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Digital labour, species-becoming and the global worker

Nick Dyer-Witheford

abstract

This paper places digital labour in the context of recently revived interest in the young Marx's concept of 'species-being' (*Gatungswesen*). Cryptically and fragmentarily announced in the *Economic and Philosophic Manuscripts of 1844*, but largely abandoned in Marx's later work, the idea has passed in and then, apparently decisively, out, of fashion amongst his interpreters. But the first decade of the twenty-first century has seen a renewed interest surely due in part to the manifest capacities of electronic networks and biotechnologies to alter the cognitive and corporeal attributes of the human. After proposing an historical, rather than essentialist, understanding of Gatungswesen the paper goes on to suggest some categories that might be adequate to a situation where the stakes in class conflict are nothing less than the trajectory of a contemporary 'species-becoming': planet factory, futuristic accumulation, global worker, techno-finance, singularity capitalism, biocommunism.

Introduction: Firewood

The current persecutions of information leakers and savage repression of youthful dissidents around the world means the following story will come as no surprise. A student radical in a peripheral zone of global capital attracts the attention of state censors for indie-media activities exposing the enclosure of a local bio-commons. Threatened by the state security apparatus, he flees to a foreign metropolis, where, while engaged in political organizing, he keeps up a blog, re-mixing the ideas of other theorists in occasional, associative reflections. From this process emerges a concept crucial to understanding digital labour – a concept no sooner posted than promptly forgotten.

These events occurred a mere one hundred and sixty seven years ago, in 1844; the young academic activist is Karl Marx; the peripheral zone of capital is Prussia; the indie-media platform the short-lived liberal paper Das Rheinische Zeitung; the bio-commons story concerns peasants prosecuted by landlords for collecting firewood from the local forest; the foreign metropolis is Paris, the blog the Economic & Philosophical Manuscripts, episodic, broken-off, heavily hyper-linked to Hegel and Feuerbach (see Tedman, 2004), brilliant shards, with, in their time, zero-comments; and the idea that passes from its pages into oblivion at net-speed is that of 'species-being' (Gattungswesen). Long-eclipsed, species-being is now, however, timely again. This

paper discusses why this revival is relevant to the topic of digital labour, and then, building on a revisited version of Gattungswesen, proposes some further analytic categories with which to situate such labour: the planet factory, futuristic accumulation, global worker, techno-finance, singularity capitalism, biocommunism.

Species-becoming in the planet factory

In the Manuscripts Marx says that private ownership of the means of production imposes on humans a four-fold alienation: from the process of production, from its products, from other producers, and from their species-being (see Ollman, 1971: 138). While the first three stages of this process have been subject to extensive exegesis, the last, the fourth alienation, is neglected. In the Manuscripts, its discussion is cryptic, fugitive, tantalizing. It is, however, clear that Marx did not mean simply human existence as a biologically reproductive group. Species-being is rather the capacity to collectively transform this natural basis, making 'life activity itself an object of will and consciousness' (Marx, 1964: 67). Witnessing the titanic processes of nascent factory capitalism Marx describes species-being as manifested in the cooperative organization of labour, the increasing power of humans to affect their natural environment, the emancipation of women, the formation of metropolii, and the application of science and technology not only to industry but to the very 'forming of the five senses' (1964: 112, 129, 134, 141).

Having introduced Gattungswesen in the Manuscripts, Marx shortly thereafter abandoned it, except for fleeting mentions in Grundrisse and Capital. Because the Manuscripts were not published until 1932, species-being never entered the Leninist lexicon. It was, however, enthusiastically embraced by Marcuse (1972) and Lukacs (1978). No sooner had species-being been resurrected by the Frankfort School, however, than it was repudiated by Althusser (1969), for whom the idea lay on the wrong side of the epistemological chasm between early, immature, and late, scientific Marxism. It reeked of essentialism and teleology. Question of species-being, of the relations of the human to the 'hedgehog, dragonfly, rhododendron' were a philosophic trap, belonging to separate theoretical universe than the proper Marxist concepts of 'the mode of production, productive forces…the relations of production…determination in the last instance by the economy…and so on and so forth' (Althusser, 2003: 279, 264) This verdict, resonating so strongly with the post-structural critique of 'man,' held sway for some time.

In the last decade, however, the concept has drawn renewed comment from Gayatri Spivak (1999), David Harvey (2000), Jason Read (2003), Paolo Virno (2004), Eugene Thacker (2005), and, more obliquely, Melinda Cooper (2008) and others. Ideas do not fall from the sky; this sudden burst of Gattungswesen chatter is not coincidental, but conjunctural – a Mayday signal, perhaps. If in 1844 we had the factory, and in the mid 20th century the social factory of Fordism, now we have the factory planet – or the planet factory, a regime that subsumes not just production, consumption, and social reproduction (as in Fordism), but life's genetic and ecological dimensions.

This is most immediately apparent in the ecological register. In a essay on climate change, 'Humanity's Meltdown', Marxist urbanist Mike Davis (2008), reports a unanimous decision by the twenty-one member Stratigraphy Commission of the Geological Society of London, to affirm that humanity is now in the era of the 'Anthropocene', an epoch defined by the emergence of urban-industrial society as a geological force. The Commission tracks 'mass extinctions, speciation events, and abrupt changes in atmospheric chemistry' recorded in the earth's sedimentary strata. On the basis of this evidence, it determined that the Holocene, the interglacial span of stable climate that saw the emergence of agriculture and urban civilization, was over, and Earth had entered 'a stratigraphic interval without close parallel in the last several million years.' In addition to the buildup of greenhouse gases, they cited human landscape transformations, agricultural monocultures, acidification of the oceans, global species migrations and the destruction of biota, factors resulting in 'a distinctive contemporary biostratigraphic signal'. These human-induced effects are, the Commission observed, permanent, as future evolution will take place from surviving (and frequently anthropogenically relocated) stocks. Davis spells out the conclusion: 'Evolution itself has been forced into a new trajectory.'

Information technologies, the product of digital labour, should, I suggest, also be understood as part of this radical change, both as contributors to the overall, earth-altering scale of industrial activity, but also in more specific ways. In production, capital's long march to automate has proceeded from the assembly line to super-computers and robots that scuttle awkwardly towards the contested status of 'artificial intelligence'. In circulation, digital communications create both virtual territories for 'second lives' and pop-up perceptual guides and filters for this one. In social reproduction, biotechnologies – inextricably dependent on computerization for gene-sequencing and bioinformatics – already offer screening and selection processes, and, in conjunction with a booming neuro-pharmaceuticals industry, promises cognitive, affective and physical augmentation. And this accelerated genetic manipulation is part of a managed reproduction of nature in which, for example, drought resistant plants, Enviro-pigs, and Franken-salmon are all part of comprehensive geo-engineering strategies by which we, or some of us, may ride out climate change.

Digital labour now includes the creation by biotechnologist Craig Venter and his research team of 'Synthia', a bacterium with a genome designed and created from chemicals, with distinctive strings of DNA implanted to prove that is not a natural object, spelling out, in code, a website address, the names of the researchers at the company Synthetic Genomics, and apt quotations such as 'What I cannot build, I cannot understand' (Singer, 2010: 21). This is the moment Marx intersects with Foucault (1984) and capital becomes a regime of 'biopower' (Hardt & Negri, 2000). Rhododendrons are spliced with frog genes to increase the harvest of flower plantations, hedgehogs are prized inhabitants of bioprospected megadiversity zones, and the Pentagon designs dragonfly-like insectoid bomb-sniffer robots. In Capital, Marx (1973: 104) notes that the concept of 'labour' only became thinkable once capitalist mechanization and marketization homogenized or abstracted a range of work or trades - smith, cooper, weaver – so that they could be theorized as sharing an identity, being made of the same 'stuff'. Today, 'life itself', abstracted as information, becomes a

productive force: species-being becomes theorize-able not as some human essence or destiny, but because capital has made it a real abstraction.

In this context we return to the Manuscripts, where as Donna Haraway (2008: 323) remarks Marx is 'both at his most humanist and at the edge of something else'. Gattungswesen might really better termed 'species-becoming', the activity of a species whose only 'essence' is its historical plasticity. 'Labour' is humanity's paradoxical anti-essential essence, its natural ability to change its nature. Gattungswesen can be thought of as the emergent capacity of a human collectivity to identify, assemble and alter itself – to be a species not only in itself, but for itself and also transforming itself, directing its own evolution. Marx's account warns against apocalyptic or euphoric views of this; it reminds us that humans have always made themselves by a series of grafts, symbioses and prostheses with tools, nutrients, and altered landscapes, so that, as Katherine Hayles put it, 'we have always been post human' (1999: 278-9). But it is also a critique of this process. For Marx understands the unfolding of species-being as determined by class and conflict. Alienation, the central problematic of the Manuscripts, is not an issue of estrangement from a normative, natural condition, but rather of who, or what, controls collective self-transformation. It is the concentration of this control in a sub-section of the species, a clade or class of the species–who then acts as gods (albeit possibly incompetent gods) – to direct the trajectory of the rest.

Futuristic accumulation

In the Manuscripts Marx observes that scientific activity, even when apparently pursued in isolation, is a manifestation of 'communal activity, and communal mind' (1964: 137). The collective character of science and technological innovation are repeated themes in his later work, from the 'fragment on machines' in Grundrisse (1973: 690-712), with its famous allusion to 'general intellect', to Capital's account of 'all scientific work, all discovery and invention' as 'universal labour' brought about 'partly by the cooperation of men now living, but partly also by building on earlier work' (1981: 199). Today the expropriation of general intellect and universal labour are the basis for the alienation of species-being in a process I call 'futuristic accumulation'.

Futuristic accumulation is the commodification of publicly created scientific knowledge, which via copyright and patent, is privatized as intellectual property for the extraction of monopolistic technological rents. Its central site is the research university, whose entrainment to business gradually evolved over the late nineteenth and twentieth centuries in both Europe and North America but reached a watershed in the United States' mobilization of university knowledge for atomic weapons, cryptography, ballistics and military projects by the United States during the Second World War. This process, intensified in the Cold War, directly linked academy and industry.

In his study of contemporary 'technocapitalism' Luis Suarez-Villa (2009) describes the emergence this new modality of accumulation. The 'massification of higher education' created a reservoir of publicly funded knowledge, and an infrastructure of laboratory facilities supported by communication systems, into which corporations could tap. A growing emphasis on applied technological research was matched by increasingly overt

forms of corporate university partnership, and a steep rise in patenting by US corporations (which multiplied four fold in US in second half of twentieth century). This process began in the 1940s, but would only come to fruition several decades later when 'a critical mass of highly talented technologists with corporate experience had formed, based on numerous waves of university graduates in the sciences and engineering' (2009: 23).

Futuristic accumulation was, however, only fully activated as a capitalist strategy in the 1970s in response to the crisis of Fordism, when, in answer to competitive threats to its traditional areas of industrial supremacy, and to the Vietnam war-era cycle of domestic and international struggles, North American capital increasingly turned to the development of high-technologies. The most important moment, foundational for digital labour, was the development of the US commercial computing industry from the 1970s on. This was generated by the three way partnership between the Pentagon, top rank research universities such as Stanford and MIT, and defense industries. From this 'iron triangle' (Edwards, 1997: 44) computing knowledge flowed – mediated, ironically, by hacking and homebrew computing cultures that believed 'information wants to be free' – to entrepreneurial ventures in office software (e.g. Microsoft) and video-gaming (e.g. Atari), and the creation of Silicon Valley culture.

This crucial instance of academic-capital collaboration was followed by other moments ringing changes on the same theme. 'Biocapital' (Rajan, 2005) was incubated in the 1980s in the couplings of academic molecular biologists, biotechnology entrepreneurs and venture capital that bred gene-decoding companies, mining 'sequences that could be sold or licensed to pharmaceutical, chemical or agro-industrial companies' or adopting research regimes targeted to exploit the most lucrative medical markets (Suarez-Villa, 2009: 26). A decade later, in the 1990s, the explosion of Internet dot.coms was ignited by Netscape's commercialization of an academically developed technology, the web browser, and sustained by spin-offs from computing science departments. In all these moments, sectors of US capital acquired the rights to exploit innovations arising from publicly funded research.

This subordination of public science to private capital does not always go smoothly. The most famous apparent breakdown was the race to decode the human genome between the publicly funded Human Genome Project and Craig Ventner's company, Celera. This conflict has been variously narrated as triumph of agile private capital over stodgy state science (Shreeve, 2004) or as staunch defense of the public interest by academic researchers (Spufford, 2004). As Ronald Loeppky (2005) argues, however, such reportage overplays the conflict; despite the real hostility between the two projects, the public program was, he argues, ultimately as dedicated to placing genetic knowledge at the disposal of industry as the private one. The distinction was between research assisting capital in general, and the proprietorial claim of one specific capital.

Even such limited friction is rare. Far more representative are harmonious arrangements such as the $500 million research consortium formed between British Petroleum and the University of California, for the Energy Biosciences Institute (EBI), which embeds corporate research on biotechnologically produced biofuels at the heart of Berkley campus despite manifest conflicts of interest (Herper, 2007) – a single example

nevertheless paradigmatic of a normalized range of research partnerships, campus research parks, academic-commercial knowledge transfers and spin-offs.

According to Suarez-Villa commercial 'experimentalism' now directs the emergence of 'critical masses of knowledge and…infrastructure' in 'fields that become emblematic of the twenty-first century', including 'every area of biotechnology, proteomics, genomics, biopharmaceuticals, and biomedicine, the nascent field of nanotechnology and all its innumerable future medical and mechanical applications, molecular computing, bioinformatics, and…biorobotics' (2009: 10). It brings with it a systematized orientation of research to the extraction of value, deploying analytic templates, incentives, and a 'permanent state of urgency'. It involves an acceptance of planned obsolescence; a blurring of boundaries between basic science and technological application; networks of 'contact, diffusion and transaction', social institutions of legitimation and individual subject formation (2009: 28). The scale of these processes is, he suggests, 'mega' – that is 'all encompassing'; they 'increasingly set the agenda for entire societies', with an 'intrusive reach' and 'scope and range' greater than, say, the nineteenth century factory or twentieth century mass production (2009: 16), but, 'like its predecessor, dynamizing the accumulation of capital by concocting means to seize it in ever faster and larger quantities' (2009: 19).

'Futuristic accumulation' suggests an analogy and contrast between this process and primitive accumulations, the process by which agrarian populations were, by enclosure, dispossessed from common lands to become a proletarian workforce. This laid the basis for capital's normal process of expanded reproduction in which the extraction of surplus value from workers proceeds through the buying and selling of labour power. Primitive accumulation and expanded reproduction are today ongoing processes: around the planet people continue to be displaced from the land by agribusiness and extractive industries into shanty towns, to work in industrial factories pouring out commodities of all sorts. But futuristic accumulation adds something new. It does not dispossess people from existing territories, but expropriates from them the emergent domains of life produced by advanced technoscientific innovations. These innovations deal with the basic building blocks of human existence, cognition, and biology, thought and the body: in exposing their deep structures digital labour create new territories–the genome and cyberspace. By imposing property rights on these scientific commons, capital commodifies and commands the evolution of life itself. This is the enclosure of the future, the alienation of species-becoming.

Global worker

The young Marx witnessed the industrial transformation of species-being in the factory workplace, in whose infernal labour process men, women and children alike were reduced to 'beasts' and 'machines' (1964: 70), as mechanization annihilated the craft skills of the artisanal worker and began to the formation of the 'mass worker'. To understand the informational metamorphoses of species-being, and the place of digital labour, we need another concept, that of the 'global worker'.

Capitalism has always drawn on world-wide labours: the slave trade, super-exploited colonial workers, and peasantry of the periphery all attest to this usually brutal truth. What differs today however is the direct subsumption of global labour force under the wage form, in production systems that are increasingly integrated, flexible and mobile. The process begins historically in the late 1960s and 70s as part of the same crisis of profitability that spurred the futuristic accumulation of high technologies. To circumvent mass worker militancy and welfare state demands, North American and European corporations embarked large-scale off-shoring and out-sourcing, using innovations in communication and transportation to move production to Latin America, Eastern Europe and, most of all, Asia-where it can buy cheaper and unregulated labour power. The idea of a 'global working class', which a decade ago would have been dismissed as leftist phantasm, is attracting increasing attention (Baranov, 2003; Linden, 2008; Mason, 2007; Struna, 2009; Breathnach, 2010).

'Global worker' designates collective labour that is : i) internationalized by the world-scale expansion of capital, a process in whose long historical arc a turning point is the doubling of the available global labour-power occasioned by the 1989 fall of the socialist states; ii) variegated by an increasingly complex division of labour, conventionally termed 'the growth of the service sector' (Soubbotina, 2000), describable in Marxist terms as an expansion of employment in the spheres of circulation and social reproduction; iii) universalized by the inclusion of women--aka 'the feminization of work' (Morini, 2007), the growth of production centers outside the global north-west, and flows of migrant labour, all shattering the notion of a white, male working class; iv) connected, albeit to very differing degrees and with many stratifications, to digitalized communications systems – crude but telling indicators are the global count of two billion Internet users and five billion cell phones; v) precarious in its conditions, with a chronic insecurity underpinned by capital's access to a transcontinental reserve army of the unemployed, a surplus population whose task it is to survive in a state of readiness for work; iv) planet-changing in the effects of its labours, effects that, while historically cumulative, are only now becoming visible in global bio-crisis.

The global worker is not just an aggregate, the sum of all labours directly and indirectly mobilized by capital, a reckoning that could have been made at any time in the last three hundred years. What gives this abstraction a contemporary concreteness is its organizational form: the 'value chain'. Subject since the 1980s of a burgeoning managerial study, value chains (Porter, 1985) – also variously termed 'supply chains' (Tsing, 2009), 'commodity chains' (Gereffi & Korzeniewicz, 1994) and 'global production networks' (Henderson et al., 2002; Levy, 2008) – are institutionally and technologically linked sequences of labour-processes that 'add value' at every stage, from research and development to assembly and marketing, dispersed to locations around the planet calculated, in terms of production costs, resource availability, and proximity to markets, to maximize profits. Some sensitive analysts prefer to avoid the 'linear connotations' of 'chains' (Levy, 2008: 2), highlighting the 'intricate links – horizontal, diagonal as well as vertical – forming multi-dimensional, multi-layered lattices of economic activity' (Henderson et al., 2002: 442). The construction of value chains require organizational power and geographic reach of the sort generally only commanded by multinational corporations, often entails foreign direct investment

(FDI), international trade agreements, and 'complex forms of governance at multiple levels' (Levy, 2008: 2). The value chain form is enabled by neoliberal globalization policies, and driven by the financialization of corporate practices in which 'need to meet capital market expectations and appease mutual fund managers' necessitates cutting costs and increasing efficiencies at every level (Levy, 2008: 35, citing Williams, 2000).

Digital technologies are a sine qua non for value chains, which depend on a telecommunications infrastructure to reduce the transaction costs of 'coordinating dispersed operations' and on software systems for 'modular production processes that rely on standards and routinized interfaces with suppliers and customers' (Levy, 2008:8). Equally important is the use of electronic communication to integrate transportation with systems of retail or business-to-business distribution: the icon of this 'the elevated significance of logistics' is the digitized Universal Product Code (Sealey, 2010: 28).

Conversely, however, value chains are necessary for digital technologies, which are produced in world-wide division of labour that links very different kinds of labour. The computer industry can be schematically divided into two main sectors: software and hardware. In the software sector, key areas such as business applications and digital games display a characteristic pattern where key creative design and engineering functions are located in high-end studio or campus ambiences in North America, Western European and Japan. Routinized programming is increasingly outsourced and off-shored to subcontracted enterprises, whether in Bangalore, Ho-Chi Minh City, Dublin or Budapest, where wages and working conditions are an order of magnitude lower. This value-adding logic also extends to the incorporation of 'free labour' (Terranova, 2000) through selective use of open-source programming initiatives or user-generated content, such as game mods. If one ignores the role of janitorial, cleaning and service staff, characteristically migrant, often female, who maintain the environments of programmers and designers working through the 'death marches' and 'crunch times' routinely demanded by the industry, much of this software work falls within the scope of 'immaterial labour' (Hardt & Negri, 2000: 290-294), even if with a very high degree of stratification.

Where the full scope of the labours necessary to a Microsoft, an Apple or Sony becomes apparent is, however, on the hardware side (Smith et al, 2006). Here again, the key design and prototyping for an Xbox, an iPad or iPod or a Playstation3 is likely to be done by high level engineers and architects. The semiconductors required, which a decade or so ago might have come from toxic chip fabrication lines, will today more likely be produced in highly automated Taiwanese plants. When one comes to the actually assembly of the devices, however, this will performed by in Central America, Eastern Europe, or – most probably – in Southern China, with its manufactories of silent, serried work, obligatory unofficial overtime and incessant industrial accidents: reports suggest as many as 40,000 fingers a year are lost in Pearl River factory lines, giving 'digital labour' a grim signification (Barboza, 2008). Beyond this, the role of manual labour in the making of computing devices plunges off into yet more abyssal directions–on one hand into the mining of columbine tantalite and other minerals indispensable to consumer electronics amidst the carnage of the Eastern Congo, and on

the other to the toxic e-waste disposal sites of Asia and Africa where computers and game consoles go to die, in their expiration poisoning the workers who excavate their remains (Dyer-Witheford & de Peuter, 2009). The point here is not just that manual work continues to exist in a so-called digital age as some residual hold over; it is rather that the profitability of digital products depends on the incessant re-positing of cheap, degraded labour, so that new technoscience and human exhaustion accompany one another hand in hand.

Anna Tsing's (2009: 48) apparently portentous claim that analysis of supply chain capitalism is 'necessary to understand the dilemmas of the human condition today' is thus correct. Global capital unites humanity, then divides it again. Class is defined by who appropriates surplus value from whom. In the planet factory, command flows down the value chain, but value flows upward in an inverse cascade, from the one billion absolutely immiserated people living at the edge of malnutrition (the involuntary regulators of the price of labour power for the system as a whole), stopping at a series of intermediate plateau or shallow pools–the old and new industrial proletariat class-bathes 'immaterial labour', and passes though a range of intermediate and contradictory positions (managers and technocrats) before ascending to condense in the bodies of a global ruling class. The process by which the rich live longer, in better health, with more beautiful bodies, sensory extensions and mobility now, in the age nanobots and immortality enzymes, promises to become a veritable plutocratic mutation.

Techno-finance

In the Manuscripts, Marx's reflects on the supremacy of money in capitalist society: 'If money is the bond binding me to human life, binding society to me, binding me and nature and man, is not money the bond of all bonds?' Reflecting on the 'overturning and confounding of all human and natural qualities, the fraternization of impossibilities' made possible by finance, Marx writes that its 'divine power' lies in its character as humanity's 'estranged, alienating and self-disposing species nature'; money is 'the alienated ability of mankind'. Marx also metaphorically links money to the new technologies unleashed by industry, calling it 'the universal galvano-chemical power of society' (1964: 167-168). Today, the crisis of financialization shows not only that money has attained an ascendancy Marx could not dream of, but that its link to technological power has become literal.

In her study of the relation of technology to financial bubbles Carlotta Perez (2003) shows how, historically, successive waves of technological innovation have ignited frenzies of speculative activity, followed by spectacular crashes. Finance capital both buys shares in new technologies, and itself adopts them, using enhanced communication, from roads and canals to telegraph, to enlarge the scope, speed and complexity of its operations. These two processes were on display in the run up to the crash of 2008, with the technology in question being the computer network. The commercial exploitation of the Internet depended on speculative investment by techno-scientifically oriented venture capital – the process that underlie the dot.com boom and bust of 2001.The subsequent, larger speculative financial bubble that burst in 2008 depended not only on the easy-money policies by which the US Federal Reserve sought

to escape the consequences of that earlier crisis, but also on the cybernetic instruments finance capital had adopted. Though the crashes of 2001 and 2008 had different epicenters – one in stratospheric cyber-space, the other in all-too down to earth evictions and foreclosures – according to Perez they should be seen as two moments of a single episode (Perez, 2009).

The first electronic trading floor conversion was NASDAQ, the centre of the dot.com bust. But finances flows metamorphosis into digital form, from 'pits to bits', trading floors to networks, outcry to cyberspace, from frenzied hand signals to streams and screens of data, only really got under way in the 1990s, led by derivative markets trading in the complex financial instruments that would bring down the system a decade later (Gorham & Singh, 2009). What accelerated the process were both the diminishing cost of computers, and the availability of excess bandwidth created by the mile-upon-mile of unused fiber optics left by the telecommunications crash that had followed the dot.com collapse. 'Dark fiber' provided the material infrastructure for the expansion of 'dark pools' of secret finance and shadow banking (Leinweber, 2009).

Marx went on from the Manuscripts to write in Volumes II and III of Capital about financial capital and the role credit in the crises of business cycle, but he could not have conceived the scale this enterprise would attain in the early 21st century. In 2008 the derivatives market, valued at $596 trillion, was reportedly worth three times more than all stock, bonds, and bank deposits in the world (Leibenluft, 2008). Behind this techno-financialization lay a deeper dynamic. The globalization capital embarked on the 1970s to escape the rigidities of trades union and welfare state claims at its core was largely successful: digitally-linked global value-chains ensured wage rates at the centre were held in check by the low wages in the new production zones. But this very success pushed down purchasing power to buy commodities, threatening a realization crisis. Financialization was a means of resolving these problems using two main instruments, credit and derivatives. Credit both created consumption, and, through interest, generated a new stream of revenue for financialized capital. Derivatives and other speculative instruments created a new market out of risk, enabling gambling on whether or not, and under what conditions, commodities, including money itself, would trade. Credit and speculation met in the sub-prime mortgage bonds that eventually brought the whole system down.

Financialization is an attempt by capital to jump out of its own skin, short its own circuit, and make money without having to go through the messy process of procuring labour and resources, combine them in production, make commodities and get them to market, but instead going directly from M (Money) to M' (more money). Several authors describe the derivatives market as 'meta-capital', capital commodifying its own operations, curving round recursively on itself, spiraling up to a higher level, a financial overworld (Bryan & Rafferty, 2006: 13). If this spiral of meta-capital originated in the realization crisis of low-wage globalization, digital communications provided its conditions of possibility. Financial markets now depend on dedicated, ultra-fast global networks, fully or semi-automated trading programs, and risk modeling programmed by the best and brightest of graduates in mathematics, physics, and computing science – the 'quants'. Algorithmic, high-frequency trading is necessary because of the speed at which risk-based transactions must be identified and executed, taking advantage of

arbitrage possibilities that exist for fractions of a second; stock exchanges build aircraft-carrier sized computing facilities adjacent to their main trading sites because the time lags of satellite uplinks is too long. Financial networks are second in sophistication only to the Pentagon's, and indeed borrow largely from military research. They are a prime site of experimentation for innovations in self-training artificial intelligences. The 'universal galvano-chemical power of society' has become the 'money grid' (Patterson, 2010: 119).

In the ultimate failure of this techno-financial grid we can see what the young Marx meant when he termed money 'the alienated ability of mankind'. The estimated cost of the global bail-out of financial capital tops seven trillion dollars. Alternative purposes to which this expenditure could have been directed include global poverty alleviation, health care, education, and environmental cleaning. Within the logic of capital, however, such projects are of less importance than saving banks. This, concretely, is what it means to say that, as money, humanity's 'species nature' becomes 'estranged, alienating and self-disposing'.

Singularity capitalism

'In the end', Marx writes, 'an inhuman power rules over everything, including the capitalist himself' (1964: 156). The immediate manifestation of the alienation of species-becoming described in Manuscripts is the subjection of the worker to the rule of the factory master. Behind this, however is a deeper process in which the system of commodity exchange assumes an autonomy to which both worker and capitalist are subordinated. Today, however, there is visible a further stage, as this system generates micro-systems of control assembled from digital, genetic and mechanical components which approach a life of their own.

That capitalism favors the rise of the machines is recognized in classical Marxist theory as a secular tendency towards alteration in its 'organic composition' – that is, the ratio between 'constant capital' – buildings, raw materials, and, especially, machines, and 'variable' capital – living labour (Marx, 1977: 762). The long-term tendency of the capitalist system, driven by competition, is to raise the proportion of constant capital to variable capital. Though Marx had in mind mechanization at the point of production, it his argument can be extended to include technological means of speeding up circulation and reproduction. Since the direction is, broadly, an increase in the ratio of technology to humans, it might be better termed a rise in the inorganic composition of capital, a system whose metabolism grows increasingly machinic.

The organic composition of capital usually figures in complex debates about a declining rate of profit arising from the increasing proportion of constant to variable capital. This essay does not enter that discussion, (though the historical path it has sketched, from the crisis of the industrial factory to the creation of global workforce and financial meltdown does suggest that capital's resort to high technology brings it increasingly baroque and ramified economic problems). The point here, however, is that the rise in the organic composition of capital becomes a change in species-composition.

In Marx's time the increase in C relative to V – aka industrialization – drove a massive increase in the mechanical and built environment, the creation of a 'second nature' (Lukács, 1972: 19). This is now overlain by the 'third nature' (Wark, 1994: 86) of informational technologies which do not just increase the ratio of C to V but break down the distinctions between them in new forms of bio-technological and nano-technological production, creating 'cyborgs' (Haraway, 1985), 'flesh machines' (Critical Art Ensemble, 1998), and 'cyber-carnal' composites (Papadopoulos et al., 2008: 132). This process works along two axes – on the one hand, the exploration, via molecular sciences and other life-sciences of the assembled, machinic, and hence engineer-able, basis of biological life; on the other, the construction – via computing science – of increasingly intelligent, and hence life-like, machines. At the point where these paths converge, changes in the organic composition of capital, driven by the imperatives of surplus extraction, becomes a transformation of species composition, in which the distinction between organic and inorganic is slowly collapsed into emergent entities shaped by the priorities of accumulation.

The momentum of capital thus eventually points to an attempt to break through the barriers posed to accumulation by the current form of the human, by generating a 'successor species'. This trajectory today does not lack for explicit ideologists: Hans Moravec (1990), patriarch for 'mind children' who will upload their consciousnesses into cybernetic entities; Ray Kurzweil (2006), proselytizer of a 'singularity' produced by human–AI fusion; Kevin Kelly (2010), celebrant of a self-determining 'technium', and a whole array of trans-humanists and extropians, many situated within the research centers of the high-technology industries. It is easy to ridicule these confident predictors of humanity's technological self-supersession – the 'rapture of the nerds' (McLeod, 2000: 115). But these millennial prophecies intersect too closely with the prosaic systemic demands for faster turn-over and more accurate weapons delivery to be safely ignored.

Marx's account of species-being is an affirmation of the dynamic capacity of humans to change themselves. But singularity capitalism promises such transformations to a few, denies any meaningful determination of the direction of the process and dictates that some step onto the train across the backs of others. Today's species transformations are fueled not just by the continuing labours of an industrial proletariat, building machines for its own replacement, but a new realm of bio-workers whose role is to provide the raw materials for the creation of alien life, for the fabrication of successor species: the organ sellers, surrogate mothers, experimental subjects of big pharma, plant and animal breeders dispossessed by corporate biopiracy, coltan miners, e-waste scavengers, and chip assemblers, the labourers of the singularity, whose destroyed lives feed the next mutation in life itself.

When the bio-rifts of neoliberalism make the masters of the planetary economy more and more literally alien from those they rule, no wonder archaic fundamentalisms are the reactive response. The Manuscripts identify two forms in which species-being is alienated: capital and religion (Marx, 1964: 111). As these two complicit alienations of species-being, futuristic capital and atavistic faith, twine around and turn on each other and on themselves in increasingly terrifying wars, all these species-altering forces converge in the one activity where Marx underestimated capital's transforming powers:

the means of destruction. Today, the American armies operating in Iraq, Afghanistan and Pakistan are an allied force of humans and robots, with over 7,000 semi- or fully-self directed autonomous mechanical agents – robots drones and tanks, such as the Predator, the Reaper, and the Talon – conducting reconnaissance, disarming IEDs, identifying targets, launching attacks (Singer, 2009; Economist, 2010).

This post-humanized military apparatus has its own escalatory dynamic. The video output from Unmanned Autonomous Vehicles (UAVs) flying over the Iraq and Af-Pak theatres is so large that the combined total for the single year 2010 'would take one person four decades to watch.' That volume will increase as America deploys drones equipped with a new surveillance system, Gorgon Stare, that 'stitches together images from lots of cameras to provide live video of an area as big as a town,''with users zooming-in to look at 'whatever takes their interest: a particular house, say, or a car' (Economist, 2010). The answer to this looming information overload is the development of systems such as ALADDIN (Autonomous Learning Agents for Decentralized Data and Information Networks) being researched in a $5 million collaboration between defense giant BAE and a consortium of British universities. This would allow automated agents to process the massive data streams flowing in from UAV observations, soldier-based sensors, satellite data, and other intelligence sources, and bargain or bid according to preset algorithms over what to do in battlefield situations. It is in the light of such experiments that we must now read the passages in the Manuscripts that speak of expropriated labour standing over and against the human as a force not only 'alien' but 'hostile' (Marx, 1964: 108).

A biocommunist prospectus

Four years after the Manuscripts came the Manifesto. What can be said today about prospects for anti-capitalist reappropriation of the products of digital labour?

At the turn of the millennium, the advent of the planet factory generated a so-called anti-globalization movement that was, ironically, the first outburst of the global worker. Integral to that wave of activism was the lateral connection of struggles in the street convergences of summit activism, the meetings of the World Social Forum, and, especially, through digital communication. Altermondialisme was a movement of 'electronic fabrics of struggle' (Cleaver, 1994: 20), of digital civil disobedience (CAE, 1996) and virtual temporary autonomous zones (Bey, 1991). The Internet disseminated the example the Zapatistas, and after the Battle of Seattle Indymedia Centers spread summit activism.

The 'movement of movements' (Mertes et al., 2004) was also, however, a movement of many internal contradictions, both tactical and strategic: between social democrats and anti-capitalist, verticalists and horizontalists, violent and non-violent resisters. How, or if, these might have been resolved in time is impossible to tell. Anti-globalization was abruptly cut short by 9/11. The destruction of the Twin Towers revealed that the planet factory had bred problems deeper than most imagined – an armed, militant, profoundly reactionary counterforce. War on terror hijacked public attention, chilled activism, and redirected the remaining street-energies on opposing invasions.

Many activists have, however, suggested that, beyond internal division and imperial war, the counter-globalization movements had another problem – overreliance on the Net. Enchantment with the fast virtual coordination of summit demonstrations led to a neglect of long term organization. The Net speed that gave the movement of movement its élan also made it evanescent. This suggests a strange parallelism. If digital technology was part of finance capitalism's nemesis, leading it to attempt a bypass of material production by a leap to ephemeral forms, it might be that the global justice movement similarly attempted to short circuit the materiality by reliance on the virtual, so that at times there was more news about struggle than actual struggle – a circuit without nodes.

The brief window in which virtual culture seemed galvanized by dissident energies was, moreover, closing quickly. In the aftermath of the dot.com crash, digital capital was already finding ways to subsume network experimentation, absorbing many apparently subversive initiatives – creative commons, user-generated content, open source software – into 'Web 2.0' business models, so that virtual activism seemed lost amongst the simulacral forms of capital's real abstractions.

Thus when in 2007 financial capital suddenly started to auto-cannibalize itself, anti-capitalist networks went silent. If in the US the disaster translated into Obama's electoral win, enlisting the digital acumen of many activists to party campaigning, this was an ambiguous victory. Crisis at the arcane heights of capitalist command, amongst networks indecipherable even to their owners, didn't present the same targets as the sitting-duck summits of the WTO. In addition, the very conditions that produced the meltdown incapacitated opposition to its consequences. This was not a crisis ignited by worker militancy, but the cardiac attack of a system struck down by its own victorious excess. The working class confronted the near collapse of the system in a state of demobilization, with union and social movement organization worn down by a quarter century of neoliberal attack, precariously employed, heavily indebted, and also speeded-up to a state of pathological exhaustion by 24/7 financial networks and digitalized value-chains. Because of the left's silence, opposition to corporate power travelled right, to tea parties and militias, filling the blogosphere with simultaneous denunciations of big government, bankers and black presidents in a toxic right wing populism. The momentum is not towards a re-compositionary circulation of struggle, but of a de-compositionary antagonism of struggles, leading to, at best, a restoration of capitalist discipline, possibly to something worse.

Nonetheless, even in North America there is left resistance to the austerity regimes by which capital intends to pay for its crisis: anti-eviction movements, the 2009 wave of student occupations against university cutbacks; and, in Canada, an anti-G20 protest that resulted in the country's largest mass arrests ever. As the epicenter of the crisis travels towards the Euro-zone larger and longer-lasting mobilizations have appeared in Greece, France, Britain, Spain and Italy.

The question confronting all these efforts is whether, as the editorial collective of the journal Upping the Ante puts it, 'novel patterns of political affinity, practical activity and leadership – the building blocks of a new "we" – can emerge from the radical left as it currently exists' (Editors, 2010: 36). This search for a new organizational plateau is

so nascent and involves so many experiments, some from within older vanguard or trades unions traditions that have learned from horizontalism, others from younger activists who find rhizomes not everything they were cracked up to be, that generalization is almost inevitably premature.

One feature, however, seems to be the creation new physical spaces for aggregation, allowing a persistence and connection lost by overreliance on virtual communication. The people's assembly is a characteristic form. So too are what Tiqqun (2001) calls 'zones of offensive opacity', militant cells intentionally avoiding the surveillance and chatter of the virtual scene. At the same time, however, these resistances also practice sophisticated digital communication strategies, whether of organizing wild demonstrations, or more strategically in circulating news of struggles. It seems symbolic of this counter-offensive 'on all fronts' that the street battles with police of the British students protesting university cutbacks unfold almost simultaneously with the explosion of hacker activity around Wiki Leaks.

These new struggles are driven by anger and desperation very different from the relative optimism of the counter-globalization movement; they are the insurgencies of a generation for whom capital has, in so many dimensions, decreed 'no future.' Yet the question of a strategic objective is inescapable. David Harvey (2009) remarks that, in an era when all liberal and social democratic ameliorations have weakly prostrated themselves before the prime directives of finance capital, the question is not is another world possible, but 'is another communism possible?' Oppositional rebellions face a 'double blockage' because 'the lack of an alternative vision prevents the formation of an oppositional movement, while the absence of such a movement precludes the articulation of an alternative' (Harvey, 2010: 227).

Can one start to think a communism adequate to the era of climate change, synthetic biologies and global networks? The gamble of Marxism is that liberation lies through, not prior to, alienation: there is no way home, only the capture of the strange planet to which the global worker has been abducted. A politics against the fourth alienation, the alienation of species-becoming, will have to produce a post-capitalism order as different from industrial socialism as industrial socialism was from the agrarian commune, an intensification of tendencies to socialization implicit in the new forces of production and destruction – something we might call a biocommunism

Powerful technology-systems produce large-scale effects rationally incommensurate with private ownership and market allocation. These effects are both constructive and destructive. They include both catastrophic ecological hazards and the productivity necessary for large sectors of the global populations to emerge from chronic immiseration. Confronting this contradiction, socialist progressivism and romantic primitivism alike appear hopelessly linear and one-sided. A diagonal approach that puts to the front the question of the social form within which technologies are produced and deployed is required.

The autonomist tradition inverted the concept of the organic composition of capital to produce the concept of class composition: the technical composition of the class, the labour process in which it was involved, became the basis for a political composition, a

capacity to become a counter-power against capitalist command. Extending this line of thought, perhaps we can say that the objective of political struggle is to replace organic composition of capital with the organic composition of the communal, in which decisions of resource allocation and investment are determined in a collective and democratic fashion.

In such a composition, the creations of digital labour could have at least three important roles. First, productivity increases from computerization could be translated, not into profits, but into resources, not just of goods but of time, allowing collective participation in decision making. Second, 'open source' circulation of knowledge and inventions would be an important element of new forms of cooperative production. Third, networks would be part of the architecture of an infrastructure of distributed democratic planning and debate of the difficult questions a biocommunist society would face: slowing or mitigating climate change, the role of genetic engineering outside corporate ownership, and, recursively, the level of virtualization that is commensurate with collective democratic planning. As Marx (1977: 447) put it, in one of his very few allusions to Gattungswesen in his later writings, 'when the worker cooperates in a planned way with others, he strips off the fetters of his individuality, and develops the capabilities of his species'.

Economic crisis is colliding with climate chaos, ecological exhaustion, energy depletion and emergent challenges to a fiscally bankrupt but militarily dominant imperial hegemon. To foresee cataclysmic instabilities ahead is neither pessimistic nor optimistic, but a historically-informed extrapolation from current tendencies. In this context, it becomes realistic to consider the cycle of university rebellions now traversing Europe, the pulsing of industrial revolt in Southern China, the climate change assemblies of the farmers and miners of Bolivia and the migrant worker movements raging from Phoenix to Marseilles as anticipations of larger tumults to come.

As this essay undergoes final revision, the contending potentials of planetary labour under digital conditions have become dramatically visible in the popular revolts sweeping North Africa and the Middle East, revolts whose main antagonists are dictatorial and kleptocratic client regimes of global capital. On the one hand, the ignition of these uprisings--one of whose immediate catalysts was the Wikileaks exposure of the corruption of the Tunisian regime--and their rapid circulation, via satellite television, mobile phone, and social media networks, testify to how contemporary means of communication can, despite censorship and black-out, abruptly burst apart the limits on thought, speech and action imposed by the dominant order. On the other, however, the insurgents who fought out against security forces in streets and squares with stones, sticks and small arms, in the most brutally immediate combat, are a defiant, collective self- assertion by subjects who have been *excluded* from the benefits of the so-called information economy. They are an eruption of populations consigned by the world market to the margins of high-technology development, to labour at its ignored material base, in oil fields and gas pipelines, mines, waste sites and farms. They are consigned to a reserve army of the un- and under-employed, suffering gyrations in food prices dictated by climate change and financial speculation in an immiseration from which migration offers the only escape. Western media have focused on the first part of this equation–the undeniable importance of computer networks–for the

uprisings; but in doing so they have created a narrative that not only focuses on the most affluent elements in the insurgent movements, but also complacently affirms the merits of market-driven technological progress. What such narratives underplay is the second, crucial, aspect of the uprisings, namely the explosive stockpile of equally market-driven unemployment, exploitation and inequality–that is to say, of class conflict--that underlies the revolts.

Regardless of their outcome, whether catastrophic, compromised or victorious in unimaginably experimental ways, these uprisings have already returned to the political horizon possibilities of radical self-organization that have in so many places been banished for a generation. They are revolutions detonated by the meeting of extraordinary high technological development and extreme inequality, a contradiction that defines the condition of the global worker, and whose resolution will determine the trajectory of human species-becoming. In such struggles, the future of the 'actual living species' (Marx, 1964: 112) will depend on the level of biocommunist organization.

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the author Nick Dyer-Witheford is Associate Professor, Associate Dean, and a member of the Digital Labour Group at the Faculty of Information and Media Studies, University of Western Ontario.
E-mail: ncdyerwi@uwo.ca