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## **The Ecological Question: Can Capitalism Prevail?**

**Daniel Buck**

There are signs everywhere that the natural resources that provide the inputs for our material commodity economy are being used up faster than they are being replaced by the physical, biochemical and ecological processes that produced them in the first instance (the most salient example is oil, but why stop there?). Amid cries that we may have already reached ‘peak oil’, accelerating conversion of the world’s tropical rain forests and all they imply to ‘use values’ in the present, rapid depletion of the world’s fisheries, rising prices for metals and minerals, and a growing consensus among the scientific community that human-induced global warming is not only a fact, but that we may be approaching catastrophic ‘tipping points’, it is easy, logical, and even sane to arrive at the conclusion that this, surely, must be the crisis that finally will destroy the wild juggernaut of capitalism.

This is the ‘ecological question.’<sup>1</sup> But these apocalyptic visions of resource exhaustion forcing capitalism’s final crisis rest upon overly narrow understandings of what, exactly, constitute natural resources. Natural resources are posited to be out there, natural things that can be picked up, cut down, mined or otherwise gathered, processed, and used. They are finite, and once used up will be gone. There is some hedging of this position, of course: forests can be re-planted, tin cans and bottles can be recycled. But this view takes resources to be strictly natural, rather than just as much social. That is, it overlooks how things found in the natural world only become useful to human societies in the context of particular socio-technical frameworks. It thus fails to adequately grasp technology and especially the dynamism of technological innovation and change under capitalism.

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<sup>1</sup> The ‘ecological question’ resonates with a long line of ‘questions’ or problematics within the Marxian tradition: Marx’s ‘The Jewish Question,’ Karl Kautsky’s ‘The Agrarian Question,’ and Manuel Castells’ ‘The Urban Question.’

Furthermore, these visions of final crisis tend to confuse particular manifestations of capitalism – that is, particular historical social formations – with capitalism itself, thus underestimating the flexibility of the beast. This short essay will unpack both of these assertions to argue that capitalism very likely will survive the “ecological challenge”, though this need not imply that the future will be rosy, utopian, or even based upon some kind of post-resource (as in post-industrial) political economy. Finally, the almost exclusive focus of the debate on the ways that capitalism must be regulated by the state into adopting solutions, should be shifted to take better account of the ways that capitalism could very well accumulate its own way to solutions – at whatever cost to humanity.

#### MARKET- or PRICE-DRIVEN TECHNOLOGICAL CHANGE

The simplest and most intuitive, though as we shall see fully inadequate, reason that capitalism will not fail due to resource exhaustion is that when something becomes relatively scarce, its price will tend to rise. This engenders a host of possible reactions, ranging from reduced consumption of a resource through simple economizing, to increased extraction from sources previously too marginal, difficult, dangerous, or for whatever other reasons too expensive. Timber will be cut further from roads or on steeper slopes, mines shafts will be dug deeper or following less productive veins, and so on. Higher prices also create new incentives to develop more efficient and cost-effective ways to extract and process resources, and encourage shifts to existing but hitherto more costly substitute resources or technologies. For example, recent rapid increases in oil prices have driven chemical companies to start looking at coal again, as a substitute for oil.<sup>2</sup> Or, solar and wind power technologies, far too costly when oil is selling for \$9 a barrel (in 1998), start looking economically feasible when oil reaches \$70.

These kinds of shifts, reactions to exogenous price shocks, are real and will play an important role in ameliorating the economic impact of increasing resource scarcity. But as oil becomes scarce and climbs above \$100, even \$400 or \$500 a barrel, it will threaten the kind of radical time-space de-compression suggested by Elmar Altvater,<sup>3</sup> and with it the

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<sup>2</sup> *New York Times*, 18 April 2006.

<sup>3</sup> Elmar Altvater, this volume. The concept of time-space compression was originally developed by David Harvey (*The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change*, Cambridge, Mass.: Blackwell, 1989), building on Marx’s depiction of the compulsion of capital to ‘annihilate space by

collapse of the vast systems weaving together industry, agriculture, and our cities and modern societies. Surely, then, such incremental adaptations and improvements on existing techniques will not be enough? At this point we are usually reminded of stories such as predictions in the late nineteenth century that the impending exhaustion of coal reserves would lead to the collapse of the industrial world – predictions made just before the discovery of petroleum. Can this civilization-saving discovery be replicated, or was that just a one-off? What miraculous new discovery will save us this time?<sup>4</sup>

The usual answer to these questions is that new scientific breakthroughs and technological advancements will save us. But the very story of the discovery of oil poses a prior question - why was it not discovered before? Since oil had been there all along, usually thought of as a sticky smelly nuisance, what was it about that particular time and place that produced its discovery? And for that matter, this notion about shifting to other technologies and resources in response to shifting price parameters, does it not also assume that those technologies are already out there, ready to be picked up and used? That those resources are already resources, that is, already “discovered”? Is part of the problem our use of the word “discovery”? Looked at this way, it should be apparent that the term natural resource is to an important extent an oxymoron, that something in the natural world only becomes useful to humans in the context of a particular socio-technical framework that can make use of it. And this puts the question of technology change back at center of analysis.

## ACCUMULATION-DRIVEN TECHNOLOGICAL CHANGE

While the dynamics described above are real and an important driver of change, they are “weak” versions of technology change that misunderstand the centrality of technology to the capitalist mode of production. Part of the problem is that technology change is assumed to be external, exogenous, rather than an intrinsic part of the internal dynamism of capitalism itself. At the very heart of Marx’s analysis of capitalism is labour, which is “first of all, a process between man [sic] and nature, a process by which man, through his own actions,

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time.’ As very astutely deployed by Altvater in this volume, time-space *de*-compression refers to the unraveling of the ways distance and time have been reduced and woven together by new and highly complex systems of transportation that rely primarily on cheap fossil fuel.

<sup>4</sup> It would do well to keep in mind that while there must, indeed, be some finite end to oil, there is also a strong argument to be made that ‘peak oil’ is in important senses a myth. See Retort (Iain Boal, T.J. Clark, Joseph Matthews, Michael Watts), *Afflicted Powers: Capital and Spectacle in a New Age of War*, London: Verso, 2005, pp. 38-78.

mediates, regulates, and controls the metabolism between himself and nature.”<sup>5</sup> We are thus reminded that all societies, in all places and times, have in common the performance of labour (which is always social labour in one form or another) on nature in order to convert it into the use values that people consume in order to survive,<sup>6</sup> at whatever socially and historically determined level of consumption.<sup>7</sup> All labour is thus social and ultimately related – no matter how distantly – to the conversion of nature to use values. At first glance it appears that Marx posited nature as out there, resources which human labour can “appropriate” and convert to use values. But this human labour is not innocent or “natural.” Several chapters later in *Capital* we read that “technology reveals the active relation of man to nature, the direct process of the production of his life, and thereby it also lays bare the process of production of the social relations of his life, and of the mental conceptions that flow from those relations.”<sup>8</sup> So even though people “confront the materials of nature as a force of nature,”<sup>9</sup> this confrontation or activity is not only social, it is always already mediated, performed through, and indeed constituted by technology. Further, this passage highlights how technology lies at the centre of, a web of dialectically-related components of a social formation (the components, in the most expansive sense, being technology, relations of man to nature, the forces and relations of production, and mental conceptions).

Social formations are always historical, and this leads us to an additional and even stronger sense in which technological dynamism is at the heart of capitalism. Capitalists must compete, and as Marx demonstrates in *Capital*, and more poetically in the *Communist Manifesto*, relentless competition forces them to constantly innovate just to avoid being thrown into the ranks of the proletariat. The bourgeoisie simply “cannot exist without constantly revolutionizing the means of production.”<sup>10</sup> In this larger context, the limited notions of change depicted in the previous section appear as relics of the kind of narrow thinking produced by mainstream economic theories of perfect competition, where capitalists

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<sup>5</sup> Karl Marx, *Capital: A Critique of Political Economy, Volume 1*, Translated by Ben Fowkes, London: Penguin Books in association with New Left Review, 1976, p. 283.

<sup>6</sup> Marx, *Capital*, p. 290.

<sup>7</sup> Marx, *Capital*, p. 275.

<sup>8</sup> Marx, *Capital*, p. 493.

<sup>9</sup> Marx, *Capital*, p. 283.

<sup>10</sup> Karl Marx and Friedrich Engels, *Manifesto of the Communist Party*, cited from *The Marx-Engels Reader, Second Edition*, edited by Robert C. Tucker. New York: Norton, 1978, p. 476.

react rationally to shifting price signals in the market.<sup>11</sup> They manoeuvre to keep up or stay ahead of one another within a given framework of competition, generally by looking for ways to cut costs and develop cheaper ways to do the same thing – in short, more efficient ways to allocate existing resources. Change in this mode is reactive and thus strangely passive. It is incremental, and rarely changes the framework of competition, resulting instead in a falling rate of profit, to which capitalists react by again reducing costs. One problem with this is that it implicitly assumes that capitalists like to compete on a level playing field, that they actually believe their own hype about free market competition. But what any capitalist really wants is a monopoly, a solid and unassailable market position vis-à-vis the competition. One of the most assured ways to achieve that (short of friends in high places) is not by beating one's competitors incrementally within a given framework, but by transforming the framework, by breaking through to a whole new framework and gaining an absolute rather than relative advantage (if only temporarily, until the others catch up). The huge profits that can accrue to the agents of such transformations push capitalists to actively seek out new forms of absolute advantage by creating something new, whether new products, whole new ways of doing things (new forms of organization), new production processes or machinery... new materials... new resources...

So the real action in the game is not about the most efficient allocation of existing resources, but the creation of new ones. Relentless competition drives innovation in the strongest sense, which in turn spills over to transform other aspects of modern life: “constant revolutionizing of production, uninterrupted disturbance of all social relations, everlasting uncertainty and agitation, distinguish the bourgeois epoch from all earlier times. All fixed, fast-frozen relationships, with their train of venerable ideas and opinions, are swept away, all new-formed ones become obsolete before they can ossify. All that is solid melts into air...”<sup>12</sup> Social formations, those webs of relationships constituting a kind of whole or totality, are thus always not only historical but also constantly in motion, hurtled along by the incessant waves of creative destruction unleashed by bourgeoisie innovation. And at the heart of any social formation is technology, or to be more precise, since a formation is always historical, a

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<sup>11</sup> This part of the essay draws heavily from Michael Storper and Richard Walker, *The Capitalist Imperative: Territory, Technology, and Industrial Growth*, Cambridge, Mass.: Blackwell Publishers, 1989.

<sup>12</sup> Marx and Engels, *Manifesto*, p. 476.

particular and particularly historical technological framework or set of scientific and technological knowledges and practices.

## FRAMES OF LONG-WAVE DEVELOPMENT

Capital has at its core a logic of continuous self-expansion, and when the different components of a social formation work together in a synergistic enough fashion the formation expands.<sup>13</sup> This growth and expansion take the material and social form of long waves of industrialization of specific territories. In *The Capitalist Imperative*, Michael Storper and Richard Walker argue that at the heart of each long wave are one or more “base technologies” that comprise a technological framework. Contrary to popular understandings, and myths of eccentric inventors and professors tinkering in their labs, innovations often occur in industry ahead of scientific understanding (the scientists then figure out why it works). Shifts occur when capitalists, driven by strong and unrelenting competition, make or deploy a series of greater and lesser inventions to break through into a new technological framework, creating whole new industries and opening up new possibilities in existing ones. Capitalists race to take advantage of the new opportunities, but these spread through industries unevenly. For each long wave of development over the last few centuries we can identify clusters of leading industries which are “propelled by the unfolding possibilities of one or more base technologies” that define whole epochs of economic history.<sup>14</sup>

The history is complex and overlapping, but to give just a few overly simple examples: spinning, weaving, and iron smelting and casting helped usher in the Industrial Revolution; advances in machine-making transformed industrial technology in the second half of the nineteenth century; electricity, chemistry, and the internal combustion engine reworked everything again around the turn of the twentieth century; only to be transformed again by advances in electronics, petrochemicals, and aerospace and a handful of other areas in the post-war era. One of the most important leading edges of capitalist development in the last few decades has been the silicon/digital revolution, and we are still watching it continue to expand and play out as even the most mundane things are reworked around the new

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<sup>13</sup> Harvey, *Condition of Postmodernity*; Storper and Walker, *Capitalist Imperative*, pp. 202-03; Robert Boyer, *The Regulation School: a critical introduction*, New York: Columbia University Press, 1990.

<sup>14</sup> Storper and Walker, *Capitalist Imperative*, p. 199.

possibilities and capabilities of the new framework.<sup>15</sup> Soon we will all have toasters made with metal parts embodying machine-tool principles developed in the late nineteenth century, plastic components derived from the petrochemical revolution of the post-war period, and guided by programmed chips developed in the late twentieth century.

This view of capitalism as existing in the shape of particular, historical social formations that are in motion, constantly upset and driven forward as fierce and relentless competition forces capitalists to make breakthrough innovations that revolutionize production and unsettle social relations in waves of creative destruction, fits well with spatio-material histories of capitalism. Technological breakthroughs drive rounds of territorial expansion as the growth of leading sector industries literally produce regional economies, usually leapfrogging over regions produced in previous long waves to produce new ones.<sup>16</sup> Of course, a long wave of producing and competing within a given framework is desirable for capitals for a while, as they must put down the fixed capital and make large investments to viably produce and compete. But eventually the new possibilities inherent in a technological framework reach diminishing returns or are exhausted, and the tendency to equalization and falling rate of profit sets in. Once it does, the only real money to be made is by breaking through the current frameworks (this is not to imply that capitalists wait until a framework is exhausted to begin trying to develop breakthroughs), and the process repeats itself, usually developing along a whole new spatial trajectory. This often takes the form of industrializing new regions, though it can also take the form of re-industrializing and transforming previously industrialized ones.

## THE SURVIVAL OF CAPITALISM

So, will capitalism survive? We will answer in three registers. First, what do we mean by the survival of capitalism? Even the quick sketch in the previous section should illustrate that capitalism is not defined by or dependent upon any particular technological milieu or framework, or any particular source of motive power. It is, ultimately, about social relations. For Marx, machines making machines represented the epitome of capitalism, but

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<sup>15</sup> Storper and Walker, *Capitalist Imperative*, pp. 199-202. See also Peter Dicken, *Global Shift: Industrial Change in a Turbulent World*, third edition, New York: Guilford Press, 1998, p. 148.

<sup>16</sup> Storper and Walker, *Capitalist Imperative*; Annalee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Cambridge, Mass.: Harvard University Press, 1994.

not the essence. The essence of capitalism is commodities making commodities. The social division of labour and social relations featuring the separation of the proletariat from the means of production are thus analytically prior to machinery, and thus also to any particular source of energy fueling mechanized production. Capital, as value in motion, does not care about what it makes, the machinery used, or the motive source. It cares only about its own self-expansion and valorization. Even if the post-oil economy fulfils the dystopian post-apocalyptic visions of a return to simple animal, human, and perhaps water and wind power as motive forces, we will still have capitalism as long as we have an industrial reserve army unencumbered by ownership or control of the means of production, as long as the production of commodities by commodities prevails. We must be careful not to confuse particular historical formations of capitalism with capitalism itself.

Second, apocalyptic visions of the final crisis implicitly assume that capitalism will end everywhere. But capitalism has never existed everywhere: its history can be divided between histories of its development in the core and its expansion into and incorporation of places once peripheral. Even in the core its conquest is not and never will be total. The first line of *Capital* begins “The wealth of those societies in which the capitalist mode of production *prevails*...” (emphasis added), implying that even in the developed core it only prevails, not that it is total. While there may be an internal tendency for capitalism to colonize and commodify all aspects of modern life,<sup>17</sup> even a cursory glance at the ways the line of commodification shifts with each reconstitution of the modern household,<sup>18</sup> and at how capitalism creates non-capitalist spheres outside and even inside itself on which to feed,<sup>19</sup> serve to illustrate that the capitalist mode of production, like Gramsci’s hegemony, will never be total and complete. So, how deep and total a capitalism do we need to say it is still capitalism? Even in the event of a radical round of time-space de-compression, who is to say that large pockets of human activity will not continue to exist in which the capitalist mode of production *prevails*? Just because there is an expansionary logic intrinsic in the commodity form does not mean that capitalism cannot contract. And once it contracts, it will have larger areas outside itself in which to expand. But even the metaphors of expansion and

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<sup>17</sup> Guy Debord, *Society of the Spectacle*, Detroit: Black and Red Books, 1977. See also Henri Lefebvre, *The Production of Space*, Translated by Donald Nicholson-Smith, Oxford: Blackwell, 1991.

<sup>18</sup> David Goodman and Michael Redclift, *Refashioning Nature: Food, Ecology, & Culture*, London: Routledge, 1991.

<sup>19</sup> David Harvey, *The New Imperialism*, Oxford: Oxford University Press, 2003.



contraction are ultimately too clumsy, belying the more complex ways that trajectories of uneven capitalist development territorialize, re-territorialize, and even de-territorialize places in an unconstant geography.

Finally, we come to the ways that capitalism may well accumulate itself out of, or through, an ecological crisis. The survival of capitalism need not be anywhere as stark as surviving pockets of people using antiquated sources of motive power to produce a limited range of inferior commodities for limited distribution. Capitalism is relentlessly in motion, constantly propelling itself forward into new technological frameworks and across space. New frameworks bring new long waves of development, and technological shifts have a way of creating their own demand. Creative destruction sweeps through the installed base of commodities, and everyone must update everything – it is still easy for us to remember the almost silent and only slightly annoying compulsion to switch from VCR to DVD machines, and to sense the coming switch from cathode-ray tube televisions to digital ones. It is just as easy to imagine how breakthroughs in fields such as nanotechnology, biotechnology, and genetic engineering will lead to not just new fuels and more energy-efficient products and industrial processes, but whole new realms of products made of materials and by processes we cannot yet imagine. And these new products and processes will create their own demand, will create new industries that will pull along whole ensembles of supporting services and businesses, and in the process will produce whole new regions (or re-produce existing ones).<sup>20</sup>

Already we hear people saying that the current, highly dispersed spatial pattern of settlement in the West is so completely predicated upon cheap energy that it will be unsustainable and have to be reworked with peak oil.<sup>21</sup> This sounds like a crisis, but from the standpoint of capital actually represents an opportunity – construction and new spatialization is a huge source and part of economic growth under capitalism.<sup>22</sup> All of that building will

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<sup>20</sup> Even our portrayal of technological change in this regard is not strong enough. We refer the reader to Neil Smith's explication of 'the production of nature' in this volume, for an even stronger version of the increasingly intense ways capitalism incorporates nature's own processes into production circuits.

<sup>21</sup> China is increasingly emulating this spatial pattern with the rapid construction of highways, upscale suburbs and suburban shopping centers, all articulated with its propulsive 'pillar' automobile and household appliance industries.

<sup>22</sup> Carol Heim argues persuasively that 'city-building' was a very significant driver of economic growth in twentieth century America. My argument about strong technological change echoes what she terms 'hypermarket forces': 'speculation and the search for large capital gains from property development and increasing land values. Such gains, rather than marginally higher rates of return from reallocation of capital and

constitute new demand, and it will be built from new materials using new technologies, giving rise to new sets of industries that supply them, and new kinds of services that supply them in turn. New spatial forms create whole new markets for new kinds of goods – just witness the way suburbanization in post-war America went hand in hand with the elaboration of many of that generation’s propulsive industries – automobiles, household appliances, food industries...<sup>23</sup>

Some will argue at this point that shifts to new technological trajectories will entail the devaluation and write-off of massive amounts of capital already fixed in the physical landscape, in the form of our housing and building stock, freeways and transportation networks, and so on, and that the capitalist system could not withstand such a financial shock. But it is important to remember that economic landscapes are frequently swept away in periodic rounds of creative destruction, and that this process is internal to the dynamism of capitalism itself. Fixed capitals only matter in terms of the rate of depreciation. Capital as value-in-motion does not care what fleeting forms it assumes, as long as it valorizes and expands itself within (socially-determined) specified time horizons.<sup>24</sup>

## CONCLUSION

Although we have become accustomed to a paucity of R & D investment in alternative energies, that will very likely soon change. Where will the investment come from to fund the research and experimentation for all of this technological change? Rising energy costs will open spaces for new investment in research and development. But more importantly and fundamentally it will come from capital itself, which, even in the form of the huge pools of accumulated value that the multinational oil conglomerates represent, ultimately does not care about oil, or any particular product line, place, or industry. It cares only about its own expanded reproduction.

This is not to put the whole burden on the individual capitalist. Another source of investment, and potential coordination of innovation, is the state. Polanyi argued that society

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labor in production, are the incentive behind much city-building, suburbanization, and redevelopment or gentrification.’ Carol E. Heim, ‘Structural Changes, Regional and Urban,’ in Stanley L. Engerman and Robert E. Gallman, editors, *The Cambridge Economic History of the United States, Volume 3 The Twentieth Century*, Cambridge University Press, 2000.

<sup>23</sup> Goodman and Redclift, *Refashioning Nature*.

<sup>24</sup> David Harvey, *The Limits to Capital*, Oxford: Basil Blackwell; Chicago: University of Chicago Press, 1982.

can fight back against the ravages of undue marketization. We usually think of members of the bourgeoisie acting individually in competition with one another, but we must not forget, as Marx himself shows, how they must act collectively at times in order to be able to continue to reproduce themselves as a class (enacting labour laws, education). Whatever one's theory of the state and its relation to the economy, society, and the bourgeoisie, even oil capitals are beginning to make noise about the need to develop alternatives (e.g. the Chevron ad: 'we used the first billion barrels in 125 years, the next billion will take only 35 years... and then it's gone'; or BP's rebranding of itself as Beyond Petroleum). The race for alternative energy sources – some of which may be cleaner, some may not – and the concomitant spillover technologies, has already begun.<sup>25</sup>

There is a strong case to be made that capitalism will survive. But the main point here is that analysis of the ecological question must begin with a more nuanced understanding of resources and technology, must move beyond the simple poles of techno-optimism (science, technology and human ingenuity will save us) and environmental pessimism (resources are running out).<sup>26</sup> And while capitalism may survive, this is not to say that we can safely embrace rosy visions of utopian futures and abandon apocalyptic dystopian ones. We can wonder at the marvellous inventions to come without forgetting the dark sides of new technologies: new technologies of control, surveillance, and exclusion; new contradictions, externalities, and pollutions that we cannot yet imagine (or that are

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<sup>25</sup> Of course, in the present capitalist formation, innovation and technological change have become highly organized, institutionalized, and even industrialized in ways that go far beyond this simple schematization of single capitalists and the state. Institutions ranging from venture capital to university-industry partnerships and regional or even national initiatives actively strive to push the envelope. Academics and planners now pay considerable attention to the spatiality of innovation, that is, to the innovative potential of actors embedded in urban and regional networks that transcend individual firms. But heavy institutional and financial intermediation does not change the basic argument here, that the logic of capital accumulation is the single most important driver of technology change. For a just sample of what is now a very large literature, see Annalee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Cambridge, Mass.: Harvard University Press, 1994; Lewis M. Branscomb, Fumio Kodama, and Richard Florida, editors, *Industrializing Knowledge: University-Industry Linkages in Japan and the United States*, Cambridge, Mass.: MIT Press, 1999; Storper and Walker, *Capitalist Imperative*; Michael Best, *The New Competition: Institutions of Industrial Restructuring*, Cambridge, Mass.: Harvard University Press, 1990; Martin Kenney, *Biotechnology: The University Industrial Complex*, New Haven: Yale University Press, 1988; Manuel Castells and Peter Hall, *Technopoles of the World: The Making of 21<sup>st</sup> Century Industrial Complexes*, London: Routledge, 1994; William Baumol, *The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism*: Princeton University Press, 2002; and Richard Florida, *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life*: Basic Books, 2003.

<sup>26</sup> Our argument should not be construed as a cavalier dismissal of efforts to conserve resources or put a halt to global warming. Rather, it is a critique of certain strains of thinking about capitalism and its relationship to nature and sustainability.

imagined in only the most dystopian science fictions). Nor is this to envision a rosy democratic future, in which radical new technologies will make energy and food and water cheap and plentiful and available to all without effort. Technological breakthroughs create whole new terrains of activity and possibility, whole new sites or commons, as technological developments that are internal to capitalism succeed in creating whole new terrains that are outside the circuits of capital, only to internalize them again through rounds of privatization, enclosure, primitive accumulation, and monopolization. The classic story of enclosures concerns the removal of the English peasantry from the commons, but we have seen many examples in recent history: the commodification of seeds,<sup>27</sup> water,<sup>28</sup> the Internet, engineered mice,<sup>29</sup> and the human genome. In the current construction of markets for carbon offsets and futures we may be seeing the incipient commodification of the very air we breathe, air which may be increasingly noxious for all those that cannot afford to purchase commodified and distributed clean air.<sup>30</sup>

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<sup>27</sup> Jack Ralph Kloppenburg, Jr., *First the Seed: The Political Economy of Plant Biotechnology, 1492-2000*, New York: Cambridge University Press, 1988.

<sup>28</sup> Erik Swyngedouw, this volume.

<sup>29</sup> Donna J. Haraway, [\*Modest Witness@Second Millennium\*](#). *FemaleMan©\_Meets\_OncoMouse™: Feminism and Technoscience*, New York: Routledge, 1997.

<sup>30</sup> For just a glimpse at the kinds of politics and struggles that might accompany such a commodification, see Swyngedouw's account of the privatization of water (this volume).