay will have more to say about the preemption of genomics later, but as long as it is risking these few kind words about Watson, it seems worth putting in a few good words for nihilism as well; in for a penny, in for a pound. Because preempting and promising bioethics will need a profusion of different vocabularies, and different grammars and rhetorics for articulating them.

Siding with science

Writing about Nietzsche, and particularly about the misreadings of his 'nihilism' that have become all too common, the well-known science studies scholar Maurice Blanchot makes a few pertinent comments about the nature of the sciences. For Blanchot's Nietzsche, 'nihilism is the possibility of all going beyond...the horizon upon which every particular science, as well as every exigency of knowledge, opens—in order to hold themselves in the very movement of this opening' (Blanchot, 1993, pp. 145–6). To be a nihilist under this definition

means to always be open to preemption, to always seek, always desire, always labor for preemption. This is what the sciences are supposed to be best at:

[S]cience cannot but be nihilist. . . knowing that the world is not to be interpreted, science transforms it, and through this transformation there passes the nihilistic exigency that is proper to it—the power of nothingness that science has made into the most effective of tools, but with which it plays a dangerous game. Knowledge is fundamentally dangerous. Nietzsche has given the most brutal formulation of this danger: ‘*We experiment on truth! Perhaps humanity will be destroyed by it! Well, so be it!*’ This is what the scientist is liable to say, and must say if he renounces the hypocrisy of deploring catastrophe, which is one of the results of science. For one cannot construct the universe without the possibility of its being destroyed. (Blanchot, 1993, p. 146)

Let me mark my words carefully here. I am not in favor of destroying the universe, nor am I advocating the destruction of humanity. I am not advocating a *laissez-faire* approach to a nihilist science so that it may do whatever it likes regardless of the danger; painstaking deliberations on promised scientific futures will continue to be essential, from multiple perspectives. But like the sciences, I do affirm transformation, and Nietzsche and Blanchot demand that we not kid ourselves: transformation has to be and transformation is a dangerous game. There’s no construction, let alone *transformation*—so much more promising than construction, where the end product only realizes an established blueprint—without at least the possibility of everything going awry.

Of the many consequences to this, allow me to mark only one of them here. So much of what I read in our disciplines of science studies is marked, or at least tinged, with a resentment—I use Nietzsche’s word—toward both scientists and the sciences, as though if they had only been more humanistic, more ethical, more responsible, or had better values to begin with, we wouldn’t be faced with the ‘implications’ that justly preoccupy our attention. If an ethics of promising needs to go beyond that kind of resentment—*über* the self-satisfied and simplistic economy of good and evil, to use another of Nietzsche’s favorite tropes—how might it do so?

Let me continue to mine this ‘minor literature’ in ethics and philosophy, in which figures like Nietzsche, Blanchot, Emmanuel Levinas, Jacques Derrida, and Gilles Deleuze bend, queer, or parasitically transform from within the ‘major’ thought tradition purveyed by the likes of Hegel, Kant, and Mill.

For responding to a science that *must* be nihilist, promissory, or preemptive, Blanchot (1993) outlines two possible scenarios. One might adopt the ‘conservative attitude’, he suggests, ‘condemning knowledge in order to safeguard the eternal in man (the man of his time)’. ‘His time’ here refers to Nietzsche’s time, but it clearly persists as *our* time as well—our time of the incessant call for the bioethical, for the ‘humanizing’ of science and technology, for re-installing a supposedly forgotten or repressed set of ‘human values’ into the biotechnosciences, a set of human values that would safeguard them and us.

We will will ourselves, in the name of the ethical, to stay the same, eternally—just with a better controlling grasp on science, making it *ours*, bringing it under *our* control.

Hence bioethics' attempt, as a conservative humanist project, to regulate, slow down, and de-limit science's excesses, by just saying no. It's an understandable, reasonable, and even *necessary* response—one that I find it mandatory and effective to engage in myself from time to time, as I'll highlight below. But why should it be the only response that qualifies as 'bioethical'? Why can't we have a kind of hedge fund or portfolio strategy for bioethics, the kind of strategy one sees in today's speculative economies? Like the financial hedge fund in which an investor takes multiple positions—long, short, and the many more exotic positions enabled by derivatives and other new financial instruments—in a complex market whose future is but a volatile promise, why can't bioethics involve inventing and holding radically different positions, as experimental investments whose collective value can only be assessed in a still-emerging future?

Such an ethic of promising would be very different from the one Hannah Arendt (1998) put forward in *The Human Condition*. Emphasizing the centrality of promising to our conceptions and practices of the political, Arendt also invested in Nietzsche's promise in that text. But Arendt limited that investment through a reading of Nietzsche's promise that shrunk it to the level of a human assertion that establishes 'an island of certainty' in a future marked by radical uncertainty. Arendt's promise made an anchor for the future, a stable position for leveraging a known and desired future out of chaotic events and possibilities.

But Nietzsche, in Blanchot's reading, opted for something other than the 'conservative attitude' of humanism toward science. He sided elsewhere, Blanchot says, than with the humanist promise that anchors an uncertain future to known politics and values: 'Nietzsche sides with science and with the being of exceeding, which is the becoming of humanity' (Blanchot, 1993, p. 146).

Nietzsche's promise, science's promise, is not an anchoring device. The 'being of exceeding' is a different kind of promise than the Arendtian one; it operates not through establishing certainty, but through the risky affirmation of a recurring, iterative *opening* rather than anchoring of a future. This promise is implicated in the inhuman innards of technoscience. This promise is a fragment of the future implicated in the hidden folds of the present, freeing it rather than anchoring it. This promise is a chip of futural excess, invisibly disrupting the reproduction of the same, to experiment on the new. Science becomes such that it always seeks its own preemption, always promises to exceed itself, always makes it possible to always go beyond. It is how the sciences, in the words of Hans-Jorg Rheinberger (1998), himself quoting the great geneticist Francois Jacob, can become 'a machine for inventing the future'—because, paradoxically, they've already downloaded part of that future into themselves, via promising.

So if a conservative, preservationist bioethics is necessary in our encounters with the excesses of biotechnoscience, it's even more necessary that we supplement it with other ethical strategies or styles that would gamble on and, with luck, capitalize on the excesses of promising.

Astonishment, the care of the data, and the right to make promises

Bioethnographic Data Point #2: In response to the talk at the 2004 CESAGen conference that was the promise of this paper, and particularly in response to the ideas advanced in the previous section, a member of the audience expressed how ‘astonished’ he was to hear such a talk at a science studies conference. Having my self attended far too many conferences of all types in which ‘astonishment’ seemed the remotest of possibilities, I would have thought the production of this affect might have been a welcome event. But the speaker, an elder of the community, was clearly distressed. His astonishment came, it seemed, from the disjunct between his expectations about the kind of talk he should hear at a science studies conference—one marked by suspicion, skepticism, distrust, antagonism, and associated affects, as discussed above—and the kind words that I was offering for Watson, genomics, a certain kind of nihilism, and other phenomena of excess.

But the ‘being of exceeding’ is nothing if not astonishing, that state in which an unexpected future suddenly crashes over you, and the wave you have been so consciously and carefully surfing has become a roiling mass of water, sand, and limbs. And most of the life scientists I’ve encountered in my work are regularly if not routinely astonished, overwhelmed by ever-escalating waves of data, molecules, connections, interpretations, and possibilities. These are scientists whose daily work and thought occurs within this culture of excess, a culture of always-going-beyond, a culture of promisings. Astonishment is a regular feature of this genomics landscape, and that is something that needs to be ethnographically reckoned with. But how, when one aspect of promising is that it exceeds any reckoning device—an S-1 registration statement with the US Securities and Exchange Commission, an investor’s analyses and hunches, a life scientist’s experimental system, an ethnographer’s limited attention?

One device I’m beginning to experiment with is the concept of ‘the care of the data’, to see what place it might have in an ethics of promising. The concept samples Michel Foucault’s familiar articulation of ‘the care of the self’, to see if bioethics might be thought otherwise, in the same manner as Foucault thought ethics and sexuality otherwise. I’ll go on to discuss some brief examples from my current research on toxicogenomics and behavioral genetics, where I see scientists doing the admirable work of developing new strategies for ‘care of the data’.

Sexual behavior constitutes ‘a domain of ethical practice’ for Foucault, because it involves ‘acts situated in an agonistic field of forces difficult to control’ (Foucault, 1985, p. 250). By the same token, genomics can be considered a domain of ethical practice, its acts also occurring within a field of excessive forces. For the promising genomicist of today, a partial list of these forces of excess includes burgeoning databases of all kinds of bioinformation—DNA sequence data, protein sequence data, tissue-specific gene expression data, signal transduction data for increasingly baroque biochemical pathways and gene interactions, phenotype data including medical records, genealogical databases: excessive data on the excessive biology of the most promising of model organisms, including but certainly not limited to us. I will elaborate on some of

these unruly forces and the ethical demands they present shortly, but this short list, focused primarily on databases, should be enough to convey the very real info-glut and bioglut that life scientists inhabit today.

Within such a complex agonistic field, Foucault's sexual subject disciplines itself not in reference to a universal law—there isn't one in this seething economy of tumult—but instead by cultivating a set of practices and strategies that would 'elaborat[e] a form of relation to self that enables an individual to fashion himself into a subject of ethical conduct' (Foucault, 1985, p. 251). Similarly, for the data subject of genomics today, *one strand* of bioethics should be conceptualized not as involving a codified set of bioethical principles, but rather as a matter of elaborating, over time, a form of relation to data—inhuman amounts of data, astoundingly open to multiple interpretations and recombinations—that will enable the genomicist to fashion the truths of a new kind of life science. Or more accurately: a bioethical form of relation that can give the genomicist the *right to make promises* about the future truths of the life sciences. 'Care of the data' is my shorthand for that relation, which of course also involves forming a particular kind of self capable of establishing or undergoing that relationship.

Here are two quick sketches, one of a psychiatric geneticist and the other more a group portrait of scientists in the field of toxicogenomics, that illustrate how at least some data subjects of genomics today are articulating a new 'care of the data', a bioethical relationship for their closest of encounters with the large data sets produced by a high-throughput, promising genomics.

In 2002–2004, Evelyn Hammonds, Rayna Rapp, and I represented the disciplines of history and anthropology in the transdisciplinary Ethics Research Consortium on Smoking, Race, and Genetics organized by Alexandra Shields at Georgetown University. At the broadest level, our consortium was trying to understand the 'implications'—those zones of our lives where a future has folded back into the present, haunting us with indistinct visions and demands—of genomics' capacity to group individuals into new subpopulations according to ever more finely grained categorizations of genetic sameness and difference—e.g., the subpopulation of those who have the DRD2 allele of a dopamine receptor gene, *and* who smoke, *and* who self-identified as 'Caucasian' by checking off the appropriate box on the appropriate form. The promised future is one of 'individualized' (although one only becomes this kind of individual by being a member of these fine subpopulations), pharmacogenomic medicine; in the case of smoking, the idea is to match different quitting therapies (transdermal nicotine patch, nasal spray, bupropion, and so on) to an individual's genome. At the same time, however, genomics has produced an explosion of both new data and theories of genetic variation, resulting in numerous articles in the scientific and medical journals questioning the use of 'race', 'ethnicity', 'race/ethnicity', or 'geographic ancestry' as variables in biomedical research, particularly research aimed at elucidating the potential genetic mechanisms involved in complex behavioral conditions such as smoking.

One of our responses fell fully within the dominant bioethics paradigm, for which I otherwise exhibit so little patience. Our transdisciplinary group published

an article in a special issue of the *American Psychologist*, mailed to all the members of the American Society of Human Genetics, setting out a set of principles regarding the use of self-identified ethnicity, geographic ancestry, and genotypes generally as variables in studies of the genetics of complex behaviors. I refer readers to the article for our full analysis, based on a review of the entire scientific literature on genetics and smoking, historical and anthropological analyses of 'race' and its use in biomedical research, and a generous critique of national policies whose laudable goal of including underrepresented populations in biomedical research and health studies has also exacerbated the problem of the careless use of these population categories (Shields *et al.*, 2005). Here I only want to consider briefly the work of one of our consortium members, the psychiatric geneticist Patrick Sullivan, to draw out some elements of some other bioethics.

Sullivan and three co-authors published 'Genetic Case-Control Association Studies in Neuropsychiatry' in the *Archives of General Psychiatry* in 2001. This article can be read as an ensemble of precepts that allow a behavioral geneticist to check his or her conduct, where 'check' has at least a doubled meaning; that advocates the renunciation of certain pleasures; and that guides psychiatric geneticists in their relentless combat with the vicissitudes of incomplete knowledge, hazily complex conditions, and the inexact rules of precision that one must rely on. By establishing guidelines for 'care of the data', and for cultivating a scientific self capable of such care, the article is far more a work of bioethics than the scads of philosopher's pronouncements that usually bears the name.

Like a sexual economy, the data economy of behavioral genetics is characterized by Sullivan *et al.* as one of excess. Genotypes are 'one of the cheapest biological markers in neuropsychiatry', and with technologies such as microarrays a researcher can analyze thousands of them. Encouraged by 'notable successes in complex disorders' such as Alzheimer's and Type 1 diabetes, and 'hastened' by the 'availability of the primary sequence of the human genome', studies that use genetic markers as risk factors in neuropsychiatry have become 'easy to conduct', and thus 'popular'. While it may be too much to call this cheap, easy, and popular data economy one of profligacy and wantonness, it is clear that the psychiatric geneticist must cultivate some kind of disciplined relationships within and to this economy of genomic excess. Otherwise, the current state of 'considerable confusion' will persist, say Sullivan and co-authors, and case-control association studies will continue to be 'controversial' (Sullivan *et al.*, 2001, p. 1015).

'In an era of increasingly high-throughput genotyping', the authors go on to note, the possibility of false-positive results due simply to chance in such studies is greatly increased. How the psychiatric geneticist can avoid this and other missteps at this very fundamental level, such as 'inappropriate control groups', are the first ethical concern to be discussed by Sullivan and friends. Because 'many genotyping methods require subjective judgments', and because 'genotyping is a complex undertaking and a multitude of technical factors can lead to erroneous data', the psychiatric geneticist must exercise 'considerable care' in producing her data, adopting such practices as genotyping blind with

respect to case or control status, and processing cases and controls at roughly the same time, rather than in separate batches months apart (Sullivan *et al.*, 2001, pp. 1016–17). Diagnostic practices also require care. For complex conditions, ‘investigators should recognize the limitations of psychiatric nosologies’, and respect the fact that ‘our knowledge of the etiology of these disorders is imprecise’, which means that ‘most statistically significant candidate genes will be false positives’. Another ethical injunction reads: ‘investigators should adopt a life-long perspective’, meaning that their case definitions should ‘allow for the lifelong (rather than current) presence of a disorder and, ideally, for its life-long absence in controls’ (Sullivan *et al.*, 2001, p. 1018).

There is much more to this rich work of science and scientific ethics, but I hope this is enough to convey a sense of the way it attempts to inculcate a ‘care of the data’ in researchers who inhabit this complex genomic economy of multiple excesses. Such thoughtfulness and carefulness give Sullivan, in my friendly opinion, the right to make promises about truths which have yet to arrive—if they ever do.

Another group of scientists which I believe is earning the right to make promises are toxicogenomicists. Kim Fortun and I have begun studying the emergence of this new field of inquiry, in which gene expression microarrays are playing a key role (Fortun and Fortun, 2005). Where some critics might see little more than another reductionist science whose future application will result in the stigmatization of individuals blamed for being ‘susceptible’ to particular toxins, we’ve tried, in effect, to remain open to the promise of toxicogenomics rather than rushing to such judgments.

To conduct this research that aims to understand how the entire genome responds to toxic exposure, microarrays containing thousands or even tens of thousands of genes referencing important biochemical pathways, DNA repair mechanisms, toxin metabolizing processes, and other vital functions are used increasingly in experiments that attempt a ‘systems biology’ approach to toxicology, illuminating how multiple genes respond in highly, even excessively, complex ways to toxic exposure. The great promise of gene expression profiling is quantity combined with speed and economy. Microarrays allow the patterns of expression, amplification, or repression of thousands of genes to be profiled in a sweep, making it possible to survey all the genes that respond to a specific toxicant, and to identify biochemical pathways, and even the ‘toxic signatures’ of particular chemical agents. This can be done for multiple organisms, for tissues from multiple organ systems, at different stages of development. Microarrays also illuminate how small differences in the ‘same’ genes, in different individuals or populations, may shape differential response to toxic exposure; microarrays also promise a better understanding of chemical classes, and how similar toxins may produce either regular or variable responses from a pattern of genes. In toxicology, the days of studying one gene product (enzyme) at a time are over, as are the days when it was difficult to establish clear, quantifiable comparisons between different chemicals. It begins to be possible to imagine toxicological research catching up to the more than 85,000 chemicals registered for use in the United States—most of which have not been evaluated for toxicity at all, individually much less in combination.

But if toxicology is being transformed by genomics, there are multiple challenges ahead. The standardization which will allow data collected from different microarray platforms to be compared, has not been worked out (Iannaccone, 2001). Comparative approaches—across organisms, across experimental platforms, across differently genotyped and phenotyped individuals—will depend on huge, complex, and well-designed databases (Waters, 2003). These databases in turn will depend on funding and administrative leadership as well as on legal and cultural developments that encourage individual scientists and the organizations they work for—academia, the chemical and pharmaceutical industries, and national laboratories—to share their data in new ways. Most importantly, these excesses of data will need to be searched, visualized, and analyzed in new ways. What will count as good toxicology in the future is not self-evident, but promised (Brown & Botstein, 1999).

The many scientists we have interviewed or encountered at toxicogenomics conferences are keenly aware of the complexities of toxic response, the limitations of their science and technology, and the extraordinary care that must be taken in the production and analysis of an explosion of experimental data. ‘It is only through the development of a rich knowledge base and its availability to all of the scientific community’, writes the Director of the National Center for Toxicogenomics Raymond Tennant, ‘that toxicology and environmental health can rapidly advance. . . . At the present state of development of the field of toxicogenomics, the major advances in understanding toxic effects will still be made one chemical, agent, or mechanism at a time. However, the promise of this new technology is such that it can be used to generate data on large numbers of chemicals and exposure conditions and to develop an unprecedented knowledge base that can be used to guide future research, improve environmental health, and aid in regulatory decisions’ (Tennant, 2002).

That’s a promise, clearly, and it deserves something other than, or at least more than, simple skepticism. An ethics of promising and friendship for us in science studies demands the continual opening of ourselves, in a series of close encounters of our own invention, to such scientist-interlocutors as Sullivan and Tennant who, in their ‘incessant reinvention of the world’, are opening themselves to the uncertainties and contingencies of the reinvented, emergent future. An ethics of promising for us means being reluctant to judge too quickly, preferring instead to construct new assemblages in which experimental practitioners from both the sciences and science studies can ‘muddle through’ together toward mutual understanding and even practical ends—uneasily, to be sure, but abetted by the same combination of laughter, dedication, forbearance born of sustained proximity, and *mutual* critique that characterizes the best friendships in the personal domain.

Conclusion

I opened this essay by citing the ‘funny thing’ that Evelyn Fox Keller describes as characterizing the course of the Human Genome Project, as it subverted the very doctrine of gene-as-ultimate-agent that was its ‘holy grail’. Watson and other

promoters of genomics in the 1980s deserve at least some credit for making this happen, even if they didn't really realize what exactly they were promising. Microarrays were certainly not foreseen when the Human Genome Project was first being proposed and debated. But these (and many other) technological products of genomics' promise are themselves embodiments of a next level of promise. As life scientists Patrick Brown and David Botstein point out in an important review article in *Nature Genetics* on microarrays, this technology is not simply about getting more data faster. 'Data sets produced in this way have emergent properties', they write; 'when the body of expression data is large enough, and only then, the patterns and systematic features become apparent and we begin to build an integrated picture of the whole system' (Brown and Botstein, 1999, p. 36). The 'emergent properties' of gene expression data sets, like the emergent properties of an organism, a language, or a society, are its promise: its subverting, preempting, and always-going-beyond excess that makes it become something else.

We are going to see more and more of these kinds of 'radical subversions' in the future, that come from within the pursuit of yesterday's genomic dogma; that's what it means to be a promissory science. This gift of the genomics revolution could not have been given without the decades of high-level public investment—and private, too—in the basic sciences and technologies that have been essential to the development of this scientific and now commercial field, where new tools and knowledge are only now leveraging the full promise that had been spliced within them.

In a similar way, investment in fundamental, innovative, and experimental scholarship in the humanities and social sciences, above and beyond their applied policy dimensions and obvious ethical challenges, is imperative if we are going to have an ethics of promising. The bioethics of 20 years from now should be as startling, as complex, and as unpredictable to us now as this networked fly would have been to the proto-genomicists of the distant year of 1989. The idea of something like an 'ethical code' to apply to genomics should be as much of an insult to ethics and ethicists in 2025 as the idea of a 'genetic code' is an insult to today's model organisms. We in science studies, including bioethicists, have to preempt ourselves, and not simply reproduce ourselves.

Having a right to make promises will have entailed learning to live with, and cultivate, the excesses of promising. Promising, and promising genomics in particular, is a matter of excess—the excess of biological matter as much as anything else. An organism like you, me, or a zebrafish, exceeds its genetic 'code'. It exceeds its 'nature' or genes, it exceeds its 'nurture' or environment (which in turn is always exceeding itself and changing), it exceeds every wonderful technoscientific tool that has ever been invented and that ever will be invented to handle the truths of it. It's the 'inability' of any given present or any given thing to coincide with itself, or to identify fully with its opposite partner, or to fully differentiate itself from its partner, that underwrites the possibility of its becoming something else. More, more, more: that's why we and zebrafish and every other geno-proteo-transcripto-culturomic enterprise *develop*. Organisms, illnesses, events, politics, ethics, technological development—all of these are matters of

excess, that happen without our full understanding or control, as the cumulative, emergent effect of a multiplicity of forces: *promises— . . .*²

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Notes

1. Beginning with my opening press conference at NIH, and later through other meetings with the press, I made clear that concern for the ethical and social implications raised by an ever-increasing knowledge of human genes and of the genetic diseases that result from variations in our genetic messages. . . I believed that we should put money behind these convictions and suggested that, at the start, at least 3% of the earmarked genome funds should go to support the ethical and social implications area (Watson, 1990, p. 46).
2. The marks ‘— . . .’ are used in just this manner by Nietzsche in a number of texts, but particularly in *The Genealogy of Morals*, where the near-aphoristic sections often end with this typographic mark, a kind of fundamental promise-gram. The period that would usually and brusquely end a sentence or a section, closing it off from a future, is replaced by a dash, stretched toward the ellipsis that marks the yet-to-arrive iteration of an eternally recurring future.

References

- Arendt, H. (1998) *The Human Condition* (Chicago: University of Chicago Press).
- Austin, J.L. (1962) *How to Do Things with Words* (Cambridge: Harvard University Press).
- Blanchot, M. (1993) *The Infinite Conversation* (Minneapolis: University of Minnesota Press).
- Brown, N. (2003) Hope against hype: accountability in biopresents and futures, *Science Studies*, 16(2), pp. 3–21.
- Brown, P.O. & Botstein, D. (1999) Exploring the new world of the genome with DNA microarrays, *Nature Genetics Supplement*, 21, pp. 33–7.
- Cook-Deegan, R. (1994) *The Gene Wars: Science, Politics, and the Human Genome* (New York: Norton).
- Fortun, K. & Fortun, M. (2005) Scientific imaginaries and ethical plateaus in contemporary US toxicology, *American Anthropologist*, 107(1), pp. 43–54.
- Fortun, M. (1993) Mapping and making genes and histories: the human genome project in the US, 1980–1990, *History of Science* (Cambridge, MA: Harvard University).
- Fortun, M. (2001) Mediated speculations in the genomics futures market, *New Genetics and Society*, 20(2), pp. 139–56.
- Fortun, M. (forthcoming) *Promising Genomics: Iceland, deCODE Genetics, and a World of Speculation* (Berkeley: University of California Press).
- Foucault, M. (1985) *The Use of Pleasure. The History of Sexuality Vol. 2* (New York: Random House).
- Fukuyama, F. (2002) *Our Posthuman Future: Consequences of the Biotechnology Revolution* (New York: Picador).
- Hall, S.S. (1990) James Watson and the search for biology’s ‘Holy Grail’, *Smithsonian*, February, pp. 41–49.
- Iannaccone, P.M. (2001) Toxicogenomics: the call of the wild chip, *Environmental Health Perspectives*, 109, pp. A8–A11.

- Keller, E.F. (1995) *Refiguring Life: Metaphors of Twentieth-Century Biology* (New York: Columbia University Press).
- Maddox, B. (2002) *Rosalind Franklin: The Dark Lady of DNA* (New York: HarperCollins).
- Mulgan, G. (2000) Roundtable: the meaning of the genome, *Prospect*, October, pp. 24–30.
- Nietzsche, F. (1956) *The Birth of Tragedy and The Genealogy of Morals* (New York: Doubleday).
- Rheinberger, H.-J. (1998) Experimental systems, graphematic spaces. In Lenoir, T. (ed) *Inscribing Science: Scientific Texts and the Materiality of Communication*, pp. 285–303 (Palo Alto: Stanford University Press).
- Shields, A., Fortun, M., Hammonds, E.M., King, P.A., Lerman, C., Rapp, R. & Sullivan, P.F. (2005) The use of racial categories in genetic studies of smoking behavior: implications for reducing health disparities, *American Psychologist*, 60(1), pp. 1–27.
- Stengers, I. (2000) Another look: relearning to laugh, *Hypatia*, 15(4), pp. 41–54.
- Sullivan, P.F., Eaves, L.J., Kendler, K.S. & Neale, M.C. (2001) Genetic case-control association studies in neuropsychiatry, *Archives of General Psychiatry*, 58, pp. 1015–24.
- Tennant, R.W. (2002) The National Center for Toxicogenomics: using new technologies to inform mechanistic toxicology (editorial), *Environ. Health Perspect*, 110, pp. A8–A10.
- Waters, M., Boorman, G., Bushel, P., Cunningham, M., Irwin, R., Merrik, A., Olden, K., Paules, R., Selkirk, J., Stasiewicz, S., Weis, B., Van Houten, B., Walker, N. & Tennant, R. (2003) Systems toxicology and the CEBS knowledge base, *EHP Toxicogenomics*, 111(IT), pp. 15–20.
- Watson, J.D. (1990) The human genome project: past, present and future, *Science*, 248, pp. 44–49.
- Weiner, J. (2000) *Time, Love, Memory: A Great Biologist and his quest for the Origins of Behavior* (New York: Vintage Books).
- Wilson, E.A. (2000) Scientific interest: introduction to Isabelle Stengers, Another look: learning to laugh, *Hypatia*, 15(4), pp. 38–40.
- Winner, L. (2003) Testimony to the Committee on Science of the US House of Representatives on The Societal Implications of Nanotechnology, Wednesday, 9 April 2003.

