Co-authored by four versatile scholars, Becoming Biosubjects: Bodies, Systems, Technologies, winner of the 2012 Gertrude J. Robinson Book Award of the Canadian Communication Association, makes a delightfully fluid read, which is as gratifying as it is analytically demanding. Although the four authors formally represent different fields—sociology/anthropology (Gerlach), law/communication (Hamilton), communication/culture (Sullivan), and literature (Walton)—their demonstrated competencies go beyond disciplinary boundaries and run through all six chapters of the book in a finely coordinated tandem.

The study tracks unobvious, multilayered dependencies along with reinterpreted familiar ones. It articulately transmits a well-supported message: “biosubjectivity” is here to stay, with all its contradictions, challenges, and promises, and humanity has choices to make. Generated at the polysemantic interface of the social, legal, political, technological, and the vital, the analysis of biosubjectivity foregrounds specifically the Canadian context, thus mapping a largely untheorized technoscientific territory. At the same time, it also situates some of the processes under investigation internationally, which enables a perspective on global developments.

The discursive mode adopted here is expressly relational and analogic. In reviewing key aspects of the book’s analytic terrain, this essay opens up venues for its participatory reading. Suggestions are made to contextualize the analysis theoretically within the McLuhanian tradition, for future explorations of the ways in which media theory’s classics could capture ongoing phenomena. On another level, an analogy is projected between the challenges of biotechnology’s ambivalent effects and the similarly consequential and controversial tangle of climate change issues. The biotechnology/climate parallel encompasses the existential continuum from the molecular to the plan-
etary strata. The essay thus brings up bidirectional extensions of Heidegger’s (1954/1977) foundational philosophical question concerning technology, which decades ago alerted the public to the dangers of technoscience in its invasive, “enframing” capacity (e.g., the hydroelectric power plant subjectifying/subjugating the waters of the Rhine River, and unlike the traditional windmill, turning nature into a “standing-reserve”).

The suitably coined neologism “biosubject,” introduced in the book, comprises various categories, spanning the entire range of biomorphological complexity. There is the human subject, whether a DNA-tracked criminal or a provisionally DNA-trackable regular citizen, the (potential) mother/father, the surrogate mother, and human hosts of pathogens (chapters 2, 3, 5). Further, there is the human embryo/fetus, in various media and modes of gestation (chapter 3). To these are added the genetically modified animal/plant life forms, e.g., Harvard’s Oncomouse and Monsanto’s Roundup Ready Canola (RRC®) (chapters 4, 6). The simplest life forms are Chakrabarty’s oil-eating bacterium, which first breached the “life patenting” boundary in 1980, and the pathogen, e.g., SARS, smallpox, anthrax, avian flu, BSE viruses (chapters 4, 6). Thus, importantly, the authors make a strong case for a kind of technologically mediated subjectivity that subsumes humans along with (much) simpler organisms, targeting the gene itself.

Although the primary interest of Gerlach et al.’s study is in biotechnological subjects as juridical, civic, political actors, the literal term “biosubject” can extend to those that are not necessarily biotechnological, in the sense of genetically engineered, yet are biological and “objectified” as subjects in a Foucauldian sense (Foucault, 1982). This serves the book well, given that the cases discussed may be ambiguous between natural and genetically engineered (SARS), sometimes the former and sometimes the latter (smallpox, anthrax), straightforwardly natural (women; embryos when traditionally conceived and gestated), or at least not genetically manipulated, even if biotechnologically assisted (“above-board” in vitro cases and abortion).

What the book achieves by analyzing (bio)subjects that precede gene technologies side by side with those that coincide with them is to reveal 1) that types of subjectivity are historically continuous, and some earlier types coexist with/are organically integrated into genetic biosubjectivity, and 2) that (bio)subjectivity co-evolves with (bio)technology as well as with (bio)governance. Regarding the first point, since for the authors it is the technological capability to “make life” that marks the crucial transition to present-day biosubjectivity (p. 188), it would be worth exploring the bounds of genetic subjectivity in its interaction with other types of (non)biotechnological and (non)technological subjectivity. As to the second point, governance is a stated priority interest of the book, and the authors convincingly show how the earlier bodily discipline (cf., e.g., Foucault’s 2003 biopower) is superseded by biogovernance that comes with DNA coding and tracking (chapters 2 and 5). In legal discourse—the analysis of which can be seen as a distinctive contribution of the study—the above transition maps onto a switch from the traditional, constitutionally protected “integrity of the body” to the more abstract “privacy.” This in effect legitimizes a much freer rein on obtaining DNA and other biometric information by the authorities, in exchange for a guarantee of (presumably) legitimate use of said
information and citizen privacy. Thus, what the case studies underscore is the urgency of the familiar question, this time in a comprehensively represented Canadian context, as to how far developments like the above can go, and how well they can negotiate democratic principles in the process.

In all cases, biotechnologies are analyzed taking into account the complex epistemic/power dynamics at the intersection of the legislative and judicial systems, politics and government, and, minimally, science itself. All along, the book discusses how the media (mostly the press) represent(s) and may variously tip the scales of the socio-political processes underway, by speech or silence. Thus, biotechnologies are shown to condition and be conditioned by economic, political, psychological, social and other processes, with biosubjectification as a hybrid of most if not all of the above types. In view of proposals by Marshall McLuhan, developed later by Eric McLuhan (McLuhan & McLuhan, 2011), which descend from Aristotle’s four causes (material, efficient, final, formal), the book can be analyzed as a study of biosubjectivity as an instantiation of “formal causality”—that is, in the McLuhans’ view, what would commonly be seen as the “(side) effects” of biotechnologies. The apparent conceptual paradox dissolves under etymological scrutiny, since the Greek word *αἴτια*, traditionally translated as “cause,” is not committed to temporal cause-effect sequencing. As Thomas Aquinas interprets it, formal cause “completes the intelligible expression of a thing’s quiddity [Lat. *quidditas* “essence,” lit. what-ness]” (E. McLuhan, 2005/2011, p. 105 [gloss mine]). To fulfill its designation as capturing the specificity of communication technologies, McLuhanian “formal cause” not only may need to “contain all the [others]” as Eric McLuhan hypothesizes (p. 83), but would have to subsume emergent along with intended effects to account for what may otherwise call for Heideggerian “Enframing.”

An obvious area for further research is the application of the McLuhans’ four “laws of media,” a.k.a. the tetrad, conceived as exhaustive of technological “effects” and thus as mechanisms of reconceptualized formal causality (McLuhan & McLuhan, 1988). Phrased as questions concerning every new medium/technology (for the environments discussed here, biotechnology), the laws certainly find answers in the book regarding 1) which earlier medium/technology biotechnology *obsolesces* (a baby in the futuristic movie *Gattaca* is “normal” only when genetically customized), 2) which much older ones it *retrieves*, likely in an upgraded form (DNA tracking compared to tracking by foot/paw prints, smell, taste), 3) which human capabilities (and nonhuman too!) it *extends/enhances* (Monsanto’s canola seeds become impervious to the pesticide Roundup), and what it may *reverse/flip* into “if pushed too far” (GMO foods turning into non-sustenance).

As socio-psychological measures of biosubjectivity, the book uses variations on the Castoriadian heuristic of the imaginary, e.g. Gerlach and Hamilton’s (2003) “social science-fiction” (henceforth hyphenated for disambiguation), and “biotechnological imaginary.” The former invokes the tension between what is already actual (e.g., DNA identification and dragnets, genetic engineering of plants and animals) and what may come, arguably, in the future (e.g., DNA cataloguing of each and every citizen, [routine] genetic engineering of humans). Seen as a narrative that is circulating/being circulated, it can play out as genuine/hopeful fantasy or as purposeful manipulation. The biotech-
nological imaginary, for its part, is grafted onto a prior (and coexisting) scientific imaginary of unquestioned faith in science, and can be counteracted by a Lyotardian postmodernist “reflexivity” about ( techno)science’s and ( techno)scientists’ authority and reliability (Lyotard, 1984). The authors are clear that critical judgment is a necessity in the biotechnological context, where promising/risky possibilities can serve research, business, or warfare, with weighty physical and symbolic implications for bodies, minds, and souls. The permeability of the imagined/actual divide corresponds to the “leakiness” of national borders in a post-9/11 world, threatened by biological warfare (chapter 5), whereby fluctuations of fiction/imaginary may balance out to invite a “biogovernmental surveillance” regime as a public insurance policy, globally (pp. 169-172), but also domestically, as part of a “full genetic justice system” (pp. 60-61).

A singularly pervasive aspect of present-day biosubjectivity, conditioned by genetic-digital technology hybridization, is somatic virtualization. Virtualization of the human body was noted already with the advent of electric technologies such as radio, telephone, and TV (see Marshall McLuhan’s “angelized” or “discarnate” [status of man] metaphors, e.g., in McLuhan & McLuhan, 2011, p. 50) and has been theorized extensively in the context of new media technologies (Haraway, 1991; Hayles, 1999). As the book problematizes it, the “contingency” of the body that goes with virtualization gains strikingly wide-ranging and far-reaching structural-systemic distribution. Whether a child is separated from the mother’s body through in vitro gestation, artificial insemination, or surrogate motherhood (chapter 3), or whether DNA digitization enables the separation of identity from the body (chapters 2 and 5) or genetics to (re)create bodies (chapter 3), potentially serious implications exist for citizens’ integrity of the body, privacy, personhood, and the structure of family and society alike. Negative and positive effects of biotechnological “extensions” are not that far apart.

For example, the restored chance of having children and the provision of individual and public safety when a state fulfills its responsibilities, as well as due recognition of advances in technoscience, are (on the surface) desirable technological impacts. However, not discounting the grades and shades between the beneficial/detrimental extremes, there is also the downside to take into account. Prenatal babies are being productized, even (arguably potentially) genetically customized, wombs are becoming available for rent, sperm and eggs for sale; presumably consensual biogovernance may flip into a form of hegemony, enslaving the public’s agency. The bottom line is that the objectification of human subjects inexorably expands with the possibility of “discovering” genes and of customizing their expression, and with the reduction of identity to DNA sequencing and convenient biometric digitization.

With the controversy around Harvard’s Oncomouse patenting, chapter 4 introduces a discursive thread that steers away from the human biosubject. Before turning to the analysis of biopatenting as a defining contribution of the book, let us address the technoscientifically mediated ontological issue. Still in chapter 4, mice (and the previously discussed humans) are joined by lower life forms, such as bacteria; in chapter 5 by viruses and in the concluding chapter 6, by Monsanto’s Roundup Ready Canola (RRC®). Being biological and in a sense agentive, as well as biotechnologically affected and subject to surveillance, the nonhuman biosubjects above align with the human.
This alignment is evidence of biotechnological obliteration of the traditionally assumed contrasts such as human/nonhuman, animal/plant/micro-organism, and nature/artefact. The totalizing contingency of biological structures is certainly part of what causes silences of legislative bodies, impasses in politics, partial/contingent decisions of the courts, discrepant coverage in the media—and in response, not surprisingly, cries of progress-murder from the biotechnology industry.

Opening a rhetorical aside on the problem of biological customization and breached boundaries could it be that biosubjectivity is merely extending available scientific knowledge, namely that at a sufficiently deep level, everything in the “known” universe is structured identically? If yes, one critical question would be: if consonant with versions of today’s ecological view and its cross-cultural predecessors (Shiva, 1989), the “crown of creation” has to give up exclusive/exclusionary status so that all that “is” gains status of value, who and what should and could determine the inclusivity parameters of such all-welcoming equity?

The distinction between ontological equity “value” and “price” becomes easy to read between the legal lines, as it is spelled out in the authors’ excellent analysis of biopatenting, and more specifically of the “design” of cancerous mice for experimentation. The legal problem boils down to legitimation of ownership of life, not excluding human. It is understandably entangled in moral-political dilemmas, generating an avalanche of questions. Is a whole Oncomouse patentable if the gene implanted in the embryo out of which it grew is? Are, then, all the mice born subsequently that carry the same gene also patentable? If a microorganism can go under “invention” as “matter” (the 1980 precedent of Chakrabarty’s oil-eating bacterium), can or should a higher life form follow? If a mouse can be “invented,” can or should a human?

Again, the book highlights the specifics of the Canadian juridical terrain. Unlike the United States and Europe, where both Harvard’s Oncomouse and the Oncogene were eventually ruled patentable, we appear to be a partial holdout. Only the Federal Court of Appeal ruled yes on both counts in 2000, whereas the Supreme Court eventually confirmed in 2002 the 1995 decision of the commissioner for patents, who had made a distinction to render the procedure of gene splicing patentable but not the mouse itself, let alone its progeny.

Just by extrapolating from the book’s account of the Oncomouse case, one can well imagine the enormity of problems around human genetic patenting, and for starters around genetic engineering, which the authors methodically triangulate within a Canadian legal-political vacuum (for some [meta-]scientific problems around human gene manipulation/ownership, see, e.g., Norrgard, 2008; Resnik & Vorhaus, 2006). If I may, it is already highly problematic that human gene patenting has escalated exponentially, even creating a genre of industrial-legal ethics (amazon.ca searches 2011-2012), while the scientific-ontological questions have receded to the background, and scientists have largely withdrawn from the public stage.

On the subject of ownership (and designing!) of human tissues and whole humans, the book references a novel (Kazuo Ishiguro’s Never Let Me Go) and a movie (Michael Bay’s The Island) about human cloning, e.g. for organ donation, which project the implications of biojuridical subjectivity “more effectively ... than any of the Cana-
dian institutional authorities have done” (p. 132). I’d propose that fiction/pop culture text here fulfills the function of art as a McLuhanian “early warning system.” In other words, the artist, as a visionary and creator of “anti-environments” with respect to dominant imaginaries and discourses, prognosticates—e.g., on the analogy of genetic-engineering computer models, or climate models, for that matter—possible future consequences, especially those that may be dangerous.

Are juridical and executive bodies prepared to listen and act? If courts are left to fend for governance as a whole, in the absence of much-needed updates in the law due to governments’ evasive tactics, such “depoliticization” regarding biotechnologies, systematically diagnosed in the book, may be the “politicization of,” that is, giving the final say in matters of governance to the merger of technoscience and entrepreneurship in an increasingly globalized world. Thus, the hitherto supreme authority of morality/legality as enforced by the nation-state would be superseded by transnational corporate interests. The study, then, corroborates the socio-technological tendencies diagnosed by Haraway (1991) some decades earlier, in her case symbolized as much as engendered by the Internet and computer gaming.

Over and above the issue of which powers hold sway, the question stands as to how to avoid committing humanity, and with it the planet, to aggravated social and environmental issues and probable destruction. This situation is not unlike the predicament of global climate change, whose risky unleashing of planetary forces matches that of biological molecular forces, with a commensurate magnitude of social-political repercussions facing a less than adequate response.

Geo-engineering, for example, can be seen as a planetary-level counterpart of molecular-level bioengineering, yielding a “geo-subjectivity” similar to that of the Rhine River (Heidegger, 1954/1977, cited above). Paradoxically, geo-engineering is being considered, in its more and less invasive formats, and has already been used, as a mitigation technique for climate change effects, although it is probably aggravating the issue, as per assessments by climate scientists Andrew Weaver (2008, pp. 264-265), James Hansen (2009, pp. 230-231), and Stephen Schneider (2009, pp. 271-272). Assuming that there is “geo-subjectivity,” as the nonorganic planetary complement to the biosubjectivity in the biosphere, and given the molecular vulnerability of the biotic/abiotic dichotomy brought up by the book, subjectivity predicated on the Earth’s ecosystem emerges as a continuum parallel to that of the planetary—molecular stretch of the existential continuum posited at the very beginning of the essay (see p. 515). The conceptualization of a healthy relationship between human-made technologies and this all-encompassing “eco-subjectivity” would thus appear to be, in large part, within the purview of scientific knowledge. In McLuhanian terms, scientists may be seen as DEW-liners on par with artists (see note 2), hence as called upon/able to diagnose present and imminent technological problems thereby aiding their solution (which, incidentally, is what Prof. Marshall McLuhan himself was doing). The study discussed here points in the same direction when it underscores the importance of scientific knowledge for policymaking.

Therefore, a highly pertinent question, as an extension of the book’s message, is the educative role of science itself. Scientists such as molecular biologist Margaret Mellon and plant pathologist Jane Rissler, director and deputy director, respectively, of the
Food and Environment Program at the Union of Concerned Scientists, have stepped into the public discourse with a series of books since the 1990s (e.g., Rissler & Mellon, 1996). Similarly, prominent climate scientists have published books specifically for a general audience: Andrew Weaver (2008) in Canada, and James Hansen (2009) and Stephen Schneider (2009) in the United States. They did so in a somewhat more momentous context of actual global warming disasters and the international push for IPCC-guided action, which has been at least on the part of some European Union countries at the level of national governance. By contrast, the human gene patenting rush, the industrialization of genetic technologies, and the confidentiality screen around some of those technologies may have contributed significantly to suppressing public discourse on related topics.

Beyond scientific knowledge being made available and accessible, however, one would expect that epistemic responsibility would be best shouldered by both the public and governance, since (in a democratic system) voters have to meet politicians halfway to effect pertinent policymaking and action. As it is, Gerlach et al. bring up time and again the passivity of the public regarding biotechnological developments, and of the media, which no doubt have a role to play in how well informed citizens are. The one conspicuous exception is Saskatchewan farmer Percy Schmeiser’s prolonged court battle against Monsanto, which rallied domestic and international support. It brings to the concluding chapter 6 an optimistic note regarding public agency.

Continuing with the climate/biotechnological challenges to governance, whatever dangerous biotechnological effects there may be (think: mutations), it is not clear how, and if, they could be “outsourced” from human agency and/or reduced to analogs of “How much warmer?” and “How long before X?” This prevents the formulation of relatively operationalizable, even if highly contingent, research questions—optimally independent of moral-legal interrogation—that an intergovernmental panel like the one on climate change (IPCC) can work on, however imperfectly. A further complication is that legislation and jurisdiction, while considering regulations, would want to avoid tying the hands of scientists with stringent restrictions, which the book acknowledges, e.g., in the discussion of alternative fertility strategies and biopatenting.

On an altogether different scale, there are cases where the problem may not even be in the realm (proper) of public jurisprudence and jurisdiction. In chapter 5, for example, other types of agency aside, the authors point out that the activities of rogue scientists and near amateurs may well be under the radar, whether because such human actors are recruited to serve special interests or have no strings attached. Yet they may have the capacity to engineer a pandemic virus, even without any substantial investment in equipment and materials or sophisticated skills. Apart from tactical challenges, a highly pertinent concern regarding strategy for both climate change and bio-engineering effects is that attention tends to snap to, and is hard to pry away from, immediate losses/gains. As a result, questions around far-reaching, potentially irreversible consequences remain pending, yet they too are clearly worth addressing appropriately and as expeditiously as current emergencies.

To conclude, I second Jennifer Daryl Slack’s evaluation that Becoming Biosubjects is an important book (back cover) and recommend it as thought-provoking scholar-
ship, worthy of the attention of both academic readers and a wider audience. The
strength of this book is as much in its detailed and sensitively modulated account of
biosubjectivity as in its abstention from making hasty judgments or from serving on
a platter a neatly sliced-up Gordian knot. It thus offers the benefit of drawing in the
reader to partake of, or at least better appreciate, the responsibility that humanity bears
for choices which, essentially, hang in the balance between technoscience’s agency
and its impact on (non)human agents’ ontology.

Through a participatory reading of the book, this essay has brought up the pos-
sibility of examining biosubjectivity, using a McLuhanian analytic lens, inviting in
this way explorations of gene technologies in the classic media theory mode. Biotechn-
nological phenomena are additionally read through the parallel with issues around
climate change. The two sets of problems map analogously in many respects: they
are similarly scaled technoscientifically, socio-economically, and politically. Projec-
tions of long-term climate change and biotechnological effects suggest the timeliness
of an inquiry by an ecological-evolutionary ethics that would generate principles to
build awareness and guide human action as it relates to (non)technologically engen-
dered subjectivity across the entire planetary ecosystem. From this comprehensive
perspective, it would be logical to step up from conceptualizing subjectivity/ies to
bringing in a notion such as Being, variously and richly theorized in philosophy (by
Heidegger, among others).

Scientific knowledge to date has “empowered” us to rehash and (re)create surround-
ing (a)biotics, and even our own bodies, long before we are able to anticipate, let alone
handle, the consequences. Average citizens and governments alike are learning that
progress has been compounding interest, just as it has been providing and promising
advantages and value. Quite appropriately, the chapter on the sexual politics of biotech-
nology has two literary quotes as epigraphs. The one about the implications of human
cloning ends with a rhetorical query: “Our species is doomed by hope then?” (Oryx and
Crake, Atwood, 2003, p. 146). Leveraging off that query to encompass the double-edged
advances of technoscience in general, here is a response question—simultaneously philo-
sophical and pragmatic—for our species to tackle in all of its dimensions and dialectics:
“Should humanity’s hopes play out as eco-evolutionary doom?”

Notes
1. See Marshall McLuhan’s analysis of “formal cause” operating in G.K. Chesterton’s writings
(M. McLuhan, 2011b), also in advertising, or any medium/technology of communication, as it affects
(and/or is intended to affect) the public/culture (elsewhere in McLuhan & McLuhan, 2011). Identifying
formal cause with the influence authors intend to exert on an audience with their writing, which he
short-hands as “(an effect on) the audience,” practically recruits all of Aristotelian causality (and more):
1) an author (efficient aitia) using language (possibly, material aitia in the abstract), in a certain
way/style (formal aitia, or eidos) to affect an audience (final aitia, or telos). Incidentally, Aristotle sees
all aitia as operating in unison and gives priority to the final, not formal, variety. Note also that his
system applies to things natural and artefactual alike, but it does not address emergent phenomena
in the case of the latter, nor does it easily allow to distinguish Heidegger’s modern hydroelectric plant
on the Rhine River (or atomic energy, the extreme case at the time) from the traditional windmill (or
the even less invasive handcrafts). This distinction, crucial for technoscience, necessitated the concep-
tualization of (the not necessarily exclusively negative, or “challenging forth”) “Enframing” as the
“essence” of modern technology, counterbalanced by “poiesis” as, in a sense, the generic/ultimate cre-
ative power (associated with art, techné, thus, in the final analysis, not necessarily strictly divorced from technology/its creative capacity).

That being said, a productive theoretical venue for consideration could be, for example, to maintain a differential inventory of *aitias* (likely, Aristotle's system with pertinent modifications) and, by varying their relative roles in each case, to account for the specificities of the natural (as non-artefactual) and various modes of the (bio)technological.

2. McLuhan's metaphor references the Distance Early Warning (DEW) Line running across Alaska, the Canadian Arctic, Greenland, Iceland, and the Faroese Islands. During the Cold War, it was set up by the United States and Canada for radar protection from military threat. Note that, although Marshall McLuhan is mostly known for viewing artists as visionaries and DEW-liners, and art as the anti-environment they create (M. McLuhan, 1965), in principle, he treats scientists/science on a par (for the art/science parallel see, e.g., M. McLuhan 2011a).


**References**


