

Information Technologies and the Social Sciences

Papers from the SSS Workshop

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The Occasional Papers of the School of Social Science are versions of talks given at the School's weekly Thursday Seminar. At these seminars, Members present work-in-progress and then take questions. There is often lively conversation and debate, some of which will be included with the papers. We have chosen papers we thought would be of interest to a broad audience. Our aim is to capture some part of the cross-disciplinary conversations that are the mark of the School's programs. While members are drawn from specific disciplines of the social sciences—anthropology, economics, sociology and political science—as well as history, philosophy, literature and law, the School encourages new approaches that arise from exposure to different forms of interpretation. The papers in this series differ widely in their topics, methods, and disciplines. Yet they concur in a broadly humanistic attempt to understand how—and under what conditions—the concepts that order experience in different cultures and societies are produced, and how they change.

In 2000-2001, the School's theme was "Information Technologies and the Social Sciences." During the year, Members explored widely circulating claims that new technologies of information and media—which had been developing and introduced at an ever-increasing pace—had brought about revolutionary changes in economic, political, and cultural spheres, while giving rise to new languages, visual practices, and even fundamental definitions of the what it meant to be human. Questions raised during the course of the year included: How far-reaching are the changes associated with new technologies? What challenges do they post to established modes of thinking and action? Are metaphors drawn from the worlds of computers and the logics of networks gaining explanatory weight in the social sciences? At the end of the year, the School sponsored a workshop inviting discussants to provide a critical perspective on their projects. The two papers here were exemplary of the work presented there.

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Thomas Streeter

The Net Effect: The Internet and the New White Collar Style

Historians and sociologists of technology have long argued that technologies emerge from, and need to be understood in terms of, particular social and cultural contexts. The internet presents a fairly obvious case of the social construction of technology, that is, of a set of technologies deeply shaped by and enmeshed in particular cultures and social structures. Because computers are programmable, they are in an important sense whatever we make them into: the same microprocessor can guide a missile, run a word processor, or drive a home game console. And for all its insularity and technical complexity, internet development has been strangely passionate, peppered with motifs of rebellion and personal transformation. Along these lines, Rosenzweig has argued that what the internet needs is “a history that brings together biographical and institutional studies with a fully contextualized social and cultural history.” In particular, he suggests, the internet needs to be understood in terms of its complicated origins in what would appear to be contradictory cultural and social locations: the military industrial complex and the ‘60s counterculture, or as he puts it, “in both the ‘closed world’ of the Cold War and the open and decentralized world of the anti-war movement and the counterculture.”¹ The seemingly schizoid character of the internet’s cultural underpinnings makes it a useful case study for understanding the relations between institutional and political processes in technological change and in the formations of affect or subjectivity.

In exploring some of these cultural underpinnings, I’ll argue that our impressions of the internet’s importance and “revolutionary” quality are to an important degree discursive, that is, are a matter of language, style, and cultural patterns of association. There has been what Foucault might have called an “incitement to discourse” associated with the notion of internet revolution, an eagerness “to pronounce a discourse that combines the fervor of knowledge, the determination to change the laws, and the longing for the garden of earthly delights.”² A significant part of what we’re talking about when we say “the internet,” this paper argues, is not just the specific functions enabled by the technology, but the way it appeared in our lives. The internet did not so much directly cause the cultural changes discussed here as play a starring role in a public drama that left an impact on our collective habits of thought. In particular, the internet is associated in popular memory not only with email, online shopping, or digital music downloads, but with the experience of major institutions needing to admit that they were confused or wrong: when the US government, the Microsoft Corporation, and the phone companies are all forced to quickly change core strategies, they thereby publicly make plain just how wrong they can be. The internet has also come to be associated with high level debate and bewilderment over categories that we ordinarily think of as fixed and clear, such as property, privacy, and rights. In large part, precisely because of these first associations, the internet is tied to changes in the tone and character of public behavior in certain circles, particularly among the members of the “knowledge class.”

New ways of speaking and acting in parts of the public realm also appeared in association with the internet in the 1990s. “Net discourse,” as I call it, is a shift in linguistic style,

modes of interaction, and behavior among significant numbers of journalists, academics, and officials in both the private and public sectors. While net discourse has probably been most pronounced in areas related to computing and the internet directly, I suspect it has filtered outward from that center into other sectors, and possibly into academia in general. Here in this paper, I'll explore specifically the character of this net discourse and its relevance for understanding technological change.

Net Discourse: Informality, Iconoclasm, Individualism, Power

Here's an example of net discourse: In the summer of 1998, Clinton administration official Ira Magaziner flew to Geneva to attend an international meeting on the newly emerged problem of "internet governance." At that time, whatever legal control existed for the internet technically lay with the U.S. government; thus Magaziner had been appointed the administration's point man on this issue. Shortly after deplaning, he launched the Geneva meeting by saying: "I'm going to welcome you, and then I'm going to leave. Not to insult you by withdrawing my attention, but to symbolize just how the United States government conceives of this process. Our job is to begin these discussions, and then get out of the room."³ These comments met with enthusiastic applause. And indeed, as soon as his ten-minute talk was over, he left the stage and, still "jet-lagged and a bit ruffled," went back to the airport.⁴

Net discourse consists in the artful juxtaposition of four traits: informality, iconoclasm, abstract individualism, and a promise of access to the corridors of power. In Magaziner's case, informality can be found in his ruffled suit, his glib gesture of departing immediately after his talk, and in the fact that he was not only seriously addressing an audience undoubtedly full of bearded, blue-jeaned, and otherwise casually-dressed computer experts, but in essence transferring power to them. There's the pleasure in iconoclasm: both Magaziner and his audience knew that as a government bureaucrat, Magaziner was acting against type. There was probably more than a little mutual admiration in that. We don't expect government officials to so willingly "get out of the room." Then there's the taken-for-granted anti-government, individualist neoliberalism: Magaziner, a former sixties activist who led the Clinton administration's effort to create a national health care system, was no principled opponent of government, and yet he knew that this gesture of turning power over to the private sector would be so automatically accepted that it would need no real defending; it was a gesture he seemed to enjoy making. (Not long after, a news article appeared titled "Ira Magaziner's legacy: doing nothing, and doing it well."⁵) Last but not least is the clear association of this gesture with a very real sense of power: Magaziner, after all, was representing the White House and the Department of Defense.

One can of course find theatrical bureaucrats in almost any era. Magaziner, however, was one of the more wonkish officials in a wonkish administration. He was not known for this kind of gesture, nor was it interpreted as a sign of his personal uniqueness. Rather, it was taken as a sign of the times, not of an individual: he was seen to be making use of something that was in the air, in the way that any administrator might use an in-vogue buzzword. This "something in the air" has deep roots in U.S. culture, most evidently in the 1960s counterculture. But it emerged with distinct inflections and renewed intensity in the mid-1990s, particularly in the usually buttoned-down communities of U.S. policy circles, an emergence, I want to suggest, complexly bound up with the spread of computer networking into the offices of the developed world.

It needs be said that desktop computers with email, word processing, and web-surfing

capabilities matter little or not at all to most people, even in highly industrialized countries. Both Bill Gates and the janitor that empties your office trash bin can get along fine without desktop computers in the day-to-day of their work lives. But computers have become a central feature of the work lives of the “knowledge” or professional classes, a group that includes middle managers, engineers, mid-level government bureaucrats, and journalists—white collar workers all. This class of worker obviously includes academics, which might help explain why desktop computing seems so obviously momentous to so many of us.

So within this limited, but important world, we can find a correlation: as all the computers on our desks became networked, and as our networks became hooked to the internet, those of us in the professional classes have become used to the informal terseness of email and the sprawling, fragmentary quality of the web. Internet-related metaphors infiltrate everyday talk: “virtual,” “cyber-” and similar terms are both more common and have new, distinct inflections. In some circles, professional interactions have become less adorned, more hurried, and more blunt. On the job market, our undergraduates are less likely to obsess over how to “dress for success” or which subtly colored paper to use for their résumés; they are directed to spend time on computer skills. If we still use the same professional paper documents and publications for much of our activities, we get more of our news, gossip and rumor from the electronic world; email and the web may not have replaced the book and the telephone but they have become an alternative to the water cooler. Among academics, even if we don’t read *Wired*, most of us know someone who does. Its glib, hip style and impatient iconoclasm now filters into some of the more sedate and arcane areas of scholarship: aphoristic, sweeping, plain-language rhetoric is fashionable, whereas long sentences and dense, specialized jargon are less so. Net discourse is a manifestation of this general pattern.

It’s tempting to suppose that this new informality emerged from something inherent in digital communication. Email, for example, became known early on, not just for its convenience, but for its distinct social qualities. In 1978, cold warrior Joseph Licklider and a colleague reflected on the surprising popularity of email on the ARPANET, which had originally been added to the system as an afterthought but quickly became the most common use:

One of the advantages of the message system over letter mail was that, in an ARPANET message, one could write tersely and type imperfectly, even to an older person in a superior position and even to a person one did not know very well, and the recipient took no offense. The formality and perfection that most people expect in a typed letter did not become associated with network messages, probably because the network was so much faster, so much more like the telephone.⁶

Was this “tolerance of informality,” this casual attitude towards hierarchy, an effect of the technology? Perhaps not. The costs of formality in time and effort (composition, proof reading, etc.) are probably equally high in the business letter as in email, and its speed is not all that more dramatic than was, for example, the speed of the mail in London in the late 19th century, when the mail could come three or four times a day or be delivered directly by servants or couriers. Nonetheless, it’s worth considering the possibility that if email had appeared at a different time and place, it might have become associated with very different social expectations.⁷

Context: The Internet Surprise of the early 1990s

It may have seemed as if the internet came from nowhere in the 1990s, but of course it did

not. Visions of a vast, flexible, multipurpose global digital network have been around for close to half a century. While it takes some imagination to see in Vannevar Bush's 1945 proposal of the "memex" a prediction of the internet (it wasn't networked; it wasn't necessarily digital⁸), Licklider's vision of "man-computer symbiosis" proposed a vision of something much like computer communication networks in 1961.⁹ By 1968, computer communications had become a professional specialty, a career track, and by 1970, visions of ubiquitous computer networks had filtered into corners of popular mythology, as evidenced in an article in the *Nation* of that year:

[T]he stage is being set for a communications revolution . . . audio, video, and facsimile transmissions . . . will provide newspapers, mail service, banking and shopping facilities, data from libraries and other storage centers, school curricula and other forms of information too numerous to specify. In short, every home and office will contain a communications center of a breadth and flexibility to influence every aspect of private and community life. . . . [this will become an] electronic highway system to facilitate the exchange of information and ideas.¹⁰

Here, twenty five years before the fact, you have a prediction of something very much like today's internet, all the way down to breathless rhetoric and highway metaphors. This might suggest that the internet was a planned system, something that groups of people envisioned, developed technologically, institutionally, and economically, and then implemented over a period of decades. Like NORAD, the interstate highway system, or Disneyland: a group of people with enough money and power had a big idea, developed it, and built it according to a preconceived plan. Yet the preceding quote was in an essay about the then-new technology of cable television, and it predicted a television-with-keyboards version of computer communication; it was off by specific technologies, industrial sectors, and two decades. Similar misjudgments about specifics persisted for more than twenty years; over those years a long line of detours and blind alleys in popular computer networking came and went: teletex in the early 1980s, Minitel in France, DECnet, X.25 networks, etc.

By the early 1990s, neoliberal economic policy—fascination with markets, privatization, and deregulation and a correlate antipathy to government regulation—seemed to be on the wane. Deregulation had lost much of its appeal even to the business community after the Reagan years: the stock market had crashed in 1987, and Silicon Valley was threatened by the Japanese, particularly in the area of memory chip manufacture. As a result, consortia and business-government cooperation were coming back in fashion. Corporations were quietly moving back towards asking for government help to organize and stabilize industries; calls for government to intervene on behalf of things like "level playing fields" and "regulatory backstops" were becoming increasingly common. In some circles, the invitation to reregulate was not euphemistic: some representatives of high technology industries began calling for government-coordinated "technology policy," which was a vague term for the use of government to provide aid in the form of tax incentives, research money, and antitrust waivers. *Fortune* magazine intoned: "What America wants, believe it or not, is proof that somebody's thinking about tomorrow. (. . .) A recent poll . . . asked respondents to pick America's most important goal for the next five years. By a large margin they selected 'strengthening technological and industrial leadership in the world'.¹¹ A U.S. Congressman argued for government involvement in the creation of a U.S. broadband network by saying, "[t]he Japanese will have an information superhighway by the year 2005 and the USA won't."¹²

It was in this context that then Senator Al Gore sponsored legislation that funded the creation of NFSnet, under the heading of what he was then calling the coming “information superhighway” and later the “national information infrastructure.” The general principle was a variation on the Fordist theme characteristic of U.S. high technology policy going back at least as far as WW II. Government sponsored research in sophisticated computer networking, the theory went, would yield practical benefits that would eventually be exploited by the business world. While this blurring of boundaries between public and private sectors has been politically problematic, over the last half-century, the pattern of developing technology with initial public money followed by commercialization has been well-tested: it has brought us satellite communication, microwave ovens, computers, jet airplanes—and the internet.¹³ The NSFnet went on to become the backbone for the evolving internet, which would explode on the national scene a few years later.¹⁴

After Clinton was elected and Senator Gore became Vice President, Gore’s enthusiasm for technology in general and networking in particular turned the phrase “information superhighway” into the slogan of the moment. A rich mix of political and economic energy attached to the phrase and it developed momentum. Politicians sought to ride on its coat-tails, and industry factions began to try to capture it; phone companies claimed they could provide the information superhighway, provided the government stayed out of it, thank you, and the cable industry countered by correcting the name of their newest technology from “500 channel TV” into “cable’s information superhighway.” “Information superhighway” became so common that a related series of metaphors evolved, “road kill on the information superhighway” being only one of the most memorable.

At the time, the relation of all this to the internet was at best obscure. During the 1980s, as the ARPANET became the internet, the outside world tended to ignore the internet, or to dismiss it as an experimental toy of university computer science departments. Statements made by telecommunications executives up through 1992 tended to dismiss the internet as a pure research tool, if they mentioned it at all. The corporate world was still placing its frequently colossal bets on various proprietary efforts: in the late ‘80s and early ‘90s, General Magic, Prodigy, CompuServe, and “video on demand” all used large amounts of corporate funding on failed efforts to create various versions of a networked future. Gore’s “information superhighway,” in sum, was something off in the future, and the NFSnet was generally viewed as a technology test bed, but not the thing itself.

In the next three years, however, the internet went from being a marginal oddity to a global institution whose existence and importance was taken-for-granted: common wisdom was overturned. By 1995, the remaining consumer systems from the 1980s were all selling themselves as means of access to the internet rather than a way around it, the US Congress was revamping its communications law for the first time since 1934, major corporations from the phone companies to Microsoft to the television networks were radically revamping core strategies, and television ads for Coke and Pepsi routinely displayed URLs.

In the history of media, this is an extraordinarily rapid and dramatic shift. The early histories of most other media suggest something comparatively well-coordinated and planned. For example, the general outlines of the TV industry in the U.S.—the major corporate players, the advertising system, networks providing programming to affiliate stations, even much of the programming like soap operas and variety shows—were clearly formed by the mid- to late-1930s, more than a decade before its full-scale introduction. (RCA, who developed NBC, made television a central part of its plans for the future in 1932, just as the networked, advertising-supported radio broadcast system was becoming consolidated.¹⁵) For all the complexities and struggles associated with their development, film, television, and VCRs

were disseminated in a context in which industry leaders, government regulators, manufacturers, and other interested parties all shared a similar general outline of what the new industries were going to look like. Disputes were limited to fine points such as technical standards (e.g., Betamax vs. VHS), revenue distribution (e.g., cable and videotape copyright issues), and the like. Arguably, the only technological system in the past century that came about with a speed similar to the internet was radio broadcasting.¹⁶

What took people by surprise, was that ubiquitous computer communication, itself predicted by many, would come via this set of things labeled “the internet,” that it would be a decentralized, packet-switched network, that it would grow explosively from a largely university-based, not-for-profit institutional context, and that it would take wing on the back of a community driven by a feverish mix of entrepreneurial and anarchistic impulses over the course of three years. That these developments were not generally expected by corporate, legal, and legislative mainstreams has left as much of a mark on political discourse in recent years as the evolution of the internet itself.

The Net Effect: an Aura of Rebellion on the Desktop in the early ‘90s

Some of what has happened to our cultural landscape, particularly when it concerns networking, can be seen by contrasting Gore’s phrase “information superhighway” with the word “cyberspace.” “Information superhighway” sounds clean, obedient, and orderly; it sounds a bit like a vision of the future from 1950s futurology, those pamphlets that many of us remember from our childhoods: pictures of smiling, clean, deliriously happy families out for Sunday drives in their flying cars. The connotations of “cyberspace,” in contrast, are darker, less regimented, more thrilling, particularly if one recognizes the term’s origin in the ur-cyberpunk novel, *Neuromancer*. Significantly, the word cyberspace has outlived information superhighway in popular usage.

To understand why we talk today of cyberspace but not information superhighways, it might help to begin by reconstructing a representative computing experience from the early 1990s (that was also the moment when “cyberspace” was introduced into mainstream usage). By early 1993, computers had become a commonplace of office life; word processing was routine and a standard secretarial skill, and a new computer had become a standard part of an academic job offer. Microcomputers had lost the sheen of newness that they had had a decade before, along with their associations with entrepreneurial innovation; by 1993 the least glamorous of the 1980s microcomputer companies, Microsoft, had achieved that much prized and much hated state common to technology industries, a practical monopoly.

Email, however, was still somewhat exotic. Many had experimented with it a bit, but typically within specific, confined worlds like Compuserve, Prodigy, local bulletin boards, or one of several restricted academic networks. In most offices, people who checked their email on a regular basis typically remained a minority. The media buzz about a coming “information superhighway,” was in the air, but this was not yet broadly associated with the internet. “Gophers” were just beginning to be experimented with on university campuses, and only a tiny circle of aficionados had heard of the World Wide Web, which at the time was just a technical protocol with no significant implementation.

Going online at the time was thus technically possible with the computers that were on the desks of journalists, academics, and other professionals, but it was out of the ordinary. Getting there typically required the user to plug in a roughly book-sized modem with a bank of mysterious flashing red lights, and then run a shareware “terminal” program, typing commands, listening to the squealing modem, and typing in another cryptic series of commands

and passwords. Gateways between computer networks were still being constructed. As a result, to send an email from the BITNET network common to less technical universities into the still limited internet, for example, the email addresses had to be sandwiched between quote marks and prefaced by "IN%"—and this technical detail was not easy to find out. If you did all this, it was something you did out of curiosity, experimentation, or to satisfy a technical need or interest; it took a substantial amount of time, and was unlikely to yield much in the way of immediate practical value. If you went online you knew that most people around you did not. But once you mastered such arcana, you could then enter into a secret world.

In this context a message appeared on a number of discussion lists, prefaced with the following:

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From: IN%"TNC@GITVM1.BITNET"      ``TECHNOCULTURE'  discussion
list" 22-FEB-1993 11:48:56.39
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To: IN%"T_STREETER@uvmvax.uvm.edu"  "Thomas Streeter"
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Subject: John Perry Barlow meets the spooks
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Folks,

This lovely missive came from SURFPUNKs (subscription info below). The idea of JPB giving an invited address on technology to the intelligence (sic) community is just soooo sweet. And it's a good speech, too.

Larry Hunter

The bulk of the posting was the text of an address given a few months before, in December of 1992, by Electronic Frontier Foundation (EFF) co-founder John Perry Barlow to a conference on National Security outside of Washington DC.¹⁷ As the message made clear, many members of the US intelligence community (i.e., CIA, NSA, FBI) were present. Barlow's agenda as EFF representative was to educate this community about the value of protecting free speech and privacy in the digital realm.

Ordinarily, when speaking to a skeptical audience, most of us are likely to adopt a careful, formal, "do as the Romans do" kind of strategy. We would downplay our disagreements and differences, and represent ourselves as having deep respect for the audience members. Barlow, however, began his talk this way:

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I can't tell you the sense of strangeness that comes
over someone who earns his living writing Grateful Dead
songs, addressing people who earn their livings as many
of you do, especially after hearing the last speaker.
If you don't appreciate the irony of our appearing in
succession, you have no sense of irony at all. (. . .)
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The reason I am here has absolutely nothing to do with
the Grateful Dead. I'm here because I met a fellow
named Mitch Kapor in 1989. Despite obvious differences,
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I felt as if we'd both been up in the same saucer or something (. . .) that we shared a sense of computers being more than just better adding machines or a better typewriters. We saw that computers, connected together, had the capacity to create an environment which human beings could and did inhabit. (. . .) The people who share this awareness are natives of the future. People who have a hard time with it may always be immigrants.

When Mitch and I saw that computers had created a place, we started asking some questions about what kind of place it was (. . .) We decided to name it Cyberspace, after Bill Gibson's description of a futuristic place rather like it which we found in his novel *Neuromancer*.¹⁸

Here again is the studied informality of net discourse ("we'd both been up in the same saucer or something," "Mitch," "Bill") the pleasure in iconoclasm ("if you don't appreciate the irony"), the individualism (in the EFF's relentless focus on personal privacy and liberties), and the association with power (the CIA!). Crucially, instead of flattering his audience or downplaying his differences from them, Barlow offers them a choice between being one who "gets it" or one who doesn't. Accept his proposition, enter into his rhetorical universe, and you are a "native of the future." Reject it, however, and you are threatened forever with immigrant status.

At the time, reading a missive like this on one's monochrome screen, perhaps during a slow day at the office or perhaps late at night at home, had an arresting effect. The incongruous juxtaposition of a Grateful Dead lyricist with CIA officials was funny, of course, but also enticing: how many people get invitations to talk to CIA officials, much less go on to tweak the officials noses and get away with it? Here was someone whose tax bracket and espionage experience were comparable to yours—that is, modest—yet he was boldly preaching to an established, powerful, and sometimes violent institution. The situation suggested a new opening, a new avenue towards power. As a white-collar reader of this text in early 1993, you felt uniquely privy to this intriguing opening, because you were among the elite few who had mastered the arcane art of online access. The relative obscurity of the procedures needed to get the message only added to the aura of being part of a special group. You, who both got the joke and technically could get access to it, were invited to be one of the vanguard, one of Barlow's "natives of the future." The effect was indeed delicious.

As Barlow's message was circulating in email discussion lists and newsgroups, the first issue of *Wired* had just hit the newsstands, offering a vision of networking distinct from Gore's '50s-style information superhighway. In the early- to mid-1990s, a growing crowd of professionals and white collar workers were being surprised by this kind of experience on their desktop computers. As the number of people with some variety of online access increased from month to month, more and more people had an experience of stumbling upon something striking: it could be a surprising exchange on an email discussion list, involving a tidbit of insider information from afar. Or it could be a titillating personal revelation; this was the moment when stories of email romances began to circulate in popular folklore. It could be a new form of access to something or someone, like the personal MTV "gopher" created as a hobby by MTV veejay Adam Curry: accessing his gopher gave one a kind of "personal" access to a media figure, to someone ordinarily shielded behind the glossy

professionalism of the television screen. (Fans of this gopher were treated to a Barlow-like iconoclastic moment in April of 1994, when Curry, with a 1960s flourish of rebellion, announced his resignation from MTV on air. He said he was resigning in order to pursue his digital activities full time, on the theory that the digital world was the wave of the future, and television was obsolete.¹⁹) Something out of the ordinary, it seemed, was afoot. A central moment in these developments was the release of Mosaic 1.0 for the Macintosh and PC in August of 1993: this first successful web browser created an almost instant “wow” effect among the growing but still narrow population of online experimenters. Seen through the focus of *Wired’s* lens, Mosaic became the “killer app” of the internet.

Crucial to the character of these developments was the fact that online access came first among those who did a lot of word processing, and thus had the necessary equipment and experience readily at hand. Graduate students and assistant professors were online before university presidents and provosts. Middle managers, technicians, and engineers were online before CEOs. Mid-level journalists were online before editors and managers. This is a relatively unusual pattern of technological diffusion: networking entered social life through the same portal as the photocopy machine, rather than through the top-down diffusion patterns of the telephone or the consumer-distribution patterns of television. This pattern thus meant that the sense of something important happening in networking would hit the middle ranks of the knowledge class first. By the mid-1990s, the stage was thus set for the middle ranks to be treated to a drama of obliviousness from above, an object lesson in high-level bewilderment. It was the people who typed their own memos, reports, term papers, and journal articles who sensed the importance of the internet first, and then watched the higher-ups struggle to catch up with them. “Cyberspace,” with its hint of rebellion and lawlessness, better captured the sense of pleasure they felt in watching their secret world trump the staid world of their superiors.

Tropes from the Counterculture: “They don’t get it”

When a marginal social movement accurately anticipates, and in the public eye, a significant historical failure of judgment on the part of leadership, the effect can be powerful. Being right about something in the face of opposition from those more powerful was, for example, a central collective experience of the 1960s counterculture: by 1969, the world had watched the television networks, the *New York Times*, and many members of the political establishment change their position on the Vietnam war. In the mid-1990s, it would be the failure to anticipate the importance of the internet, or in the late 1990s the value of open software. And part of the power of such moments is that they open the door to iconoclastic and other new currents of thought; if the authorities are wrong about that one thing, what else might they have missed?

At the same time, this kind of collective experience establishes the conditions for a less clearly beneficial drawing of boundaries between those who knew and those who didn’t. This boundary-drawing is best captured in the phrase “they don’t get it,” a phrase that tells the listener that he or she and the speaker are part of the elite group. There’s a thrill in the implication that you and I stand apart from despised others in the world. This trope is very much alive today: in Slashdot discussions of politicians, the most important political value is whether or not the politician under discussion “gets it” (about technology). (During the last election, there was much debate on whether or not Gore “got it”; the consensus was that Bush did not.)

In one sense, the 1960s counterculture never went away. It just became available

through popular memory as a set of cultural devices, a cultural tool kit for use by media executives, anti-abortion activists, rock bands, and left activists alike. And so in the early 1980s, for example, MTV turned this boundary-drawing mode of address into a successful corporate marketing strategy, which has since become referred to in the jargon of media executives as media product with “edge.”²⁰ MTV first etched its way into American teenage consciousness—and thereby made itself stand out from the long list of cable television channels that surrounded it—with the now-legendary advertising campaign of the early 1980s, centered on short, often irreverent and visually distinct promos that always ended with the tag-line, usually uttered by a rock star in close up, “I want my MTV.” Like much advertising, the tag line invites identification, in this case, the teen viewers’ identification with the star. What set this campaign apart was that the rock star/viewer was speaking defiantly to an imagined authority figure. The line implied an additional addressee that was a disapproving parent: “my MTV” is not “your TV.” Viewers of the promos knew not only who the ad was for but also who it was not for, and the fact that it was not for parents was one of its selling points.

This is different from straightforward niche marketing that advertises something of interest to a particular group or subgroup (such as *Runner’s World*). In fact, MTV stayed with hard-edged, macho, male-oriented rock and roll long after it became clear that its largest audience segment was young adolescent girls; the macho rebelliousness of the music worked in concert with the channel’s marketing strategy even if it did not exactly fit the tastes of its audience. MTV wasn’t just marketing itself to a niche, it was establishing a cultural identity. “Edgy” institutional communicators establish an identity for themselves and, by extension, their audiences, based in part by articulating what they are not. This strategy makes the typical adolescent desire for self-differentiation from parents a model for a structure of communication. If there’s something adolescent in the tone of much of the web and the media generally these days, it may be more the result of “edgy” modes of address and the desire for differentiation than the actual age of the audience.

It is a well-known fact (though not a well-theorized one) that the historical experience of the anti-Vietnam war movement and the counterculture left its mark on various segments of the computer engineering community, the “invisible colleges” within which the technology was developing. In the 1970s, the engineers at Xerox PARC made bean bag chairs into office furniture, after being celebrated for their hacker rebelliousness by Stuart Brand in the *Village Voice* in 1972. Theodor Nelson’s *Computer Lib* began circulating among computing professionals and amateurs in 1974, and he became a familiar side show at professional conferences during the decade. Jobs and Wozniak had founded Apple computer in 1976, after making friends while phone phreaking in college and then attending meetings of the Homebrew Computer Club, which itself had been founded by activists with considerable countercultural and anti-war experience.²¹ The formation of Computer Professionals for Social Responsibility around anti-nuclear issues took place in 1981. In general, the cold war consensus that had formed the cultural glue of the military-industrial-complex had worn out; during the 1970s, a small community of computer engineers and tinkerers began to envision computers through lenses colored by; countercultural ideas that then were made manifest in a set of ideas and tropes available to the larger culture. These ideas, borne over the net, became vehicles for promoting new meanings, new habits of talk and action.

A case in point can be seen in Louis Rosetto’s creation of *Wired* in the image of *Rolling Stone*. In a 1997 interview, whose point was to dismiss *Newsweek*’s, and by implication all mainstream media’s, technology coverage, Rosetto invoked the renewed mantra of “they just don’t get it.”²² Now part of the rhetorical foundation of outlets like Slashdot or *Wired*, in constant cavalier dismissal of vaguely defined, “old” institutions and points of view (e.g.,

Microsoft, television networks, government bureaucracies, Keynesianism) these media sell an audience by allowing them to feel a part of a knowledgeable avant garde. But if being right about some central event like Vietnam or the internet gives the rhetoric of “getting it” force, accuracy in general is not necessary or even a precondition for the rhetoric to work. The internet was not mentioned once in *Wired’s* first issue; Rosetto had to catch up to the internet like everyone else in the media. More important to its function is that, once the rhetorical ground is established by whatever means, a powerful trope for shutting down further inquiry is made available. In the interview, Rosetto was asked if he was religious, he replied “no.” When asked if he was an atheist, he also replied “no,” and then continued: “It’s not worth thinking about (. . .) I mean, I’ve gone beyond it.”²³ The rhetoric of “they don’t get it” can be used to invalidate any questions the avant garde doesn’t consider important, and that refusing to follow this rejection is the only wise course. The reader is made automatically wary of voicing any criticism, even to themselves. Express doubts, and you risk being worse than wrong, you risk revealing yourself to be a dinosaur, and thus no longer part of the privileged club; you just don’t get it.

Net Modes of Address: Slashdot vs. *The New York Times*

What are the formal indicators of net discourse? Compare Slashdot, a popular website devoted to the open software movement, with its old-media cultural opposite, *The New York Times*. The *Times* identifies itself to us with its grandiose, thoroughly familiar, and typographically retro masthead, accompanied by a subhead: “All the news that’s fit to print.” As if in mockery of the self-confident grandiosity of that subhead, Slashdot’s title banner describes it as “News for Nerds. Stuff that Matters.” The *Times* presents itself as comprehensive; few read everything in it, but we all hold that “everything” in our hands. It feels like a totality within itself. Slashdot presents itself as self-consciously eccentric, and as an entry-point into a labyrinthine world: updated around the clock, each front-page “story” on Slashdot consists of a short paragraph of “news” followed by an always steadily growing train of “posts” from reader/contributors. Scrolling is a necessary part of the experience, as is following links; the familiar “slashdot effect”²⁴ refers to the highly predictable overloading of external web sites within minutes after their URLs are posted in Slashdot stories. While much of Slashdot’s content concerns open software fairly directly—new linux software releases, developments in intellectual property law—a good deal of the content is more general, reflecting the interests and spirit of its young coding-adept producers and readers: intriguing developments in science, reviews of science fiction films, amazing things done with Lego.

It doesn’t help much to describe Slashdot simply as more postmodern or democratic than the *Times*. Relative to, say, books or movies, both web sites and newspapers are fragmentary, non-linear, fast, information rich, and address a kind of engaged citizenry. And both proclaim themselves to be democratic while being edited by, and speaking to, rather specific communities of interests.²⁵ The difference, I suspect, is better approached in terms of their respective modes of address, that is, the character of the social relations implied by the stylistic habits or rhetorical structures with which they address their readers as readers.

I remember well the first time I saw *The New York Times’* masthead on my laptop computer screen in the summer of ‘95. It was a then-new service of the newspaper, offered before they put their content in the www that, after a substantial download, displayed a digest of the newspaper, laid out in the same format as the paper version. I was reading it on an airplane; another passenger a few rows back hopped out of his seat to get a better look and

asked me with wonder how I'd gotten the paper that way.

The effect of seeing the gray lady's masthead on my screen was so striking that it forced me to reflect on what it was that drew me to the paper version of the *Times* in the first place. Why should the masthead matter? Before that moment, I'd downloaded individual *Times* articles from Nexis-Lexis in ASCII format many times in the course of doing research, but seeing the masthead on top of multiple columns of black-on-white justified text gave the writing an entirely different and strangely satisfying authority. The masthead told me which major institution, with all its aura of power and centrality, was speaking to me. I was drawn into reading, not a particular article for some particular information, but simply "the paper." I didn't want it to answer already-formulated questions, but wanted it to tell me what the questions were. The effect is similar to that of the triumphant, resolute musical themes, the logos, insignia, call signs, and other trademarked sonic and visual imagery used to introduce major television network news programs world wide. The aim here is to address the audience in a way that presumes institutional importance, to present an institution's symbols, its "persona," in a terse but declarative tone designed less to persuade us that what follows deserves our attention—that persuasion is reserved for various "hooks" that preview content—but as if we already want to know what the institution has to say and that the urgent declaration of institutional identity is merely to make sure we are forewarned of the coming important information.

Almost as quickly as I recognized the effect of the *Times* masthead on my computer screen, however, I noticed its limitations: scroll down to read an article, and the masthead is gone. No matter how hard they try, the major media institutions of the world have a hard time reproducing their customary grand modes of address on the world wide web (portal strategies notwithstanding). And this limits their draw: after various aborted efforts to develop subscription models, the *Times* is still giving away its content on the web, unable to command enough digital authority to demand payment. (This in spite of an obvious longing for the iconographic power of the masthead, on the part of the editors and probably some portion of the audience: www.nytimes.com still offers an image of the first page of the daily print edition, downloadable at great expenditure of time, bandwidth, and legibility.²⁶ One can't actually read the stories in this format.)

The thrill I get from Slashdot, by contrast, is from the implication that I, the clever Slashdot reader, stand apart from despised drones in suits who might, for example, work for Bill Gates. The implication, then, is that by reading Slashdot, you are part of a distinct cadre very much defined in terms of its opponents. "Slashdot" derives from the computer command `"/.` which takes the operator to the "root" directory of Unix systems, a privilege only available to system operators with absolute "superuser" privileges over a multi-user system. It's a common command if you're fiddling with the technical setup of a Unix system. But it's also about power. If you can type `"/.` on a Unix computer and get to "root," you can get into and modify anyone's account on the system. You can do things like read other people's email or change their passwords. You are omnipotent.

Slashdot is no Quaker meeting.

Pop Weberians

The "new non-fiction" shelves of the Borders and Barnes and Noble bookstores across the land are currently featuring a book called *The Hacker Ethic and the Spirit of the Information Age*. Compared to the pop-social-theorizing in the tradition of Alvin Toffler that typically populates these shelves, this book is relatively free of the relentless anecdotalism and indif-

ference to scholarship characteristic of the genre. Sociologist Manuel Castells contributed an appendix. The book makes frequent reference to Weber's *Protestant Ethic*, and mentions other relevant literature such as the work of E.P. Thompson. The book, in reflecting on the "hacker ethic" at the core of the open software movement, actually contains something like a thoughtful discussion of a key issue of social theory: what common sense ethical frameworks shape human behavior, and how do these relate to dominant economic structures? And the book calls into question some of the key premises of the neoliberal economic world view that has been setting the policy agenda across the globe for the last twenty years.

That said, the book is more a reflection of our current intellectual climate than an explanation of it. Castells, it turns out, merely recapitulates some of the themes and assertions of his three volume work, *The Information Age*. The second author listed, über-hacker Linus Torvalds, contributed only a short "Prologue," which proposes that all human motivation can be classified into three categories: the search for survival, for social life, or for entertainment. It's an engaging, self-confident bit of sui generis social theorizing, in tone somewhat reminiscent of the Unabomber manifesto, though with a more amiable interpretation of human nature and technology. The book's actual author is a relatively unknown professor of philosophy by the name of Pekka Himanen. Perhaps with his publisher's encouragement, he has sought attention by hammocking his name and text between the rock-star-like fame of Torvalds and the highbrow status of Castells. (It's worked on Slashdot, at least, where the book has gained a permanent link prominent link in a box on background reading.)

What stands out most about *The Hacker Ethic*, however, is that at its core it adheres to a naive abstract individualism, in spite of all its borrowings from social theory and social theorists. Exhibit A of the open software movement, the story of Torvald's crafting of the linux kernel, is presented in accordance with the folklore: as an isolated act, occurring outside of any material context beyond the online world of fellow hackers. Torvalds, we're told, learned programming on his own, outside of any coursework, and wrote linux out of sheer curiosity and passion. That Torvalds was in fact a computer science major and then graduate student at the taxpayer-funded Helsinki University during the crucial years of linux development—he cut a lot of classes, apparently, but did read the textbooks—is nowhere mentioned.²⁷ Thus the role of Finland's social democratic welfare state, elaborate educational system, and high tax rate as conditions of possibility for this open software triumph is obscured. For that reason alone, it's hard to imagine that *The Hacker Ethic* would ever be accepted as a graduate thesis in any average sociology department.

My point here, however, is not that the book is worthless. On the contrary, *The Hacker Ethic* nicely captures the contours of contemporary net discourse: the thoughts of a computer programmer, pop philosopher, and sociologist are all juxtaposed as if they were revelatory. The appearance of yet another trade book that mangles social theory is not in itself surprising, but what this book illustrates is the broader field of discourse that will shape the reception of any effort we might make to talk outside our own immediate scholarly circles.

Conclusion: the Incitement to Discourse

When John Perry Barlow began using the term "cyberspace" to refer to the world of networked computers, in order to explain the meaning of the then-unfamiliar term, he would say, "if you're having trouble with the concept [of cyberspace], ask yourself where phone conversation takes place. That's right. Cyberspace is where you are when you're on the phone."²⁸

Like any good sound bite, Barlow's analogy is vivid and accessible, and merely a means

to get quoted. But let us take the telephone metaphor just a little bit more seriously than Barlow intended. If cyberspace indeed encompasses the telephone, then cyberspace is more than a hundred years old, and has been shaping everyday life for several generations. And if that's true, those of us interested in studying cyberspace logically would be busy studying the history and social impact of the telephone. The telephone, after all, not only offers a century's worth of rich data on technological change, but it is change that is still ongoing: most people in the world have yet to gain access to telephone service; the world is literally full of people with living memories of the introduction of the telephone into their lives. The telephone, one would think, provides a golden opportunity for real life causal, before-and-after analysis of technological diffusion. It furthermore, has arguably changed everything from people's habits of romantic intimacy to the means of political organization to the boundaries between private and public to our senses of space and time. Sex, democracy, privacy, virtuality—it's all there in the telephone.

Now go to your university library's catalog, and do a search for books under the subject heading, "technology—social impact—telephone." And now try "technology—social impact—internet." In my experience, you'll find a three- or four-to-one ratio of books on the internet to books on the telephone.²⁹ In old-fashioned print media alone, the internet has inspired a fountain of talk, reflection, and publication; never mind what's going on online.

So why do we have so much to say about the internet? What has prompted this vast production of scholarly discourse? The reasons are complicated, and of course do include the fact that the internet is a remarkable phenomenon worthy of inquiry in its own right. But I think we should at least allow that the larger social significance of the internet is still an open question, and that therefore we should leave open the possibility that the internet is merely another in a long line of remarkable communication technologies including the telegraph, radio, cinema, television, audio recording—each of which was quite startling in its own day—and that the outpouring of scholarship on the internet and information technology may be a symptom of things not entirely technological.

Some might protest: what about the many astonishing events associated with the internet, the sudden mushrooming of new corporate empires, the incredible mergers, the fact that even the Chairman of the Federal Reserve believes (or for a time, believed) that we live in an internet-driven "new economy?" Unless one subscribes to the notion that markets and business behavior are necessarily, mechanically, and firmly linked to the underlying truths of human life (for which the collapse of the internet stock bubble serves as commentary enough), the connection of these events to the internet itself is not self-evident; all that is required for these events is a shared suspicion that the internet is somehow important, not a truth that it is in fact so. Yet even so, many say, the internet changed my life because of email, or discussion lists, or PhotoShop, or the web. There is undoubtedly some form of important truth to such claims, but before generalizing from our personal experience to the world, shouldn't we consider the specifics of our social position as academics, and weigh the current claims against other explanations and other technologies? The photocopy machine changed our lives as well, and perhaps similarly, speeding up the pace of the circulation of texts, changing the way documents were produced and circulated globally, and throwing book production and intellectual property law into turmoil. Yet where is the talk of the photocopying revolution?

Why do we even listen to claims like Louis Rossetto's in the first issue of *Wired*, where he asserted that computer technology is creating "social changes so profound their only parallel is probably the discovery of fire?" In the 1960s, Tom Wolfe tried to explain the

McCluhan phenomenon by comparing McCluhan's arguments about television to Freud's arguments about sexuality; in both cases, what was compelling about the argument was not that it was overwhelmingly convincing, but that it raised the question, "what if he's right?"³⁰ What if something so mundane and common as sex or television was as important as these oracles claim? With this in mind, one might rewrite what Foucault said about the repressive hypothesis by replacing references to sexuality with "internet revolution," thusly:

[T]here may be another reason that makes it so gratifying for us to define the relationship [between technology and society in terms of revolution]: something that one might call the speaker's benefit. [If the internet is revolutionary], then the mere fact that one is speaking about it has the appearance of a deliberate transgression. A person who holds forth in such language places himself to a certain extent outside the reach of power; he upsets established law; he somehow anticipates the coming freedom. (. . .) [when we speak about the internet] we are conscious of defying established power, our tone of voice shows that we know we are being subversive, and we ardently conjure away the present and appeal to the future, whose day will be hastened by the contribution we believe we are making. Something that smacks of revolt, of promised freedom, of the coming age of a different law, slips easily into this discourse.³¹

ENDNOTES

Thanks to Sylvia Schafer for suggesting the title, to Michael Fortun for suggesting the use of Foucault's incitement to discourse, and to Clifford Geertz and the members of the IAS Infotech seminar for their many other helpful comments and suggestions on this material.

- 1 Roy Rosenzweig, "Wizards, Bureaucrats, Warriors, & Hackers: Writing The History Of The Internet," *American Historical Review*, December 1998, volume 103, number 5; pp. 1530-1552.
- 2 Michel Foucault, *The History of Sexuality: Volume I*, Robert Hurley (trans.), New York: Vintage, 1980, p. 7.
- 3 Lawrence Lessig "Governance Draft 3.0," Keynote: CPSR Conference on Internet Governance, October 10, 1998, p. 6.
- 4 Lessig, "Governance," p. 6.
- 5 See <http://www.politechbot.com/p-00068.html> or "Clinton Net Guru's Legacy: Doing Nothing Well," DECLAN MCCULLAGH AND NIALL MCKAY (Reuters) LA Times, Thursday, November 12, 1998.
- 6 Licklider and Veza 1978: 1330-1346; quoted in Hardy 1996 (see note 7).
- 7 Ian Hardy, "The Evolution of ARPANET email," Unpublished Senior Thesis, University of California, Berkeley, 1996, available at http://server.berkeley.edu/virtual-berkeley/email_history.
- 8 Bush imagined a storage medium of "improved microfilm." See his article: Vannevar Bush, "As We May Think," *The Atlantic Monthly*, July 1945, which is available online at <http://www.theatlantic.com/unbound/flashbks/computer/bushf.htm>.
- 9 J. C. R. Licklider "Man-Computer Symbiosis," *IRE Transactions on Human Factors in Electronics*, volume HFE-1, March 1960, pp. 4-11.
- 10 Ralph Lee Smith, "The Wired Nation," *The Nation*, May 18, 1970, p. 582 and p. 602.
- 11 Richard I. Kirkland Jr., "What The Economy Needs Now," *Fortune*, December 16, 1991, Domestic Edition, p. 59.
- 12 Alan Stewart, "NCF flexes its muscles," *Communications International*, November, 1991, No. 11, Vol. 18; Pg. 12, quoting Congressman Don Ritter, a member of the U.S. House Science, Space and Technology Committee.

- 13 Historian Thomas Hughes grumbles about the difficulties of convincing both the left and the right of the post-1960s generation that what he calls the ‘military-industrial-university’ complex was valuable. Thomas Hughes, *Rescuing Prometheus*, New York: Pantheon, 1998.
- 14 This was what Gore was referring to when, early in the recent presidential campaign, he said “I took the initiative on the internet.” This statement was then attacked in print by Wired magazine reporter and libertarian Declan McCullagh, and eventually twisted by various Republicans into the inaccurate soundbite that Gore said he invented the internet. It’s galling that so many leading reporters irresponsibly repeated that soundbite up to the end of the campaign; it seems plausible that the “Gore said he invented the internet” quip did at least as much damage to Gore’s final vote count as Ralph Nader. But, while it’s factually untrue, the sound bite is funny. And I suspect it’s funny because it appeals to a common skepticism about the technocratic optimism and perhaps arrogance of the managerial mode of thought associated with technology policy: it’s common and it’s fun to be skeptical of the overly optimistic visions of order and predictability that so often seem to motivate this kind of policy logic.
- 15 See Erik Barnouw, *A Tower in Babel: The History of Broadcasting in the United States to 1933*, New York: Oxford University Press, 1966.
- 16 In 1918, the corporate world imagined radio as a tool exclusively for strategic, point-to-point uses like ship-to-shore and military communication, and it took the radio amateur community (the original hackers of the twentieth century) to discover the pleasures of broadcasting and using radio for entertainment in the 1906-1919 period. When radio became a popular craze in 1920, the corporate world was taken off guard, and it took major strategic reorientations, a new relationship to Madison avenue, and a new regulatory agency and legal constructs to bring things under control again. It was a key moment in the consolidation of Fordism.
- 17 Remarks of John Perry Barlow, First International Symposium on National Security & National Competitiveness, McLean, Virginia, December 1, 1992
- 18 My ellipses.
- 19 David Toop, “MTV gets tangled in the net,” *The New York Times*, May 28, 1994.
- 20 “Edge” is a media industry colloquialism regularly heard in product development meetings. It is both an aesthetic category—“edgy” texts do not soothe—and a demographic strategy: products with “edge” sharply define the boundaries of their intended audience and offer a demographically tightly focussed appeal.
- 21 See Steven Levy, *Hackers: Heroes of the Computer Revolution*, New York: Penguin USA, [1984] 2001.
- 22 Paul Keegan “Reality Distortion Field,” *Upside.com*, February 01, 1997
- 23 Keegan, “Reality Distortion Field.”

- 24 See <http://ssadler.phy.bnl.gov/adler/SDE/SlashDotEffect.html>.
- 25 It's true that Slashdot's open posting policy makes it quite distinct from a largely one-way medium like the Times. But those who post are a quite rarefied group; if you don't know how to compile a linux kernel or don't have the time and resources to read and make sense of all the insider information—that is, if you're an ordinary US citizen—you're practically speaking just as excluded from contributing as you are from the Times.
- 26 See <http://www.nytimes.com/yr/mo/day/front/scan.html>.
- 27 Glyn Moody, *Rebel Code: the Inside Story of Linux and the Open Source Revolution*, Cambridge, MA: Perseus Publishing, 2001, pp. 10-11.
- 28 Remarks of John Perry Barlow, First International Symposium on National Security & National Competitiveness, McLean, Virginia, December 1, 1992
- 29 The Princeton University Library's main catalog turns up 34 books for the internet, and seven for the telephone. This is of course hardly a complete bibliometric analysis, but you get the point.
- 30 Tom Wolfe, "What if He is Right?" in *The Pump House Gang*, New York: Bantam, 1968.
- 31 Foucault, *The History of Sexuality*, pp. 6-7.

Michael Fortun

To Speculate—On Genomics

LavaXLand

Being a hot spot above a mantle plume, Iceland has been piled up through voluminous volcanic material with a much higher production rate per time unit than in any region in the world. It has grown by rifting and crust accretion through volcanism along the axial rift zone, the volcanic zones, which in terms of the plate tectonic framework marks the boundary between the Eurasian and North American plates. Accordingly the western part of Iceland, west of the volcanic zones, belongs to the North American plate and the eastern part to the Eurasian plate (. . .)The rate of spreading is calculated to be 1 cm in each direction per year(. . .)The best place in the world to study divergent plate boundaries is Thingvellir, which offers the possibility of observing, in a graben system, both faults and tension fissures (*gjá*) related to the rifting and drifting of the North American and Eurasian plates away from each other.—*Iceland: The Republic*¹

The fissure swarms—a precise geological term—appear across Iceland from the southwest to the northeast, diagramming with little black cross-hatches the volatile zone where the North American tectonic plate separates from the Eurasian, suggesting a country constituted by eruptions, crustal upheavals, subglacial shifts, lacustrine sedimentations, and other kinds of multiple flows at multiple speeds that fold into or grind against each other, sometimes imperceptibly, sometimes violently. The quasi-solid geo-logic nevertheless opens itself to readings along multiple logic registers—conceptual, sociological, economic, biological—that are not only possible but vital for speculating on genomics today.

Iceland is the main subject of my broader, more ethnographic project on the multiple volatilities of genomics, of which this essay is only a part. The issues, dilemmas, and urgencies specific to Iceland's political and scientific economy are submerged here in favor of sounding some of the conceptual and rhetorical fissures that cut across genomics in its more global manifestations as an assemblage of technoscientific practices (from “wet” practices like phlebotomy to the “dry” databasing of molecular information), investment strategies (from the on-line trades of the “unsophisticated investor” to the massive gambles of pharmaceutical companies), and most of all, the rhetorics and pragmatics of a certain class of statements which may be grouped under the heading of “forward-looking statements,” although “speculations” would be no further from the truth.

It has been the ethnographic exploration of genomics in Iceland in the last years of the twentieth century that opened me to the necessity of diagramming and experimenting with a new set of concepts. Genomic volatility there has presented a difficult set of challenges:

the privatization and monopolization of their national health care records, achieved by deCODE Genetics, Inc. (incorporated in the U.S. in 1996, impelled by venture capital firms affiliated with the University of Chicago and Harvard University, outfitted in nationalist wool as an “Icelandic” company, kept afloat by a \$200 million promise from Swiss-based Hoffman-La Roche until a July 2000 IPO injected an additional \$182 million) in collusion with a conservative majority coalition of the Icelandic parliament; a CEO, Kári Stefansson, who is by most accounts highly volatile and by some accounts a psychopath, who has breathed new life into the mythic figure-word “Viking;” the fissuring of the communities of scientists and physicians; the transferral of financial risk from Stefansson, the VCs, and deCODE to the second mortgages and personal loans of 6,000 Icelanders who bought stock in deCODE from the Icelandic state banks at “gray market” prices of \$30-65 per share (deCODE opened at \$18 in its IPO, rode a brief bubble of volatility to \$28, and as of this writing trades around \$9), an operation that may otherwise be referred to in the future as “swindling”; the decaying practices of informed consent in biomedical research as they give way to the “open consent,” “broad consent” and “presumed consent” that allow biodatabases and biobanks to be built up most quickly, with the bio-“donors” in this exchange economy effectively shut out from any writing of the future; and a swarm of other fissures that can’t be enumerated here.

This essay diagrams sequences of speculative activity as they operate across a range of global genomics territories in which Iceland is but one particularly “hot spot.” It reads in, across, and between the territories of an informed, networked genetics; an informed, networked genomics industry; an informed, networked economy of millennial capitalism; and the informed, networked economy of volatile concepts that comprise the postal system of language that relays, switches, and swerves “our” “thought.” The promise made here is that this set of concepts networked around speculation and volatility will be better for thinking about and living with genomics.

Having opted into that economy of valuation, I should begin to flesh out this vague notion of better in the easiest way possible, through reference to its opposite: the worst place to start thinking about what genomics is and what it entails for Icelanders and the rest of us, is with the images, stories, and concepts that readers are undoubtedly all too familiar with: that our DNA, our genes, and our entire genomes are blueprints, codes, programs, secrets—“the book of life,” to enclose these images within the standard cover story. No serious molecular geneticist even starts here anymore, unless perhaps they are testifying before a congressional committee or speaking to a group of dim-witted potential investors looking only for the quickest possible return. An organism—human, mouse, fruit fly, worm, bacterium or virus—is, they know, simply a much more complex territory. A territory not unlike Iceland, in which multiple forces act across different time scales, powerful collisions and collusions are the norm, faults emerge out of vast subterranean landscapes, and sublime wonders appear alongside other, more disturbing effects.

Genomics has marked our time as one in which blood or tissue samples are donated or taken, and their long coils of DNA sequenced and databanked in computers that we are barely confident in distinguishing as “private” or “public.” These biomaterials and biodata are exchanged, traded, sold, and speculated on in an incredibly differentiated, interlinked, and fast-moving economy of university labs, hospitals, sleek new commercial genomics companies, and imposing pharmaceutical corporations. Extraordinary claims are made for the role of genes in the illnesses that befall our friends, in the behaviors that we watch ourselves and others perform, in the patterns of entire societies—claims that are, on some occasions, borne out in interesting ways. Hundreds of social scientists, ethicists, and legal scholars

work diligently on research projects about “genetics and society,” attend an endless stream of professional conferences, and intensify or assuage our concerns about informed consent in biomedical research, other discriminatory practices channeled through genetic technologies, corporate control of “life itself,” the health and ecological risks of genetically modified organisms, and the always-imminent departure from the values, rights, and modes of existence that some fondly call “human.”

While most of us do not live in Iceland, when it comes to genomics, we are all inhabitants of lavaXland. The X in lavaXland marks the fissure out of which emerges both flowing lava and solid land. The figure marks the spot of volatility and speculation. It marks the place where lava and land are joined, in sameness while separated in difference. It marks the place of in which change and recombination are manifest. It marks an event. It marks an *and*—lava and land—although it would be better to say that the X marks the not²—not lava, not land: it marks what can’t be marked and yet what must be discerned. The X is a figure of difference, divergence, void, interruption, and emergence. It is a necessary and productive (non)concept, but one that has been marginalized in favor of the more comforting *ground* against which it occurs: identity, stability, presence, continuity, solidity, and perpetuity.

Each section here falls under the sign of the X—by which I mean not our letter *x* but the Greek letter *chi*—marking the chiasmus. The chiasmus appears at the center of the analyses here because it is a potent figure both in the field of biology, and in the field of rhetoric. In more properly biological terms (forgetting for the moment the chiasmus that occurs in the fold of rhetoricXbiology) the *chiasmus* is the name given to the site where two chromosomes join, become entwined, and, most importantly and productively, recombine rather than simply reproduce or replicate. The chiasmus is the site of chance and an emergent future—and, with luck, evolution.

One of its operations in rhetoric is to join and distinguish, combine and reverse two terms. The chiasmus marks a folding into each other that, like any of a number of M.C. Escher prints, never settles down into a *first this, then that* image, statement, or concept. Rhetorically, the chiasmus marks the spot where two distinct concepts can’t be distinguished from each other, but feed off each other, send silent coded messages between themselves, and set possibilities in motion: not the smooth and simple interaction between distinct entities (nature and nurture, to cite just one familiar example), but the inescapably volatile and generative operations of an *aporia*.

The chiasmus or fissure also figures in the project of “cultural critique” as articulated by George Marcus: a “strategy of engagement” oriented towards “finding where the ‘fissures’ are—that is, finding those concepts, methods, ideas, practices, and life experiences within the culture of the mainstream, about which there is self-doubt and uncertainty,” and “understanding these potentially self-critical cultural formations (. . .) *ethnographically*, in their own terms and expressions”³ Or in the terms that Elizabeth Wilson borrows from Eve Sedgwick and Adam Frank: it is a matter of tracing the “potent incoherences” that constitute the force of any project of knowledge and thought.⁴ Or a matter of locating oneself within the baroque folds, “pleats of matter,” and diverging intubations of concepts, souls, and other events of the LeibnizianXDeleuzian animal.⁵ Or a matter of sliding along the moebius-morphology that characterizes Elizabeth Grosz’s “volatile bodies,” and the ways in which their defining aspects—matter and symbol, biology and culture, sex and gender—do not oppose each other or merely “interact,” but become irreducibly entangled or, less redundantly, simply *become*.⁶

This essay leverages itself from the same “first premise” that vitalizes the promise of

Wilson's *Neural Geographies*: "the first premise(. . .)is that if our critical habits and procedures can be redirected so that biology and neurology are not the natural enemies of politics(. . .)then we will find a greater critical productivity in biology" than we are often led to believe.⁷ My attempt at such a redirection, with genomics substituted for neurology, will necessarily depend on the same volatile combination of deferral, premissing, refiguring, speculating, and attending to the forces of difference and margins that Wilson deploys as a way to avoid "reduc[ing] and simplif[y]ing] the complexity of the relation between biology and its outside."⁸

Each section below diagrams the irreducible complexities of a different site—genomic databases, the general economy of genomic corporations, securities law, and so on—where some form of speculation not only occurs, but must occur. One future or another usually demands to be named in this speculative moment, so statements about the future become a recurrent theme. How are genomic futures narrated? What statements about the future are possible, and/or necessary? What are the mutating legal, conceptual, and rhetorical apparatuses by which such statements about genomics on its multiple plateaus are produced and regulated? How are such statements implicated in the performative production of genomic futures?

To begin, let's witness how the explosion of genetic information in the past decade and a half has allowed geneticists to more fruitfully encounter the limits of their discipline, its concepts, and its organisms. Such an encounter or event has also sometimes been known as deconstruction.

DeconstructionXBiology

In their article "Exploring Genome Space," Ognjenka Goga Vukmirovic and Shirley M. Tilghman write of the "intellectual and experimental sea change" that biology is undergoing as an effect of the massive amounts of genetic and other information now routinely pouring out of corporate, university, and government labs. They describe, in adaptationist terms, "some of the challenges that biologists face as they acclimatize themselves to this change in the data landscape."⁹ Space, sea, landscape: we life scientists are in vast territories now—virtual-material spaces of bio-info-material produced, managed, and mined through networked biological databases and bioinformatic practices that share the time, genealogy, and political economy of the PC and the Internet.

The "reductionist approach" that had characterized biology, they write, although a "powerful strategy" that "will continue to be important," had always been "overwhelmed" by the "enormous complexity of a living organism." (Ibid.) The "post-genomic" era was, is, and/or will be—the timing of such events is always a question awaiting a decision—an era of "functional genomics." (Long before the completion of any full human genome sequence, and hence long before it might be considered proper to speak and write about what "genomics" was, life scientists who might otherwise be extremely allergic to "post-" constructions were already anticipating and welcoming the "post-genomic" era. In this highly accelerated bioworld where every scientist and every corporation and every nation perceive themselves as in some kind of race or another, post-genomics couldn't even wait around for genomics to be developed.) Vukmirovic and Tilghman write about the challenge of this information-intensified, post-genomic futureXpresent:

The challenge is to describe the collective properties of whole organisms in a precise and quantitative way. This challenge is new to biology, and its

resolution will require, in addition to existing paradigms of molecular biology, new sets of analytical tools. It is hardly a coincidence that many universities and research institutes, including our own, are making major investments in multidisciplinary life-science initiatives to explore the complexity of living things. Organisms are networks of genes, which make networks of proteins, which regulate genes, and so on *ad infinitum*. The amount of complex data that will be generated, and the need for modeling to understand the way networks function, will ensure that disciplines outside of biology will be required to collaborate in this problem, if the ultimate goal to deconstruct such networks is to come to fruition. (Vukmirovic and Tilghman 2000, 822)

Like the organism, and like the biology of which it writes, this passage itself is subject to deconstruction—which is, in a very precise way, its gift¹⁰: How can a challenge to biology be troped as “new,” when many biologists have, for as long a time as one might care to remember, articulated the challenge which they encounter in terms of “describ[ing] the collective properties of whole organisms in a precise and quantitative way”? How is it that one can write of and aspire to an “ultimate goal,” when one’s object is a network of networks implicated within networks, “*ad infinitum*”?¹¹ Perhaps only if the ultimate goal is not to take apart, and certainly not to destroy or kill, but to repeatedly shake the apparent foundations, to rattle the structures of life and the life sciences that are always already trembling anyway. This is indeed where biology collaborates with what is here called its “outside.” Vukmirovic and Tilghman and *almost* all other life scientists might never number those diverse practices gathered under the name of “deconstruction” as among those that have to be admitted to “multidisciplinary life-science initiatives.” But such a collaboration is indeed possible and even necessary. This “genome space,” this new “data landscape,” is the sea of change where a biology bent on deconstructing organisms in truth needs deconstruction itself—needs it because it already has it, or continually undergoes it.

As the molecular biologist and historian of molecular biology Hans-Jörg Rheinberger writes: “It is precisely the characteristic of ‘fall(ing) prey to its own work’ that brings the scientific enterprise to what Derrida calls ‘the enterprise of deconstruction’.” If the enterprise of deconstruction was concerned primarily with tracing the limits of systems of writing and their effects, Rheinberger extends that analytic to trace the limits of experimental systems in the life sciences. Such experimental systems in genomics—built around and out of organisms like mice, fruit flies, and humans—“can be compared to a labyrinth whose walls, in the course of being erected, simultaneously blind and guide the experimenter(. . .)It cannot be planned. It forces one to move by means of checking out, of groping, of *tâtonnement*.” As a result,

one never knows exactly where it will lead. As soon as one knows exactly what it produces, it is no longer a research system. An experimental system in which a scientific object gathers contours and becomes stabilized, at the same time must open windows for the emergence of unprecedented events (. . .)Stabilization and destabilization imply each other. If the system becomes too rigid, it is no longer a means for making the future; it becomes a testing device(. . .)[and] loses its function as a research tool.¹²

For another angle on the (in)stabilities of experimental systems, consider the articulations of David J. Lockhart and Elizabeth A. Winzeler of the Genomics Institute of the Novartis Research Foundation, who trope the main challenge of (post-)genomics as one of

“making sense.” Life scientists, they write, are relatively well-equipped with both the wet and dry tools for producing and now combining large data sets, evidenced by such websites as the *Saccharomyces* (yeast) Genome Database, MIPS (Munich Information Center for Protein Sequences), WormBase (for the nematode *C. elegans*), FlyBase (for the fruit fly *Drosophila*), EcoCyc (the Encyclopedia of *E. Coli* Genes and Metabolism), and KEGG (the Kyoto Encyclopedia of Genes and Genomes). Post-life scientists—that is, those who have no choice but to think within the “rhetorics of post-vitality” whose emergence and productivity has been written about in Richard Doyle’s *On Beyond Living*³—are now in need of “more sophisticated systems of knowledge representation (or ‘knowledge bases’) that organize the data, facts, observations, relationships and even hypotheses that form the bases of our current scientific understanding. This information needs to be more than just stored; it needs to be available in a way that helps scientists understand and interpret the often complex observations that are becoming increasingly easy to make.” But the problem, as they understand and interpret it, is that “the scientific literature has been somewhat haphazardly built, without the benefit of a controlled grammar or restricted vocabulary and a well defined semantic and grammar.”

What’s needed, they argue, is “a step beyond”¹⁴ these kinds of databases, to “one in which concepts as well as facts are more fully integrated and related.” Lockhart and Winzeler do not walk my route, which I’d call something like genomeomics, and which would clarify the ancient or at least classical forces that operate in this “new era.” Instead they briefly pin some hope on the development of a “biological ‘expert system’, not unlike the expert system (‘Big Blue’) that IBM scientists and engineers built to play chess (successfully) against the world’s best chess player.” But deeming it unlikely that such a system could ever “replace the trained human brain,” they settle for the more modest trope of supplementation, asking only that trained human brains be provided with such “appropriate tools” so that “the most insightful questions can be asked and the most meaningful interpretations made.”¹⁵

In this passage with its own restricted vocabulary, controlled grammar, and well-defined semantics, one can find many surprising, unpredictable effects. But one would have to resist the merely corrective impulse that might point out the simple mistake that, according to our current semantics, the proper name for the IBM “expert system” that defeated Gary Kasparov was “Deep Blue” and not “Big Blue.” Big Blue is the nickname for the corporation itself. But this kind of reverse-metonymic slip, in which the whole is substituted improperly for the part, does indeed “make sense.” Kasparov (who, if there were time, should be depicted as multiple himself) was indeed defeated not by a machine, but by an entire corporate assemblage that included Deep Blue, its chess-expert programmers, lord knows how many software and hardware technicians, the utility company that provided the electricity, a hard-working marketing department, banks, military contractors, and a large population of shareholders. And the “expert system” that could be called Big Blue but which we usually name as IBM was indeed “built” by “IBM scientists and engineers”—just like the machine they produced for one of its corporate gambits.

Metaphorical transferences and metonymic substitutions occur in any sense-making operation. The boundaries supposed to separate levels and layers—informationXsense, genomicsXbeyond, expert systemXsystem of experts—are volatile, semi-permeable membranes. The question, “Which of these is more fundamental?,” becomes less interesting, or at least less satisfactorily answerable within the syntax of the life sciences as usual. It is the constant transport of materialitiesXvirtualities across and through these membranes, rather than the “fundamentality” or “beyondness” of the respective territories, that renders them

lively.

GeneXOme

“Like other sciences, biology today has lost many of its illusions. It is no longer seeking for truth. It is building its own truth. Reality is seen as an ever-unstable equilibrium.”—François Jacob, *The Logic of Life* (1970)

Coming to terms with the volatilities of the life sciences and their languages is not necessarily such a new development for life scientists (especially for those engaged more with matters of development than heredity). The Nobel laureate and fine writer François Jacob (whose creation with Jacques Monod of the operon model of gene action marks a key moment in the entangling of the gene and its others) has long understood how our conceptualizations of organisms are themselves a kind of vibratory effect of whatever laboratory, social, and linguistic technologies are being used in the building of biological truths at any given moment in history.¹⁶

Evelyn Fox Keller has recounted much of that conceptual history in her most recent book *The Century of the Gene*, concerned with detailing the rather paradoxical development in which, “at the very moment in which gene-talk has come to so powerfully dominate our biological discourse, the prowess of new analytic techniques in molecular biology and the sheer weight of the findings they have enabled have brought the concept of the gene to the verge of collapse.”¹⁷ It is a conceptual collapse caused by the sheer weight of new genetic sequence information and other kinds of information. Keller quotes molecular geneticist William Gelbart who, in his 1998 article in *Science* titled “Databases in genomic research,” argues that the gene may be “a concept past its time;” the “historic baggage” which the concept has accumulated may have to be shed, since “we may well have come to the point where the use of the term ‘gene’ (. . .) might in fact be a hindrance to our understanding.”¹⁸

If the 20th century was indeed *The Century of the Gene*, then the 21st is shaping up to be The Time of the -Ome. The -ome has become a necessary supplement to the gene, and now to a host of other entities as well. In the 1980s it became no longer sufficient to study a gene or genes, but to move to the study of the entire *genome*. Instead of merely studying proteins now, one is engaged in proteomics: the study of all the proteins produced by an organism, its *proteome*. If organs and tissues are more your thing, you now might consider the relationships of genes and their expression to the *physiome*. Life scientists who were once enmeshed in the processes of single gene expression and the ways in which a piece of DNA was written into messenger- and transfer-RNA now have interested themselves in the *transcriptome*, the tome that covers all of an organism’s capacities for expression. This promise of totalityXtotality of promise that comes with the territory of molecular databases is often summed up under the newXold heading of “systems biology.”¹⁹

To begin to understand why all this is happening, and how this event in the genealogy of the life sciences and “life itself” is conditioned by, among many other things, the rapid growth and intensification of a variety of information technologies, let’s turn not to genes but to some quick framings that illustrate the conceptual evolution that proteins are undergoing.

Four life scientists at the hyphenated hybrid university-federal organization called the UCLA-DOE Laboratory of Structural Biology and Molecular Medicine recently provided a succinct statement on what proteins are: “Proteins are the main catalysts, structural

elements, signalling messengers and molecular machines of biological tissues.”²⁰ At some other historical moment, in another grammar and syntax, life scientists might have said something simpler, more telegraphic: *proteins are the secret of life*. But one of the *gifts* of the post-genomics era in which these four life scientists write (about) what proteins *are* is the provision of a complex, differential system of elements that would render such simple, telegraphic devices unproductive and untruthful. Protein function in the post-genomic era has moved on from the classical view, which focused on the action of a single protein molecule that catalyzed a reaction or bound to another specific protein molecule, to an “expanded view of protein function” in which a protein “is defined as an element in the network of its interactions.”

The classical view of protein function is given the name “molecular function.” What to name the new articulation of protein function remains, as yet, an open question; “contextual function” or “cellular function” have entered into useage or have been, as these four life scientists phrase it, “coined.” One can trade on these names and attempt to leverage them into new products. “Whatever the term,” they announce, “the idea is that each protein in living matter functions as part of an extended web of interacting molecules.”²¹ The simple evolutionary diagram they provide for this conceptual evolution of protein function might be transferred, with some small degree of resistance, to a diagram of the always undergone, always yet-to-be-undergone transition from a correspondence model of signified-to-signifier, to a semiotics of the post-structuralist, postal structure of multiple relays. Protein function becomes borrowed, deferred, disseminated.

The webbed interactions of proteomics are but one sign of a new appreciation for and interest in complexity. As Craig Venter (then President of Celera Genomics) and his 273 co-authors wrote in their article in the February 16, 2001 issue of *Science*, describing some of the lessons learned from the newly completed—more or less—sequence of the human genome: “The enumeration of other “parts lists” reveals that in organisms with complex nervous systems, neither gene number, neuron number, nor number of cell types correlates in any meaningful manner with even simplistic measures of structural or behavioral complexity. Nor would they be expected to; this is the realm of nonlinearities and epigenesis.”²² It’s a nice irony: having the complete linear sequence of the human genome reminds us of just how nonlinear we are—that the correlations and “inter”actions between multiple genes, multiple proteins, complex diseases, and complex behaviors, are all subject to complex developmental or epigenetic contingencies.

As a first cut into this realm of complexity, we could say that the life sciences (like deconstruction) partake of the procedures of speculating, promising, leveraging, borrowing, and transferring—all occurring in a distributed, disseminated, (un)limited economy or system of resistances and writings. They each partake of these procedures, but are hardly founded upon them. These procedures will proceed to differ from themselves in the acts of borrowing and transferring across the various, different networks. It will be vital to insist on these differences. A biochemical pathway of souped-up proteins is not a system of interconnected regulatory and coding genes is not a genomics laboratory of heterogenous practices and technologies is not a tangled global alliance of genomics start-ups and transnational pharmaceutical corporations. A network is not a network is not a network. It will be necessary—for a time, for some hard-to-establish term—to resist the strange attractions of complexity theories that invite identifications across diverse autopoietic systems as well as across the scales of any given one.

At the same time . . .

Epistemology X Stock Options

Biological reductionism and genetic determinism may not be fully dead, but they are certainly well on their way to becoming something else. Thanks in no small part to the virtual multiplicities contained in and opened up by molecular databases and the information technologies that connect and recombines them, we seem to be coming to know organisms as “complex systems,” and the word “holism” passes through the lips of life scientists with greater frequency and ease. What kind of difference might this promise?

Or to phrase the question from the biotech business executive’s perspective: should you hire an epistemologist? This was the title of a short commentary in *Nature Biotechnology* in 1997, written by investment analyst and biotech consultant William Bains. Bains was responding to the developmental geneticist Richard Strohman’s “impassioned appeal to look again at genetic determinism and the cult of the gene,” which *Nature Biotechnology* had published two months previously. Most readers of this essay, I presume, would be in accord with Strohman’s critique of genetic determinism and his invitation to a future science of biological complexity—but so was Bains. Bains writes, “Can we have got it so wrong? I am sure we have, and I am equally sure it does not matter.” A few excerpts from his commentary:

The fallacy of hunting down genes ‘for’ common diseases is now evident. People are systems whose levels of causality are complex and intermingled (. . .)Saying that a gene ‘causes’ hypertension or depression is similar to saying that a flat tire ‘causes’ a car to slow down(. . .)On this reading, the genome program at any philosophical level is a doomed exercise.

But should we care? Of course we should, but not to the extent that we give ourselves ulcers or sell all our shares in genome company stocks. This is not “Nature Philosophy”: All definitions of “biotechnology” share a pragmatism that comes from having to make things(. . .)If we are after practical results rather than philosophical absolutes, then we can use the genetic paradigm as a lever to open up the black box labeled ‘life,’ allow us to glimpse some lever to pull, and hand us the tools to pull it(. . .)Strohman’s comments are completely valid(. . .)Strohman points the way to the future(. . .)The new systems biology will generate its own tools and(. . .)its tools will put to shame the rudimentary gene tinkering of the late 20th century. But(. . .)in the meanwhile, the genome databases, cloned proteins and other paraphernalia of functional genetics will generate tools, products, insights, careers, and stock options for us all.”²³

“In the meanwhile...”: have we ever been anywhere else? It may be a different, meaner meanwhile for genomics just now in the spring of 2001 as I speak. In 1997, not only did Bains’s non-absolutist optimism hold sway, but would hold even *faster* over the next three years. Genomics companies like Millennium Pharmaceuticals, deCODE Genetics, Incyte Pharmaceuticals, and Human Genome Sciences would come to benefit from increasingly lucrative alliances with Big Pharma companies like Roche, Lilly, Pfizer, Monsanto, and Bayer, all trying to leverage genomic tools and information into drug targets or diagnostic kits, or at least another level of *promise*. And as far as stock options go, 1997’s genomic optimism had nothing on the period that would begin in the fall of 1999 and run for the next year and a half.

If the latter part of the 1990s was a time of pragmatism and the development of basic

tools and products, it was also a time of speculation; the invention of “levers” for opening life’s black boxes was tightly webbed with the speculative leveraging of a series of options and new economies—or old ones, further intensified and volatilized.

ManiaXFundamentals

In the year 2000, according to one estimate, 67 biotech IPOs and secondary offerings raised a total of \$39 billion—\$30 billion more than was raised in the previous three years combined.²⁴ Was this great genomics run-up of 1999-2000 a “speculative bubble,” an instance of “financial euphoria” or a “mania,” in the tradition of the Dutch tulipmania of the early seventeenth century, the Mississippi gold (Banque Royale) or the South Seas bubbles of the early eighteenth century, or the speculative periods that preceded the stock market crashes of 1929 and 1987? Does the emerging genomics economy, after the precipitous decline that began in March 2000, remain an example of “irrational exuberance” in the market? And is there a methodological and/or theoretical approach—historical analysis and analogy, economics, social psychology—that could resolve such questions, without further speculation?

Irrational Exuberance became a popular catch-phrase with the publication of Robert Shiller’s book of that title in 2000.²⁵ Shiller’s book is only the most recent in an extensive literature that attempts to circumscribe the value of speculation in economic activity, and to gauge its welcome and unwelcome effects.²⁶ In this writing I limit myself to the economic historian Charles Kindleberger’s reading of the *Manias, Panics, and Crashes* that are a regular if not frequent product of speculative activity. Kindleberger offers a careful analysis of the fundamental double binds or aporias at work in speculative events. Although he opts in the end for the resolving trope of synthesis, his rhetoric at the same time keeps the volatilities of his own necessary speculation in view: “A study of manias, bubbles, crashes, panics, and the lender of last resort helps us to move from classical thesis through revisionist antithesis to a more balanced synthesis. Or so I claim.”²⁷

Kindleberger claims that the problem of panics, bubbles, and other mania is created not by speculation per se, but by “speculative excess.”²⁸ As suggested by his preference for synthesis, Kindleberger is always at pains in his analysis to avoid “extremes,” which for him include monetarist fundamentalists: “The monetarist school of Milton Friedman, for example, holds that there is virtually no destabilizing speculation, that markets are rational, that governments make mistake after mistake.” Such theories, Kindleberger suggests, “although not necessarily wrong, are too emphatic and leave too little room for exceptions.”²⁹ It is less a question of clear-headed, non-speculative analyses that might allow one to distinguish between the necessarily wrong and the necessarily right, suggests Kindleberger, but instead the more tropic questions of emphasis and of the inexorable logics of deviation, dissemination, and exception. Speculation and its excesses guarantee unstable outcomes and the subsequent need for unstable, pragmatic responses.

The rich and lengthy historical record of excessively speculative episodes involving “commodity exports, commodity imports, agricultural land at home or abroad, urban building sites, new banks, discount houses, stocks, bonds (both foreign and domestic), glamour stocks, conglomerates, condominiums, shopping centers, [and] office buildings” indicates, says Kindleberger, that neither extreme nor simple resolutions are workable.³⁰ While “markets work well on the whole, and can normally be relied upon to decide the allocation of resources,” they “occasionally(. . .)will be overwhelmed and need help.”³¹ But the help cannot take the form of a synthesis, since it must negotiate or traverse a double bind: “The dilemma, of course, is that if markets know in advance that help is forthcoming under

generous dispensations, they break down more frequently and function less effectively.”³²

The historical record suggests that “official warnings,” “moral suasion or jawboning,” and other clear and present responses are ineffectual, or may in fact precipitate the crisis they aim to fend off. To describe what governments or banks must do to respond well to speculative excess, Kindleberger has to shift to a language that has more in common with the excesses of magic than with reason. A “neat trick” has to be performed, he writes, a “sleight of hand” that, if not invisible, is at least the inexplicable effect of a smoke-and-mirrors machine that reflects contradictions back on themselves. Not at all unlike a god, a gene, or a human genome project, the “lender of last resort”—who must exist, but whose “presence should be doubted”—must

always come to the rescue(. . .)but always leave it uncertain whether rescue will arrive in time or at all, so as to instill caution in other speculators, banks, cities, or countries. In Voltaire’s *Candide*, the head of a general was cut off “to encourage the others.” What I am urging is that some sleight of hand, some trick with mirrors be found to “encourage” the others (without, of course, cutting off actual heads) because monetarist fundamentalism has such unhappy consequences for the economic system.³³

It might be said that fundamentalism has to be replaced, then, by a foundation without foundation, a ground mined under.³⁴ And not in the name of truth, but for the sake of consequences. Tricked-out mechanisms of doubledness, that traverse chiasma without synthesizing them, that can leverage a future with no point of purchase.

One set of such mechanisms worth experimenting with and worth improving are the disclosure mechanisms of the U.S. Securities and Exchange Commission. These mechanisms have to negotiate, in a pragmatic, day-to-day way, these same fissures of an unavoidably speculative economy.

Open FutureXSafe Harbor

Forward-looking information occupies a vital role in the United States’ securities markets. (U.S. Securities and Exchange Commission 1994)

Maybe it’s not, as it is so often said, *information* that plays the life-giving role in the markets of today’s “Information Society.” The U.S. Securities and Exchange Commission, that regulatory body most concerned with enforcing the disclosure of corporate information, here names the market-animating “vital” force as *forward-looking* information. Just what kind of force is in play here, when forward-looking information plays its role? Or maybe we should ask: what is the place in the network, in the so-called information economy, which forward-looking information *occupies*? What kinds of reading practices does forward-looking information demand, and from whom? In a territory of forward-looking information, how does one decide between fact, speculation, puffery, and bald-faced lie?

My interest in such questions is again motivated by my work on deCODE Genetics, whose operations, I claim, will have been best described with the terms toward the end of the previous sentence. Because of some earlier ethnographic work done with Kim Fortun on how the U.S. Securities and Exchange Commission understands and works on important abstractions—information, disclosure, truth-telling, transparency, due diligence—in the pragmatic context of globalizing capital markets,³⁵ I found myself reading closely deCODE’s SEC filings in company with the Icelandic scientists and physicians who are opposed to

deCODE's state-sanctioned genotype and phenotype databasing efforts. I gladly provided some help as they wrote letters to the SEC (as well as the National Association of Securities Dealers) detailing the inadequate disclosure of business risks in deCODE's March 2000 registration statement filed with the SEC in preparation for an initial public offering on the NASDAQ exchange. The SEC provides a wealth of information on genomics and other corporations; it is the place where the "self-regulating" securities industry that undergirds the U.S. capital markets is, in fact, regulated.

An important part of those securities regulations changed, however, with the passage of the Private Securities Litigation Reform Act of 1995. The change concerned how "forward-looking information" would be read by the courts, and how it should be read by someone sometimes called "the sophisticated investor," and at other times as the more modest "reasonable investor." It is the regulatory framework that has shaped the genomics companies, which emerged from the same territory of the 1990's U.S. political economy as the Internet-software-dot.com companies.³⁶ Genomics companies have existed almost entirely in this historically specific regulatory framework of corporate disclosure—a framework that sanctions and encourages the speculative and promissory quality of the "information" which these corporations produce and on which they thrive.

Here's the genealogy: In late 1994, the SEC issued a "concept release" calling for comments on proposed changes to the "safe harbor" provisions of federal securities law. The SEC asked "whether the safe harbor provisions for forward-looking statements(. . .)are effective in encouraging disclosure of voluntary forward-looking information and protecting investors." What is forward-looking information? The 1994 concept release made this distinction:

Required disclosure is based on currently known trends, events, and uncertainties that are reasonably expected to have material effects, such as: a reduction in the registrant's product prices; erosion in the registrant's market share; changes in insurance coverage; or the likely non-renewal of a material contract. In contrast, optional forward-looking disclosure involves anticipating a future trend or event or anticipating a less predictable impact of a known event, trend or uncertainty.³⁷

Since its establishment in 1933 as part of the New Deal, the SEC had prohibited disclosure of forward-looking statements. With the 1929 crash fresh in its institutional memory, the SEC regarded such statements as "inherently unreliable," the kind of speculative activity that had bubbled and burst the economy so recently. In its role as protector of investors and preserve of trust in capital and its markets, the SEC worried that "unsophisticated investors would place undue emphasis on the information in making investment decisions." This philosophy prevailed for thirty years.

In the mid-1960s the SEC formed the Wheat Commission to reconsider the question of speculative statements. Despite the fact that the Wheat Commission's 1969 report found that "most investment decisions are based essentially on estimates of future earnings"—that is, "based on" something that, at least in part, was spectral or speculative—they did not recommend changing disclosure requirements at that time, apparently for the sole reason that that was the way things had been done for thirty years: "Commission stated that its decision not to mandate disclosure of forward-looking statements was based on its desire not to deviate too far from its historical position of prohibiting such disclosure."

In 1972 the SEC held further hearings and solicited more comments, only to announce its "intention" to promulgate rules that would not require the disclosure of forward-looking

information, but would encourage its voluntary disclosure, while promising corporations some limited protections from anti-fraud litigation. In the end, it never issued those new rules, citing “opposition from commenters,” and simply deferred to the future once again, hoping that the issue would be taken up by its newly formed Advisory Committee on Corporate Disclosure.

The courts, in the meantime, had begun to issue rulings bearing on similar questions that revolved around such notoriously difficult yet ever necessary concepts as “facts,” “intentionality,” and “prediction.” In the case with the almost allegorical title *Marx v. Computer Sciences Corporation*,³⁸ the courts first addressed the question of whether “predictions or statements of opinion could ever be considered to be ‘facts’ which could be said to be false or misleading for purposes of liability under the securities laws.” The court found that “while predictions could properly be characterized as facts, the failure of a prediction to prove true was not in itself actionable. Instead, the court looked at the factual representations which it found were impliedly made in connection with the prediction; namely that, at the time the prediction was made, it was believed by its proponent and it had a valid basis.”³⁹

In its 1994 “concept release,” the SEC noted new trends in capitalism that suggested the need for change in disclosure requirements; the networks were being rearticulated. They found “increasing interest” in both corporations and in the analyst and investment communities for “enhanced disclosure of information that may affect corporate performance but is not readily susceptible of measurement in traditional, quantitative terms.”

Among such qualitative informational items are workforce training and development, product and process quality and customer satisfaction. A large registrant considers one such item—product quality—to be so important to its profitability that it has chosen to make it a key determinant of executive compensation. Other companies are beginning to experiment with voluntary disclosure of the utilization of an intangible asset termed “intellectual capital,” or employee knowledge. In this connection, another federal agency has urged more corporate disclosure of the use of measures of “high performance work practices and other nontraditional measures” of corporate performance.⁴⁰

At the same time, some corporations had also expressed their concerns about the increased risk of securities antifraud class action suits that such disclosures might encourage. “Recent surveys,” the SEC wrote, “suggest that this threat of mass shareholder litigation, whether real or perceived, has had a chilling effect on disclosure of forward-looking information.” (The fine-print footnote to this statement, with its “suggestion” of a freeze-effect whose real cause is undecidable, discloses the source of the surveys: the National Venture Capital Association, the National Investors Relations Institute, and the American Stock Exchange CEO Survey. This list of names suggests a certain slant, whether real or perceived, to the survey.)

The SEC also included in its “concept release” some suggestions from legal scholars as to how the speculative status of forward-looking statements might be re-codified. Professor John Coffee offered a “Bespeaks Caution” doctrine under which “a forward-looking statement would be protected so long as it were properly qualified and accompanied by ‘clear and specific’ cautionary language that explains in detail sufficient to inform a reasonable person of both the approximate level of risk associated with that statement and the basis therefor.” (The “reasonable” if not “sophisticated” investor returns as ideal assessor here again, precisely at a time when the sheer increase in the number of investors into the U.S. securities

market might have called for some reconsideration of the security of these characterizations.) In addition, “the suggested safe harbor would not require that the forward-looking statement have a ‘reasonable basis’ (as under existing Rules 175 and 3b-6) because, according to Professor Coffee, this requirement often raises factual issues that cannot easily be resolved at the pre-trial stage.”⁴¹ These suggestions—in which the volatile and hence litigation-inviting concepts of “fact,” “reason,” and “basis” are de-volatilized by a second cautionary statement that simply names them as volatile—would become part of the new disclosure landscape.

The concepts released in 1994 by the SEC were soon gathered and picked up by the Newt Gingrich-led Republican Party, which wrote them into the Private Securities Litigation Reform Act of 1995. Introduced into the U.S. Congress early that year, as part of Gingrich’s “Contract with America” package of legislation, the PSLRA was intended to have multiple effects. The two most vital were a reduction in the number of “frivolous lawsuits” brought against corporations by their shareholders, and an expansion of the “safe harbor” for forward-looking statements. The high-tech, info-centric corporations of Silicon Valley were one of the main forces behind the passage of the legislation. As an editorial in *The Washington Post* put it on the day of the final Congressional vote (that would override President Clinton’s veto of the bill): “When the price of a company’s stock drops sharply, the present law invites suits on the questionable grounds that the company’s past expressions of hope for its future misled innocent stockholders. This kind of suit has turned out to be a special danger to new companies, particularly high-technology ventures with volatile stock prices(. . .)The bill would protect companies’ forecasts as long as they did not omit significant facts.”⁴² *Money* magazine, which spoke in the name of protecting “small investors like you,” was more critical of the proposed legislation, characterizing it as “a license to defraud shareholders” by “help[ing] executives get away with lying.”

High-tech executives, particularly those in California’s Silicon Valley, have lobbied relentlessly for this broad protection. As one congressional source told *Money’s* Washington, DC. bureau chief Teresa Tritch: “High-tech execs want immunity from liability when they lie.” Keep that point in mind the next time your broker calls pitching some high-tech stock based on the corporation’s optimistic prediction.⁴³

When *Money* only orders you to “keep that point [lying? or executive desire for immunity?] in mind” as you presumably make some kind of informed decision about the voice coming over the telephone and the future it is announcing, the second-person mode of address contributes to the erasure of the volatile zone between a “lie” and an “optimistic prediction.” How are you supposed to “keep in mind” what the law cannot write—namely, whether a forward-looking statement is a lie or an optimistic prediction? The volatile difference between a lie and a prediction must be traced, not to mind, but to speech, particularly those speech acts that J.L. Austin named “commissive speech acts.”⁴⁴ Are these subject to legislation?

What the Private Securities and Litigation Reform Act (PSLRA) of 1995 accomplished is perhaps best described by Pillsbury Madison & Sutro LLP, the law mega-firm that occupied a central position in these events as Counsel to the Securities Litigation Reform Coalition, a political pack consisting of close to 200 corporations and their CEOs.⁴⁵ By their own description, Pillsbury Madison “assisted in framing the debate surrounding the bill, aided in drafting the statute, and provided members of Congress and Congressional and White House staffs with ‘real world’ information about the frivolous lawsuits that have

plagued both mature and emerging companies over the past decade.” The web page from which these words are excerpted is a part of their ongoing “framing” work (since the establishment of frames, margins, and reading practices of exclusion and inclusion is a never-ending task), explaining to their clients and others the possible meanings and effects of the new law.

Pillsbury Madison call the safe harbor provisions of the 1995 legislation “the most important provision” for most companies. It embodies the “belief that the U.S. capital markets will benefit from an increased flow of forward-looking information.” The final legislation adopts a strong form of John Coffee’s “bespeaks caution” doctrine, making a company which makes forward-looking statements “immune from civil liability if the forward-looking statement is identified as a forward-looking statement. The legislative history accompanying the bill makes clear that it is unnecessary to state explicitly that “This is a forward-looking statement.” Instead, cautionary words such as “we estimate” or “we project” likely will be sufficient.”

In sum, the PSLRA authorized statements about the economic future by establishing a “safe harbor” that protected corporations from shareholder lawsuits.⁴⁶ “Oral forward-looking statements” (such as things said on IPO “road shows” or teleconferences) and “written forward-looking statements” (such as ebullient press releases) were sanctioned, so long as they were marked as such, and so long as potential investors—“sophisticated” or not—were also directed to other, more “cautionary” texts. Pillsbury Madison again:

the general requirement that a forward-looking statement be accompanied by a listing of “important factors” can be met by a statement identifying the information as forward-looking along with a further statement clearly conveying the message that actual results may differ materially from the results predicted in the forward-looking statement and referencing a “readily available written document” that contains cautionary language.

Such documents often turn out to be SEC filings: registration prospectuses, quarterly and annual reports, and the like. But before turning to some examples of such forward-looking and cautionary statements in the genomics world, let me close this section by sketching roughly a few additional effects that this legislation seems to have had on the economy more broadly.

The full and final effects of the PSLRA, according to most sources that I’ve seen, remain unclear. Whether it has reduced the number of lawsuits (and whether there were, as certain surveys “suggested,” so many of them in the first place), whether it has given CEO’s “a license to lie,” and whether it has increased market volatility while parting the sophistication-challenged investor from his and her money—all remain relatively uncertain, unknowable, or at least open to debate.⁴⁷ But some signs of this uncertain future are still worth reading and pondering.

In their delectably named article “Enter Yossarian,” Elliott Weiss and Janet Moser analyze the Catch-22 set up by the PSLRA: plaintiffs in securities fraud cases need to show a company knowingly misrepresented matters in a forward-looking statements, but can only do so by being granted discovery, which they can’t get since they can’t file suit based on forward-looking information now protected by the expanded “safe harbor.”⁴⁸ This fissure is also plumbed by Douglas Branson, who describes the effect as one of the substitution of “mere” words or ink for “due diligence”:

The PSLRA provision provides that if a statement is “accompanied by

meaningful cautionary statements,” plaintiffs are denied discovery and the court must dismiss allegations as to the false or misleading nature of the statement when presented with a dispositive motion.⁴⁹

The effect of the PSLRA provision, as with stronger forms of the judge-made bespeaks caution doctrine, is to substitute mere cautionary words for the due diligence traditionally associated with preparation of statements in disclosure documents. Rather than building a due diligence file that, through research, establishes more than plausible, and often alternative, bases for making the statements made in the documents, securities lawyers will plaster forward-looking statements with cautionary warnings. (. . .)No incentive now exists for hiring the traditional, classical securities lawyer who quarterbacked the research and other effort necessary to do the due diligence exercise. Instead, Congress has placed a premium on buying and using ink by the barrel.⁵⁰

Are there non-volatile rules for distinguishing a “forward-looking statement” from a historical matter of fact? One case discussed by Richard Rosen suggests not—that that such matters will have to be decided, after an encounter with undecidability:

In the *Gasner v. Board of Supervisors* case from the Fourth Circuit, decided on New Year’s Eve 1996, for example, two judges held that a statement that a solid waste company’s technology was “proven” and had been incorporated from existing facilities using the same “proven” design was not actionable because the prospectus negated this statement with cautionary language that there was no guarantee that the facility would operate functionally and that the issuer had never operated a similar facility. But the dissent said the bespeaks caution doctrine simply does not apply because the statement regarding the “proven” characteristics of the design is not forward-looking at all. “Rather, it involves misrepresentations about historical facts. ‘Proven’ describes an established fact, not a forward-looking projection.”⁵¹

Rosen is quite sympathetic to the PSLRA, so it is instructive to examine some of his rhetoric and that of some of the other cases that he discusses, to better diagram exactly how cautionary language protects forward-looking statements. In the case of *Parnes v. Gateway 2000, Inc.*, we see that we have to add another element to the network of these statements so that they can function properly, namely the old reliable “reasonable investor”:

The plaintiffs claimed that the computer company misrepresented its obligations to pay sales taxes to states other than South Dakota. But the court pointed out that the prospectus warned investors that taxing authorities in other states had sought information regarding the sufficiency of Gateway’s contacts with the states, that the company had not established any reserves and that it might be required to pay income or franchise taxes in other states. The court found that “any reasonable investor would be on notice that Gateway faced potential state tax liability for states other than South Dakota.”

Gateway also warned that because of volatility of the computer industry, the introduction of new products was a risky venture and there was no

assurance of success. This more generalized risk disclosure was also found to be sufficient, even though it says little that is specific to a company or its products. Yet there is no question that some courts would have found the latter statement by Gateway to be too general to be “meaningful.”⁵²

The next section takes a closer look at how such reasoning about disclosure and the reading demands placed on “any reasonable investor” works out on the ground in the worlds of genomics: as burdenXresource. The general pattern can be glimpsed here in the Gateway case, however: the reasonable investor does not watch TV news puff pieces, read press releases or the newspaper articles based on them, or surf a plethora of investment web sites, but spends all her time wading through the downloaded equivalent of reams of Form 10-K’s.

Let’s close out Rosen and this discussion of forward-looking information and its burdens with one last quote:

Of course, it would be wonderful to have a rule that allowed courts and litigators unflinchingly to be able to discriminate among the cases and to allow discovery to proceed only in those in which there was some reason to believe that, notwithstanding adequate cautionary language, the company’s management really did know that the predictions were not likely to come true. But because no such rule could ever be constructed, any rule will either allow a few dishonest issuers to win motions to dismiss or will impose enormous costs on honest companies and their shareholders. Congress has struck the balance in favor of protecting companies and their shareholders—a balance which strikes me as absolutely correct.⁵³

I would agree with Rosen that it is indeed impossible to construct “unflinchingly” discriminatory rules for calculating fissures, volatilities, and chiasma such as these opened up by forward-looking information. But it would be prudent and even reasonable to question the “balance” that he hyperbolizes as “absolutely correct,” since it in fact depends on a far-from-certain calculus of the fissure: how does one know that, in the chasm opened up by forward-looking information, there won’t be an “enormous” number of dishonest issuers and only a “few” costs to honest companies? Rosen’s unsubstantiated calculation is nothing more than a political endorsement of the balance that Congress indeed “struck”: a forceful cut that transfers financial risks and the burdens of proof, discovery, and due diligence from corporations to their presumably sophisticated shareholders.

PromisingXGenomics

“We have an open-ended business model.”—Kurt Leutzinger, CFO, AbGenix.⁵⁴

I decided not to shell out the \$4,950 to buy “Pharmacogenomics: Impact on Drug Discovery,” a “200-page narrative, 50+ exhibits, 50+ web-links” CD-ROM that was offered by the consulting company AdvanceTech Monitor. Even though it promised to evaluate the kind of promises that interest me, namely how “massive genotyping experiments promise to generate new, higher quality targets for drug discovery and novel diagnostic assays to target drugs to an individual’s genetic predisposition.” Now, once again, it’s too late, but if I had acted before October 31, 1999, I presumably could have had, for the bargain price of \$4,550—that’s almost ten percent off!—the answers to such questions as:

--How can big pharma thrive in an atmosphere of micro-segmented markets?

- Will available technologies permit cost-effective massive genotyping?
- Should pharmacogenomic capabilities be built in-house or outsourced?
- Will the healthcare system risk high drug prices for the promise of lower overall healthcare costs?
- Will the benefit of pharmacogenomics-era drugs outweigh the costs?
- How will the public react to the threat of invasion of genetic privacy and its attendant consequences?⁵⁵

Answering such heavy questions would be useful to more than the investors to whom the report is targeted; any one of us working on the politics of genomics-to-come would welcome such answers. However, for the slightly more modest sum of \$4,000, I could have bought myself a seat at a table in the World Series of Poker in Las Vegas,⁵⁶ and my prospects for a definitive outcome there would have been the same as those facing the Big Pharma or genomics company that form AdvanceTech's client base: ante up, play the game, call or raise, and you'll have your answer in due time. The answer to such questions can't come in advance, can't be spoken predictively, but can only be parlayed. Which is not to say that there aren't questions of strategy, or that the careful deployment of one's resources would not make a difference, but only that there are many other players at the table, not all of them human, and their multiple differential resources will interact in complex ways.

Every business day, the reasonable investor who is trying to play in this game may get an email from Biospace.com. While the service keeps one apprised of happenings in the entangled worlds of biomedical research, pharmaceuticals, government regulation, and the biotech and genomics industry, it's also a daily reminder of the unmasterable, maddening multiplicity of the territory. As Biospace.com's slogan goes: "Everything biotech—all the time." Who could possibly keep up with that?

There was nothing significant about December 23, 1999 - just another typical day on the bio-beat:

Lead Stories

Pharmacia & Upjohn (PNU) Says Linking Drug Units Validates Merger With Monsanto (MTC)

Incyte Pharmaceuticals (INCY) And Cambridge University Scientists Identify A New Genetic Cause For Type 2 Diabetes, Severe Insulin Resistance And Early Hypertension — INCY Stock Up + 7.6% On Thursday At 10:09 AM EST

American Home Products' (AHP) Settlement In Mississippi May Hamper Merger Plan With Warner-Lambert (WLA)

Celera Genomics (CRA) Acquires Molecular Applications Group's Panther Technology — CRA Stock Up + 9.3% On Thursday At 10:04 AM EST

SuperGen (SUPG) Acquires Equity Interest In AVI BioPharma (AVII) — AVII Stock Up + 4.5% On Thursday At 10:06 AM EST

Millennium (MLNM) Announces The Completion Of LeukoSite (LKST) And Millennium BioTherapeutics Mergers — MLNM Stock Off -5.6% On Thursday At 10:09 AM EST
http://www.biospace.com/b2/news_archive.cfm?StoryDate=991223

 Features

Scientists Place Jellyfish Genes Into Monkeys
(Story from New York Times [Free Registration Required])

Protein Design Labs (PDLI) Powers Biotech Group
(Story from CBS MarketWatch)

Drug May Replace Steroids For Asthma Patients
(Story from New York Times [Free Registration Required])
(Story from CNN)
(Story from ABC)
(Story from MSNBC)
(Story from Washington Post)

U.S. Judge's Decision Could Complicate Dow Corning Breast-Implant
Settlement
(Story from The Wall Street Journal [Paid Registration Req.])

Genome Therapeutics Corp. (GENE) Soars 72% On Osteoporosis Alliance
(Story from CBS MarketWatch)
(Story from Boston Globe)
http://www.biospace.com/b2/news_archive.cfm?StoryDate=991223

Molecular bonds are bonded to corporate alliances are allied with media broadcasts that oscillate a volatile stock market that responds to judicial decisions. Unending waves of mergers, settlements, acquisitions and, behind it all, further complications, implications, and other folds

Most of these stories are linked to a press release from a genomics company or one of its Big or (since hyperbole is the rule) Bloated Pharma allies—a press release which the “sophisticated” or at least “reasonable” investor is nevertheless supposed to ignore as immaterial, if we take the PSLRA at its word. Sometimes the announcement of the isolation and characterization of a new candidate gene sequence, or a new licensing agreement or equity swap, will result in a brief upward jolt to the share price; other times, the reverse occurs. But without fail, the cautionary language that establishes the “safe harbor” and prevents investors from becoming frivolous litigants against promising genomics companies appears at the bottom of the press release:

Certain statements in this press release are forward-looking. These may be identified by the use of forward-looking words or phrases such as “believe,” “expect,” “intend,” “anticipate,” “should,” “planned,” “estimated,” and “potential,” among others. These forward-looking statements are based on PE Corporation’s current expectations. The Private Securities Litigation Reform Act of 1995 provides a “safe harbor” for such forward-looking statements. In order to comply with the terms of the safe harbor, PE Corporation notes that a variety of factors could cause actual results and experience to differ materially from the anticipated results or other expectations expressed in such forward-looking statements. The risks and uncertainties that may affect the operations, performance, development, and results of Celera

Genomics' businesses include but are not limited to (1) early stage of operations; (2) no precedent for Celera Genomics' business plan; (3) need to manage rapid growth; (4) uncertainty of successful integration of GenScope and AgGen; (5) uncertainty of sequencing strategy; (6) uncertainty of successful operation of new sequencers and sequencing operations; (7) uncertainty of polymorphism data; (8) initial reliance on pharmaceutical industry; (9) anticipated future losses and uncertainty of operating results; (10) high dependence on key employees; (11) uncertain protection of intellectual property and proprietary rights; (12) adverse effect of public disclosure of genomic sequence data; (13) highly competitive business; (14) uncertainty of success of Year 2000 compliance; and (15) other factors that might be described from time to time in PE Corporation's filings with the Securities and Exchange Commission.⁵⁷

These different documents snipped from the web of the genomics economy recapitulate the entire territory covered thus far in this paper: post-vital organisms are becoming volatile networks, as life scientists have converted them into a variety of informational forms that can be databased, browsed, and recombined in ways that point beyond a strict determinism. If this becoming-volatile presents a number of new epistemological problems and desires, it also defines a new space for biocorporate enterprises in the production, the copyrighting, the patenting, the instrumentalizing, and sale of all manner of biomaterials and biodata—a space that is profoundly experimental and aleatory, since it depends less on holding epistemological truths and more on holding options on a promising future. The volatilities of organisms give rise to their counterpart in an economy, where an already spectral or speculation-infected “value” becomes further intensified with the help, maybe, of new discursive rules intended to promote or at least protect promising. How do genomics companies try to thrive in this ecology?

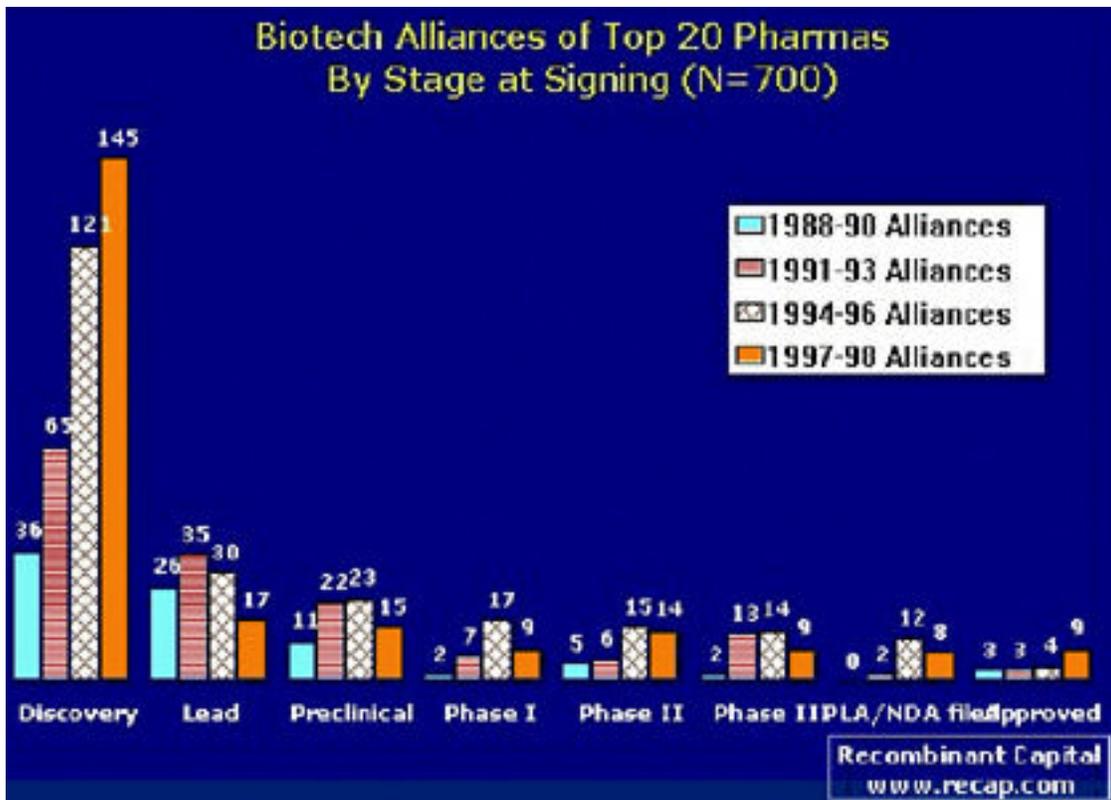
In the genomics economy that exploded in the 1990s—a largely U.S.-centered commercial genomics sector whose future “dominance” in a competitive global bioeconomy was one of the key rationales for federal spending on the Human Genome Project⁵⁸—Human Genome Sciences, Incyte, Millennium, GenSet, and other companies began working and trading on the promises of forward-looking genetic information. None had secure knowledge of what would pan out over what period of time: how many genes there were, what kinds of uses could be made of how many of them, what proteins will hit as good “drug targets” and which will veer wide of the mark, what the long-term prospects are for genetic sequence databases, and so many other contingencies. The dominant mode of production in genomics has been one of automated data production followed by datamining, sometimes referred to derogatorily as “fishing expeditions.” But Lockhart and Winzeler, who appeared here earlier discussing genomics' need for an expert system like Big Blue, provide a succinct defense:

Genomics and gene expression experiments are sometimes derided as “fishing expeditions.” Our view is that there is nothing wrong with a fishing expedition if what you are after is “fish,” such as new genes involved in a pathway, potential drug targets or expression markers that can be used in a predictive or diagnostic fashion.⁵⁹

If a genomics company doesn't necessarily know what it's fishing for and therefore requires an “open-ended business plan,” a similar situation holds for its Big Pharma partner or, in the best of all possible genomics worlds, partners. With the notable exception of deCODE

Genetics and its single major alliance with Hoffman-LaRoche, genomics companies thrive on multiple alliances with multiple pharmaceutical companies, biotech start-ups, and sometimes with other genomics companies. The pharmaceutical companies, in turn, will forge multiple bonds with multiple genomics companies. Together they all pursue multiple technological strategies—new search strategies for databases, combinatorial chemistry, rational drug design through molecular modeling, monoclonal antibodies, and many others—since it’s not entirely clear which one of these promising “technology platforms” will cash out—most likely some ensemble and not any particular one. “There is a reason people are paying up for these databases,” suggests Emily Hall, a financial analyst with Morningstar Inc.. “But Celera is still a company moving through uncharted waters in terms of a business strategy.”⁶⁰ Patience and “the portfolio approach”⁶¹ work best in these gambles in uncharted waters that are nevertheless not without their reasons. So in the final analysis there seem only to be “rules of thumb,” and the Big Pharma company surely heeds the strategic advice offered to the individual investor in genomics: “It’s a rule of thumb among biotech investors that for every 10 stocks, one or two may succeed, two or three will be marginally successful and the rest will fail.”⁶²

This terrain has two associated effects or features, on different ends of the temporal spectrum. There is an intensified front-loading of capital into the “technology platform” companies, with the genomics companies getting the lion’s share. A recent graph produced by Recombinant Capital, a biotechnology corporate and financial analysis firm in San Francisco, illustrates the phenomenon:



Capital and scientific attention have become paid increasingly to data production, gene searching, and the generation of literally thousands of promising DNA or protein sequences and other small and large molecules. Over the course of the 1990s, the percentage of money devoted to all phases of drug development increases most dramatically at the most basic, uncertain, data-intensive end of the spectrum. More data and more molecules in less and less time: this was the rule of thumb for maximizing the chances of success in this era. But another necessary corporate asset in this high-stakes, fast-paced, frequently reshuffled and front-loaded bioeconomy is what is usually called “access”—which may be access to a set of blood or tissue samples, access to a family or other well-defined set of individuals who may share a propensity toward certain abnormal conditions, access to physicians and hospitals who can bring patients into clinical trials, or as with Iceland, Estonia, Newfoundland, and Tonga, access to an entire population and to the information which it exudes in various genotypic and phenotypic forms.

Which brings up the second effect or feature of this terrain: the front-loading of capital and resources to be accessed has the effect of volatilizing the future. Given that both the science and business of genomics exhibit “open-ended”-ness, with research questions and economic gambits subject to multiple contingencies and continual revision, a very difficult set of questions erupts, concerning how biosamples and the people who for the moment provide a safe harbor to them are to be treated in this unspeakable future so permeated with speech.

PresumedXConsent

In addition to the usual sorts of financial problems that come with the territory of being the sorriest excuse for a genomics company currently going, deCODE Genetics has created social volatility in Iceland around matters of informed consent in genomics research. I won't be dealing here with the tangle of issues, questions, and pressing policy questions currently faced by Icelanders who, by national law, were all “presumed” to have consented to have their health care records assembled into a database that would be licensed exclusively to the brand spanking new genomics company that had in fact drafted the database legislation for Iceland's Ministry of Health—nor with the principle of “broad” or “open consent” that deCODE uses in its construction of its genotype database that will be combined with the health sector database, allowing them to use biosamples and biodata collected for a particular research program to be used in any other research program it undertakes in the future (“broad consent” is also the operative principle in the Icelandic legislation of May 2000 that establishes the political and legal territory for national “biobanks”). Icelanders are faced with only a more intense version of this volatile fissure that gapes beneath the feet of all of us in genomics lavaXland: the practices and concepts that produce our consenting relationships to speculative biomedical futures about which we have vanishingly little information.

For those who don't have enough to read, the entire transcripts of all the public meetings of the White House's National Bioethics Advisory Commission (NBAC) are made available on the Internet at what, in my opinion, is one of the scarier looking URLs out there, <http://www.bioethics.gov>. The urgent questions of what “informed consent” is and how it can be enacted are the subjects of days and days of discussion over months and years, with drafts upon drafts of reports and executive summaries and appendices that all remain, in the end, “advisory.” Let's hurriedly read only two micro-events within this vast bioethical desert, across which we seem destined to wander.

In its August 1999 report, *Research Involving Human Biological Materials: Ethical Issues*

and *Policy Guidance*, the NBAC discusses at length some of the difficulties that principles of informed consent face in a world become increasingly speculative and future-oriented. One of their recommendations reads:

Recommendation 9:

To facilitate collection, storage, and appropriate use of human biological materials in the future, consent forms should be developed to provide potential subjects with a sufficient number of options to help them understand clearly the nature of the decision they are about to make. Such options might include, for example:

- a) refusing use of their biological materials in research,
- b) permitting only unidentified or unlinked use of their biological materials in research,
- c) permitting coded or identified use of their biological materials for one particular study only, with no further contact permitted to ask for permission to do further studies,
- d) permitting coded or identified use of their biological materials for one particular study only, with further contact permitted to ask for permission to do further studies,
- e) permitting coded or identified use of their biological materials for any study relating to the condition for which the sample was originally collected, with further contact allowed to seek permission for other types of studies, or
- f) permitting coded use of their biological materials for any kind of future study.* (National Bioethics Advisory Commission 1999, 84-85)

(Let's quickly note in passing the gaping chasm that, within a bioethical discourse where the principle of "autonomous individual choice" is supposed to trump everything and serve as foundation for all other ethical principles, a phrase such as

- g) I claim commercial rights in my 'own' biological materials and a .007% return in any future licensing arrangements that might arise out of speculation using said materials

is not even provided on the list of bioethicist-generated options.)

The asterisk at the end of the sanctioned list directs one to an enormously long footnote in the finest of print, in which three "Commissioners" articulate their disagreements about these options. Commissioner Capron thought that neither option "e" nor option "f" should be included on *any* consent form because, since they "encompass future studies with unknown risks and benefit, neither adequate IRB review nor informed consent is possible at the time when subjects are asked to provide consent for the future use of stored material." Another commissioner, Commissioner Shapiro, agreed to that reasoning but as applied to

option “f” only. They are clearly in the minority on this issue of the volatile future.

Prevailing wisdom is represented by Commissioner Miike, who “offers” a “statement” in this long footnote. Miike makes it clear that these are options, as those on a “menu,” and he expects that individual researchers will choose among them. He opines that 9f is the “most controversial” of these options. While it might seem that 9f “contradicts” the “overall report, with its focus on consent as truly being informed,” he says, one should look more carefully, or cut more finely. In a clinical context, he suggests, when people’s minds are likely to be preoccupied with some immediate treatment for their volatile body, it may be that we should not ask for such broad futural consent, also called “prospective consent.” But it is much more “reasonable” to do so in the context of long-term biomedical research divorced from an immediate need. I leave it to the reader to speculate on the diagram of forces that produce this particular form of reason that produces a particular form of a truncated future:

This general consent recommendation would seem to contradict the Commission’s overall report. [This] report, however, addresses human biological materials collected both in research and clinical care settings. In the research setting, an extensive prospective consent form that includes the entire range identified in Recommendation 9 seems reasonable. Given the nature of current consent documents in the clinical care setting, however, I believe it is unreasonable to expect patients to deal with such a complicated consent form for permissible future research. In the clinical setting, I am primarily concerned with separating the consent to treatment from the consent for possible future use of any biopsied or surgically removed tissues. Patients, whose primary concern is treatment or diagnosis, cannot be expected to reasonably evaluate the diverse range of prospective consent choices as identified in Recommendation 9. Thus, for practical purposes, a general consent form must be used. For those concerned over the use of such a general prospective consent, my response is as follows: For participants in research projects who are asked to consent or decline to give permission for use of their tissues in future research projects, the range of consents identified in Recommendation 9 can be provided. However, for patients in clinical settings, the primary problem currently is that the consent for possible future use in research of any tissue collected is buried in the clinical care consent form. This separate consent should be made explicit by requesting two signatures—one for the clinical care, the other for possible future research uses (see Recommendation 6). As for the specific language of the prospective research use, a complicated document will raise unnecessary concerns and would, I predict, lead to a significant decrease in the availability of such materials. Moreover, this report makes other recommendations which strengthen the current informed consent process. Any general consent would be reviewed when future research projects are undertaken: 1) to assess whether the consent is appropriate in view of the particular research project to be undertaken; 2) the practicability of contacting the tissue donor for updating that consent; and 3) designing the project to strengthen confidentiality and/or to ensure anonymity. Without a general consent option, I am concerned that consent forms in the clinical setting will become too complicated and patients will be overly concerned and opt not to sign. Even when the research will be minimal risk and not

require informed consent, such biological materials will be forever lost to research, because they would have been excluded at the time of biopsy or excision from any future research use.

The second NBAC bioethics event pertains more to the scientific and economic culture in which such future-oriented research enterprises are located.

In one of the NBAC's public meetings, bioethicist Jeffrey Kahn spoke about informed consent, and the changes in the biomedical research environment since the days of the Belmont Report which codified many of those processes and principles in the 1970s. Kahn spoke at length about many issues, including the change in social expectations in the U.S. whereby getting into a clinical trial for an experimental drug or treatment had gone from guinea-pig suspicion to the most sought-after, "best" medical care available. His presentation left Stanford geneticist David Cox with two related questions, and he used them to push the discussion even further.

First, asked Cox, "why do you think it is that we have switched in this format from protecting people to everyone clamoring for the benefits? Where are those benefits and why has that come about? I have my own views but I would be very interested in yours." The second related question, Cox continued, was "if this is more in the context of explaining to people that they are partaking in a risky situation, which I actually think that that is exactly what the process is about, then why would anybody want to do it?"⁶³

Kahn's answer was couched in terms of historical and social complexities: the 1980s and 1990s gave us a "mixed up" "cocktail" of AIDS activists demanding the reconfiguration of clinical trials and inclusion in them, women with breast cancer and other conditions similarly demanding greater attention to and direct involvement in research on women's health issues, and other large-scale changes in the culture of biomedical research. Having now collectively downed that cocktail (my extension of Kahn's metaphor), we have the "sort of sense that, you know, there are real benefits to be had in research and that is part of why it makes sense to be a research participant, rightly or wrongly."⁶⁴ Experimental biomedical research and its speculative treatments had become not only a normal part of the health care system, but a normal expectation.

Cox agreed with Kahn's narrative and analysis, but then added several of his own views promised earlier in the discussion. The geneticist Cox knew his own culture better than the bioethicist Kahn, or simply felt more at liberty to critique it in public:

I would have added one other thing: I think over the past 10 years the research community has become extremely adept at their own public relations(. . .)to the point where even they believe it(. . .)[A]nd there is some truth to it but not on the time scale that it is represented. So it is long-term gains, not short-term gains. It is like the stock market. We should have some stock people actually doing this for us so that—so I really think that things have changed in my view. I think you are right but not because the process of consent has changed but because the players have changed and gotten—have changed sort of what the game is to get people to enroll.⁶⁵

Scientists like David Cox can help all of us to read the margins of organisms, research communities, and stock markets. He tells a brief story about indirect links, feedback loops, partial or emergent truths, compelling P.R., and other nonlinearities that give rise to raised expectations among all participants in the game: the people taking drugs, the researchers that develop drugs, the people who invest in the corporations that make drugs. This changed game that Cox describes is a game of speculating on, and within, complex systems;

we can't seem to escape these two words, complexity and speculation, at this historical moment.

SpeculationXSpeculation

Speculation, this speculation thus would be foreign to philosophy or metaphysics. More precisely, speculation would represent the very thing which philosophy or metaphysics guard themselves from, which philosophy or metaphysics consist in guarding themselves from, maintaining with it a relation without relation, a relation of exclusion which signifies simultaneously the necessity and the aporia of speculation. And it is within the "same" word—speculation—that the translation is to find its place, between the philosophical concept of speculation in its dominant, apparently legitimate determination, the determination granted to the elementary consensus of the philosophical tradition, and the concept that is announced here. This latter has been able to be the other's other by inhabiting it, by letting itself be excluded without ceasing to work upon it in the most domestic fashion(. ..)

What to do with this inconceivable concept? How to speculate with this speculation?...What is it that fascinates under this heading? And why does it impose itself at the moment when it is a question of life death, of pleasure-unpleasure, and of repetition?—Jacques Derrida, "To Speculate-On 'Freud.'"⁶⁶

"We're going to have to learn to live with increasing volatility."—Dennis Purcell, global head of life sciences, Chase H&Q, San Francisco⁶⁷

Dennis Purcell gets points for brevity. He's got a knack for getting right to the point, in the chummy first person plural, not repeating himself, not piling question upon question, not scattering his infinitives all over the place with complex phrases and paradoxes networked in between, but efficiently packing them together on iambic feet: to have, to learn, to live. A global head of life sciences needs that kind of skill.

But brevity can't stand alone as a virtue in an era wherein organisms like us are apprehended by billion-character genetic informational sequences, downloaded and uploaded with increasing frequency, and always supplemented by a growing list of equally prolix annotational practices that refer and connect to protein studies, gene expression studies in particular tissues at particular times, clinical findings, and many other conceptual-empirical nodes on an ever-denser network. Doubled epigraphs for a fissured terrain demanding doubled readings and doubled writings will be a minimum requirement for learning to live with increasing volatility.

No surprise, then, that if you were net-searching for genomic investment advice in today's market, wondering about the status of speculation there, you would find only doubled readings that required yet another round of some kind of speculation. On the one hand, The Motley Fool provides the non-exuberant, sober, post-bubble, post-genomics advice: "There's no reason why the average investor, one with a casual interest in stocks, should be invested in biotechnology companies. None. It doesn't make sense, from a risk-

reward perspective, for the average investor to make big bets in a debate waged by scientists, doctors, and researchers, if you're investing money you don't want to lose." But the Fool's bottom line advice—"You can only pay so much for promise"—is nevertheless haunted by the open question: *but just how much would that be?*⁶⁸

And on the other hand, taking your internet investing advice not from The Motley Fool but from Red Herring:

What's an investor to do? Believe the unbelievable. "Like never before," says Mr. Deleage. Certainly cancer victims have little else to do; same with parents of premature babies, men with testicular cancer, and women with breast cancer. It was not so long ago that these maladies meant certain death. Biotechnology has changed that one-way course, if only by a few precious degrees. What human being would not want to be a part of that? Surely the naive and the perplexed can be forgiven for their enthusiasm about what this industry is capable of in the next 25 years.⁶⁹

An axiom haunted by its own spectral question: *but how much naivete and perplexity can be forgiven?*

I've tried in this essay to diagram rather than resolve the tangle of recombinant forces that occur within these genomic sites, the simultaneous "necessity and the aporia of speculation," in which futures fold into presents. They are diagrams of speculationXspeculation, that inconceivable and unworkable concept that never ceases to work—diagrams, since *clear and globally applicable* rules for separating the "good" speculation from the "bad" are simply out of the question. SpeculationXspeculation, that relation without relation, is the essential if disavowed force inhabiting biological, economic, and political reason, and inhabiting biological, economic, and political activity. It inhabits us and we inhabit it, and there would be no life—and no life sciences—without it. Unsettled settlement that we are going to have to learn to live.

It is a time of speculating in volatile bioeconomies, volatile life sciences, volatile concepts, and volatile bodies. It still unsettles me, in my naive and perplexed attachment to the ideal of being debt-free and economically independent, to borrow from the figures and instruments of the financial world, but what seems to be called for is some kind of hedge fund or straddle that would allow us to take radically different positions in the genomics economy, some lively combination of exuberance, caution, excess, attention to fundamentals, and ineradicable but hopefully modest risk whose precise iteration as yet escapes us. As Charles Kindleberger summarizes the paradox and dilemma of regulating speculation: "'Too little, and too late' is one of the saddest phrases in the lexicon not only of central banking but of all activity. 'Too much, too early' is not an evident improvement. Enough at the right moment is better than either. But how much is enough? When is the right time?"⁷⁰ The lender of last resort—whose potential presence in the system, you will recall, must always be doubted—"faces dilemmas of amount and timing (. . .)As for timing, it is an art. That says nothing-and everything."⁷¹

ENDNOTES

- 1 See (Nordal 1996, 23).
- 2 See e.g. Mark C. Taylor, *Nots* (Chicago: University of Chicago Press, 1993).
- 3 (Marcus 1998, 208).
- 4 (Wilson 2000).
- 5 See e.g. (Deleuze 1993).
- 6 (Grosz 1994) and (Grosz 1999).
- 7 (Wilson 1998, 62).
- 8 Ibid. 63.
- 9 (Vukmirovic and Tilghman 2000, 820).
- 10 To learn more about the complex networks that animate terms such as: the gift, language, time, and the disseminated practices collected under the names of “deconstruction,” “anthropology,” and “literature,” it would be worth one’s time to run a few experiments with (Derrida 1992).
- 11 Brian Rotman deconstructs the infinitist metaphysics of mathematics, and how new computational practices promise to reinscribe mathematics within the more material algorithms of repeated iteration, a promise which he describes as “taking God out of mathematics and putting the body back in,” in (Rotman 1996).
- 12 (Rheinberger 1998, 291).
- 13 (Doyle 1997).
- 14 On the stammering and vertiginous logic, structure, or event of “the step beyond,” which is also, in French at least, “the not-beyond” [*le pas au-delà*], see (Blanchot), and (Derrida 1987). On the particular not/step beyond that animates life, see (Doyle 1997).
- 15 (Lockhart 2000, 834-835).
- 16 See (Doyle 1997) for an analysis of Monod and Jacob’s operon model of the gene, and also for details on the French television show *Vivre et parler* featuring Jacob, Roman Jakobson, and Claude Lévi-Strauss.

- 17 (Keller 2000, 69).
- 18 (Gelbart 1998), quoted in (Keller 2000, 67-68).
- 19 In their article “‘Ome Sweet ‘Omics,’” Nobel laureate Joshua Lederberg and Alexa McCray comment on the recent proliferation of -ome terms in the life sciences, and suggest a number of possible etymologies, including one by “a Sanskrit-speaking friend [who] offers that ‘-OM signifies fullness, completeness as in divinity (. . .) it encompasses the entire universe in its unlimitedness.’ S: , with its endless intonation, is then redolent with the S, the greatest and the very last character in the Greek alphabet. What could resonate more with today’s -ome terms!” See (Lederberg and McCray 2001).
- 20 (Eisenberg et al. 2000, 823).
- 21 (Eisenberg et al. 2000, 826).
- 22 (Venter 2001).
- 23 William Bains, “Should You Hire an Epistemologist?,” *Nature Biotechnology* 15 (May 1997):396.
- 24 (Herrera 2001).
- 25 (Shiller 2000).
- 26 (Chancellor 1999) is a smart and readable summary of speculative episodes; see also (Galbraith 1990) and (Garber 2000).
- 27 (Kindleberger 1978, 13). J.L. Austin claims the name “expositives” for such speech acts as “I claim,” although he admits that these are “difficult to define. They make plain how our utterances fit into the course of an argument or conversation, how we are using words, or, in general, are expository. Examples are ‘I reply,’ ‘I argue,’ ‘I concede,’ ‘I illustrate,’ ‘I postulate.’ We should be clear from the start that there are still wide possibilities of marginal or awkward cases, or of overlaps.” (Austin 1962, 151-152) And while Kindleberger may claim, in the end, that it is a synthesis that his economic theory is pursuing—an economic theory which he admits would be derogatively referred to as “literary economics”—his language along the way opens up other possibilities. At the very least, it must be said that Kindleberger’s synthesis is one with multiple remains, residues, and other loose ends; the bottom line is not synthesis, but a more or less volatile chiasmus. Over and over, he returns to “fundamental ambiguity,” contradictions, conceptual and empirical “difficulties,” and “dilemmas” or double binds.
- 28 (Kindleberger 1978, 4), my emphasis. I will have to defer the Bataillean analysis that would be—or so I claim—so promising here.
- 29 *Ibid.*, 13.
- 30 *Ibid.*, 9.

- 31 Ibid., 6.
- 32 Ibid., 6.
- 33 Ibid., 12.
- 34 The rhetorical figure in such an operation would be catachresis rather than chiasmus. For such an analysis applied specifically to the problem of writing value “under erasure,” see (Spivak 1988). For a reading that collates Spivak, Derrida, Irigaray, Marx and others writing on the spectres and ghosts that must haunt speculation and other productions of value, see (Keenan 1997).
- 35 See (Fortun and Fortun 1999).
- 36 Incyte Pharmaceuticals (now Incyte Genomics) in Palo Alto, for example, was one of the earliest genomics companies: founded in 1991, it began shifting from the more traditional biotech drug-company identity to one based on producing and selling access to molecular databases, going public in 1993. It became one of the first companies to employ the Netscape browser, allowing Incyte’s clients in the pharmaceutical industry to navigate its multiple databases—genetic sequence, gene expression, protein sequence, and others—easily and productively. Incyte’s corporate strategy has been described as “more like a software company than a biotechnology firm,” and its former President and Chief Scientific Officer Randy Scott has been described as “a product of Silicon Valley, where suing a company in the morning and then inking an alliance with them in the afternoon is just another day in the high-tech fast lane. Valleyites call the attitude ‘co-opetition.’” See Joan O’Connor Hamilton, “How SmithKline and Incyte Became Lab Partners,” *Signals Magazine* (September 5, 1997), available at www.signalsmag.com.
- 37 (U.S. Securities and Exchange Commission 1994). All the following quotes in this section are from this document unless otherwise indicated.
- 38 507 F.2d 485 (9th Cir. 1974).
- 39 Ibid. The SEC also cited “more extreme positions” taken by some courts, which ruled that “soft,” “puffy” statements “upon which no reasonable investor would rely” would not be actionable, unless they were worded in the language of a guarantee.
- 40 Ibid. The footnote to this passage refers to two documents to substantiate this historical argument: a Harvard Business School Working Paper, “Improving the Corporate Disclosure Process” (by R. Eccles and S. Mavrinac, 1994) and an article in *Fortune* magazine, “Your Company’s Most Important Asset: Intellectual Capital” (October 3, 1994, p. 68).
- 41 Ibid.
- 42 (*Washington Post* 1995). This editorial was inserted into the Congressional Record (104th Congress, page S19147) by advocates of the legislation.

- 43 (Lalli 1995). In another example of the mass media being targeted to the reading and citational practices of a few readers, this editorial too was included in the Congressional Record.
- 44 “It is gratifying to observe in this very example how excess of profundity, or rather solemnity, at once paves the way for immorality. For one who says ‘promising is not merely a matter of uttering words! It is an inward and spiritual act!’ is apt to appear as a solid moralist standing out against a generation of superficial theorizers: we see him as he sees himself, surveying the invisible depths of ethical space, with all the distinction of a specialist in the sui generis. Yet he provides Hippolytus with a let-out, the bigamist with an excuse for his ‘I do’ and the welsher with a defence for his ‘I bet.’ Accuracy and morality alike are on the side of the plain saying that our word is our deed.” (Austin 1962, 9-10)
- 45 As a side note, Pillsbury Madison (now Pillsbury Winthrop) also did the legal work for Genentech Inc., in the first (and highly volatile) biotech IPO in 1980; see James B. Stewart, *The Partners: Inside America’s Most Powerful Law Firms* (New York: Warner Books, 1984).
- 46 Protected them in federal courts, at least. One effect of the PSLRA was to create a rush to file suits in various state courts, a problem addressed by the Securities Litigation Uniform Standards Act of 1998, which preempts class-action suits being filed in state courts; see (Lerach 1998). But that’s a different story.
- 47 See, e.g., Michael A. Perino, “What We Know and Don’t Know About the Private Securities Litigation Reform Act of 1995,” Testimony Before the Subcommittee on Finance and Hazardous Materials of the Committee on Commerce, United States House of Representatives, October 21, 1997; available from the Securities Class Action Clearinghouse (<http://securities.stanford.edu>).
- 48 (Weiss and Moser 1998).
- 49 (Branson 1998, 518).
- 50 (Branson 1998, 518-519).
- 51 (Rosen 1998, 655).
- 52 (Rosen 1998, 656-657). Rosen continues in this passage to rely on the reasonable investor: “I would submit that, however anomalous the result may seem on the facts of a particular case, this result is correct as a matter of policy as well. The theory of the Act-like that of much prior case law-is that no reasonable investor could rely on a forward-looking statement in light of specific attendant risk disclosures, so a prediction that is adequately hedged with concrete cautionary language simply is not material.” (p. 657)
- 53 (Rosen 1998, 657-658).
- 54 (Gillis 2000).

- 55 (AdvanceTech Monitor 1999).
- 56 See (McManus 2000). I owe James Der Derian for anteing in this reference to my pot.
- 57 Taken from a press release from Celera, which is now being sued by some of its shareholders for failing to disclose the full extent of the breakdown in negotiations between Celera and the U.S. government concerning genomic data access and release, as well as who would accrue the cultural capital that would come with “winning the race” to the human genome; see (Philipkoski 2000).
- 58 See (Fortun 1999) for a longer discussion, but here are two data points. In 1987 Charles DeLisi, one of the earliest and strongest advocates of the HGP and at that time in the U.S. Department of Energy, testified to a U.S. Senate committee that the goal of the HGP was “to develop technologies that would make sequencing...a lot quicker than it currently is (. . .)[I]f you want to sequence a hundred thousand bases [in] twenty people and compare their sequences and understand disease susceptibilities, you can’t do that, it’s not a clinically viable procedure. We can make that a clinically viable procedure. That’s the goal, it’s not to sequence the human genome, at least initially.” (U.S. Senate 1987a:12) And Johnson & Johnson Corporation’s Jack McConnell, who helped draft early U.S. legislation on the HGP, testified: “If we want the U.S. to maintain its position as a dominant force in the pharmaceutical industry in the world, I cannot imagine our letting this opportunity pass us by...[T]he group that first gains access to the information from mapping and sequencing the human genome will be in position to dominate the pharmaceutical and biotech industry for decades to come.” (U.S. Senate 1987b:329).
- 59 (Lockhart 2000, 830).
- 60 Quoted in (McReynolds 2001).
- 61 See (Barbash 2000).
- 62 (Hamilton, 2000 #37).
- 63 (National Bioethics Advisory Commission 2000, 273-4).
- 64 Ibid. 276.
- 65 Ibid. 277.
- 66 (Derrida 1987, 277).
- 67 Quoted in (Dorey 2000).
- 68 (McCaffery 2001).
- 69 (Herrera 2001).
- 70 (Kindleberger 1978, 178).

71 (Kindleberger 1978, 181).

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