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# BIOMEDICALIZATION: TECHNOSCIENTIFIC TRANSFORMATIONS OF HEALTH, ILLNESS, AND U.S. BIOMEDICINE

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*The first social transformation of American medicine institutionally established medicine by the end of World War II. In the next decades, medicalization—the expansion of medical jurisdiction, authority, and practices into new realms—became widespread. Since about 1985, dramatic changes in both the organization and practices of contemporary biomedicine, implemented largely through the integration of technoscientific innovations, have been coalescing into what the authors call biomedicalization, a second “transformation” of American medicine. Biomedicalization describes the increasingly complex, multisited, multidirectional processes of medicalization, both extended and reconstituted through the new social forms of highly technoscientific biomedicine. The historical shift from medicalization to biomedicalization is one from control over biomedical phenomena to transformations of them. Five key interactive processes both engender biomedicalization and are produced through it: (1) the political economic reconstitution of the vast sector of biomedicine; (2) the focus on health itself and the elaboration of risk and surveillance biomedicines; (3) the increasingly technological and scientific nature of biomedicine; (4) transformations in how biomedical knowledges are produced, distributed, and consumed, and in medical information management; and (5) transformations of bodies to include new properties and the production of new individual and collective technoscientific identities.*

**T**HE GROWTH OF medicalization—defined as the processes through which aspects of life previously outside the jurisdiction of medicine come to be construed as medical problems—is one of the most potent social transformations of the last half of the

twentieth century in the West (Bauer 1998; Clarke and Olesen 1999; Conrad 1992, 2000; Renaud 1995). We argue that major, largely technoscientific changes in biomedicine<sup>1</sup> are now coalescing into what we call

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<sup>1</sup> Following Latour (1987), we use the term “technoscience” to indicate an explicit move past scholarly traditions that separated science and technology conceptually and analytically. We argue that these two domains should be regarded as co-constitutive; we thus challenge the notion

*biomedicalization*<sup>2</sup> and are transforming the twenty-first century. Biomedicalization is our term for the increasingly complex, multisited, multidirectional processes of medicalization that today are being both extended and reconstituted through the emergent social forms and practices of a highly and increasingly technoscientific biomedicine. We signal with the “bio” in biomedicalization the transformations of both the human and nonhuman made possible by such technoscientific innovations as molecular biology, biotechnologies, genomization, transplant medicine, and new medical technologies. That is, medicalization is intensifying, but in new and complex, usually technoscientifically enmeshed ways.

Institutionally, biomedicine is being reorganized not only from the top down or the bottom up but *from the inside out*. This is occurring largely through the remaking of the technical, informational, organizational, and hence the institutional infrastructures of the life sciences and biomedicine via the incorporation of computer and information technologies (Bowker and Star 1999; Cartwright 2000; Lewis 2000; National Research Council 2000). Such technoscientific innovations are reconstituting the many institutional sites of health-care knowledge production, distribution, and information management (e.g., medical information technologies/informatics, networked or integrated systems of hospitals, clinics, group practices, insurance organizations, the bioscientific and medical technology and supplies industries, the state, etc.). These meso-level organizational/institutional changes are

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that there are “pure forms” of scientific or technological research totally distinguishable from their practical applications. Similarly, the term “biomedical” features the increasingly biological scientific aspects of the practices of clinical medicine. That is, the technoscientific practices of the basic life sciences (“bio”) are increasingly also part of applied clinical medicine—now biomedicine.

<sup>2</sup> Other scholars have used the term “biomedicalization” (C. Cohen 1991, 1993; Estes and Binney 1989; Lyman 1989; Weinstein and Weinstein 1999). They were not, however, concerned with technoscience. See Clarke and Olesen (1999) and Clarke et al. (2000) for earlier formulations of these ideas.

cumulative over time and have now reached critical infrastructural mass in the shift to biomedicalization.

Clinical innovations are, of course, at the heart of biomedicalization. Extensive transformations are produced through new diagnostics, treatments, and procedures from bioengineering, genomics, proteomics, new computer-based visualization technologies, computer-assisted drug developments, evidence-based medicine, telemedicine/telehealth, and so on. At the turn of the twenty-first century, such technoscientific innovations are the jewels in the clinical crown of biomedicine and vectors of biomedicalization in the West and beyond.

The extension of medical jurisdiction over health itself (in addition to illness, disease, and injury) and the commodification of health are fundamental to biomedicalization. That is, health itself and the proper management of chronic illnesses are becoming individual moral responsibilities to be fulfilled through improved access to knowledge, self-surveillance, prevention, risk assessment, the treatment of risk, and the consumption of appropriate self-help/biomedical goods and services. Standards of embodiment, long influenced by fashion and celebrity, are now transformed by new corporeal possibilities made available through the applications of technoscience. New individual and collective identities are also produced through technoscience (e.g., “high-risk” statuses, DNA profiles, Syndrome X sufferers).

Biomedicalization processes are situated within a dynamic and expanding politico-economic and sociocultural biomedical sector. In this sector, the incorporation of technoscientific innovations is at once so dense, dispersed (from local to global to local), heterogeneous (affecting many different domains simultaneously), and consequential for the very organization and practices of biomedicine broadly conceived that they manifest a recorporation—a reconstitution—of this historically situated sector. We term this new social form the “Biomedical TechnoService Complex, Inc.”<sup>3</sup> The growth

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<sup>3</sup> This concept merges the “medical industrial complex,” a term coined by HealthPAC (Ehrenreich and Ehrenreich 1971), with the “New World Order, Inc.” coined by Haraway (1997).

of this complex since World War II is clear. The U.S. health sector has more than tripled in size over the last 50 years from 4 percent to 13 percent of GNP, and it is anticipated to exceed 20 percent by 2040 (Leonhardt 2001). At the same time, Western biomedicine has become a distinctive sociocultural world, ubiquitously webbed throughout mass culture (e.g., Bauer 1998; Lupton 1994). Health has been the site of multiple old and new social movements (e.g., Brown et al. 2001). Biomedicine has become a potent lens through which we culturally interpret, understand, and seek to transform bodies and lives. That is, if the concept of the Biomedical TechnoService Complex, Inc. particularly captures some politico-economic dimensions of biomedicalization, the concept of biomedicine as a culture per se, as a regime of truth (Foucault 1980: 133), particularly captures some sociocultural dimensions.

Although we can conceptually tease apart organizational, clinical, and jurisdictional axes of change and their situatedness within a politico-economic and sociocultural sector—however vast—the ways in which these changes are simultaneous, co-constitutive, and nonfungible inform our conceptualization of biomedicalization. That is, a fundamental premise of biomedicalization is that increasingly important sciences and technologies *and* new social forms are *co-produced* within biomedicine and its related domains.<sup>4</sup> Biomedicalization is reciprocally constituted and manifest through five major interactive processes: (1) the politico-economic constitution of the Biomedical TechnoService Complex, Inc.; (2) the focus on health itself and elaboration of risk and surveillance biomedicines; (3) the increasingly technoscientific nature of the practices and innovations of biomedicine; (4) transformations of biomedical knowledge production, information management, distribution, and consumption; and (5) transformations of bodies to include new properties and the pro-

<sup>4</sup> For reviews of the history and sociology of medical technologies and related practices, see Marks (1993) and Timmermans (2000). Co-constitution is defined as the mutual and simultaneous production of a social phenomenon; for a discussion, see Jasanoff (2000).

duction of new individual and collective technoscientific identities. These processes operate at multiple levels as they both engender biomedicalization and are also (re)produced and transformed through biomedicalization over time. Our argument, thus, is historical, not programmatic.

We begin by examining the historical shift from medicalization to biomedicalization. We then elaborate the five key historical processes through which biomedicalization occurs. We conclude by reflecting on the implications of the shift to biomedicalization.

### FROM MEDICALIZATION TO BIOMEDICALIZATION

Historically, the rise in the United States of Western (allopathic) medicine as we know it was accomplished clinically, scientifically, technologically, and institutionally from 1890 to 1945. This first “transformation of American medicine” (Starr 1982) was centered not only on the professionalization and specialization of medicine and nursing but also on the creation of allied health professions, new medico-scientific, technological, and pharmaceutical interventions, and the elaboration of new social forms (e.g., hospitals, clinics and private medical practices) (Abbott 1988; Clarke 1988; Freidson 1970, 2001; Gaudilliere and Lowy 1998; Illich 1976; Lock and Gordon 1988; Pauly 1987; Pickstone 1993; Risse 1999; Stevens 1998; Swan 1990). Then, in the decades after World War II, medicine, as a politico-economic institutional sector and a sociocultural “good,” grew dramatically in the United States through major investments, both private (industry and foundations) and public (e.g., the National Institutes of Health [NIH], Medicare, Medicaid) (Kohler 1991; NIH 1976, 2000a, 2000b). The production of medical knowledges and clinical interventions—goods and services—expanded rapidly.<sup>5</sup>

As medicine grew, sociologists and other social scientists began to attend to its impor-

<sup>5</sup> We use the plural “knowledges” to signal that knowledges are heterogeneous and may be incommensurate and contested. On the production of “situated knowledges,” see Haraway (1991); for an exemplar, see Clarke and Montini (1993).

tance, especially as a profession (Abbott 1988; H. Becker et al. 1961; Bucher 1962; Bucher and Strauss 1961; Freidson 1970; Parsons 1951; Starr 1982; Strauss, Schatzman, et al. 1964). The concept of medicalization was framed by Zola (1972, 1991) to theorize the extension of medical jurisdiction, authority, and practices into increasingly broader areas of people's lives. Initially, medicalization was seen to take place when particular social problems deemed morally problematic and often affecting the body (e.g., alcoholism, homosexuality, abortion, and drug abuse) were moved from the professional jurisdiction of the law to that of medicine. Drawing from interactionist labeling theory,<sup>6</sup> Conrad and Schneider (1980) termed this a transformation from "badness to sickness." Simultaneously, some critical theorists viewed medicalization as promoting the capitalist interests of medicine and of the medical industrial complex more broadly (e.g., Ehrenreich and Ehrenreich 1978; McKinlay and Stoeckle 1988; Navarro 1986; Waitzkin 1989, 2001).

Through the theoretical framework of medicalization, medicine came to be understood as a social and cultural enterprise as well as a medico-scientific one, and illness and disease came to be understood as not necessarily inherent in any particular behaviors or conditions, but as constructed through human (inter)action (Bury 1986; Lupton 2000). Further, medicalization theory also illuminated the importance of widespread individual and group acceptance of dominant sociocultural conceptualizations of medicine and active participation in its diverse, interrelated macro, meso, and micro practices and institutions, however uneven (Morgan 1998).

Gradually the concept of medicalization was extended to include any and all instances of new phenomena deemed medical problems under medical jurisdiction—from initial expansions around childbirth, death, menopause, and contraception in the 1970s to post-traumatic stress disorder (PTSD), premenstrual syndrome (PMS), and attention deficit hyperactivity disorder (ADHD) in the 1980s/1990s, and so on (Armstrong 2000;

Conrad 1975, 2000; Conrad and Potter 2000; Conrad and Schneider 1980; Figert 1996; Fox 1977, 2001; Halpern 1990; Litt 2000; Lock 1993; Riessman 1983; Ruzek 1978; Schneider and Conrad 1980; Timmermans 1999). Social and cultural aspects and *meanings* of medicalization were elaborated even further and, as we argue next, largely through technoscientific innovations. For example, conditions understood as undesirable or stigmatizable "differences" (Goffman 1963) were medicalized (e.g., unattractiveness through cosmetic surgery; obesity through diet medications), and the medical treatment of such conditions was normalized (Armstrong 1995; Crawford 1985). These were the beginnings of the biomedicalization of *health*, in addition to illness and disease—the biomedicalization of phenomena that heretofore were deemed within the range of "normal" (Arney and Bergen 1984; Hedgecoe 2001).

Then, beginning about 1985, we suggest, the nature of medicalization itself began to change as technoscientific innovations and associated new social forms began to transform biomedicine from the inside out. Conceptually, biomedicalization is predicated on what we see as larger shifts-in-progress from the problems of modernity to the problems of late modernity or postmodernity. Within the framework of the industrial revolution, we became accustomed to "big science" and "big technology"—projects such as the Tennessee Valley Authority, the atom bomb, and electrification and transportation grids. In the current technoscientific revolution, "big science" and "big technology" can sit on your desk, reside in a pillbox, or inside your body. That is, the shift to biomedicalization is a shift from enhanced control over external nature (i.e., the world around us) to the harnessing and transformation of internal nature (i.e., biological processes of human and nonhuman life forms), often transforming "life itself." Thus, it can be argued that medicalization was co-constitutive of modernity, while biomedicalization is also co-constitutive of postmodernity (Clarke 1995).

Important to the shift are the ways in which historical innovations of the medicalization era (organizational, scientific, technical, cultural, etc.) became widely elabo-

<sup>6</sup> For a review and extended citations to this theoretical approach, see Pfohl (1985).

rated and dispersed material infrastructures, resources and sociocultural discourses, and assumptions of the biomedicalization era (Clarke 1988). Biomedicalization is characterized by its greater organizational and institutional reach through the meso-level innovations made possible by computer and information sciences in clinical and scientific settings, including computer-based research and record-keeping. The scope of biomedicalization processes is thus much broader, and includes conceptual and clinical expansions through the commodification of health, the elaboration of risk and surveillance, and innovative clinical applications of drugs, diagnostic tests, and treatment procedures. This includes the production of new social forms through “dividing practices” that specify population segments such as risk groups (Rose 1994). These groups are to be given special attention through new “assemblages” (Deleuze and Guattari 1987) of spaces, persons, and techniques for care-giving. Innovations and interventions are not administered only by medical professionals but are also “technologies of the self,” forms of self-governance that people apply to themselves (Foucault 1988; Rose 1996). Such technologies pervade more and more aspects of daily life and the lived experience of health and illness, creating new biomedicalized subjectivities, identities, and biosocialities—new social forms constructed around and through such new identities (Rabinow 1992). We seek to capture these changes in the ordering of health-related activities and the administration of individuals and populations<sup>7</sup>—including self-administration—referred to as governmentality.<sup>8</sup>

<sup>7</sup> The term “population health” is increasingly used to refer to studies of particular population groups (the aged, women, ethnic groups, adolescents, etc.).

<sup>8</sup> Governmentality is a Foucauldian concept used to refer to particular kinds of power often guided by expert knowledges that seek to monitor, observe, measure, and normalize individuals and populations (Foucault 1975, 1980, 1988, 1991). This kind of power relies not upon brute coercion, but instead upon diffuse mechanisms such as discourses that promote the pursuit of happiness and healthiness through certain modes of personal conduct including self-surveillance, and self-regulation. We use “governmentality” to

Table 1 offers an overview of the shifts from medicalization to biomedicalization cobbled and webbed together through the increasing application of technoscientific innovations. One overarching analytic shift is from medicine exerting clinical and social *control over* particular conditions to an increasingly technoscientifically constituted biomedicine also capable of effecting the *transformation of* bodies and lives (Clarke 1995). Such transformations range from life after complete heart failure to walking in the absence of leg bones, to giving birth a decade or more after menopause, to the capacity to genetically design life itself—vegetable, animal and human. Of course, many biomedically induced bodily transformations are much less dramatic, such as Botox and laser eye surgery, but these are no less technoscientifically engineered.

The rest of Table 1 describes shifts from medicalization to biomedicalization within the five key processes that co-constitute biomedicalization. Analytically, the shift from medicalization to biomedicalization occurs unevenly across micro, meso and macro levels. Significantly, biomedicalization theory emphasizes organizational/institutional/meso-level changes, and these are highlighted here in order to describe the processes and mechanisms of action and change in concrete—if widespread—practices. Biomedicalization is constituted through the transformation of the organization of biomedicine as a knowledge- and technology-producing domain as well as one of clinical application. Computer and information technologies and the new social forms co-produced through their design and implementation are the key infrastructural devices of the new genres of meso-institutionalization (Bowker and Star 1999). The techno-organizational innovations of one era become the (often invisible) infrastructures of the next (Clarke 1988, 1991).

The following points are at the core of our argument about the shift from medicalization to biomedicalization. We offer an alternative understanding of historical change

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connote various governing rationalities based in disciplining and surveillance, biopower, and technologies of the self (also see Rose 1996; Turner 1997).

beyond that of technological determinism (e.g., Jasanoff 2000; Rose 1994). While we see sciences and technologies as powerful, we do not see them as *determining* futures. With other science, technology, and medicine studies scholars, we start with the assumption that sciences and technologies are made by people *and* things working together (e.g., Clarke 1987; Latour 1987). Human action and technoscience are *co-constitutive*, thereby refuting technoscientific determinisms (M. Smith and Marx 1994). Although the changes wrought by biomedicalization are often imaged as juggernauts of technological imperatives (Koenig 1988) bearing distinctive Western biomedical assumptions (Lock and Gordon 1988; Tesh 1990), the new social/cultural/economic/organizational/institutional forms routinely produced as part and parcel of technoscientific innovations are usually analytically ignored (Vaughan 1996, 1999). That is, the realms and dynamics of the social *inside* scientific, technological, and biomedical domains are too often rendered invisible. At the heart of our project lie the tasks of revealing these new social forms and opening up critical spaces to allow greater democratic participation in shaping human futures *with* technosciences.

Therefore, central to our argument is the point that in daily material practices, biomedicalization processes are not predetermined but are quite contingent (Freidson 2001; Olesen 2002; and Olesen and Bone 1998). In laboratories, schools, homes, and hospitals today, workers and people as patients and as providers/health system workers are responding to and negotiating biomedicalization processes, attempting to shape new technoscientific innovations and organizational forms to meet their own needs (Strauss, Schatzman, et al. 1964; Wiener 2000). In practice, the forces of biomedicalization are at once furthered, resisted, mediated, and ignored as varying levels of personnel respond to their constraints and make their own pragmatic negotiations within the institutions and in the situations in which they must act (Lock and Kaufert 1998; Morgan 1998; Olesen 2000; V. Smith 1997). As a result, the larger forces of biomedicalization are shaped, deflected, transformed, and even contradicted.

Many of the themes we develop here are not new; but their synthesis within an argument for technoscientific based biomedicalization is. Further, the shifts are shifts of emphasis—these trends are historical and historically *cumulative* from left to right across Table 1, not separate and parallel. Traditional medicalization processes can and do continue temporally and spatially at the same time as more technoscientific based biomedicalization processes are also occurring. Innovations accumulate over time such that older, often “low(er)” technologically based approaches are usually simultaneously available somewhere, while emergent, often “high(er)” technoscientific based approaches also tend over time to drive out the old. There is no particular event or moment or phenomenon that signals this shift, but rather a cumulative momentum of increasingly technoscientific interventions throughout biomedicine since roughly 1985. The unevenness of biomedicalization persists and will continue to persist historically and geographically in the United States and elsewhere.

We turn next to an elucidation of the concrete practices and processes of biomedicalization.

## KEY PROCESSES OF BIOMEDICALIZATION

Biomedicalization is co-constituted through five central (and overlapping) processes: major political economic shifts; a new focus on health and risk and surveillance biomedicines; the technoscientization of biomedicine; transformations of the production, distribution, and consumption of biomedical knowledges; and transformations of bodies and identities. We emphasize historical developments in the transitional and current biomedicalization era.

### 1. ECONOMICS: THE U.S. BIOMEDICAL TECHNOSERVICE COMPLEX, INC.

One theoretical tool for understanding the shift from medicalization to biomedicalization is the concept of the “medical industrial complex” put forward in the 1970s in the midst of the medicalization era. Changes in medicine in that era were critically theorized

as reflecting the politico-economic development of a “medical industrial complex” (taking off from President Eisenhower’s 1950s naming of “the military industrial complex” consolidated through World War II). This concept was coined by a progressive health activist group, HealthPAC (Ehrenreich and Ehrenreich 1971), and subsequently was taken up inside mainstream medicine by Relman (1980), then editor of *The New England Journal of Medicine* (also see Estes, Harrington, and Pellow 2000). For the current biomedicalization era, we offer a parallel concept—the Biomedical TechnoService Complex, Inc. This term emphasizes the *corporatized* and *privatized* (rather than state-funded) research, products and services made possible by technoscientific innovations that further biomedicalization. The corporations and related institutions that constitute this complex are increasingly multinational and are rapidly globalizing both the Western biomedical model and biomedicalization processes *per se*.

The size and influence of the Biomedical TechnoService Complex, Inc. are significant and growing. The health-care industry is now 13 percent of the \$10 trillion annual U.S. economy. In the economic downturn of late 2001, the health-care sector was even viewed by some as the main engine of the U.S. economy, offering a steadying growth. Pharmaceutical-sector growth is estimated at about 8 percent per year (Leonhardt 2001). Americans spent more than \$100 billion on drugs in 2000, double the amount spent in 1990 (Wayne and Petersen 2001). The emergence of a global economy dominated by flexible accumulation by interdependent multinational corporations (Harvey 1989), streamlined production arrangements, new management technologies (V. Smith 1997), and increased specialization enables many of the biomedicalization processes discussed here.<sup>9</sup>

Through its sheer economic power, the Biomedical TechnoService Complex, Inc.

shapes how we think about social life and problems in ways that constitute biomedicalization. The most notable socioeconomic changes indicative of and facilitating biomedicalization are, as indicated in Table 1, (1) corporatization and commodification; (2) centralization, rationalization, and devolution of services; and (3) stratified biomedicalization.

**CORPORATIZATION AND COMMODIFICATION.** Trends in corporatization and commodification are embodied in the moves by private corporate entities to appropriate increasing areas of the health-care sector under private management and/or ownership. In biomedicalization, not only are the jurisdictional boundaries of medicine and medical work expanding and being reconfigured, but so too are the frontiers of what is legitimately defined as private versus public medicine, and corporatized versus nonprofit medicine. For example, in the United States, federal and state governments have been instrumental in expanding the private health-care sector by inviting corporations to provide services to federally insured beneficiaries. Historically, since the Social Security Act established the government as a direct provider of medical insurance coverage through the Medicaid and Medicare programs in 1965, most recipients have been treated in public and/or not-for-profit clinics, hospitals, and emergency rooms. As health-care costs and competitive pressures for personnel and revenues escalated, however, many of these facilities closed or were bought out and consolidated by for-profit corporations. By the late 1990s, efforts were underway to move such patients into private HMOs, effectively privatizing social health-care programs (e.g., Estes et al. 2000).

Second, under pressure from powerful biomedical conglomerates, the state is increasingly socializing the costs of medical research by underwriting start-up expenses of research and development yet allowing commodifiable products and processes that emerge to be privatized—that is, patented, distributed, and profited from by private interests (Gaudilliere and Lowy 1998; Swan 1990). The Human Genome Project is one high-profile example. What began as a federally based and funded research effort culminated in the shared success of sequencing

<sup>9</sup> For discussions of trends in the political economy of health care, see, for example, Bond and Weissman (1997), Estes (1991), Estes et al. (2000), Estes and Linkins (1997), Light (2000a, 2000b), Navarro (1999), Robinson (1999), Salmon (1990), and Whiteis and Salmon (1990).



**Table 1. The Shift from Medicalization to Biomedicalization**

Medicalization	Biomedicalization
Control	Transformation
Institutional expansion of professional medical jurisdiction into new domains	Expansion also through technoscientific transformations of biomedical organizations, infrastructures, knowledges, and clinical treatments
<i>Economics: The U.S. Biomedical TechnoService Complex, Inc.</i>	
Foundation- and state-funded (usually NIH) biomedical, scientific, and clinical research with accessible/public results	Also increasing privatization of research including university/industry collaborations with increased privatization and commodification of research results as proprietary knowledge
Increased economic organization, rationalization, corporatization, nationalization	Also increased economic privatization, devolution, transnationalization/globalization
Physician-dominated organizations	Managed care system-dominated organizations
Stratification largely through the dual tendencies of selective medicalization and selective exclusion from care based on ability to pay	Stratification also through stratified rationalization, new population-dividing practices, and new assemblages for surveillance and treatment based on new technoscientific identities
<i>The Focus on Health, Risk, and Surveillance</i>	
Works through a paradigm of definition, diagnosis (through screening and testing), classification, and treatment of illness and diseases	Works also through a paradigm of definition, diagnosis (through screening and testing), classification, and treatment of risks and commodification of health and lifestyles
Health policy as problem-solving	Health governance as problem-defining
Diseases conceptualized at the level of organs, cells	Risks and diseases conceptualized at the level of genes, molecules, and proteins

*(Continued on next page)*

the genome between Celera Genomics and government-funded scientists. In related developments, genetic and tissue samples collected from the bodies of individuals and communities have become patented commodities of corporate entities that offered no patient or community reimbursement (Adams 2002; Landecker 1999; Rabinow 1996). Another striking example is the patenting of the BRCA1 genes (breast cancer markers) by Myriad Genetics. The company not only receives royalties each time a genetic test for breast cancer is given but also holds sole proprietor rights over research conducted on those genes (Zones 2000), though ownership of such rights is being challenged in the company's own country (Canada) and in France (Bagnall 2001).

Further, as suggested in Table 1, industry-academy collaborations are also becoming routine sources of funding for universities,

including academic medical centers (combinations of medical schools, hospitals, clinics, and research units) that had been federally funded for 30 years. The U.S. Balanced Budget Act of 1997 cut an estimated \$227 billion, with large cuts of hospital budgets, while federal indirect medical education payments were also trimmed (L. Fishman and Bentley 1997). Strapped academic medical centers are filling this gap in part by conducting extensive clinical trials for pharmaceutical companies, requisite to bringing new products to market. Special contracts units, a new social form, have been established at major medical centers, often within their "offices of industry and research development," to negotiate blanket contract overhead rates with pharmaceutical companies.

Trends toward increased pharmaceutical company sponsorship of research have become highly problematic, however. The cur-

(Table 1 continued from previous page)

Medicalization	Biomedicalization
<i>The Technoscientization of Biomedicine</i>	
Highly localized infrastructures with idiosyncratic physician, clinic, and hospital records of patients (photocopy and fax are major innovations)	Increasingly integrated infrastructures with widely dispersed access to highly standardized, digitized patients' medical records, insurance information processing, and storage
Individual/case-based medicine with local (usually office-based) control over patient information	Outcomes/evidence-based medicine with use of decision-support technologies and computerized patient data banks in managed care systems
Medical science and technological interventions (e.g., antibiotics, chemotherapy, radiation, dialysis, transplantation, new reproductive technologies)	Biomedical technoscientific transformations (e.g., molecularization, biotechnologies, geneticization, nanoscience, bioengineering, chemoprevention, genetic engineering, and cloning)
New medical specialties based on body parts and processes and disease processes (e.g., cardiology, gynecology, oncology) assumed to be universal across populations and practice settings	New medical specialties based on assemblages—loci of practice and knowledge of accompanying distinctive populations and genres of sciences and technologies (e.g., emergency medicine, hospitalists, prison medicine)
<i>Transformations of Information, and the Production and Distribution of Knowledges</i>	
Professional control over specialized medical knowledge production and distribution, with highly restricted access (usually limited to medical professionals)	Heterogeneous production of multiple genres of information/knowledge regarding health, illness, disease, and medicine, widely accessible in bookstores and electronically by Internet, etc.
Largely top-down medical professional-initiated interventions	Also heterogeneously initiated interventions (examples of new actors include health social movements, consumers, Internet users, pharmaceutical corporations, advertisements, websites)
<i>Transformations of Bodies and Identities</i>	
Normalization	Customization
Universal taylorized bodies; one-size-fits-all medical devices/technologies and drugs; superficially(including cosmetically) modified bodies	Individualized bodies; niche-marketed and individualized drugs and devices/technologies; customized, tailored, and fundamentally transformed bodies
From badness to sickness; stigmatization of conditions and diseases	Also new technoscientifically based individual and collective identities

rent and former editors of 13 major medical journals stated in an editorial in *Journal of the American Medical Association* that they would reject any study that does not ensure that the sponsor gave researchers complete access to data and freedom to report on findings (Davidoff et al. 2001). Further, a new study found that industry-sponsored research is 3.6 times more likely to produce results favorable to the sponsoring company, implicating both universities and individual scientists (Bekelman, Li, and Gross 2003).

**CENTRALIZATION, RATIONALIZATION, AND DEVOLUTION OF SERVICES.** Centralization of facilities, health-care services, and corporate health-care coverage has been on the rise through the merger and acquisition of hospital facilities, insurers, physician groups, and pharmaceutical companies. This has resulted in the loss of many community, public, and not-for-profit facilities that either could not compete or were acquired expressly for closure. The underlying objectives are to boost the efficiency and unifor-

mity of services, to centralize and rationalize decision-making about service provision, to capture more markets and arenas of health for profit, and to exert greater economic control within these arenas. In practice, Foucauldian panoptical patterns of physical decentralization with administrative centralization are common (Foucault 1975, 1991). These patterns are greatly facilitated by meso-level computer and information science practices and programs that automatically monitor highly dispersed developments for centralized management operations.

Although such health-care consolidations bring some efficiency, they also pose numerous dangers as a result of corporate concentration. Such dangers include, for example, inflationary tendencies from the concentration of pricing power, new administrative burdens, and the enhanced political power of conglomerates. Such consolidations now exert significant leverage over political and regulatory processes, as well as decision-making that affects provider groups, patient care, and service options in highly stratified ways (Waitzkin 2001; Waitzkin and Fishman 1997). For example, in Northern California recently, Blue Cross (a health insurance company) and Sutter Health (a for-profit corporatized provider network) were locked in contractual conflicts over reimbursement rates. Because of Sutter's acquisition of large numbers of health-care facilities in the area, it was able to effectively deny services to many Blue Cross subscribers by not accepting Blue Cross insurance, eventually compelling the insurer to agree to higher rates.

Devolution of health-care services also demonstrates the trend toward rationalization. That is, there are attempts to routinize and standardize health services while also shifting increasing proportions of the expensive labor of hands-on care to families and individuals (Timmermans and Berg 1997). Outpatient surgery, home health care, and elaborating subacute care facilities (e.g., skilled nursing facilities, nursing homes) are a few examples of devolution. Devolution also contributes to the fragmentation of health care and its geographic dispersal, making rationalizing more difficult.

**STRATIFIED BIOMEDICALIZATION.** Morgan (1998) recently reasserted the uneven-

ness and instabilities of medicalization processes, reminding us that medicalization was not monolithic and unidirectional but heterogeneous and fraught with paradoxical problems of exclusion, inclusion, participation, and resistances. Such arguments were initially elaborated in Ehrenreich and Ehrenreich's (1978) critical elucidation of the dual tendencies of medicalization. The first tendency, *cooptative medicalization*, refers to the jurisdictional expansion of modern medicine—extending into areas of life previously not deemed medical. The second tendency, *exclusionary disciplining*, refers to the *simultaneous* exclusionary actions of medicine that erect barriers to access to medical institutions and resources that target and affect particular individuals and segments of populations. Historically, these dual strategies have stratified the U.S. medical market by race, class, gender, and other attributes. For example, cooptative tendencies have long predominated for white middle- and upper-class groups, especially women, while exclusionary tendencies or particular kinds of cooptative medicalization (such as provision/imposition of birth control and sterilization) have prevailed for peoples of color and the poor (Riessman 1983; Ruzek 1980; Ruzek, Olesen, and Clarke 1997). Medicalization was stratified, and so too is biomedicalization.

We term the reformulation and reconstitution of such processes in the biomedicalization era *stratified biomedicalization*.<sup>10</sup> The cooptative and exclusionary tendencies noted above persist and become increasingly complex, and new modes of stratification are also produced. Even as technoscientific interventions extend their reach into ever more spaces, many people are completely bypassed, others impacted unevenly, and while some protest excessive biomedical intervention into their lives, others lack basic care. Such innovations are far from the goal of universally accessible and sustainable health care promoted by some bioethicists and others (e.g., Callahan 1998).

Even rationalization itself is stratified, producing fragmentation. For example, availability of routine preventive care,

<sup>10</sup> We borrow aspects of Ginsburg and Rapp's (1995) framing of stratified reproduction.

screening services, pharmaceutical coverage, and “elective” services such as bone-marrow transplants or infertility treatments are differentially available depending on one’s health insurance plan, or lack thereof. There are still over 1,000 different insurers in the United States, all providing different kinds of coverage, and thus, as a whole, the system is highly uncentralized, inefficient, and uncertain—the very things that, in theory, rationalization attempts to eliminate.

In 2001, the share of the population wholly uninsured for the entire year rose to 14.6 percent or 41.2 million people up from 14.2 percent in 2000 and an increase of 1.4 million people (Mills 2002:1). In 2001 and 2002, about 75 million people under age 65 went without health insurance for at least one month; nearly 3 in 4 were in working families and more than half were white (Meckler 2003:A4).

Cutbacks in government coverage of medical care are also widespread, and are being made in concert with reductions in a range of social services that affect the health status of individuals and groups downstream. There has even been research on the efficacy of group medical appointments for the poor instead of (or with) short individual examinations (McInaney 2000). Such gate keeping becomes ever more imperative in efforts to eke economic profits from increasingly expensive and highly technological procedures, and from providing services to less desirable but financially still necessary markets and population groups.

At the same time, there are dramatic increases in stratifying fee-for-service options for those who can afford them. The most common and affordable alternatives are choosing high-end preferred providers through such an insurance plan. Here providers to whom you pay a higher co-payment are often more available (within weeks rather than months) and may have better reputations. Some plans offer high-end hospital options—you pay more to go to certain “better” hospitals. Out-of-pocket boutique medicine options usually range from cosmetic surgeries to new reproductive/conceptive technologies to some organ transplants. In addition, there are emerging options for “boutique or concierge primary care” based on privately paid annual fees to individual

physicians in private practice. Here, individuals pay providers an annual amount (from a few thousand dollars to many thousands of dollars). In return they get appointments within 24 hours and for longer durations than the average patient, cell phone and e-mail access to their physicians, house calls, and so on. High-end versions (at about \$13,000 per year) are located in chic spa-like offices with marble baths, terry robes, and complete privacy, and are being organized through franchises. This “concierge” model is popular with wealthy seniors, people with chronic illnesses, and the youthful rich (Heimer 2002). In short, even “good” medical insurance no longer ensures good primary care.

In sum, the politico-economic transformations of the biomedical sector are massive and ongoing, ranging from macro structural moves by industries and corporations to meso- and micro-level changes in the concrete practices of health and medicine. Not only do such transformations produce new and elaborated mechanisms through which biomedicalization can occur, but also biomedicalization, in turn, drives and motivates many of these economic and organizational changes.

## 2. THE FOCUS ON HEALTH, RISK, AND SURVEILLANCE

In the biomedicalization era, what is perhaps most radical is the biomedicalization of health itself. In commodity cultures, health becomes another commodity, and the biomedically (re)engineered body becomes a prized possession. Health matters have taken on a “life of their own” (Radley, Lupton, and Ritter 1997:8).

**HEALTH AS MORAL OBLIGATION.** Specifically, health becomes an individual goal, a social and moral responsibility, and a site for routine biomedical intervention.<sup>11</sup> Increasingly what is being articulated is the individual moral responsibility to be and remain

<sup>11</sup> For more on the links between health and morality, see for example Bunton, Nettleton, and Burrows (1995), Crawford (1985, 1994, 1999), Edgley and Brissett (1990), Howson (1998a), Illich (1976), Lupton (1993, 1995), Tesh (1990), Williams (1998, 1999), and Zola (1972).

healthy (e.g., Crawford 1985) or to properly manage one's chronic illness(es) (Strauss, Corbin, et al. 1984), rather than merely attempt to recover from illness or disease when they "strike" (Parsons 1951). In the biomedicalization era, the focus is no longer on illness, disability, and disease as matters of fate, but on health as a matter ongoing moral self-transformation.

Health cannot be assumed to be merely a base or default state. Instead, health becomes something to work toward (Conrad 1992; Edgley and Brissett 1990), an ongoing project composed of public and private performances (Williams 1998, 1999), and an accomplishment in and of itself (Crawford 1994, 1999). Terms such as "health maintenance," "health promotion," and "healthy living" highlight the mandate for work and attention toward attaining and maintaining health. There has been a steady increase in mandates for self-regulation until, with biomedicalization, there is a shift in the general cultural expectations of whole populations. In this constant, self-disciplining and other/public-disciplining, there is no rest for the weary.

**RISK FACTORS AND SELF-SURVEILLANCE.** In the biomedicalization era, risk and surveillance practices have emerged in new and increasingly consequential ways in terms of achieving and maintaining health. Risk and surveillance concerns shape both the technologies and discourses of biomedicalization as well as the spaces within which biomedicalization processes occur (Bud, Finn, and Trischler 1999; Fosket 2002). Risk and surveillance mutually construct one another: Risks are calculated and assessed in order to rationalize surveillance, and through surveillance risks are conceptualized and standardized into ever more precise calculations and algorithms (Howson 1998b; Lupton 1995, 1999).

Risk and surveillance are aspects of the medical gaze that is disciplining bodies. They are aspects of biomedicalization that, in a quintessential Foucauldian sense, are no longer contained in the hospital, clinic, or even within the doctor-patient relationship (Armstrong 1995; Waitzkin 1991). Rather, they implicate each of us *and* whole populations through constructions of risk factors, elaborated daily life techniques of self-sur-

veillance, and the management of complicated regimens around risk and chronic conditions.<sup>12</sup>

It is no longer necessary to manifest symptoms to be considered ill or "at risk." With the "problematisation of the normal" and the rise of "surveillance medicine" (Armstrong 1995:393), everyone is implicated in the process of eventually "becoming ill" (Petersen 1997). Both individually and collectively, we inhabit tenuous and liminal spaces between illness and health, leading to the emergence of the "worried well" (Williams and Calnan 1994), rendering us ready subjects for health-related discourses, commodities, services, procedures, and technologies. It is impossible not to be "at risk."

Instead, individuals and populations are judged for *degrees* of risk—"low," "moderate," or "high"—vis-à-vis different conditions and diseases, and this then determines what is prescribed to manage or reduce that risk. Thus, biomedicalization is elaborated through daily lived experiences and practices of "health" designed to minimize, manage, and treat "risk" as well as through the specific interactions associated with illness (Fosket 2002; Press, Fishman, and Koenig 2000). Risk technologies are therefore "normalizing," not in the sense that they produce bodies or objects that conform to a particular type, but more that they create standard models against which objects and actions are judged (Ewald 1990).

Of particular salience in the biomedicalization era is the elaboration of standardized risk-assessment tools (e.g., to assess risk of breast cancer, heart disease, diabetes, hypertension, etc.) that take epidemiological risk statistics, ostensibly meaningful only at the population level, and transform them into risk factors that are deemed meaningful at the individual level (Gifford 1986; Rockhill et al. 2001). For instance, current breast cancer risk-assessment technologies construct a

<sup>12</sup> On risk factors, see, for example, Armstrong (1995), Castel (1991), and Petersen (1997). On techniques of self-surveillance, see, Crawford (1994), Edgley and Brissett (1990), Featherstone (1991), and Turner (1984; 1992). On chronic conditions, see, Charmaz (1991), Hunt and Arar (2001), Strauss and Corbin (1988), Strauss and Glaser (1975), and Strauss, Corbin, et al. (1984).

standardized category of “high risk” for breast cancer in the United States. Women classified as “high risk” are given the option of taking chemotherapy—pharmaceuticals usually used only to treat cancer because of their toxicity and other negative side effects—to “treat” the *risk* of cancer (Fosket 2002). Genomic technologies and profiling techniques mark the next wave in such risk assignments (Fujimura 1999; Shostak 2001).

Further, with the institutionalization of the assumption that everyone is potentially ill, the health research task becomes an increasingly refined elaboration of risk factors that might lead to future illnesses. Such research and knowledge production—as well as its active consumption by patients/consumers and providers—are primary and fast-growing components of biomedicalization and will continue to be major contributors to the development of “surveillance medicine” (Armstrong 1995) and to new forms of public health in the twenty-first century (Shim 2000, 2002a, 2002b). Health is thus paradoxically both more biomedicalized through such processes as surveillance, screening, and routine measurements of health indicators done in the home, and seemingly less medicalized as the key site of responsibility shifts from the professional physician/provider to include collaboration with or reliance upon the individual patient/user/consumer.

### 3. THE TECHNOSCIENTIZATION OF BIOMEDICINE

The increasingly technoscientific nature of the practices and innovations of biomedicine are, of course, key features of biomedicalization. While science and technology became increasingly constitutive of medicine across the twentieth century, in its final decades, technoscientific transformations gained significant momentum. These changes are part of major shifts in the social organization of biomedicine itself, the objects of biomedical knowledge production, the ways in which biomedicine intervenes, and the objectives with which it does so. Moreover, innovations are increasingly likely to be hybrid ones that are generated simultaneously through sciences *and* technologies *and* new social forms—most often

computer and information technologies and the organizational structures developed to articulate them into the flows of biomedical and related work (Berg 1997, 2000; Star 1995; Wiener 2000). These changes, we argue, have spurred biomedicalization and are also manifest in how it is effected.

We describe three overlapping areas in which the technoscientization of biomedicine is manifest: (1) computerization and data banking; (2) molecularization and geneticization of biomedicine and drug design; and (3) medical technology design, development, and distribution.

**COMPUTERIZATION AND DATA BANKING.** Fundamental to biomedicalization is the power (past, present, and especially future) of computerization and data banking. These technoscientific advances are pivotal to the meso-level (re)organization of biomedicine. That is, many of the biomedical innovations of the twenty-first century are situated in *organizations* that are themselves increasingly computer-dependent in heterogeneous ways that in turn are increasingly *constitutive* of those organizations. The application of computer technologies within multiple biomedical domains and their organizational infrastructures are thereby mutually constructed, creating new social forms for orchestrating and performing the full range of biomedically related work.<sup>13</sup>

One important computer-based organizational innovation involves the reorganization of and much wider access to individual medical records. Centralized storage and access to patient records have been hopes of doctors, hospitals, and insurers since at least the nineteenth century (Blois 1984). Recent technological breakthroughs in hardware, software, and data processing and storage technologies have allowed the integration of medical data into heterogeneous and widely dispersed databases to become routine in systemic and ubiquitous ways. Considerable pressure is being brought to bear to computerize *all* medical records according to stan-

<sup>13</sup> The consequences of organizations per se on scientific and technical work are only recently being addressed beyond traditional concerns about productivity (e.g., Vaughan 1996, 1999). On work organization, see Mechanic (2002) and V. Smith (1997).

standardized formats that can be webbed across multiple domains. Thus, as noted in Table 1, from paper versions of medical records dwelling in individual physicians' offices, clinics, and hospitals, common during the era of medicalization, patient information can now be uploaded and accessed via cybersites managed by HMOs, pharmacies, and other third-party entities in far away places for multiple purposes. Also, new companies are engineering "doctor-friendly" formats (Lewis 2000; National Research Council 2000).

These new and elaborating meso-level infrastructures are facilitating many of the downstream processes requisite for biomedicalization, not only enabling the expansion of medical jurisdiction, but also producing infrastructures for greater public-private linkages and new iterations of biomedical governmentality. Computerization allows more aspects of life to be scrutinized, quantified, and analyzed for their relationships to health and disease. Integration and compatibility of data across various sites are articulated via specialized software that increasingly imposes standardized categories and forms of information (Bowker and Star 1999). Such formats make it all but impossible to enter certain kinds of data in the medical record, especially highly individualized information common to medical practice on unique individual bodies. At the same time, these data formats render it all but impossible *not* to record other kinds of data, such as the information required to comply with "clinical decision-support technologies" (Berg 1997) and highly detailed diagnostic and treatment regimens. These are the very meso-level techno-organizational transformative "devices" that biomedicalization demands and *is*.

Decision-support technologies are generated through outcomes research and evidence-based medicine that depend on major computerized databases, as noted in Table 1 (Ellrodt et al. 1997; Traynor 2000). Here the safety and efficacy of specific protocols and treatments are assessed based on data from very large populations of patients and providers across time and space. The geographic variations in "conventional" treatments and the different "community standards" revealed by regional health statistics

have long irked segments of the American medical profession (Reverby 1981). As the production of biomedical knowledge is accelerated through the use of computer technologies, both behavioral and outcomes research are increasingly defining new biostatistical criteria for what counts as "scientific." Such research allows for the "objective" statistical identification of "industry standards" (Porter 1995), and insurance companies are already moving toward covering only those procedures demonstrated as "valid" through such standardizing research. Such developments will likely cut in many different and even paradoxical directions simultaneously. For example, *vis-à-vis* women's health, "unnecessary" yet costly hysterectomies and Cesarean sections, so long criticized by feminists (e.g., Ruzek and Hill 1986), will be highlighted for deletion. Other highly vaunted treatments, such as bone-marrow transplants for breast cancer and estrogen replacement therapy for menopausal symptoms, have already been challenged due to such outcomes studies (Weiss et al. 2000; Writing Group 2002).<sup>14</sup>

Further, such protocols are being developed in concert with the spread of another new social form, the specialty of "hospitalists"—physicians who practice only in hospitals and to whose care medical responsibility is almost completely shifted from the patient's own primary physician upon hospitalization (Pantilat, Alpers, and Wachter 1999). A major rationale here is that the technoscientific infrastructure of hospital medicine is so complex and rapidly changing that only a localized specialist can keep up with its applications in acute patient care.

Finally, error in medicine—mistakes at work—is a recent focus of research using the new massive computer databases (Institute of Medicine 1999). Prevention of such errors and the knowledge thought to be gleaned from analyses of centralized data will likely

<sup>14</sup> Bastian (2002) notes that one pharmaceutical company attempted to stem its losses from hormone replacement therapy reductions by promoting an alternative product via a campaign to hairdressers with free salon capes bearing the product logo, "scripted messages" to insert in conversations, and fact sheets to hand out to clients.

drive the rhetoric that justifies the dramatic losses of privacy and the creation of new vulnerabilities caused by the computerization of medical records. Thus, the potential generated by the compilation, storage, analysis, and control of computerized patient data furthers the possibilities of biomedicalization processes in new and important ways.

The guiding assumptions common to these developments are that care and treatment services can and should be better rationalized such that variations are indicative of up-to-date scientific decision-making rather than “unnecessary” or “discretionary” treatment. However, provider discretion about individual case treatment, continuity of care, doctor/patient relationships, situationally appropriate care, privacy of treatment, and patient involvement in treatment decision-making will likely be drastically, though unevenly, limited and stratified.

**MOLECULARIZATION AND GENETICIZATION.** Second, the biomedical sciences of the new millennium are being transformed by molecular biologies. Molecular biological approaches initiated in the 1930s yielded in the 1950s the discovery of DNA structure. This and related developments in basic science and research technologies are now propelling attempts to understand diseases at the (sub)molecular levels of proteins, individual genes, and genomes (proteomics, genetics, and genomics), partially displacing previous emphases on germs, enzymes, and biochemical compounds (Chadarevian and Kamminga 1998). The study of differences among humans is also devolving to the level of the gene—called “geneticization” (Hedgecoe 2001; Lippman 1992).

In current treatment and drug development, these developments have generated a shift from “discovery” of the healing properties of “natural” entities to computer-generated molecular and genetic “design,” or what Jacques Loeb would have called “engineering” (Pauly 1987), that can be targeted precisely at diseases and/or conditions likely to generate high profits (e.g., baldness, obesity). Pharmacogenomics—the field that examines the interaction of genomic differences with drug function and metabolism—offers the promise that pharmaceutical therapies can be customized for groups and individuals. Such gene therapies (including the

just patented “gene-pill”) and related innovations are beginning to hit the market (Genteric 2001). Further, re-engineering human germ lines through choosing and assembling genetic traits for offspring will become possible and desired by some, a “do-it-yourself evolution” (Buchanan et al. 2000), while strongly opposed by others as further stratifying reproduction (Rapp 1999).

These applications of molecular biology and genomics to medicine are themselves highly dependent on computer and information sciences, and the convergence of these two domains was further fueled by the announcement in 2001 of the completion of the first rough map of the human genome. For example, software to analyze and predict how genome interactions might promote health or cause disease, developed by scientists at the National Human Genome Research Institute, are being scaled up to run on supercomputers. Such large-scale information technologies are being enlisted by biotechnology and pharmaceutical groups to crunch through hundreds of such genome interactions to find potential intervention points (Abate 2000a). In the process, novel meso-level organizational partnerships are being forged among government entities, information technology companies, and biotechnology firms. The mutual constitution and dependency of computerization and molecularization trends is reflected in new hybrid professions like bioinformatics, which pairs biology with computer science. Dubbed “the career choice of the decade” (Wells 2001), bioinformatics is spawning new well-funded training programs to produce a workforce able to sort through and translate the findings of genomic and proteomics research into information eventually usable for medical purposes.

Biotechnological pursuits of genomic manipulations are today at the pinnacle of technoscience. While computerization is standardizing patient data, it paradoxically also enables the further tailoring and customization of bodies (Conrad 2000), central to processes of biomedicalization. The basic medical assumption about intervention in the United States and other highly/overdeveloped countries will be that it is “better” (faster and more effective though likely not cheaper) to redesign and reconstitute the



problematic body than to diagnose and treat specific problems in that body.<sup>15</sup> Molecular biologies and genomics will make such redesign possible “from the inside out” or transformatively, rather than operating externally as most prosthetics traditionally do (Clarke 1995).

**MEDICAL TECHNOLOGY DEVELOPMENT.**

Third, medical technology developments of all kinds are being transformed through digitization, miniaturization, and hybridization with other innovations to create new genres of technologies. These extend the reach of biomedical interventions and applications in fundamentally novel ways. For instance, recent advances in material sciences make possible hybrid and bionic devices. Examples from corneal implants to computer-driven limbs, continuously injecting insulin packs for diabetics, electronic bone growth stimulation devices, and heart and brain pacemakers (the latter initially used for treatment of depression) are becoming routine in boutique Western medicine. Hybridization is also apparent in the next generation of transplant medicine, termed “tissue engineering,” which will include new kinds of implants: body parts custom-grown through molecular means, modified through materials science, and triggered by “biological switches” (Hogle 2000).

Digitization has also transformed medical technologies in ways that further their gaze and reach into both the interior of the body and its behaviors. In addition to the computerization of patient data, including genomic, behavioral, and physiologic information, visual diagnostic technologies are also elaborating rapidly with technical innovations, at times outpacing local organizational capacities to use them safely and effectively (Kevles 1997). Imaging tech-

nologies are increasingly digitized, facilitating their resolution, storage, and mobility among multiple providers, distributed sites of care such as telemedicine, and agencies or entities interested in centralizing such information (Cartwright 2000). The costly reading of cytological and pathological specimens such as Pap smears and biopsies is also being computerized after decades of effort (Bishop, Marshall, and Bentz 2000). Finally, transplant medicine has shifted from a local medical charity to a transnational web of organizations made possible through computer and information sciences, ranging from local hospitals to cutting edge biotechnology firms to multinational distribution organizations (Hogle 1999). But this is also intensifying the stratification of biomedicalization globally through organ purchasing by the rich from the poor, largely arranged online (L. Cohen 1999; Delmonico et al. 2002; Organs Watch 2001; Scheper-Hughes 2000).

Biomedicine is increasingly part of what Schiller (1999) calls digital capitalism. The Internet is a key reorganizing/transforming device and hence a key technology of biomedicalization. The Internet has recently been called “the first global colony,” in part because its economics and individualist culture “feel awfully American” (Lohr 2000:1). The National Research Council (2000) published recommendations and guidelines for extending health applications of the Internet, from virtual (remotely guided) surgery to education, consumer health, clinical care, financial and administrative transactions, public health, and research. An important digital aspect over the coming decades is likely to be the application of distance learning techniques and technologies to professional education for all kinds of health-care careers, also easily globalized.

In sum, the ongoing technoscience of biomedicine is at the heart of biomedicalization. Theorizing these technoscientific transformations of biomedicine requires that their meanings *and* their material forms and practices, including embodied corporeal transformations and manifestations, be conjointly studied and analyzed as co-constitutive (Casper and Koenig 1996; Gray, Figueroa-Sarriera, and Mentor 1995; Haraway 1991, 1997; Hayles 1999).

<sup>15</sup> This is already the situation in infertility medicine, where the notion of a sequential ladder of appropriate care from less to more intervention has largely been abandoned in favor of immediate application of high-tech approaches that are more certain to produce babies regardless of cost (G. Becker 2000). For lesbians using assisted reproductive technologies to get pregnant, the social category “lesbian” often serves as the basis for high-tech infertility interventions, regardless of the complete absence of infertility diagnoses (Mamo 2002).

#### 4. TRANSFORMATIONS OF INFORMATION AND THE PRODUCTION AND DISTRIBUTION OF KNOWLEDGES

Information on health and illness is proliferating through all kinds of media, especially in newspapers, on the Internet, in magazines, and through direct-to-consumer prescription and over-the-counter drug advertising. In fact, biomedicine, more than being a subculture, is today so much a fundamental element of mass culture that Bauer (1998) suggests that its constant presence in popular media points to the medicalization of science news and of society generally:

Medicine is the current core of popular representations of science. . . . [O]ur evidence of the dominance of health news is an empirical indicator of the advent of a medicalized society. . . . [The] medicalization of science news is a correlate of these larger changes in society, celebrating the successes of medical sciences, anticipating breakthroughs on the health front, and mobilizing an ever greater demand for medication and services. (P. 747, 744; also see Hodgetts and Chamberlain 1999)

The cultural imaginary of biomedicine travels widely and is locally and flexibly accessed and (re)interpreted.

Thus, the production and transmission of health and medical knowledges are key sites of biomedicalization in terms of both the transformation of their sources and distribution channels and the reformulation of who is responsible for grasping and applying such knowledges. Biomedicalization also works through the co-optation of competing knowledge systems, including alternative medicine and "patient-based" social movements (Adams 2002; Belkin 1996). Finally, techniques for the legitimation of biomedical knowledge claims are also changing.

**HETEROGENEITY OF PRODUCTION, DISTRIBUTION, AND ACCESS TO BIOMEDICAL KNOWLEDGES.** First, the sources contributing to the production of health-related information have both increased and diversified. In cyberspace, for example, federally sponsored websites target not only researchers and health-care providers, but also Internet-savvy health-care consumers. On one such site (<http://www.clinicaltrials.gov>), potential human subjects can find clinical trials for

which they may be eligible. Numerous private companies also provide medical information. The information provided on these websites comes from a variety of sources. Although there is still a reliance on medical professionals for answers to health questions, sites often have discussion boards where users exchange their own knowledges and experiences with others. Another rapidly growing source of medical knowledges is patient advocacy groups that have their own organizations, newsletters, websites, and serious stakes in knowledge production and dissemination (Brown 1995; Brown et al. 2001).

In principle, these changes democratize production and access to medical and health knowledges in new ways. In practice, the waters are muddy (e.g., Kolko, Nakamura, and Rodman 2000; National Research Council 2000; Yates and Van Maanen 2001). First, it is often difficult to know whether the seemingly "objective" information located on the Internet is produced by medical experts holding professional credentials and/or what kinds of financial and/or scientific stakes they might have in presenting information in a particular way. Potential profits rise every time someone logs onto the growing number of health-care websites on the Internet that couple the provision of information with the marketing of products (including alternative medicine products and dietary supplements). In addition, corporate agreements with search engine companies have found ways to limit the access of Internet consumers to the diversity of information sites available on the Web. Companies can purchase "prime time" and "sole supplier" status from search engines, thereby preempting access to their competition, and consumers are often unaware of such agreements (Rogers 2000). Last, it is unknown whether do-it-yourself sites are more or less common or more or less likely to be hot linked (National Research Council 2000). However, the heterogeneity of knowledge sources also can be interpreted as disrupting the division of "expert" versus "lay" knowledges and enabling new social linkages. For many, these new modes of access to health information are a welcome change; for others, they confound more than they clarify. For yet others,

the “digital divide” is all too real and access remains elusive and stratified.

Second, biomedical knowledges have been transformed in terms of access, distribution, and in the allocation of *responsibility* for grasping such information. Historically in the United States, nonexperts’ ability to obtain biomedical information was severely limited, as such knowledges dwelled almost exclusively in medical libraries and schools that were closed to the public, creating what amounted to a professional monopoly on access to information. Popularized “lay” health information was also scarce. Health sections in bookstores were rare and small until the 1970s, when women’s health and consumer health movements began producing self-help books. Activists in such movements were instrumental in altering the self-help landscape, including the Boston Women’s Health Book Collective’s first *Our Bodies, Ourselves* in 1970.<sup>16</sup> A breast cancer patients’ movement challenged the use of radical mastectomies as the de-facto treatment, advocating greater patient involvement in surgical decisions (Montini 1996), and AIDS activists successfully challenged NIH’s clinical trial practices (Epstein 1996). In each case, activists challenged the professional monopoly over the production of medical knowledges by insisting on their own participation as they acquired and disseminated scientific information, and demanded immediate access to innovative health care. Today, individuals, enabled by computer technologies, are organizing to articulate new research interests, fund research studies and, at times, to open up new research frontiers (Brown 1995; Brown et al. 2001; J. Fishman 2000; Kroll-Smith and Floyd 1997). Some groups are even starting to fund their own science directly (Rabeharisoa and Callon 1998). Because of increasing Congressional responsiveness to their demands, some supposed “patients’ groups” are now started by scientists, pharmaceutical companies, and/or professional medical organizations (Zola 1991; Zones

<sup>16</sup> This book has been adapted and translated into 19 languages and has sold over 4 million copies (<http://www.ourbodiesourselves.org/jamwal.htm>).

2000), known among health NGOs as *astro-turf* rather than *grass-roots* based.

In the biomedicalization era, while knowledge sources proliferate and access is streamlined in ways purportedly in the interests of democratizing knowledge, the interests of corporate biomedicine predominate. This point is highlighted by the loosening, in 1997, of the criteria under which direct-to-consumer advertising of prescription pharmaceuticals is allowed by the Food and Drug Administration (FDA), a profound shift in social policy on the proper relationship between the public and biomedical knowledge. Previously, provider-patient relationships were based on a notion of protecting “lay” people from knowledge best left to professionals. Now, pharmaceutical companies encourage potential consumers to first acquire drug information and then proactively ask their providers about the drugs by brand name. In 2001, the industry spent about \$2.5 billion on consumer advertising (Freudenheim and Petersen 2001:1,13). One recent survey found that 30 percent of Americans surveyed who viewed direct-to-consumer advertising said they talked to their doctor about a specific medication they saw advertised, and 44 percent of those report that their doctors provided them with the prescription medicine they asked about (Kaiser Family Foundation 2001:18–20). While direct-to-consumer advertisements do help to educate the public about potential treatment options, such marketing undeniably boosts pharmaceutical revenues: Prescriptions for the top 25 drugs directly marketed to consumers rose by 34 percent from 1998 to 1999, compared with a 5.1 percent increase for other prescription drugs (Charatan 2000: 783). This both transforms doctor-patient relationships and increases the power and profit of the pharmaceutical industry, furthering biomedicalization (Woloshin et al. 2001).<sup>17</sup>

But all is not *new* knowledge and information. Within these new technoscienti-

<sup>17</sup> The birth control pill was an early event in this shift (Oudshoorn 2002). “The pill” was the first serious pharmaceutical designed to be taken by healthy asymptomatic people (women). Grave doubts that people would take powerful drugs in the absence of illness were quickly erased by its immediate success.

fically based knowledge sources, there is also ramped up access to older *cultural* discourses of stratification. Through what are called “re-mediations,” new visual technologies such as computer graphics and the World Wide Web “are doing exactly what their predecessors [film, television, photography] have done in (re)enacting similar inequities . . . yet they present themselves as refashioned and improved versions of other media” (Bolter and Grusin 1999:14–15). The continuities are significant, as the media often import historic cultural stratifications regarding sex, race, sexuality, and gender—and patienthood as well—that usually remain unquestioned. For example, Forsythe (1996) studied a patient information system for migraine sufferers that was intended to provide information distinct from that provided by physicians. She found the system “in fact offers information characterized by the same assumptions and deletions as that provided by neurologists” (Forsythe 1996:551). Intended to empower migraine patients, the system may instead reinforce rather than reduce power differentials between doctor and patient.

**CO-OPTATION OF COMPETING KNOWLEDGE SYSTEMS.** Another transformation of knowledge constitutive of biomedicalization is the co-optation of competing knowledge systems and the reconfiguration of health-care provision and organizations in ways originally proposed and implemented by social movements.

The last decades of the twentieth century in the United States saw a profound rise in the use of alternative and complementary medicines. In 1993, one study estimated that \$10.3 billion consumer dollars a year were spent on alternative medicines in the United States (Eisenberg, Kessler, et al. 1993:346). In 1998, a follow-up study conservatively estimated out-of-pocket patient expenditures for alternative medicines at \$27 billion, which is comparable to the out-of-pocket costs to patients for all physician services (Eisenberg, Davis, et al. 1998:1569). These findings, perceived as an economic threat to Western biomedicine, clearly repositioned alternative medical knowledge systems as legitimate (at least to users/consumers), shifting them from the margins of health care to the center. The response from deep

within the structures of Western biomedicine has been a marked increase of interest in such approaches. At the turn of the twentieth century, Western biomedicine dealt with such approaches by organizing anti-quackery committees and recruiting the state to make such practices illegal (Gevitz 1988); similar efforts continue today (Adams 2002). Additionally, at the turn of the twenty-first century, Western biomedicine is attempting to co-opt and incorporate many elements of alternative medicines. As understandings of health and healing systems from other cultures have spread, and as people knowing such systems have migrated globally, there have been interesting nomenclature shifts in Western medical fields, from considering “other” people’s health/life/healing systems as “superstitions” to “culture-based healing systems” to “alternative medicines” (Anderson 2002; Arnold 1988). Numerous large-scale clinical trials are testing the “effectiveness” of alternative medical practices and therapies (Adams 2002).<sup>18</sup> Major pharmaceutical companies now market their own brands of herbal and nutritional supplements and vitamins.

Similarly, biomedicalization includes co-optation of organizational and ideological shifts and innovations brought about by grassroots social movements such as women’s health movements, disability rights, AIDS activism, and other disease-specific movements (Belkin 1996; Worcester and Whatley 1988). For example, early feminist consumer activism centered on expanding patient access to drug information via “patient package inserts” and medical information via readable materials on health and illness (e.g., Boston Women’s Health Book Collective 1971) and feminist women’s health centers (Ruzek 1978). Displacing feminist centers, biomedicine now offers “sleeker” versions of women’s health (Worcester and Whatley 1988). Building on decades of efforts by women’s health move-

<sup>18</sup> University of California, San Francisco (UCSF) researchers, for instance, are currently conducting major clinical trials to assess the impacts of traditional Chinese herbs and acupuncture on negative side effects arising from cancer treatment. The Osher Center at UCSF received a \$5 million grant for this work.

ments, AIDS activists in the 1980s and 1990s provoked major changes in the testing and approval of new drugs. Rapid patient access to experimental therapies for AIDS and many other conditions through innovative clinical programs is now administered by the FDA (Epstein 1996) with participation information accessible over the Internet.

**TECHNIQUES OF LEGITIMATION OF BIOMEDICAL CLAIMS.** A final shift regarding knowledges within biomedicalization concerns techniques used for the legitimation of biomedical claims—the standards by which the innovations offered by biomedical sciences are tested and deemed acceptable. As noted in Table 1, early standards of care and quality control over various drugs and technologies from about 1890 to 1940 were established through the classic individual case-observation method. Reform efforts and a series of U.S. policies passed early in the twentieth century created a federal “pure food and drugs” infrastructure for oversight and regulation, acting through institutional medicine and public health. New standards required drug manufacturers to submit evidence from “adequate tests” to demonstrate that a drug was “safe” before it could be licensed for sale.

The development of the randomized clinical trial as the “gold standard” for the legitimation of biomedical claims soon followed. In 1962, after the Thalidomide crisis, in which many children were born with birth defects, in addition to securing evidence of drug safety, the FDA began requiring pharmaceutical companies to obtain evidence of drug “efficacy” through “adequate and well-controlled investigations incorporating ‘appropriate statistical methods’” (Marks 1997: 129). The randomized controlled trial consisting of three phases of testing in human subjects has become the ideal instrument for producing “scientific” knowledges and evidence for the therapeutic appropriateness of releasing any drug or medical device onto the market. With the rise of biostatistics, methods of drug evaluation have achieved a distinctive form of scientific and bureaucratic standardization (MacKenzie 2001; Marks 1997; Porter 1995). Major policy events indicative of this shift in the science of legitimation include the 1993 NIH guidelines requiring the inclusion of women and

racial minorities in NIH-funded clinical studies, and the 1998 FDA requirement that clinical trials produce explicit data on women and minorities (Epstein forthcoming). Today, clinical trials are big business, offering new careers in clinical trial management to nurses and others (Mueller 1997; Mueller and Mamo 2000). However, serious ethical problems, including patient deaths attributed to conflicts of providers’ interest, has led the NIH to close down *all* NIH-sponsored research temporarily at several major university medical centers in the past few years.<sup>19</sup> Informed consent and other trial protocols were typically found inadequate, and there was serious underreporting of safety problems to the FDA, along with inadequate record-keeping.

These emergent forms of legitimation contribute to a biomedicalization of clinical trials not only through a scientization of the FDA’s approval process, but also through new linkages created among government agencies (e.g., the FDA), private industry (e.g., pharmaceutical companies), and academic research institutions. These new assemblages, which often give rise to different criteria for drug approval, also create new structural and infrastructural ties between what were formerly known as the “public” and the “private” (J. Fishman forthcoming).

##### 5. TRANSFORMATIONS OF BODIES AND IDENTITIES

The fifth and last basic process of biomedicalization, as noted in Table 1, is the transformation of bodies and the production of new individual and collective identities. There is an extension of the modes of operation of medical research and clinical practice from attaining “control over” bodies through medicalization techniques (e.g., labeling disease and concomitant medical interventions) to enabling the “transformation of” bodies to include desired new properties and identities (Clarke 1995). As a

<sup>19</sup> These university medical centers include the University of Illinois at Chicago, University of Pennsylvania, and Johns Hopkins University, which receives the highest amount of federal NIH research dollars (Riccardi and Monmaney 2000; Russell and Abate 2001).

Foucauldian technique, regulation through biomedicalization works “from the inside out” as a type of biomedical governance. It is achieved through alterations of biomedicalized subjectivities and desires for transformed bodies and selves. The body is no longer viewed as relatively static, immutable, and the focus of control, but instead as flexible, capable of being reconfigured and transformed (Martin 1994). Thus, opportunities for biomedicalization extend beyond merely regulating and controlling what bodies can (and cannot) or should (and should not) do to also focus on assessing, shifting, reshaping, reconstituting, and ultimately transforming bodies for varying purposes, including new identities. Such opportunities and imperatives, however, are stratified in their availability—imposed, made accessible, and/or promoted differentially to different populations and groups.

**FROM NORMALIZATION TO CUSTOMIZATION.** Where medicalization practices seemed driven by desires for normalization and rationalization through homogeneity, techniques of stratified biomedicalization additionally accomplish desired tailor-made differences. New technoscientific practices offer “niche marketing” of “boutique medicine” (Hannerz 1996) to selected health-care consumers usually on a fee-for-service basis. Institutionally, customization has been increasingly incorporated into biomedicine through projects such as computer-generated images of the possible results of cosmetic surgery, the proliferation of conceptive technologies promoting “rhetorics of choice” (Rothman 1998), and the promise of individualized gene therapies and pharmacogenetics. Such customization is often part of the commodification and fetishization of health products and services common in the biomedicalization era, wherein health products and services become revered, valued, and imbued with social import that has little to do with their use-value or physical properties.

Such desires are concomitant with another trend in stratified biomedicalization: “lifestyle” improvement. The pharmaceutical industry’s attention to developing “lifestyle drugs” such as Viagra exemplifies this movement toward enhancement and the concern with “treating” the signs of aging

(Mamo and Fishman 2001), targeting the fastest growing U.S. population segment. For another example, “Better Bodies” was the name of a 2000 conference focusing on innovations in cosmetic surgeries, sponsored by the UCSF Foundation and promoted to major campus donors.

Such attention to customization applies not only to bodily improvement and enhancement, including anti-aging strategies, but also to “health promotion” through obtaining enhanced knowledge about individualized susceptibilities and potential pathologies. One of the newest incarnations of this phenomenon is the public availability of “total body scans”—high-resolution CAT scans of the body billed as *preventive* in that they may detect early signs of disease or verify the healthiness of various parts of the body, including the brain, heart, lungs, colon, ovaries, abdomen, and kidneys. These imaging services are available on demand in many U.S. cities and suburban malls in stand-alone offices, and are generally paid for out-of-pocket.<sup>20</sup> The biomedical governmentality to “know thyself” that is associated with such bodily techniques often relies on a neo-liberal consumer discourse that promotes being “proactive” and “taking charge” of one’s health.

In the move from universalizing bodies to customizing them, biomedicine has also allowed for some destabilization of differences. Human bodies are no longer expected to adhere to a single universal norm. Rather, a multiplicity of norms is increasingly deemed medically expected and acceptable. Technoscience is seen as providing the methods and resources through which differences of race/ethnicity, sex/gender, body habitus, age, and so on can be specified, measured, and their roots ascertained. Significantly, biomedicalization processes are appropriating both the definition of and management of bodily differences as within the proper jurisdiction of biomedical scientific research and technologies. This new regime of biomedical governance allows the further stratified customization of medical services, technologies, and pharmaceuticals

<sup>20</sup> See, for example, <http://www.tbscenters.com/tbs.htm> and <http://www.lifescore.com/heartfaq.htm>.

to “manage” such differences (Lock and Gordon 1988), thus further biomedicalizing them. Examples of such stratified biomedicalization include “culturally competent care,” pharmacogenetics, and new social forms—new systems of service provision designed to render increasingly customized care, ranging from high-end birthing clinics to AIDS nursing care delivered in satellite offices located in single-room-occupancy hotels to avoid costly hospitalization.

How the body is conceived of and treated by biomedicine has also changed over time and constitutes another important site of biomedicalization. In the early twentieth century, conventional medical treatments focused on the ill body, emphasizing surgery (as technologies of anesthesia and asepsis were refined) and control of acute infectious diseases (such as tuberculosis, through quarantine and isolation). Over the course of the twentieth century, improved living conditions, the advent of antibiotics around World War II, and successful interventions into acute diseases gradually shifted the focus to management of chronic illnesses such as some cancers, heart disease, and AIDS (Strauss, Corbin, et al. 1984; Strauss and Corbin 1988; Strauss and Glaser 1975). In biomedicalization, the focus shifts to behavioral and lifestyle modifications (e.g., exercise, smoking, eating habits, etc.) literally promoted by the government among others. Such techniques have become part of conventional treatments, with an enormous contiguous industry that has grown up around stress management regimens, wellness programs, the diet industry, and extensive direct-to-consumer advertising of both prescription and over-the-counter pharmaceutical and nutritional technologies for “maintaining” health and “controlling” chronic illness. Thus, although in some respects no less normalizing or disciplining, biomedicalization enacts its regulation of bodies through offering not just “control over” one’s body through medical intervention (such as contraception), but also “transformation of” one’s body, selves, health. Thereby new selves and identities (mother, father, walker, hearer, beautiful, sexually potent person) become possible. Some such identities are sought out, while others are not.

**TECHNOSCIENTIFIC IDENTITIES.** *Technoscientific identities* is our generic term for the new genres of risk-based, genomics-based, epidemiology-based, and other technoscience-based identities. The core criterion is that such identities are *constructed through technoscientific means*. That is, technoscientific identities are produced through the application of sciences and technologies to our bodies directly and/or to our histories or bodily products including images (Dumit 1997). These new genres of identities are frequently inscribed upon us, whether we like them or not. For example, individuals today may unexpectedly learn they are genetic carriers of inherited diseases (Karlberg 2000) or may seek out such information about themselves. The new subjectivities that arise through the availability of these technosciences do so through a biomedical governmentality that encourages such desire, demand, and need to inscribe ourselves with technoscientific identities (Novas and Rose 2000). Of course, people negotiate the meanings of such identities in heterogeneous ways.

This is not to say that the identities themselves are all new, but rather that technoscientific applications to bodies allow for new ways to access and perform existing (and still social) identities. There are at least four ways that biomedical technoscience engages in processes of identity formation. First, technoscientific applications can be used to attain a previously unavailable but highly desired social identity. For example, infertility treatments allow one to become a “mother” or “father,” while the identity of “infertile” can be strategically taken on by lesbians and single women in order to achieve pregnancy through technoscientific means (Mamo 2002). Second, biomedicalization imposes new mandates and performances that become incorporated into one’s sense of self. The subjectivities that arise out of these performances of what it is to be healthy (e.g., proactive, prevention-conscious, neo-rational) suggest how biomedical technoscience indicates a type of governmentality that can enact itself at the level of subjective identities and social relations. Third, biomedical technosciences create new categories of health-related identities and re-define old ones. For example, through use of

a risk-assessment technique, one's identity can shift from being "healthy" to "sick," or to "low risk" or "high risk" (Fosket 2002).

Fourth, biomedicalization also enables the acquisition and performance of identities as patients and communities through new technoscientific modes of interaction, such as telemedicine. As new computer-based technologies allow cosmopolitan providers to "reach out and heal" people whom Cartwright (2000) has called "remote locals" in their communities, new social identities and social formations are created. Telemedicine "is a method of reordering geography and identity through new styles of health management that involve new configurations of population and different ways of imagining what global health is and will be . . . unhinged from local practices" (Cartwright 2000:348–49). One wonders what will happen, through such technoscientific interventions, to what Lock (1998:182) has called "local biologies," often centuries-long established cultural differences in meaning-making associated with what we today term biomedical issues.

In discussing the relations between medicalization and disease concepts, Lock (1998:180) has noted the tendency to "streamline and normalize" specific conditions/diseases into entities wholly (or at least normally) treatable by an available or soon-to-be-available drug, device, or procedure. The classic case she examines is menopause, which was transformed in the West from a complex and unevenly symptomatic syndrome into a standardized "estrogen deficiency disease" treatable by hormone replacement therapies (now deemed dangerous after 60 years of increasingly intense use). Here we see how the meaningful identities of disorders and diseases as well as of persons and groups are also being redefined at this historical moment and also through technoscientific means (also see J. Fishman and Mamo 2002). Fleck ([1935] 1979) was among the earliest to alert us to such possibilities.

The major framing of technoscientific identities to date is Rabinow's (1992) concept of biosocial identities and biosocialities that "underline[s] . . . the certain formation of new group and individual identities and practices arising out of these new truths" (pp. 241–42) (e.g., neurofibromatosis

groups). "These [biosocial] groups will have medical specialists, laboratories, narratives, traditions, and a heavy panoply of pastoral keepers to help them experience, share, intervene in, and 'understand' their fate" (Rabinow 1992:244). However, attribution of identity does not equal acceptance of it (Novas and Rose 2000). Interactionist labeling theory again becomes relevant, raising questions of power—who gets to label whom, with what consequences, and what "responses" may occur? Technoscientific identities' origins stories usually lie in sites where technoscience successfully dwells: in research/medical/insurance/governmental/legal domains, which are often socially and culturally highly privileged and potent. Yet on an individual basis, technoscientific identities are selectively taken on, especially when accepting such identities seems worthwhile, including access to what can be experienced as "medical miracles." Such an identity can be handled as a "strategic" identity,<sup>21</sup> seemingly accepted to achieve particular goals, but also (typically in other situations) it may be refused. Such identities may also be ignored in favor of alternatives. Negotiations with biomedicalization processes are ongoing.

## CONCLUSIONS

We have offered an analysis of the historical shift from medicalization to a synthesizing framework of biomedicalization that works through, and is mutually constituted by, economic transformations that together constitute (1) the Biomedical TechnoService Complex, Inc., (2) a new focus on health, risk, and surveillance, (3) the technoscientization of biomedicine, (4) transformations of knowledge production, distribution, and consumption, and (5) transformations of bodies and identities. We have argued that biomedicalization describes the key processes occurring in the domains of health, illness, medicine and bodies especially but not only in the West. We have asserted that

<sup>21</sup> Spivak's (1988) concept of "strategic essentialism" asserts the legitimacy of using essentialist/realist epistemological assertions when they may be more effective politically than assertions of multiplicity or diversity.



the shifts are shifts of emphasis: Medicalization processes can and do continue temporally and spatially, if unevenly. Innovations thus are cumulative over time such that older approaches are usually available simultaneously somewhere, while new approaches and technoscientifically based alternatives also tend to drive out the old over time.

In addition to being temporally uneven, we have argued that biomedicalization is *stratified*, ranging from the selective corporatization of “boutique” biomedical services and commodities directed toward elite markets, to the increasingly exclusionary gatekeeping made possible by new technologies of risk and surveillance to the stratification of rationalized medical care. Through emergent “dividing practices,” some individuals, bodies, and populations are perceived to need the more disciplinary and invasive technologies of biomedicalization, as defined by their “risky” genetics, demographics, and/or behaviors; others are seen as especially deserving of the customizable benefits of biomedicine provided through innovative assemblages, as defined by their “good” genetics, valued demographics (e.g., insurance and/or income status), and/or “compliant” behaviors.

Stratified biomedicalization both exacerbates *and* reshapes the contours and consequences of what is called “the medical divide”—the widening gap between biomedical “haves” and “have-nots” (Abate 2000b). Surveillance, health maintenance, increased knowledge, and extended health and biomedical responsibilities for self and others are, however, promoted for all. This imperative to “know and take care of thyself,” and the multiple technoscientific means through which to do so currently, have given rise to new genres of identities, captured in our concept of *technoscientific identities*. The ubiquity of the culture of biomedicine renders it almost impossible (and perhaps not even desirable) to avoid such inscriptions.

We believe the concept of biomedicalization offers a bridging framework for new conversations across specialty divides within sociology and more broadly across disciplinary divides within the social sciences. Biomedicalization engages the concepts of structure and agency, stratification, and the

complex intersectionalities of culture, political economy, organization, and technoscience. The transformations of biomedicalization are manifest in large, macrostructural changes as well as in new personal identities and subjectivities, but especially at the meso-level of new social forms and organizational infrastructures. Further, we assert that the processes and experiences of biomedicalization illustrate the importance of interaction and contingency in social life. Finally, biomedicalization demonstrates the *mutual* constitution of political economic, cultural, organizational, and technoscientific trends and processes. Our view of the complex transformations we are currently witnessing in Western biomedicine is that their roots, manifestations, and consequences are most often *co-produced* and *reciprocally* (re)constructed and (re)generated continuously over time.

Those of us who dwell in the sociology of health, illness, medicine, and related areas tend to vividly see the increasing pervasiveness of biomedicine in everyday life. Although not all-encompassing, its ubiquity must be negotiated by each of us on a daily basis. We are awash in a sea of biomedicalizing discourses. And we agree, however anxiously, with Abir-Am (1985) that in the sense that any advertising is good advertising, our project here cannot help but constitute and promote biomedicalization. (Re)naming is creating; representing *is* intervening (Hacking 1983).

Yet biomedicalization is punctuated—in fact, rife—with contradictions and unanticipated outcomes that complicate this trend relentlessly. The power-knowledges produced by social sciences *of, in, and for* biomedicine transgress those boundaries, percolate widely, and are potentially disruptive. There are no one-way arrows of causation, no unchallenged asymmetries of power, no simple good versus bad. In fact, the blurrings of certain boundaries in the creation of new social forms—public/private, government/corporation, expert/lay, patient/consumer, physician/insurer, university/industry/state, among others—are unleashing new and sometimes unpredictable energies. Thus, we refuse interpretations that cast biomedicalization as a technoscientific tsunami that will obliterate prior practices and cul-

tures. Instead we see new forms of agency, empowerment, confusion, resistance, responsibility, docility, subjugation, citizenship, subjectivity, and morality. There are infinite new sites of negotiation, percolations of power, alleviations as well as instigations of suffering, and the emergence of heretofore subjugated knowledges and new social and cultural forms. Such instabilities always cut in multiple and unpredictable directions (Strauss 1993). Thus we end by calling for case studies that attend to the heterogeneities of biomedicalization practices and effects in different lived situations.<sup>22</sup> We have attempted to elucidate some rich contradictions here in hopes of provoking more democratizing interventions.

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<sup>22</sup> See Fosket (2002) for a study of chemoprevention as the biomedicalization of breast cancer risk; see J. Fishman (forthcoming) for a study of the biomedicalization of sexuality; see Mamo (2002) for a study of the biomedicalization of lesbian reproduction; and see Shim (2002a, 2002b) for a study of the biomedicalization of race, socioeconomic status, and sex through epidemiology. See Clarke et al. (in prep.).

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