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Cybernetics and the Making of a Global Proletariat

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Abstract

This article analyses the relation of cybernetic technologies to global class composition in the light of the 2011 revolts and their aftermath. Almost from their inception, computers and networks were weapons wielded by advanced capital not only against external enemies but also against its industrial working class. From the 1970s on, computerized automation, digital supply chains and electronic financialization served as instruments in the decomposition of the Fordist mass worker of the global North-West. In the same process, however, they constructed the technical basis for a new world-scale mobilization of labours, wages and unwaged—that of a global proletariat. It was stacked, segmented and segregated across planetary wage zones, but commonly characterized by subjection to extremes of plutocratic power, precarity, migrancy, ecological disaster and networked connection. The financial crash of 2008- paradoxically caused by the very success of capital's cybernetic offensive in creating a low-wage high-tech economy--in 2011 generated a new cycle of struggles signaling a political recomposition of new proletarian segments and re-proletarianized members of intermediate 'middle class' strata. These uprisings featured widespread re-appropriations of social media and mobile networks. The *detournement* of capital's technologies is however, a more contradictory process than is recognized by either enthusiasts for or detractors of so-called 'Facebook revolutions'; it brought both strengths and weaknesses to the 2011 uprisings. As repercussions of the crisis continue to roil the word economy, new movements of proletarian recomposition combining both rejections and adoptions of the digital, can be expected in contexts characterized by intensifying automation, omnipresent surveillance and incipient cyber-wars.

Introduction: composition

The concept of class composition, passed to the present from the schools of workerism (*operaismo*) and autonomist Marxism (Wright, 2008; Eden, 2009), enables us to think both the constancy of class antagonism within capital and how the features of such antagonism change historically (Cleaver, 1979; Dyer-Witheford, 1999; Wright, 2002; Read, 2003). In such analysis the role of

machinery is crucial, not in any technologically determinist sense, but rather as the "weaponry" of class struggle (Cleaver, 1981).

The theorists of o*peraismo* (Tronti, 1977; Panzieri, 1980; Alquati, 2013) took as their point of departure Marx's concept of the organic composition of capital--the ratio of fixed capital (raw materials and machines) to variable capital (workers). In Marx's account, this ratio was considered as it affected the waxing and waning of capital's surplus value extraction. *Operaismo* however famously "inverted" the idea of composition and viewed it from the position of the working class (Tronti, 1977). The "technical composition" of the class involved the modes of division, control and replacement imposed on it by capital, but its "political composition" entailed the capacities of workers to resist and defeat capital (Kolinko, 2001). While the classic Marxist concept of capital's composition points to consideration of how technology affects the rate of profit, the idea of class composition looks at how it influences the rate of struggle.

Operaismo class composition analysis was strongly oriented to identifying forms of worker organization at the leading edge of revolutionary struggle (Wright, 2002). The paradigm case was the "mass collective worker" of the Fordist factory, whose technical composition as de-skilled labor on semi-automated assembly lines contained within it the political capacity to paralyze production by strikes, walk outs and sabotage. The celebration of this form of struggle by *operaismo* drew on the experience of the American working class from the 1930s on, but in the Europe of the 1960s it was belated, just before capital largely dis-assembled the mass worker's factory base with automata and networks.

There were various attempts by operaismo theorists to analyze the new conditions of post-Fordist class composition (Bologna, 2014). Best known is that of Antonio Negri and his co-author Michael Hardt, who in *Empire* (2000) suggested that a fully global capital now confronted not so much a working class as a "multitude" immersed in "immaterial labour" of networked production. Whereas previous Marxist analysis, including that of the *operaismo* tradition, emphasized the despotic, deskilling functions of cybernetics, Hardt and Negri instead stressed the potential for this new "cyborg" (Haraway, 1985) workforce to re-appropriate the technological products of the "general intellect" (Marx, 1973) in moments of spontaneous rebellion.

This appeared as youthful alter-globalist protestors grown up with the World Wide Web and music piracy were taking to tear-gas drenched streets from Seattle to Genoa, experimenting with indie-media centers, Zapatismo in cyberspace and electronic civil disobedience. The book *Empire*, and two subsequent volumes (Hardt and Negri, 2004; 2009), became the basis of a '*post-operaismo'* analysis of "cognitive capitalism" (Terranova, 2004; Lazzarato, 2004; Virno, 2004; Vercellone, 2006; Fumagalli, 2007; Moulier-Boutang, 2011; Pasquinelli, 2014). It also, however, met with fierce scepticism from other sections of the left (Dean and Passavant, 2003; Balakrishnan, 2003; Camfield, 2007). Hardt and Negri were criticized for the vagueness of "multitude", and its ambiguous relation to class; for their apparent denial of materiality and manual toil; and for a teleological, and technological, optimism. They were "downgrading the negative" (Noys, 2010: 125) in a way that uncannily mirrored bourgeois information society theory.

In my view Hardt and Negri's analysis was both an important, provocative challenge to nostalgic leftism fixated on memories of a fading class composition, *and* at crucial points cloudy, hyperbolic and romantic. It also now requires reassessment in the context of the 2008 financial crash and new struggles that show some continuities with *alterglobalism* but also sharp differences. This article therefore proposes a 'post-post-*operaismo*' analysis that can be read as extending and critiquing Hardt and Negri's work by specifying aspects of the multitude missing from their account of its

composition (Dyer-Witheford, 2008), and by recovering the class relations that term occludes. This discussion will turn on the concept of proletarianization [1].

'Working class" and "proletariat" are often used synonymously to mean simply wage-labor. Proletariat can, however, convey a wider provenance. Marx himself was clear that being a proletarian was, by definition, a condition of precarity, constantly liable to ejection from the "filled void" of workplace exploitation and vulnerable to the "absolute void" of unemployment and social "non-existence" (1964: 122; see also 1977: 764). Some class composition theorists have developed this expanded concept of proletarianization - for example, George Caffentzis (2013), Silvia Federici (2012), and Midnight Notes (1992) in their analysis of primitive accumulation and female domestic labor. I draw particularly on Karl Heinz Roth (2012) whose work with labor historian Marc von Linden (2013) insists that the exclusive focus on wage labor misses much of the underside of twenty-first century capital.

Roth and von Linden delineate a proletarian "multiverse" made up of diverse waged and unwaged labors, emphasizing how much the global economy depends on forms of dependent, informal, bonded or slave labor, and other forms of shadow work, (many of which, I would add, now occur on digital networks). Roth also sketches a dynamic of "de-" and "re-proletarianization" by which certain workers rise out of sheer poverty and disempowerment through strong organization or special skills, only to face "re-proletarianization" as technological change or new labor sources kick the floor out from beneath apparently secure and well-rewarded jobs (2010: 219).

Centering class composition analysis on 'proletarians' rather than 'workers' acknowledges that today, as the weak joke has it, capitalism isn't working; a large proportion of the working class exists outside of, or in a very intermittent relation, to the wage. Proletariat encompasses not only the 'flexibly' employed assembly line electronics worker or call-center operative but also the former peasant populations plucked off the land without being able to find employment, or labor ejected from production by cybernetic automation and communication as so much living debris. Now, as in Marx's era, proletariat denotes the incessant phasing in and out of work and the workless-ness, or precarity, of the class that must live by labor - a condition raised to a new peak by cybernetics.

Cybernetics

"Cybernetics" is an old term (Wiener, 1948), today largely superseded by reference to 'digitization', 'ICTs' (Information and Communication Technologies) or the 'knowledge economy.' It is, however, a resonant name, for its derivation from the Greek *kybernetes* –'rulership' gives it connotations of command and control, and points to the deep issue behind the development of computers and networks; that of who (or what) will rule in an age of intelligent machines (Tiqqun, 2001).

Capital is a whirlwind- like formation that both depends on labor and replaces it with machines in a "moving contradiction" (Marx, 1973: 106; see Endnotes 2010). Historically its cyclonic path has relied on the accelerating throughputs of successive industrial revolutions -the steam engine, cotton jenny, self-acting mule, railway, coal-burning ship and telegraph, all the way to the semi-automated assembly line. The latest of these violent machinic injections is the cybernetic revolution, catalyzed by the Second World War and then by the Cold War. Its leading theorists - Norbert Weiner, John von Neumann, and Claude Shannon, fused work on computerized automata—autonomous machines, self-reproducing robots, and artificial life, with research on digital networks and communications, laying the foundations of capital's information age (Hayles, 1999; Johnston, 2008; Kline, 2015).

Developed within the US "iron triangle" (Edwards, 1997: 47) of military, corporate and academic interests, cybernetic technologies rapidly became the basis of a commercial computer industry. Driven by the two great "laws" of digital production, Moore's, which specifies that the computer power available at a given price doubles approximately every eighteen months, and Metcalfe's, which declares that the value of a network increases as the square of its nodes, cybernetic development follows a runaway trajectory. In 1946, 12 percent of the US fixed investment in equipment was for data processing; by 2001 communications and computers made up almost 50 percent of fixed investment (Dumenil and Levy, 2004: 152-153). Using slightly different measures, the OECD (2013a) declares ICTs "the most dynamic component of investment in the late 1990s and early 2000s", accounting for about one-third of private investment in US economy, and between 10 and 25 percent in other advanced economies (OECD, 2013a; Worthington, 2014: 60).

ICT industries, defined as including communications services, computer and related services, communications goods and semiconductors, computers and office machinery, constitute about 6 percent of global GDP, and a similar share of most major economies, (including China) (OECD, 2013a). However, these figures do not include components that are incorporated in other products, such as motor vehicles or machine tools. Many economists claim ICTs importance cannot be assessed sectorally because they are a "general-purpose platform technology" that "fundamentally changes how and where economic activity is carried out ... much as earlier general-purpose technologies (e.g., the steam engine, automatic machinery) propelled growth during the Industrial Revolution"(NSB, 2012).

In considering the implications for class composition, we must look at both the computer industry's own work force, and the consequences of computerized applications within other industries, from auto-manufacture to big-box retail of the digital machines enabled by computer technologies. Silicon Valley saw the emergence of a distinctive set of production relations (Hayes, 1989; Pellow and Park, 2002). These included the rise of astronomically rich capitalists supported by venture capital; a well-paid (albeit increasingly regimented and routinized) cohort of programming professionals; and an array of proletarian - often female and non-Caucasian - service and industrial workers, and, in regard to chip manufacture, intensifying automation (semiconductor factories are amongst the most capital intensive on earth).

As the computer industry developed, various shards of the production process were broken off and distributed planet wide (Luthje et al., 2013)—electronics assembly work to Special Economic Zones (SEZs) in Latin America, Eastern Europe and Asia, and then overwhelmingly to China; routine programming to India; semiconductor plants to Taiwan. In its advanced capitalist heartlands, the ICT sector today accounts for some 4-6 percent of the workforce, but internationally, it includes some of the world's largest employers (e.g. Hon Hai Electronics, *aka* Foxconn). And while information society propaganda has seized on the image of hacker-entrepreneur, recent research along the computer industry supply chain's discloses some of the most degraded, desolate and toxic forms of proletarian labor on the planet, from coltan mines, to electronics assembly lines, and e-waste sites (Smith et al., 2006; Brophy and de Peuter, 2014; Dyer-Witheford, 2015).

Far more complex is the issue of how the computer industry's innovations reshaped the labor of workers in other industries, new and old. The OECD (2011a) recently adopted two measures of "ICT employment," one "narrow," comprising specialists directly focused on ICT such as software engineers" the other "broader," counting "jobs that regularly use ICT" such as "scientists and engineers, as well as office workers", but excluding teachers and medical specialists for whom, apparently, "the use of ICT is not essential for their tasks." The narrow definition accounted for 2-5

per cent of OECD employment, and the broader group for over 20 percent, with both on a rising trend (there is no comparable data for poorer countries).

However, though it is important to distinguish modes and intensities of computerization, digital devices today enter nearly all labor processes, from fast food to architecture. Ursula Huws, whose analysis of the "cybertariat" (2004) is a major contribution to the discussion of cybernetics and proletarianization, suggests that today "ICTs . . . become part of the taken for granted environment of *all* work (2014: 22, original emphasis). This is not exclusive to advanced capital; the global explosion of mobile phones extends the ICT work environment to India or China. It does not require an "immaterial labor" thesis to recognize that computers and networks touch the conditions of even brutally material labor; the next section identifies some key tendencies in this process.

Though the class composition of the computer industry must be distinguished from changes in the composition resulting from computerization of other industries, there is also a connection. As the Fordist Detroit auto factory was in its era a template for the mass worker class composition that spread in other industries, so the Silicon Valley computer enterprises (itself the most computerized form of production in the world) provided a model for wider transformations associated with cybernetics (Bacon, 2011). In particular, the vertiginous distinction between billionaire, one percent capitalists, a new strata of digital professionals, and immiserated proletarians outside traditional labor organizations became a new norm. Both the latter groups are precarious, but at very different levels of income. What follows therefore emphasizes the adjacency and overlap between the computer industry itself and the wider class composition of a "cybernetic capitalism" (Robins and Webster, 1988; Tiqqun, 2001; Peters et al., 2009).

Globe

Capital's adoption of cybernetics was set in the context of the overall crisis of class relations that afflicted advanced capital in the last quarter of the twentieth century as it confronted an industrial working class whose strike power drove wage and welfare gains that threatened the rate of profit. The new technologies first developed to combat the external threats of fascism and state socialism, were also, almost from their inception, but especially from the 1970s, deployed against advanced capital's home front, to break down mass worker strength (Noble, 1984; Schiller, 1999). This "cybernetic offensive" (Tiqqun, 2001) involved:

i. **Automating factories**: the classic mechanical liquidation of labor pursued at a higher level by self-guiding tools. The first cybernetic robot arm was patented in 1961 and used on General Motors assembly lines (Rosen, 2011), setting in motion a decades long "micro-miniaturization and robotization of production facilities, and conversion of machinery into assemblages of individually enumerated and monitored components" (Roth, 2010; 230). This occurred across an increasing range of manufacturing and office workplaces.

ii. **Relocating industrial production**: many commodity chains became dependent on telecommunications infrastructures, modularized interfaces, bar codes and radio frequency identification tags (RFIDs). This is the logistical aspect of the cybernetic, which rather than replacing labor, expands it globally - but at the lowest wage, and with maximum disposability, and minimum environmental regulation (Gereffi and Korzeniewicz, 1994; Schiller, 1999; Tsing, 2009; Cowen, 2014).

iii. **New forms of commodification**: in the former industrial centres plans for post-industrial growth increasingly rest on fresh commodity opportunities opened by cybernetics; consumer computing, Internet and web services, video games, business applications and social media. Such industries are formed outside of, and in sharp differentiation from, the class struggle conditions of the mass worker

iv. **Financialization**: computing has been intrinsic to the electronic connection of banks and stock markets (Schiller, 1999; Zaloom, 2006), and the development of increasingly esoteric financial instruments such as derivatives and futures. Initially, these instruments were employed defensively to hedge foreign investments before morphing into high risk speculative activities dependent on computer modeling and high-speed trading (McNally, 2011).

Over some forty years from the mid-1970s these processes decomposed the factory bases of the classic working class; the mainly male, eventually relatively well-waged mass worker of the planetary north-west. With this decomposition, an entire culture of class struggle all but melted into air. What emerged was the technical basis of a new class composition - that of a global proletariat, or perhaps more properly a set of global proletariats sliced, diced and dispersed along the supply chains that gave capital a worldwide supply of labor, even as it its need for labor was diminished by automation. From 1980 to 2010 capital's planetary labor force expanded from 1.2 billion to about 3 billion, not just by population growth, but by deepening market penetration of the planet: the end of the socialist bloc alone doubled the number of workers available (Dobbs et al., 2012: 3; World Bank, 2013b: 3–4). Capitalism has of course *always* drawn on world-wide labor: the slave trade, super-exploited colonial workers, and peasantry of the periphery all attest to this usually brutal truth. But today this labor is organized in systems of production and circulation of a scope, flexibility and granularity that would have been impossible without cybernetic technologies.

In the 1960s and 1970s Marxist world-systems theorists had analyzed the relation between capitalism's industrial "core" and a "periphery" of formerly colonial possessions condemned by the "development of underdevelopment" (Frank, 1966). These possessions served as an apparently perpetual reservoir of raw materials and cheap labor (Amin, 2010). During the 1970s and 80s, however, capital's supply-chain driven restructuring disrupted this map of "core" and "periphery." The rise of Asian "dragons" or "tigers," (Singapore, Taiwan, Hong Kong and South Korea), special investment zones (SEZs) in Asia and Latin America, and, eventually, the emergence of China as the "workshop of the world", broke up the unity of the global South, as some areas industrialized and others slid into deepening misery. By the 2000s, a celebratory ruling class discourse on "globalization" asserted that all traces of a colonial past had been erased in the "flat world" of universal capitalism (Freidman, 2005), a view echoed in Hardt and Negri's (2000) account of the "smooth" space of empire.

In reality, neither Third World-ism nor Empire-theory adequately describes the globality of cybernetic capital. Capital's colonial expansion, driven by its need to escape internal class conflict, had produced a planetary core/ periphery structure that was now, at a higher level of subsumption, reworked as the manufacturing capacity of the former industrial centres in North America, Europe and Japan were off-shored. Wage and regulatory differentials between the former capitalist core and periphery drove this offshoring process, but it also set in motion a reverse dynamic whereby some low-wage destinations ('BRICS'-Brazil, Russia, India, China and South Africa) upgraded themselves

as subsidiary or rival centres of capital accumulation, while other areas, by-passed entirely by the supply chains, slid into catastrophic immizeration.

In terms of class composition, what results is neither smoothly unified nor stably segregated. *Theorie Communist* (*TC*) (2011) speaks of series of "zonal" arrangements; "capitalist hypercenters" of "finance, high technology, research'; secondary zones of assembly, logistics, and distribution; and perpetual crisis zones or "social dustbins." As *TC* observes, "Although the valorization of capital is unified through this zoning, the same is not true for the reproduction of labor power." In the first zone, "high-wage strata" mesh with fractions of the labor force for whom "aspects of Fordism have been preserved" while others struggle in precarious work and welfare. In the second zone, precarious low wage employment is the norm, with "little or no guarantee for social risks". In the third, proletarians depend on informal economies, illicit trade, humanitarian aid, and agricultural survival. The 'poverty line' usually applied to crisis zones is $1.25 a day, an amount that in the United Kingdom would be equivalent to "37 people living on a single minimum wage, with no benefits" (Selwyn, 2014). The USA's official poverty line in 2013 was $63 a day for a family of four (Economist, 2013: 11). This does not mean that the poor in the US or other capitalist hyper-centres of the planet do not suffer, or that they are precisely 12.6 times better off than those in the planet's crisis regions, but it does indicate the sharpness of capital's zonal differences.

These zonings still reflect colonialisms deeply racialized division of global labors, but are more porous and volatile, repeatedly traversed by new proletarian migrations and subject to constant re-alignments of capital. In these arrangements, class is both fractal and fractioned; fractioned in so far as the conditions of social reproduction vary sharply, fractal in that the basic relations separating capital, intermediate strata and proletarianization manifest across all of them, albeit in different mixes and ratios. It is far better, usually, to be a proletarian in Canada than a China, and better in China than Chad, but in each zone, capital leaps ahead of all other classes, and intermediate classes pull ahead of workers, who, in different registers (depending on their permanent, part-time or precarious relation to capital) repeatedly lack control over working conditions, relative impoverishment, and chronic insecurity. Thus, paraphrasing Gurgaon Workers News, we could say that there is a planetary proletariat, but "in local [or perhaps zonal] formation" (2010). It is segmented, stacked and stepped across a hierarchy of border-policed wage zones from Bangladesh to Baltimore, but also networked and connected, to capital, commodities, and to itself by vast systems of transportation, over two billion internet connections and by seven billion mobile phones (World Bank, 2013b). The entire formation is charged with simultaneous potentials for intra-proletarian conflict and affinity.

Proletarians

Within this process of technical recomposition of global class relations, I identify seven points of where cybernetics has played an important role in global proletarianization:

i. **The erosion of the global peasantry**. Around the world the subsistence farming that for millennia supported most of the world's people has in recent decades been slowly collapsing (Wildcat, 2008; 2011). This is due to many pressures, amongst them the automated harvesters and genetically modified seeds of high tech, mono-cultural agribusiness plugged in to the supply chains of the global food industry (Weis, 2007). The consequence is a world-historical flight of populations from the land in a massive new round of the primitive accumulation that provided capital's early proletariat. More and more people depend on commodity exchange, but only some can sell the one commodity they own—their labor power. Of the capital's 3 billion workers almost half are unwaged

and 'vulnerably employed' i.e. unpaid family workers and own-account informal workers (Foster, 2011; Dobbs et al., 2012: 3; World Bank, 2013a). Indentured servitude, bonded labor, outright slavery and pitiful piece work abounds, not least at the base of cybernetic industries themselves, be it as Chinese rare earth extractors, Colombian or Congolese coltan miners, or e-waste pickers in Ghana or India.

ii. Some of the tide of dispossessed flood into the ranks of **new factory proletariats**. Contrary to de-industrialization claims, the world employment share of industrial labor has remained relatively steady over the last four decades. However, industrial work *has* been trans-nationally reorganized, declining in old industrial countries as it moves, first to special export zones in Central America, Eastern Europe and Asia, then in China (Silver, 2003; Ngai, 2005; Chan, 2013). This generates new industrial proletarian formations that not only stand at the foot of cybernetic supply chains, but make cybernetic machines. Their work conditions are indexed by disasters such as the Rana Plaza collapse, or by the anti-suicide nets at Foxconn. These formations in some ways resemble those of the old mass worker. However, the solidarity of today's workers is weakened by the agility of digital supply chains and the new intensities of automation available to capital if particular workforces put upward pressure on wages.

iii. **Tertiarization**. If agricultural work is declining and industrial work steady, work in the third sector, services, is growing. 'Service' is a notoriously vague category, but we can say much of it incorporates the spheres of circulation (retail, advertising and promotion, sales), and social reproduction (domestic work, health care, education). The growth of the service sector, and the new 'nimble fingered' industrial assembly work, has been closely tied to what is sometimes termed the feminization of work, actually a female 'double shift' of work, both waged and unwaged (Huws, 2003; 2014). Although some service work such as haircutting or hospitality work is 'in person', much is intensely mediated by information technologies. This includes routinized information work performed by a "white collar" but brown or yellow skinned proletariat" (Nadeem, 2011: 4). Such workers can be found in call centres, and various forms of shadow work, from gold farming for computer games to virtual sex work (as well as in attempts to control such outlaw activity, as in commercial content moderation).

iv. **Migrations**. There is debate as to whether populations are today more mobile than ever before. In the nineteenth century 10 percent of the world population may have migrated, largely on trans-Atlantic routes to the North American "new world". In comparison, it is suggested, today's supply chain globalization is actually more friendly to the mobility of capital than of people (Solimano and Watts, 2005). However, if one takes into account migration within national borders, the picture changes: the movement off the land in China alone over recent decades is often considered the largest in history. Today's migrations are certainly different from those of previous centuries. They follow new routes; they involve more women, many leaving families at home that they support by working to care for them abroad. Other migrants are caught up in massive global sex trafficking operations; and they move at tempos shaped, on the one hand by new means of transportation and communication, such as mobiles, and on the other, by the barriers of smart borders and detention camps (Mitropoulos, 2003; Papadopoulos et al., 2008; Struna, 2009; Mezzadra and Neilson, 2013).

v. **Re-proletarianized professionals**. Informal work, new factory labor and cyber-service work are each segments of classic proletarianization, a long stretch from the empowering knowledge work that was always promised with cybernetics. But such work does, to a degree, exist, largely in the new intermediate strata emerging between labor and capital. It is composed of those who design hardware and software for cybernetic systems, or who supervise, train and manage, and educate those working

with such technologies—in administrative offices and game studios, the medical and military apparatus, in the great information corporations, and in the finance sector. Over the last decade the share in employment of "professionals and technicians" has increased in most economies. In Europe they account for about 25 percent, in developing countries they number perhaps 15 percent and have become central to narratives of progress. One example is that of a 'Shining Idea' built around computer programming offshored from the US (Aneesh, 2006; Biao, 2007). The ILO (2011) identifies new intensities in automation and communication as an important factor in this growth.

It is in this intermediate sector where we might expect to find the 'good jobs'. They are well paid, with some workplace autonomy. Such jobs are celebrated in accounts of a new "creative class", ascendant "symbolic analysts", and burgeoning IT "knowledge workers". However, over recent decades these middle-class jobs have become increasingly subject to the very dynamics of network outsourcing and automation which they help set in motion. They are also vulnerable to the labor shedding promoted by the merger and acquisitions resulting from the drive of corporations to increase their value in financial markets. Consequently, across a whole range of information and technical professions—from journalism, public relations, advertising, and design to software development—more work is performed by pools of low-waged, precarious labor, clinging by its fingernails to high-status but poorly paid and exhausting jobs, or by equally insecure freelancers (McKercher and Mosco, 2007; Ross, 2008; Gill and Pratt, 2008; Bergvall-Karebon and Howcraft, 2011; Timberg, 2015). The precarity of these re-proletarianized professionals**,** who were to become important actors in the 2011 revolts, was aggravated by two sources of 'free labor' to which we now turn.

vi. **Social media free labor**. The Web 2.0 search-engine and social-media model which appears from 2004 onward depends on the free labor of user-generated content and search results (Terranova, 2000; 2010; Fuchs, 2014a ; 2014b) [2]. It produces a small amount of technical work for companies such as Google, Facebook and Twitter which employ few paid workers. Approximately 1.17 billion people use Google; their workforce numbers 50,000. There are 1.35 billion Facebook users compared to a workforce of 8,000. Twitter attracts 232 million users yet employs only 3,500 (*Economist* 2015). The search-engine, social-media model also mobilizes free 'prosumer' content provision just as 'old media' professionals, such as journalists, are threatened by the competition of free labor. Meanwhile, there has been a surge of micro-business ventures, spurred on by niche advertising on Facebook or Google, which partly compensates for the lack of stable employment.

vii. Similar increases in precarity accompany the world-wide growth of a **student workforce**. As EndNotes (2013: 34) points out, during the 2000s, global participation rates in post-secondary tertiary institutions rose all around the world, as universities and colleges attracted the children not only of capitalists and professionals, but also the offspring of proletarian families. Such students were working through school or racking up debts. The "edu-factory" (Edu-Factory Collective, 2009) incorporates vocational mission, corporate management models, deep divisions between tenured faculty and contract instructors, and the emphasis on science, technology, engineering and mathematics (STEM). The tight linkages of such institutions to the high-tech sector, was in part a response to the needs of cybernetic capital, for which it functions as an incubator, market and supplier of low- or no-pay interns (Bousquet, 2009).

Capitalist cybernetics thus involves new proletarianization as well as de-proletarianizing and re-proletarianizing tendencies. As the classic mass worker declined, leaving behind a diminishing group of protected workers with full time wages and benefits, capital's labor force not only spread out across the world, it also balkanized, like an amoeba splitting into segments. On the one hand, we observe a vast sea of chronically insecure labor, and on the other a growing intermediate strata of professionals

and technicians, who are nonetheless undermined by free labor of various types while being vulnerable to crisis fluctuations (Therborn, 2012; 2014). The most extreme split, however, was that between capital and everyone else.

Crisis

In 2005, the investment bank Citigroup affirmed that "the world is dividing into two blocs—the Plutonomy and the rest." This plutocratic class is divided between mere millionaires, of whom there are about 29.6 million (less than half a percent of the global population) and the 847,000 Ultra-High Net Worth Individuals, with assets of over $50 million (Credit Suisse, 2011). Silicon Valley's top tech magnates—the likes of Gates, Ellison, Bezos, Brin and Page, Zuckerberg, and Jobs regularly occupy lists of the richest people on the planet. According to The Economist (2015), the "silicon sultans" represent one of the most significant concentrations of business wealth in the world. But this accumulation of high-tech fortunes is not the only or most significant contribution of cybernetics to the rise of 'the one percent'.

Over the period of rapid cybernetic adoption—from the 1970s on—capital's share of GDP relative to labor has steadily increased all around the world. According to the International Labour Organization (ILO) (2011), labor's share in 16 developed countries dropped from about 75 percent on in the 1970s to 65 percent just before the financial crisis. This fall is evident across "rich" and "poor" economies alike. In China labor's share of GDP nearly 65 percent in 1992 fell to 50 percent in 2008.

Although explanations for this shift vary, they always implicitly or explicitly emphasize the role played by cybernetics. The ILO ascribed 46 percent of the fall in labor share to growth in the financial sector—the most highly cybernetic sector of capital, dependent on algorithms, computerized risk modeling and high-speed network trading. The OECD, in contrast, attributes 80 percent of the shrinkage in labor share to "capital deepening" made possible by new technologies, allowing business to capture productivity increases and replace workers by machines, especially in routine jobs (OECD, 2011; Wheatley, 2013). Whichever of these two explanations is most correct, the message is the same: cybernetics enterprise has been capital's armourer in a relentless class war waged from above.

The economic crisis that began in 2008 with the implosion of US sub-prime mortgages was not effected by global working class strength but by global working class weakness. Paradoxically, it arose from the very success of capital in decomposing its class antagonist. The defeat of the mass worker and the erosion of the welfare state in the global North created a problem at the consumption end of capital's circuit. Wages and social costs in the centre could be held in check by automation and outsourcing, but a global low-wage economy with limited purchasing power, generated over-production and a shortage of investment opportunities. At the same time—and in a reciprocal relation with this over-production problem-- the growing costs of technological investments in increasingly complex cybernetic systems began to cancel out whatever remissions computerization had given capital from the tendency of profit rates to fall.

Finance capital filled this void with a bubble of debt and speculation. Debt, via credit cards, mortgages or micro-finance, created consumption power that the global proletariat lacked. Loans for the purposes of consumption would be paid back with interest over life-times. Derivatives and other speculative instruments enabled capital to make money gambling on the risks of its own circuit without actually producing and selling commodities. When capital's contradictory need for low wages and high consumption collided in the sub-prime mortgage collapse that destroyed the US

housing sector and disrupted the entire world market, cybernetic systems of exceptional scope and speed created the networks for this runaway breakdown.

Finance capital's "money grid" (Patterson, 2010: 119) distributed esoterically packaged 'securitized' subprime mortgages primed to explode like mailed time bombs. Once these started to go off, financial markets responded at speeds dictated by algorithmic trading programs sensitive to time-arbitrage possibilities that existed for milliseconds. Thus the house of cards fell fast and hard, as defaults on sub-prime mortgages caused a general credit crisis, the paralysis of industrial capital, and the government bailout of banks. This series of events set off waves of global disruption, moving in complex and contrary directions, manifested simultaneously in the terrible slowness of US welfare lines compared to the speed-up of Chinese assembly lines.

Within cybernetic capital, the proletarianizing process of absorption into, and ejection from waged work, can be metaphorically depicted as that of different population's fluctuating in in altitude above an ever present abyss of immizeration. This provided the basic process of accumulation. Neoliberal economists boasted of an "end to poverty" by global industrialization (Economist, 2013: 11). Around the world proletarians emerging from peasant communities were, at least in monetary terms, better off, than their parents. Everywhere, however, they were separated from their class masters by a greater gulf than ever before, and in ways more visible thanks to advanced media. They also inhabited a world in which the close coupling of cybernetically integrated systems meant that turbulences created an immense insecurity, so that improvements in living conditions could be dashed in a few months by an alteration in technological conditions, or in a day by the millisecond fluctuations of financial markets.

Even before the crash, 'precarity' had become a flashpoint. The term originates in Euro May Day during the mid-2000s. It focused on a range of labor arrangements that dissolved security and income. These included part-time work, temporary-work, unpaid internships, freelancing, and unstable and dependent self-employment. Precarity was also encapsulated by the prevalence of informal work in the Global South, the casual employment that increasingly replaced Japan's 'salary men' (Alison, 2013), and the situation of migrant workers in South China's factory system and elsewhere (Standing, 2008: 1-4) [3].

The sudden paralysis across the key sectors of the capitalist economy following the Wall Street crash of 2008 threw into terrible clarity the underlying problem of cybernetic capital—its vast "over-supply" of labor relative to what capital was willing to wage (Alpert, 2013). This oversupply was generated by the automation which replaced work of all kinds; through networked supply chains, which, while they delivered jobs to the end of the earth, could as swiftly snatch them back again. At the same time, electronic financialization severed accumulation from production. Cybernetics had at once enlarged the pool of workers on which capital could draw, and enabled capital to disassociate itself from these workers. It was the existence of a great, cybernetically-created pool of un- and under-employed labor that was at the heart of the global proletarian condition.

At the peak of the crisis John Foster *et al* (2011) reanalyzed International Labour Organization (ILO) figures depicting the global workforce. He noted that the numbers for those "vulnerably employed"—that is, laboring in informal, subsistence and unpaid work, the "economically inactive" (students, criminal, and chronically unemployable), and the outright unemployed, amounted to a figure of some 2.4 billion (compared to the 1.4 billion in the "active labor army") (Foster, 2011: 20). Foster and his co-authors discussed their findings in terms of the classic Marxist category of the unemployed "reserve army". Even this category may be inadequate to the scale of the problem their

work identifies, since it is clear that many of those in the reserve would never be called for active service: their predicament invoked a yet bleaker term, "surplus humanity" (Davis, 2007).

The proletariat that was plunged into the 2008 crisis was more segmented and more fluid than envisaged by Marx and Engels (1964) in their famous call to the "workers of the world". Its basic condition—exploitation in work or expulsion from work—has been divided and recombined in packages of sharply varying ratios and intensity according to capital's zonal arrangements. At the same time, de-proletarianizing processes unfolded whereby some layers of workers, through their expertise or organization, gained in security and prosperity (even though these gains could be suddenly lost to new technical or organizational offensives by capital). As austerity and depression proliferated, the urgent question was this: what, if any, political recomposition could arise out of the new class formations?

Cascade

If the "global slump" (McNally, 2011) touched the entire planet, it did not do so in the same way everywhere. Some areas fell into economic decline, others stagnated, yet others grew even faster than before but with increased social polarization. Thus the rebellions that sprung up in the wake of the crisis did so in regional clusters, simultaneous or serial, some clearly interlinked, some more apart. The major examples were: Eurozone anti-austerity revolts; a strike wave in China; an Arab Spring and an American-based Occupy movement. Later, in a Winter of emergent markets, there were uprisings in Brazil, Turkey and Ukraine. All of these rebellions together marked a widespread intensification in social antagonisms. A new cycle of struggles had begun.

The wave of unrest suddenly illuminated cybernetic capitalism's new class composition; the layers of surplus populations (dramatized in the suicide of Mohamed Bouazizi, the impoverished street vendor whose death catalyzed popular revolt in Tunisia); the youth in the edu-factories, now suddenly reproletarianized as "the graduate student without a job" (Mason, 2011); the neo-industrial proletarians that leapt from dormitories in Foxconn plants; and the myriad, precarious, low-wage workers who filled squares from Cairo to New York. These movements displayed the divisions and confluences between secure and precarious workers, and the contradictory class positioning of the intermediate strata of professionals and technicians (who at some times and places marched and demonstrated together, or at least in parallel, with proletarian strata). This occurred at moments in Egypt and Europe, although at other times and places professionals and technicians mobilized against proletarians (as in later turmoils in Thailand and Venezuela). These events showed the complex connections across, and rifts within, the global proletarian multiverse. They also raised the question of whether the same cybernetic technologies that brought this new class composition into being might be turned against capital in so-called 'Facebook revolutions.'

Well before digital times, *operaismo* theorists had contrasted the circulation of capital, which sped up the realization of value in market exchange, with a circulation of struggles and the connecting of resistances to capitalist accumulation. In the mid-1990s *alter-globalism* extended this via the Internet as indie-media centres wove "an electronic fabric of struggle" (Cleaver, 1995), circumventing the ideological filters of media capital (Wolfson, 2014). But as the tide of alter-globalization ebbed in the wake of the 9/11 terror attacks, reliance on cyber-activism seemed to contribute to the movement's evanescence. Capital recuperated its radicalism in the commodified 'Web 2.0' of Google and Facebook, fuelled by free cultural labor and users' surveilled self-revelation. This resulted in a

"communicative capitalism" (Dean, 2009) apparently capable of assimilating everything digital militants threw at it.

The uprisings of 2011, however, gave another twist to this story, igniting hot debate between champions of digital networks' radical power (Mason, 2011; Castells, 2012) and those who minimize their role in social movements (or even see it as deleterious to class politics) (Mirowski, 2013; Dean in Arria, 2012). The trope of Facebook, Twitter or YouTube revolutions has undoubtedly been fetishized in media reporting as if, for example, social media and not unemployment caused revolt, or that no rebellions, ever, had been possible before smart phones. Although this is manifest nonsense (Aouragh and Alexande, 2011), the 2011 unrests did occur within populations for whom the cybernetic was becoming increasingly commonplace.

The International Telecommunications Union (2013) estimates that in 2010 67 percent of the developed world populations used the Internet, but only 21 percent in the developing world, so that 30 percent of the world was Internet connected, and 70 percent was not (these figures had by 2013 changed to 77 percent, 31 percent and 39 percent, respectively). More significant was the mobile phone, which was ubiquitous, with 77 subscriptions per 100 people globally in 2010 (115 in the 'developed' world and 69 in the developing). Three years later there would be 96 subscriptions per 100 globally, with 89 per 100 in the developing world. Broadband was a major marker of class and zonal division; in 2010, the 'developed' world had 43 mobile broadband subscriptions per 100 people, and the developing world 4, for a world total of 11. Change was rapid, however, and by 2013 those figures were 75, 20 and 30 respectively. The new struggles thus unfolded in contexts where, though access continued to stratify by class, class fraction and zone, the division of digital-haves and have-nots was giving way to gradations of digital "haves" and "have-lesses" (Qui, 2009).

The changes were qualitative as well as quantitative. As Facebook, YouTube, Flickr and Twitter developed in a US of housing booms and infinite credit card debt, it seemed that corporate social media had captured user-created cybernetic commons for consumer capital. What became apparent in 2011, however, was that, in more explicitly authoritarian political contexts, such as Egypt (Herrera, 2014), these platforms, even in the hands of a relatively small number of activists, recovered a subversive charge. This was then relayed back up capital's zonal hierarchy of regions to Europe and North America in a new set of digital agitation practices.

These cyber-practices, however, varied across class segments. The communization theorists Woland and Blaumen (2014:7) describe the "uneven dynamic" of the 2011 cycle as including "riots of the excluded," "mass public space occupations," and workplace conflicts, or what they term movements for the "revindication of the wage." Accepting this schematization, and adding one other category of struggles , "leaks and hacks", we can see digital re-appropriations occurring in ways that varied according to their class composition.

Riots of the excluded involved minorities, migrants and other pauperized proletarians, penned in urban ghettoes or detention camps. An early example was the 2005 uprisings in Paris *banlieues*. After the crash austerity conditions led to further riots (often incited by police violence). This occurred in Greece from 2007-2008, in London and other UK cities in 2011, in Sweden during 2013, and repeatedly in French and Italian migrant detention camps. These were not Facebook revolutions; anyone using social media to incite riots was swiftly arrested. But mobile phones *were* widely used, with Blackberry smartphones famously the device of choice of in the 2011 UK riots (Lewis et al., 2011). Though this became a topic for "social media panics" whereby technological devices were blamed rather than social policies for the urban insurgency (Fuchs, 2012), it is also true that mobiles did provide rioters some counter-power against the high-tech police forces they confronted.

In regard to wage and workplace struggles, Steven Colatrella (2011; see also Hall-Jones, 2010) argues that up to 2010 the main resistance against state austerity programs was that of a "global strike wave" involving workers in the public sector, transport and communication, and new industrial centres (see also Karatasli et al., 2015). Many probably used digital communication a little or not at all. However, the largest and most sustained part of this strike wave was cybernetic –intensive. Migrant proletarians of Southern China factories had, since 2004, been protesting low wages and precarious conditions. When China's government met the global financial crisis with massive economic stimulus, it tightened labor markets, and created the occasion for a new eruption.

The strikers were part of what Qui describes as a "networked working class," habituated to mobiles, on-line games, cyber-cafes, the QQ instant messaging service and other social networks. In strikes this made for high "contagion" (Beja, 2012: 5). Workers struck outside and in defiance of state organized trades unions; "exchanges via Internet, weibo (the Chinese Twitter), and SMS made up for the absence of organizational resources" (Beja, 2012: 5). This contributed to a succession of victories in auto-plants and other industries. Digital media and cell phones were also important at Foxconn, in circulating the news of suicides within the vast plant—producing its own fatal contagion effect. The tragic events were then communicated more widely first to Chinese, and then to international media. This resulted in the global exposure of "iSlavery", which was the heart of digital device production (Qui, 2014).

"Mass occupy" movements assumed prominence from 2011 on with the sequence of 'take the square' protests running from Tahrir Square to Puerta del Sol, Zuccoti Park, and on to Taksim/Gezi Park and the Maidan. Protests were triggered not just by economic crisis but by elite corruption, authoritarianism and kleptocracy. To these examples we can add student movements such as those in the US in 2009, the UK 2011, Chile 2011-13 and Montreal 2012. Woland and Blaumen associate such protests with a "collapsing middle class" (2014: 9). In our terms, they were re-proletarianized intermediate strata, blocked from achieving the jobs and status its members expected. This may be rather too restrictive a description as occupations could involve a wide variety of participants. Nevertheless, the large numbers of precarious cultural, intellectual and technical workers, and students with or without jobs meant that the frequent press description of protestors as 'media savvy' was fairly accurate.

These are the struggles for which the 'Facebook [or Twitter] revolution' designation is most apt. Paolo Gerbuado (2012) has described how, during the sequence of occupations, there gradually emerged a recognizable pattern to the digital "choreography". A social media call to occupation was followed by, or occurred alongside, more terrestrial organizing. After circulation of news on Facebook, Twitter, YouTube, Tumblr and blogs as the occupation begins, more calls for support proliferate. Daily organization of the commune (assemblies, security, food, sleeping, washrooms, security) was coordinated via social media and mobiles; digital sites issued demands and manifestos (or insisted no manifestos or demands be issued). Protestors' social media streams in some cases fed into mainstream media coverage, helping to build wider support. If the protests did not at their peak evict the ruling regime amidst intense street violence—as they did in Egypt and Ukraine—the waning of social media traffic indicated a declining trajectory entailing eviction or abandonment of the squares.

The 2011 struggles also involved a sub-set of cybernetic "leaks and hacks" or virtual exploits with ramifications on the street (Greenberg, 2102). These included the disclosures of Wikileaks (Assange, 2012) and its battles against the retaliatory actions of the US state; the counter-strikes by Anonymous (Coleman, 2014), and, in turn, its targeting by the security apparatus. There were other hacker

interventions, such as those of Redhack in Turkey in support of the Taksim Square occupation (Polat et al., 2013). These actions were in part undertaken by defectors from the military industrial complex such as Chelsea Manning and, later, Edward Snowden. Also involved were the hacker subcultures from which Julian Assange emerged as well as young people socialized in chat rooms and music piracy who could deploy the easy-to-use hacker tools as exemplified by Anonymous (Deterritorial Support Group, 2012).They wielded arcane technical expertise, sometimes from the shadows, sometimes with a manifest elitism (which in Assange's case became problematic in several ways). Their specific concerns with the freedom of Internet speech did not necessarily correspond directly with the issues of jobs, evictions and debt that drove many to the streets and squares. Nonetheless, there was a general articulation with popular outrage at an unaccountable, venal power. Anonymous' masks appeared on streets and squares from Cairo to New York to Istanbul.

The most powerful influence of cybernetic technologies on the movements of 2011 was capital's preceding deployment of digital instruments to slice and stratify what was nonetheless a global labor force. The struggles of the cycle were fought on the basis of a divided proletariat's "uneven dynamics", segmentary subjectivities, limited horizons and fractioned class capacities. This created initial conditions of decomposition and weakness but also the possibilities of connection and recomposition. The reappropriation of commodified social media offered a way of countering divisions, but also in some ways replicated them.

What resulted was not so much a circulation of struggles connecting parts of a relatively homogeneous working class, as might have been imagined in the time of the mass worker, but a chaotic and contradictory "cascade" of struggles traversing proletarianizations that were segmented, fractalized and fractioned [4]. Cybernetic communication occurred within the forms characteristic of particular class segments. This was notably the case amongst the mass public occupations, interlinked hackers and leakers, and also within strikes in China and perhaps elsewhere. This was not so much the case between riots, wage struggles, and occupations. Although occupiers were aware of rioters and strikers, practical links were few or non-existent; suspicions and antagonisms were often high. Certain moments cut through this, as at the peak point of the struggles in Egypt. At an overall level, the real-time visibility of different levels of struggle created by digital networks gave a sense that the whole system was breaking down (Adams, 2014).

This cascade, however, resulted in many tumults, but no anti-capitalist breakthroughs. In many cases there were reactionary victories**.** Thus the riots of the excluded proceeded largely outside of any articulated political horizon. They flared up and went down - until next time. Wage struggles, where they were not simply defeated, as they usually were, could be contained by wage increases. In China, strike waves subsided as the price of labor rose. Occupy movements generally failed to grow out of the squares into the mass of service and industrial labor and pauperized communities. In cases where rebellions were not simply extinguished but actually won a change of government, as in Egypt and the Ukraine, secular and left components were electorally eclipsed by fundamentalist and nationalist elements. As the cycle went on, there were increasing tendencies for sections of intermediate strata to take to the streets not against capital, but for it. Leakers and hackers, however startling their exploits, paid a very heavy price for them. The same was true of terrestrial protestors who were increasingly digitally tracked in the "cyber-crack downs" of security forces (Comninos, 2011).

Neither the successes nor failures of the 2011 rebellions can be laid solely at the door of social media. But the unrests had an "up like a rocket, down like a stick" quality that relates to digital platforms (Plotke, 2012). Proletarian movements against capital must make use of cybernetic systems, because they are in a profound way inside, and indeed *of*, such systems formed under

conditions of technological subsumption that have for a generation shaped workplaces, workers, individual subjectivities, and cultures. It would be difficult today to riot, organize, or occupy without using networks. At the same time cybernetics, perhaps to a greater degree than any other technological system, has been imprinted by capital's need to accelerate, amplify and intensify the circulation of commodities. Their speed is a mixed benefit for proletarian organizing (Pietrzyk, 2010; Wolfson, 2014). Networks circulate news and excitement quicker than robust solidarities and decision-making processes can form. This enables the start-up of struggles, but also their ephemeral fragmentation; militancy gains brilliant visibility but is subject to omnipresent scrutiny. Wide in scope, weak in ties; fast but evanescent; unstoppably viral but ubiquitously surveilled; these properties mean proletarian movements can and must use such systems (even while countering their bias against longer term strategies, solidarities and security).

Aftermath

Some seven years after the onset of the great recession the immediate high tide of revolt had ebbed. Global economic recovery was uneven and fitful. The extreme levels of unemployment widespread at the height of the crisis slowly subsided in some areas, including the US, though hardly at all in others. Under-employment and insecurity, or precarity, continued almost everywhere: a 2013 Gallup Poll investigation, based on 136,000 interviews in 136 countries shows that only one in four adults worldwide, or roughly 1.3 billion people, worked full time (defined as 30 or more hours a week) for an employer. The percentage of full time jobs varied from 43 percent in North America to 19 percent in the Middle East and North Africa and 11 percent in Sub-Saharan Africa. In all of these regions, much part time work was involuntary (Clifton and Ryan, 2014). Class divisions continued to intensify. As the *Economist* (2011a) observed:

> Globally, the rise of many people out of poverty has reduced income inequality, though many people in informal and illegal work have not benefited. But within most counties inequality . . . has increased in recent decades. In most countries inequality seems bound to keep growing.

In North America and Europe, austerity regimes continued to press down on wages, public service workers and welfare provisions. Debt crises persisted from Greece to Puerto Rico.

Capital's accumulation and ejection of proletarians proceeded at yet higher cybernetic intensities, often in ways spurred by the revolt. Following the Foxconn worker suicides, Terry Gou, chief executive of the company, announced a plan to "hire" one million robots. As the *Economist* (2011b) observed "[r]obots are easier to manage"; they "don't complain. Or demand higher wages, or kill themselves". Gou's plan has faced difficulties, but as wage rates rose Chinese companies more generally started to automate intensively (Durfee, 2012). US corporations, faced with rising off-shore labor costs, planned on 'repatriating' jobs, to be performed by new adept robot systems drawing on military research from the 9/11 wars (Markoff, 2012). At the same time, a new wave of algorithmic expert systems threatened not only routinized jobs, such as those of call centre operatives, but also the 'white collar' tasks of pharmacists, legal professionals, laboratory technicians and journalists, previously considered immune to automation (Steiner, 2012; Brynjolfsson and McAfee, 2014).

Meanwhile, cybernetic capital continued globally scoping-out and scooping-in cheapened labor power. Supply chains were rendered yet more sinuous and scale-able by crowdsourcing and by using software to "carve a given task into microscopically small pieces" for digital execution at minimal

skill levels (Stross, 2010). Such techniques were extended to the huge labor pools of low-income countries via mobile phone to become the new horizon of cybernetic piece work. In the advanced zones, Silicon Valley enterprises push to break down employment in regulated industries into software-coordinated micro-businesses through ventures such as Uber and Air B&B. Coming in the wake of the 2008 crisis, these activities were characteristically dressed with a revolutionary rhetoric of freedom, cooperation, and equalitarianism, promising 'user empowerment', 'digital socialism' or a 'sharing economy'. Meanwhile their underlying reality was the lowering of wages, unmonitored work conditions and more precarity (Morozov, 2015).

The high frontier of cybernetic innovation continued in a financial sector now run in almost human-free mode by algorithmic high frequency trading (HFT) programs operating near light speed (Seymour, 2011; Patterson, 2012; Toscano, 2013). The most dramatic demonstration of this activity came in the algorithmically induced "Flash Crash" of May 6, 2010. The Dow Jones Industrial Average fell 600 points in five minutes, the biggest one-day decline in its history. High frequency trading (HFT) is considered most advanced in derivatives markets. Their size is extremely difficult to measure, but is almost certainly now larger than before the 2008 crash and may be as much as 14 times bigger than world annual GDP (Sivy, 2013; Economist, 2013b). From capital's point of view, this scale of operations inverts the conventional distinction between 'real' and 'fictitious' economies.

The brief global synchronization of struggles apparent in the digital cascade of 2011 had broken up. On a more regional and national basis, however, experiments in political recomposition, including cybernetic re-appropriations, continued. In North America the impetus of Occupy, including its digital tactics, flowed into initiatives such as: the collective eco-disaster relief of Occupy Sandy; a student debt-strike; living wage campaigns; campus strikes by teaching assistants and contract instructors; and unionization drives in digital industries. In Ferguson, Baltimore and elsewhere, uprisings against the violence of racist policing were riots of the excluded driven by digital surveillance, live streaming of demonstrations, and social media solidarities including the broader protest forms of Black Lives Matter. Networks of alternative news and online publications provided a diaphanous connection amongst all these outbreaks, and social forum and common front projects attempted to knit them more closely together. However, they faced intractable problems of cross-segmentary cooperation and coordination. The collective weapon of synthesizing occupations, assemblies, strikes, blockades, and hacktivism around a core of common goals seemed at once very necessary, tantalizing close but as yet unrealizable

An answer to these problems seemed to some to be promised by the revival of electoral anti-austerity politics in Europe, with the emergence of new parliamentary parties such as Syriza in Greece and Podemos in Spain. These parties were created by activists from the 2011 cycle of struggle. Podemos in particular adapted the digital techniques of assembly movements to the building of a more durable organization, for example through the creation of digital 'circles' as organizational components (Tenhunen and Rodriguez, 2014). These initiatives raised many hopes amongst those disappointed by short-lived occupation movements. However, the capitulation inflicted on Syriza in its 2015 negotiations with Euro-bankers showed the limits of reformist strategies. To make real gains such electoral efforts would require radical militant base organization capable of propelling them to rupture with capital's elites and sustaining the consequent social conflict.

Where capitalist cyber-offensive and proletarian cyber-activism seemed to collide most sharply was, however, in China, the new "global epicentre" of labor unrest (Silver and Zhang, 2009). Because the 2010-11 strike wave had been contained by wage increases, more jobs were being off-shored and automated. From 2014 on there were again labor actions from migrant workers, now fighting not just

for improved wages and conditions, but for longer term security (Economist, 2015; Kirby, 2015). Although the strength of the movements arose in part from shared factory conditions, social media use allowed workers to compare conditions in different factories, and gave their grievances an expression denied in television, radio or press. The very size of China's social media sector was making it increasingly uncontrollable; unable to repress it, party officials monitored it to identify problems they would attempt to head-off or co-opt.

Elsewhere, however, digital activism was becoming increasingly dangerous. The scope of US cyber-surveillance unleashed in the 'war on terror' had been disclosed in the last and greatest of the "hacks and leaks" of the 2011 cycle, the revelations of Edward Snowden. As uprisings in Ukraine and in Syria, Libya and elsewhere in the Middle East fell into civil wars, whatever vestiges of progressive movements remained learned to act in a context of lethal information monitoring, media blackouts and blockades, censorship, viral mis- and dis-information saturation, and abrupt communication disruptions.

Cybernetics was from its start the creation of war. The very changes in the global division of labor that cybernetic technologies have facilitated now generate new conflicts. They emerge as reactionary revolts by those consigned to the abyss of surplus humanity, or between blocs of capital competing to command the top of the digital supply chain. In her study of world labor activism in the twentieth century, Beverly Silver (2003: 176) noted that the contemporary capitalist offensive of restructuring, globalization and financialization, with "growing structural unemployment, escalating inequalities and major disruptions" repeated the crisis patterns of previous eras that had generated strong proletarian movements. The missing condition was the disruption of "armed conflict". Since Silver wrote, this condition has reappeared, and seems likely to do so with increasing frequency and force. Although the height of the economic meltdown had passed, intensifying international conflicts, continuing financialization, and escalating ecological stresses suggested it would not be the last great crisis to confront global proletarians.

Conclusion: changing the balance of forces

Mario Tronti, the leading theorist of *operaismo* who eventually departed its autonomist metamorphosis to rejoin the Communist Party, wrote:

> Workers' struggles determine the course of capitalist development; but capitalist development will use those struggles for its own ends if no organized revolutionary process opens up, capable of changing that balance of forces (2012: 128).

The cycle of struggles that reached its first crest in 2011 has not yet generated such a process, but there are, perhaps, hints at what it might look like. As Midnight Notes pointed out some years ago (Neil, 2010), *operaismo* class composition theory gravitated towards the identification of singular, leading edge forms of class struggle. This is not be possible for a global proletarian composition characterized both by commonalities (of precarity, migrancy, immizeration relative to corrupt elites, debt and ecological crisis) and intense segmentations across and within the zones of global capital. Its recomposition depends upon intensifying and connecting different types of struggles from local to international scales. Hardt and Negri's "multitude" recognizes this complexity, but was mistaken in suggesting it would be spontaneously resolved by shared participation in "immaterial labor."

E. P. Thompson, author of *The Making of the English Working Class*, wisely observed that to formulate a politics adequate to " a time when both capitalist and state communist needs and

expectations may decompose, and human nature be made into a new form" might be "to whistle into a typhoon" (1991: 11) (see Kidd, 2010). We are now, however, surely in that typhoon. The future may see proletarian attempts to breakdown the polarity between vanguard and distributed forms of struggle, recombining the persistence and decision-making capabilities of vertical organization with the speed and horizontal fluidity of networks in new apparatuses of political recomposition (Nunes, 2014; Wolfson, 2014). For such fighting machines, network communication will necessarily be an important mode of operations, but the inherent contradiction between the fast time of digital mobilization and the slow time of movement building will also have to be reckoned into organizing practice. In the context of heightened surveillance, the limitations of the social media so important in 2011 will be recognized by militants who grapple with anonymization, encryption, and verification. Refusal and reappropriation of the cybernetic are both likely to be intensified. There will be refusal by groups that conduct themselves off the grid to surprise capital with sudden disruptions and yet more militant hacking. Both approaches will circulate around larger scale assembles, occupations and strikes. The global proletariat is both in and of capital's digital whirlwind, but new lines of struggles, more and less cybernetic, may yet open a way beyond it.

Author Bio

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Endnotes

[1] Hardt and Negri on occasion refer to "multitude" as a post-Fordist proletariat (2000: 52-53, 256-257). In general, however, *post-operaismo* discourse is ambiguous about the relation of multitude to class.

[2] Initiatives such as the "wages for Facebook" manifesto (Ptak, 2013) lead to debate as to whether user-created content actually generates surplus value. Search-engine and social media capital act as circulation accelerators for commodities created by other forms of capital. This occurs through advertising, either provided directly from their corporate clients, or by selling lists and social graphs of targetable consumers to such clients. Ultimately the revenues of Web 2.0 capital derive from other forms of directly productive capital. To attract these advertising revenues, however, search engines and social media have to assure advertisers of audiences, and to gain these audiences they need content to attract users. In 'old' media this content was provided by waged cultural workers (script-writers, television production crews etc. actors etc.). In 'new' social media, however, it is provided by the users of the platform, whose unpaid contributions substitute for that of waged workers. In search engines it is provided by all Internet users (the makers of the National Film Board of Canada documentary *Do Not Track* calculate that "Google makes $45 per year from each one of us" (Everett-Green, 2015). Unpaid content provision thus attracts the revenues Web

2.0 capitalists gain from other capitalists who pay to have the circulation time of their commodities reduced (they hope) via on-line advertising. This is because shortening circulation time speeds the overall turnover time of their capital, thereby multiplying the moments of surplus value extraction. The 'free labor' formulation is an abbreviation of this complex discussion.

[3] The recognition of precarity has ignited controversy between those who propose 'the precariat' (Standing, 2008; 2015) as a new class and others who see it as a manifestation of the classic reserve army of the unemployed, always a feature of capital (Breman, 2013; Post, 2015). The first position is advanced by drawing a sharp line between "the precariat" and permanent workers and the chronically unemployed that ignores the interdependence of these proletarian fractions. The problem with the second position is that it denies the significance of the multiplying new forms of job insecurity to which many workers are subject. The position taken here is an intermediate one: intensified precarity is a feature of the working class's recomposition as a global proletariat (see also Neilson and Rossiter, 2008; Palmer, 2015).

[4] "Cascade" has been used by information scientists to describe the political consequences of digital communication, but generally in studies without a class-struggle orientation (Lohmann, 2000; Fabrega and Paredes, 2013; Fischer, 2013). It is used here to suggest the sudden but uneven actions of networks across a global but segmented proletarian formation.

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