DISCIPLINARY TECHNOLOGIES AND THE SCHOOL IN THE EPOCH OF DIGITAL REASON: REVISITING *DISCIPLINE AND PUNISH* AFTER 40 YEARS

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ABSTRACT. Foucault's masterpiece *Discipline and Punish* (1975) provided a genealogical analysis of the prison as a model for the disciplinary society that displaces the liberal juridico-political theory of sovereignty with a new kind of disciplinary power exemplified by Bentham's panopticum. This article revisits Foucault's classic as a basis for examining it significance for school in the epoch of digital reason.

Keywords: Foucault; disciplinary society; panopticum; digital reason

Introduction

Discipline and Punish: The Birth of the Prison, originally published in 1975, provided a genealogical analysis of the prison as a model for the disciplinary society, focusing on the fundamental shift from sovereign to disciplinary power. This new kind of power that displaces the liberal juridico-political theory of sovereignty also marks modernity in the eighteenth and nineteenth centuries. It is historically witnessed by the demise of torture as a public spectacle and the rise of a legal-scientific complex and its continuous effects as a distributed form of public power. Foucault exposed disciplinary power as the birth of the "humane" sciences focused on greater humanity, reform and the humanization of penalties that obscured the workings of power as a set of techniques for the coercion of individuals operating directly on the

training of the body. By appealing to Bentham's "panopticum" Foucault also analyzed the dominant institutions of the prison, the military, the school, and the factory in terms of disciplinary technologies that at once house, compartmentalize, distribute, normalize, and individualize bodies in the creation of modern subjects. The carceral archipelago makes these penitentiary techniques central to the disciplinary society. In *Society Must be Defended* (and later works) given as a series of lectures in 1976 Foucault confirms his aim to discuss the theory of right in terms of a methodology that does not analyze power as "rule-governed and legitimate forms of power with a single center" but "to understand power by looking at it extremities" (p. 27) where it operates in institutions as capillary where it transgresses the rules of right and is embodied in techniques and exercised in networks – as a microphysics of power. Disciplinary power was the necessary correlate of industrial capitalism and cannot be justified in terms of the juridical theory of sovereignty. Against Hobbes and the Leviathan model of the State he goes on develop his conception of biopower as "power over life" – from "man as body to man as species" – and to "correct" his earlier overemphasis on disciplinary power.

Gilles Deleuze (1992) comments: "Foucault located the disciplinary societies in the eighteenth and nineteenth centuries; they reach their height at the outset of the twentieth. They initiate the organization of vast spaces of enclosure." He acknowledges Foucault's brilliant analysis of institutions of "enclosure" but also comments how Foucault recognizes that just as disciplinary societies succeeded societies of sovereignty, so too societies of control began to replace disciplinary societies as all spaces of enclosure experienced a generalized crisis due to cybernetic epistemology that developed in the post-war period. Deleuze (1992), by reference to William Burroughs, goes on to name *societies of control* as the emerging form of society replacing disciplinary societies where open rather than closed forms of enclosure support a free-floating logic of *modulation* based on the dominance of computers that opens schools and other institutions directly to the market forces of global capitalism. I will argue that within "societies of control," if we are to adopt Deleuze's term, or what I prefer to call "the epoch of digital reason," education rather than the prison becomes the primary model institution of social control that breaks the mold of spatial enclosure of the classroom or the lecture hall, to adopt different forms of digital logic that turn the classroom and the lecture hall inside out. The spatial enclosure becomes spatialized in a different manner as loose, scaleable and connected networks that take on global proportion that in every way exceeds the State and its territory. This process of digital logic opening up spaces of enclosure provides a very different institutional setting, much decentralized and autonomous within the network but linked in such a way that constitutes a system for data harvest of all behavioral characteristics. In these new network spaces disciplinary tech-

nologies are intensified and closely associated with the calculative rationality of algorithms that drive the information and search system.

In the epoch of digital reason, exemplified by the advent of the Internet and the adoption of open architectures, platforms and networks, all modern spaces of enclosure are opened up to external global forces that exhibit themselves through the combination of the market and new digital technologies. We can understand the operation of global market forces through an analysis of neoliberal globalization that at once promotes policies of deregulation, dezoning, decentralization on the one hand, and encourages both privatization and monopolization on the other. Digital logic permits a scalability of operations that is truly global as witnessed by the spectacular growth of the info-utility US-based transnational corporations such as Google, Facebook, and Amazon.com. These transnational corporations are the new configuration of global companies that are at the heart of "knowledge capitalism" (Peters & Besley, 2006). In the era of digital reason dominated by knowledge capital corporations, "education" (not just schools) considered in the widest sense and at all levels becomes the dominant means of providing digital labor for global knowledge capitalism (Peters & Bulut, 2011).

This process of opening up modern spaces of enclosure spells the end of all modern institutions that once comprised disciplinary societies. Digital logics turn these institutions inside out and open them up through the process of promoting a greater interconnectivity and nested set of networks that hook them up in multiple configurations. This process is just beginning and represents an early stage of computerization and networking – from closed to open spaces. Yet disciplinary technologies still operate in schools and universities to provide forms of continuous control and surveillance within open platforms and architectures in ways that occlude the juridico-political theory of sovereignty by virtue of its extraterritoriality. Foucault's "panopticonism" based on Bentham's design to make possible surveillance within the prison, now becomes the principle and metaphor for surveillance in "open structures" of the digital age. The generalizable mechanism of "panopticonism" becomes even more possible and prevalent in the digital age by developing the surveillance gaze of the State and the corporation of global populations that use new technologies to observe, surveil, track, monitor, and tag subjects while at work, at home, and at play. The Panopticon digitally enhanced creates a consciousness of permanent visibility and data capture as forms of power, where spatial enclosure and lock ups are no longer necessary for control any more. The new visability is supplemented through all forms of metrics including bio-metrics and bibliometrics that can continuously track, "listen," monitor and tag our movements, our conversations, and our purchases. Education in the epoch of digital reason exemplifies the disciplinary power of surveillance and mechanisms of control in terms of increasingly

global systems of "big data" and leaning analytics that delivers public education into the hands of the info-utility transnational corporations.

The Panopticon: Bentham and Foucault
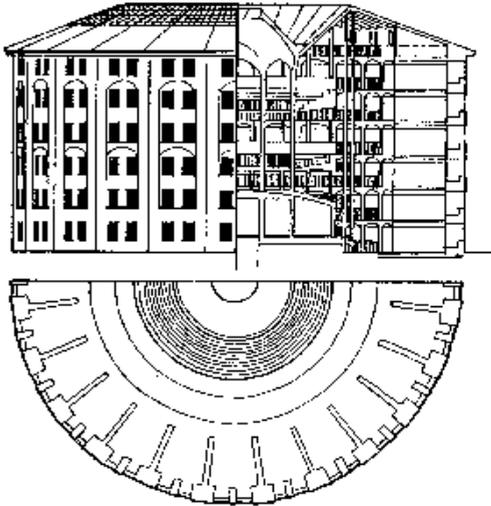
> *Morals reformed – health preserved – industry invigorated – instruction diffused – public burthens lightened – Economy seated, as it were, upon a rock – the gordian knot of the Poor-Laws not cut, but untied – all by a simple idea in Architecture!....*
>
> A new mode of obtaining power of mind over mind, in a quantity hitherto without example: and that, to a degree equally without example, secured by whoever chooses to have it so, against abuse. – Such is the engine: such the work that may be done with it.
> –Jeremy Bentham, *Panopticon, The Works of Jeremy Bentham*, vol. 4 (*Panopticon, Constitution, Colonies, Codification*) [1843], http://oll.libertyfund.org/titles/1925)

Jeremy Bentham's brother originally invented the concept of a circular building to enable a small number of managers to control a large number of unskilled workers. In 1786 on a visit to Krichev (in present day Belarus) to see his brother Samuel who advised Prince Potemkin, he seized on the idea of the panopticon and developed it as a form of *contract management* that he saw as particularly appropriate for the model form of the prison, both more economical and more effective.

In his edited works the following series of letters are recorded under the heading: "Panopticon; Or, The Inspection-House: *Containing the Idea of a New Principle of Construction Applicable to Any Sort of Establishment, in which Persons of Any Description Are to Be Kept under Inspection; And in Particular to Penitentiary-Houses.*" The title is then followed by a list of institutions including: "Prisons, Poor-Houses, Lazarettos, Houses of Industry, Manufactories, Hospitals, Work-Houses, Mad-Houses, and Schools." The edited works also contain the added description: "With a Plan of Management Adapted to the Principle: In a Series of Letters, Written in the Year 1787, From Crecheff in White Russia, to a Friend in England" (Jeremy Bentham, *The Works of Jeremy Bentham*, vol. 4 (*Panopticon, Constitution, Colonies, Codification*) [1843], http://oll.libertyfund.org/titles/1925). It is clear that Bentham thought the idea had almost universal application and certainly was seen as having application specifically to schools. He says of the "General Idea of the Inspection Principle:"

> No matter how different, or even opposite the purpose: whether it be that of *punishing the incorrigible, guarding the insane, reforming the vicious, confining the suspected, employing the idle, maintaining the helpless, curing the sick, instructing the willing* in any branch of industry, or *training the rising race* in the path of *education:* in a word, whether it be applied to the purposes of *perpetual prisons* in the room of death, or *prisons for confinement* before trial, or *penitentiary-houses,* or *houses of correction*, or *work-houses,* or *manufactories,* or *mad-houses,* or *hospitals,* or *schools.* (Letter 1, Ibid.)

And he remarks specifically of schools:

> With regard to *instruction,* in cases where it cannot be duly given without the instructor's being close to the work, or without setting his hand to it by way of example before the learner's face, the instructor must indeed here as elsewhere, shift his station as often as there is occasion to visit different workmen; unless he calls the workmen to him, which in some of the instances to which this sort of building is applicable, such as that of imprisoned felons, could not so well be. But in all cases where directions, given verbally and at a distance, are sufficient, these tubes will be found of use. They will save, on the one hand, the exertion of voice it would require, on the part of the instructor, to communicate instruction to the workmen without quitting his central station in the lodge; and, on the other, the confusion which would ensue if different instructors or persons in the lodge were calling to the cells at the same time. (Letter 2, Ibid.)

In Letter XXI he addresses himself to "Schools" commenting: "All play, all chattering – in short, all distraction of every kind, is effectually banished by

the central and covered situation of the master, seconded by partitions or screens between the scholars, as slight as you please." Inspection is the general principle that enlivens a course of moral philosophy that outlines a system of education based on discipline and control. He says in this regard: "whoever sets up an inspection-school upon the tiptop of the principle, had need to be very sure of the master; for the boy's body is not more the child of his father's, than his mind will be of the master's mind; with no other difference than what there is between *command* on one side and *subjection* on the other." For Bentham the "inspection-school" becomes a form of experimental metaphysics which can be tested and the basis for a reform of society according to "this single principle" which might "spread itself over the face of civilized society" to reform morals, preserve health, invigorate industry, diffuse instruction, lighten the public burden, and cut the gordian knot of the poor-laws – "all by a simple idea in architecture."

In his subsequent work Bentham goes into considerable detail on the construction of the "penitentiary prison-house" in all it aspects, and also compares it to the penal colonialization system in New South Wales ("In a Letter addressed to the Right Honourable Lord Pelham") arguing for punishment by confinement over punishment by transportation on the grounds of the aims of a penal justice system: "The characteristic principle of the colonization plan (loose confinement, without inspection) having been tried and found to fail – to fail as completely as it was possible for a principle to fail – one resource alone remained. This was the opposite principle, close inspection – inspection as close as there were means for making it; with or without confinement, also according to the means."

In *Discipline & Punish: The Birth of the Prison* (1977) Michel Foucault picks up on the significance of Bentham's Panopticon as a means of addressing disciplinary societies. He rediscovers in Bentham's work the reformist humanitarian impulse that inaugurates the rise of modern penal discourses that also demonstrate what he sees as an "automatic functioning of power" based on its visibility and consciousness in the inmates rendering the actual exercise of power unnecessary (Brunon-Ernst, 2013). The centrality of the inspection principle is built into the architectural apparatus as "a machine for creating and sustaining a power relation independent of the person who exercises it." The prisoners thus become the bearers of their own surveillance as they internalize that fact that they are able to be observed at all times without knowing whether in fact they are being observed at any particular moment. Power is thus based on an unverifiable visibility that comes from an architecture that permits spying at any point during the day or night. Each prisoner confined to a single cell is unable to develop any solidarity with other prisoners. Foucault (1995: 228) suggests: "The Panopticon is a machine for dissociating the see/being seen dyad: in the peripheric ring, one is totally

seen, without ever seeing; in the central tower, one sees everything without ever being seen."

The practice of putting individuals under "observation" becomes the principle for the inspection of all kinds of institutions and a kind of reformist justice that works through disciplinary methods and examination procedures. This emergence of modern surveillance is therefore associated with the rise of the human sciences that record observations, analyze and normalize individuals. The fact is given this central inspection principle and the architecture to facilitate it the prison become the exemplary institution and all others are based on resemblances to prisons

Foucault also clearly relates panopticism to capitalism commented that they provide a basis for obtaining "the exercise of power at the lowest possible cost (economically, by the low expenditure it involves; politically, by its discretion, its low exteriorization, its relative invisibility, the little resistance it arouses)" and "to link this 'economic' growth of power with the output of the apparatuses (educational, military, industrial or medical) within which it is exercised; in short, to increase both the docility and the utility of all elements of the system" (p. 218). Economic take-off in the West that made possible the accumulation of capital was accompanied a political take-off for the control of people based on a "calculated technology of subjection." As he argues: "The growth of the capitalist economy gave rise to the specific modality of disciplinary power, whose general formulas, techniques of submitting forces and bodies, in short, 'political anatomy,' could be operated in the most diverse political régimes, apparatuses or institutions" (p. 221).

Panopticon and Surveillance Studies

Shoshana Zuboff (1989), *In the Age of the Smart Machine: The Future of Work and Power*, builds on Bentham's and Foucault's insights to apply Panopticonism in the present technological information era providing an account of the panopticon power effect of information technologies as the means of surveillance, discipline and punishment in a work environment. In the age of the smart machine it is the implicit and invisible architecture of computer systems that provides "observation," work surveillance and supervision function as the means of allocating tasks, recording performance and also the time taken to complete daily assigned activities. While Information Panopticons can be defined as a form of centralized power that uses information and communication technology as observational tools and control mechanisms often and unlike Bentham's subjects, surveillance is made of willing participants who give their consent to the system of control and performance culture, sometimes where online self-disclosure means the voluntary surrender of privacy.

The information panopticon has lead Dobson and Fisher (2007) to hypothesize three models: Bentham's and Foucault's model of the disciplinary society; the Orwellian "Big Brother" ideal of surveillance; and the final form of high-tech human tracking systems based on geographical information systems (GIS), cell phones and radio-frequency identification tags that are cheap and effective means of providing surveillance for every day use by employers, parents, and neighbors instead of solely for national security.

In today's climate increasingly we are witnessing in the disclosures of Edward Snowden a cache of documents that reveal the activities of the NSA that through the "Five Eyes" network carried out global surveillance on millions of domestic citizens of participating Western countries, sweeping telephones, Internet and location records of whole populations and in the name of national security establishing a global surveillance State-system, often in complicity with the major US-based information utilities and Internet companies. Dragnet surveillance of civil populations is a form of disciplinary technology that works to normalize the disciplinary digital society. Some would argue that this kind of State snooping on its citizens is a threat to civil liberties. The harvesting of Internet metadata is the digital equivalent of secret policing. Serious questions must be asked about the "Five Eyes" electronic eavesdropping alliance and the NSA's Prism program. The new architecture of observation is buried in the data networks that accompany what can be regarded as a universal public good and threatens to corrupt its democratic promise by infringing on ideals of individual and state privacy. Five Eyes is an intelligence network linking the US, UK, Canada, Australia and New Zealand described by Edward Snowden as "a supranational intelligence organization that doesn't answer to the known laws of its own countries" (cited at http://en.wikipedia.org/wiki/Five_Eyes). Nyst and Crowe (2014) make the following observation:

> The Five Eyes agencies are playing a dirty game. They have found ways to infiltrate all aspects of modern communications networks: forcing companies to hand over their customers' data under secret orders, and secretly tapping fiber optic cables between the same companies' data centres anyway; accessing sensitive financial data through SWIFT, the world's financial messaging system; spending years negotiating an international agreement to regulate access to the data through a democratic and accountable process, and then hacking the networks to get direct access; threatening politicians with trumped-up threats of impending cyber war while conducting intrusion operations that weaken the security of networks globally; and sabotaging encryption standards and standards bodies, thereby undermining the ability of internet users to secure information (p. 51).

Its origins lie in the period before the Cold War and the ECHELON network that as a global surveillance system sweep up Internet and telephone data after it was introduced in the 1990s and became part of a wider global system during the "War On Terror" including PRISM, XKeyscore, Tempora, MUSCULAR, STATEROOM and others operated by the NSA and their equivalents. These covert spying operations serve to remind us how much surveillance has been a significant part of the digital revolution since its very beginning. There is at least one serious reading that suggests that the Internet and new digital technologies grew out of experiments in military intelligence in the immediate postwar era and that the development of cybernetics with its military, scientific and economic developments are part of a new post-industrial complex at the very heart of the 21st hegemonic superpower rivalry that rests on what I call digital reason and cybernetic rationality.

The Epoch of Digital Reason and Cybernetic Capitalism[1]

Global finance capitalism (and "financialization") is but one prominent and rapidly growing aspect of "cybernetic capitalism." Western modernity and the developing global systems spawned by Western (neo)liberal capitalism exhibit long-term tendencies of an increasing abstraction that can be described in terms of long-term modernization processes including the "formalization," "mathematicization," "aestheticization" and "biologization" of everyday life (Peters et al., 2010). These cybernetic processes are characteristic of otherwise seemingly disparate pursuits in the arts and humanities as much as science and technology and have been driven in large measure through the development of logic and mathematics especially in the world architecture of emerging global digital systems. In this respect we can talk of the *emergence of digital reason* and of the school and the university in the epoch of digital reason.

By this description I mean principally a set of developments in foundations of mathematics and the algebra of logic that predate the founding of cybernetics as a discipline with the 1946 and 1953 conferences sponsored by the Josiah Macy, Jr. Foundation in New York City on the subject of "Circular Causal and Feedback Mechanisms in Biological and Social Systems" (Umpleby, 2005). The prehistory of cybernetics that result in the problematic history of the development of digital logic including Boolean algebra, gates that process logic signals, switching theory, flip-flops and memory elements that store logic signals and in general the representation of binary information in physical systems. In this tangled genealogy George Boole (1847) wrote *The Mathematical Analysis of Logic* that provided the calculus for a two-valued logic, applying algebra to logic, representing true or false within assertion logic that is the basis for all modern programming languages and digital electronics. Claude Shannon discovered that the rule of Boolean

algebra could be applied to switching circuits and introduced switching algebra in order to design circuits of logic gates. (The algebra of 0 and 1 was applied to electrical hardware comprising logic gates to form a circuit diagram).[2]

Digital reason is a wider and a more philosophical notion than digital logic, named here in the tradition of Kant and Foucault. It governs the historical emergence of a techno-epistemological epoch that is so recent but indicates a deep transformation of economy, society and the university. Its concepts are the concepts of speed and velocity – involving limits of the physics of light – as well as system, feedback and control. Much of this rapid transformation of digital logic and the properties of systems can be captured in the notion of "algorithmic capitalism" (Peters, 2012c, 2013) as an aspect of informationalism (informational capitalism) or "cybernetic capitalism," a term that recognizes more precisely the cybernetic system similarities among various sectors of the post-industrial capitalist economy in its third phase of development – from mercantilism, to industrialism and finally to cybernetics – linking the growth of the multinational info-utilities (e.g., Goggle, Micro-soft, Amazon) and their spectacular growth in the last twenty years, with developments in biocapitalism (the informatization of biology and biologiza-tion of information), and fundamental changes taking place in the nature of the market with algorithmic trading and the development of so-called "financialization" (Peters et al., 2015).

"Fast knowledge" is part of fast capitalism, and serves to highlight an emergent new generic form of capitalism based increasingly on forms of symbolic capital associated with the rise of global finance and associated with new information and communication technologies. "Knowledge capital-ism" conveys the digitalization of knowledge production processes and the way in which all phases of knowledge production – its creation or generation, its storage and retrieval, its formal and informal acquisition and transmission, and its distribution or circulation – have been speeded up, with significant consequences not only for knowledge production but also, more generally, for learning, education, and culture.

Speed is of the essence; it defines contemporary capitalism as "fast" capitalism. As a single principle, speed annihilates distance, increasing access to global markets and promoting the mobility of factors of production. Speed defines the essence of finance and information capitalism. The mobility of capital has greatly increased private capital flows in the symbolic form of information that can be speedily transferred in deregulated 24-hour virtual finance markets, allowing international currency speculation and increased geographical spread of foreign direct investment. In the information economy the effect of location is diminished as virtual marketplaces and virtual organi-zations offer benefits of speed and agility, of round-the-clock operation, and

of global reach. Knowledge and information "leak" to where demand is highest and the barriers are lowest and, thus, laws and taxes are difficult to apply on solely a national basis. The new information and communications technologies have accentuated and augmented aspects of the traditional industrial economy, making even more efficient international transactions and promoting flows of capital, goods, labor, and services at the speeds of sound and light.

This has led to the unparalleled growth of e-commerce and e-business, that is, of electronically mediated business transactions, to create and transform relationships for value creation among organizations and between organizations and individuals. There has been a growing convergence of specific technologies into new integrated systems. The radical and globalised concordance of image, text, and sound has created new IT, media, telecom-munications, and information = knowledge infrastructures, and a global media network reflecting the emergence of a Euro-American dominated global consumer culture with the rise of multi-national edutainment conglomerates in music, film, and TV. The impact of the new digital technologies permitted liberalization of world capital markets and simultaneously enabled high-tech Internet and telecommunications companies to rapidly develop and to make massive gains. The dynamic relationship between capital markets and digital technologies temporarily sustained a financial ecosystem that seemed to call into question the rules of the old game, creating a US innovation system based on large-scale venture capital investment. These developments have led some economists to emphasize the growing importance of an international knowledge system as a basis for a source of labor value and productivity, research, and technological innovation.

"Fast knowledge," then, is a central element in knowledge capitalism both as content and as technology, refining the very system that is responsible for its ever-increasing "fast" circulation. Fast knowledge is an inextricable part of finance capitalism and through the model of the copy (copyright, patent, and trade mark) is controlled by the emerging structures of international property rights regimes such as GATS and TRIPS, which include edu-cational services. Fast knowledge also increasingly defines aspects of the international knowledge system, determining the speed and efficiency of knowledge creation, transmission, and distribution (Besley & Peters, 2006).

Big Data, Learning Analytics and the Surveillance School

Farnam Jahanian, who heads the National Science Foundation directorate for Computer and Information Science and Engineering (CISE), presented a paper entitled "The Promise of Big Data" at the Big Data Partners Workshop

on 3 May, 2013 as part of The White House Initiative of Big Data, 2012 where he made the following claim:

> Advances in information technologies are transforming the fabric of our society, and data represents a *transformative new currency* for science, engineering, education and commerce (Jahanian, 2013, p. 2).

Jahanian suggests that a "paradigm shift" has occurred from "Hypothesis-driven to Data-driven Discovery" and he illustrates this claim by reference to three sources:

> • *Science* – In the 11 February 2011 issue, *Science* writers joined with colleagues from *Science Signaling, Science Translational Medicine*, and *Science Careers* to provide a broad look at the issues surrounding the influx of research data. The collection of articles highlights both the challenges posed by the data deluge and the opportunities that can be realized if we can better organize and access the data.
> • *The Economist*'s 14-page special report: The data deluge released February 2010.
> • Microsoft Research's (2009) The Fourth Paradigm: Data-Intensive Scientific Discovery which it claimed presented the first broad look at the rapidly emerging field of data-intensive science, released in 2009.

These sources and a range of other related initiatives indicate a profound shift in the nature of knowledge production. As Bernard Steigler (2014) writes in "The Digital Future of the University," "The digital constitutes a new *épistémè:* it is the very nature of knowledge in all its forms that will be affected. This technology will function for our epoque in the same way that writing did for antiquity." Bernard Stiegler is a French philosopher at Goldsmiths, University of London and at the Université de Technologie de Compiègne.

"Analytics" is a term used in business and science to refer to computational support for capturing digital data to help inform decision-making (UNESCO, 2012, p. 1). "Learning analytics" is a term used by those in the education community who are seeking to understand the implications of these developments for how we analyze learning data for use by organizations to improve learning systems (UNESCO, 2012). Learning Analytics involves the use of computational techniques to analyze learner data, generate visualizations of learning dynamics, and build predictive models to test theories. As data can be gathered in real time the proposal is that there is a possibility of continuous improvement via multiple feedback loops that operate along different timescales – immediate to the student about the next problem, daily to the teacher to inform the next day's teaching focus, and less regularly for principals to monitor progress. Put another way, the hope is for data-rich sys-

tems that are able to provide informative and actionable feedback to learners, teachers, and to leaders and administrators (Bienkowski, Feng, & Means, 2012).

The current conversation on learning analytics includes technologists (academic and commercial), researchers in education, leaders and policy-makers, educational practitioners, organizational administrators, instructional designers, product vendors, and learners themselves. However, as the UNESCO 2012 research brief identifies, "critical debate is needed on the limits of computational modeling, the ethics of analytics, and the educational paradigms that learning analytics promote."

Shoshana Zuboff (2014) in her paper "A Digital Declaration"[3] invokes us to take action against the Surveillance Capitalism of "Big Data." She asks, if the digital future is to be our home, then what kind of home will it be?

> When it comes to 'big data' and the digital future, we are at the very beginning. Despite the rapid pace of connection and the oceans of data it generates, our societies have yet to determine how all this will be used, to what purpose, and who decides. The big tech companies want us to believe that the future will roll out according to their visions and the so-called 'objective requirements' of technological development as a driver of economic growth in a free market. Their scenario is straight from the playbook of the neo-liberal theorist Friedrich Hayek – what he called a self-determining 'extended order' that individuals cannot understand but to which they must submit.

Zuboff (2014) suggests in comparison with industrial capitalism "Our new era will be ultimately be shaped by the ideas around which we mobilize for new market forms and new institutions. Life in 2050 will depend on developments like these that have not yet occurred, and we will look back to see this time, our time, as the beginning." In this context it is important to hear her warning:

> The analysis of massive data sets began as a way to reduce uncertainty by discovering the probabilities of future patterns in the behavior of people and systems. Now the focus has quietly shifted to the commercial monetization of knowledge about current behavior as well as influencing and shaping emerging behavior for future revenue streams. The opportunity is to analyze, predict, and shape, while profiting from each point in the value chain.

> There are many sources from which these new flows are generated: sensors, surveillance cameras, phones, satellites, street view, corporate and government databases (from banks, credit card, credit rating, and telecom companies) are just a few.

She focuses on "data exhaust" as "user-generated data harvested from the haphazard ephemera of everyday life, especially the tiniest details of our online engagements – captured, datafied (translated into machine-readable code), abstracted, aggregated, packaged, sold, and analyzed" which "includes everything from Facebook likes and Google searches to tweets, emails, texts, photos, songs, and videos, location and movement, purchases, every click, misspelled word, every page view, and more." This harvest of meta-data is used algorithmically to make online advertising more effective and to accurately target its identified audiences.

As Zuboff claims, as a result of these strategies "By February 2014, Google's $400 billion dollar market value had edged out Exxon for the #2 spot in market capitalization" and she goes on to argue "The ugly truth here is that much of 'big data' is plucked from our lives without our knowledge or informed consent. It is the fruit of a rich array of surveillance practices designed to be invisible and undetectable as we make our way across the virtual and real worlds. The pace of these developments is accelerating." Her warnings are very salutary: "These surveillance practices represent profound harms – material, psychological, social, and political – that we are only beginning to understand and codify, largely because of the secret nature of these operations and how long it's taken for us to understand them."

Where I talk of "cybernetic capitalism" (Peters), Zuboff (2014) talks of "surveillance capitalism," because surveillance assets, as we've seen, attract significant capital and investment that I suggest we call "surveillance capital." The declaration thus established a radically disembedded and extractive variant of information capitalism that can I label "surveillance capitalism," a new market form that "entails wholly new moral and social complexities along with new risks."

In this new digital universe the "big data" of education and the new forms of "learning analytics" become the fastest way of handing over public assets and education goods to the private sector in a marriage of big information corporation and State that harvest meta-data, tracks and monitors student achievement and assessment and deprofessionalizes teachers in a cybernetic system run by administrators. The meta-data can be used in many different forms to target markets, sell educational products including text-books and the latest laptop, and ultimately outside the system as form of data capture that can be on-sold and used for purposes other than educational.

Already in the UK there have been outcries against "school surveillance" with complaints against cameras in toilets and the use of data-bases of pupil's fingerprints, indicating that the "surveillance state is quietly invading our schools."[4] The Guardian article referred to above suggests, with more than a shadow of Foucault, quoting a passage by the journalist Annette Fuentes

from her book *Lockdown High*, subtitled "When the schoolhouse becomes the jailhouse:"

> Every day in communities across the United States, children and adolescents spend the majority of their waking hours in schools that increasingly have come to resemble places of detention more than places of learning. From metal detectors to drug tests, from increased policing to all-seeing electronic surveillance, the schools of the 21st century reflect a society that has become fixated on crime, security and violence.

Fuentes describes a movement of schools security that began with the Columbine shootings of 1999 detailing the like of the following kind of incident:

> a high-flying student from Arizona strip-searched because ibuprofen was not allowed under her school rules; the school in Texas where teachers can carry concealed handguns; and, most amazingly of all, the Philadelphia school that gave its pupils laptops equipped with a secret feature allowing them to be spied on outside classroom hours.

These security-conscious schools Fuentes writes about are united by a belief in "zero tolerance." The article goes on to draw the connection between surveillance capitalism and schooling:

> Their scanners, cameras and computer applications are supplied by a US security industry that seems to grow bigger and more insatiable every year. And as she sees it, their neurotic emphasis on security has plenty of negative results: it renders the atmosphere in schools tense and fragile, and in coming down hard on young people for the smallest of transgressions, threatens to define their life chances at an early age – because, as she puts it, 'suspensions and academic failure are strong predictors of entry into the criminal justice system.' There is also, of course, the small matter of personal privacy.

These claims have been repeated now many times in the media as matters of grave concern.[5] Torin Monahan and Rodolfo D. Torres' (2010) *Schools under Surveillance: Cultures of Control in Public Education* provide a comprehensive introduction to some of the best US-based research that ranges over the territory in several parts of the "New Disciplinary Orders: Police, Surveillance, and Inequality in the Carceral School" (Part One); "Schools as Markets: Selling Security, Buying Students" (Part 2); "Security Cultures: Preparing for the Worst" (Part 3); "Accountability Regimes: Tests, Standards, and Audits as Surveillance" (Part 4) and "Everyday Resistance: Contesting Systems of Control" (Part 5).

In *Surveillance Schools: Security, Discipline and Control in Contemporary Education*, Emmeline Taylor (2013) charts the growth of surveillance tech-

nologies globally and the impact that continual monitoring is having upon the school. These schools are characterized by routine practices that identify, verify, categorize and track pupils that make use of the latest biometric technologies such as fingerprinting and iris scanning. Along with CCTV, microchips in ID cards and "smart uniforms," metal detectors and police officers patrolling the school corridors with sniffer dogs, schools have become militarized, increasingly fortified and function like a new panopticon prison system.

Taylor outlines the phenomenon of the Surveillance School, mapping the driving forces behind them and analyzes the impact suggesting "that often these technologies do little to safeguard young people, do not represent financial savings or increased efficiency, but serve to strip pupils of their privacy, undermine their trust in others and create an atmosphere of suspicion" (book synopsis).

The use of these all-pervasive, continuous forms of surveillance that harnesses metadata as well as providing CCTV and other forms of security has the capacity to replace schools as democratic institutions, turning them into technology markets based on surveillance data streams in a kind of school panopticon, linking schools to wider society surveillance systems and establishing the basis for data exchanges, data borrowing and data exhausts that provides a forbidding totalitarian system of control.

Bentham and Foucault in different ways recorded the change from physical punishment to psychological control through forms of architecture that permitted a one-way observation administered by the few in the name of more humane liberal government. The panopticon is the living metaphor of a system of government that produces the illusion of greater individual freedom while paradoxically also providing the means for new disciplinary technologies. Just as Bentham's panopticon provided the universal method of social control for disciplinary societies in the form of spatial enclosures, so too today it takes the form of open architectures that inverts the logic of enclosure while maintaining and enhancing the effects of disciplinary technologies. In the epoch of Digital Reason new soft networks of power utilizing algorithms provide a step-by-step procedure for a new calculative rationality that promotes data processing and automated reasoning. This algorithmic reading of disciplinary societies is a 300 year-old history (Berlinski, 2000) whereby the notion became transformed from an idea to define the computer that guides the social machine relying on its logical structure expressed in symbolic vocabulary as a series of discrete rules in a finite procedure with guaranteed results; in effect, a set of simple instructions for carrying out a complex task that can be broken down into a step-by-step procedure. This political evolution of the panopticon into digital form of the algorithm can also be described as a form of "bio-informational capitalism"

(Peters, 2012), that provides the conceptual means of linking Foucault's notion of disciplinary societies not only with his later notion of biopower and bio-politics but also with the algorithmic origins of life itself (Walker & Davies, 2013).

Acknowledgement

NOTES

1. This section is drawn from Peters (2014).

2. See Burris (2013) on "The Algebra of Logic Tradition;" O'Regan (2008) on the history of computing; and Stankovic & Astola (2011) on switching theory.

3. See http://www.faz.net/aktuell/feuilleton/debatten/the-digital-debate/shoshan-zuboff-on-big-data-as-surveillance-capitalism-13152525.html

4. "School Surveillance: How Big Brother Spies on Pupils" at http://www.the-guardian.com/uk/2011/jun/09/schools-surveillance-spying-on-pupils

5. See, for example, http://www.wired.co.uk/news/archive/2014-06/18/school-surveillance, http://www.telegraph.co.uk/education/educationnews/10776060/Class-rooms-put-under-permanent-surveillance-by-CCTV.html

REFERENCES

Bentham, J. (1843/1925), *The Works of Jeremy Bentham*, vol. 4 (*Panopticon, Constitution, Colonies, Codification)* [1843], at http://oll.libertyfund.org/titles/1925.

Bentham, J. (1995), *Panopticon Letters*. Miran Bozovic (ed.). London: Verso.

Berlinski, D. (2000), *The Advent of the Algorithm: The 300-Year Journey from an Idea to the Computer*. San Diego, CA: Harcourt.

Bienkowski, M., M. Feng, & B. Means (2012), *Enhancing Teaching and Learning Through Educational Data Mining and Learning Analytics: An Issue Brief*. U.S. Department of Education Report (October), at http://www.ed.gov/edblogs/technology/files/2012/03/edm-la-brief.pdf.

Boole, G. (1847), *The Mathematical Analysis of Logic*, at http://www.gutenberg.org/ebooks/36884

Brunon-Ernst, A. (2013), *Beyond Foucault: New Perspectives on Bentham's Panopticon*. London: Ashgate.

Burris, S. (2013), "The Algebra of Logic Tradition," *The Stanford Encyclopedia of Philosophy* (Summer edn.), Edward N. Zalta (ed.), http://plato.stanford.edu/archives/sum2013/entries/algebra-logic-tradition/ .

Deleuze, G. (1992), "Postscript on the Societies of Control," *October* 59: 3–7. At https://files.nyu.edu/dnm232/public/deleuze_postscript.pdf

Dobson, J. E., & P. F. Fisher (2000) "The Panopticon's Changing Geography," *Geographical Review* 97(3): 307–323.

Foucault, M. (1995/1997), *Discipline and Punish: The Birth of the Prison.* Trans. from the French by Alan Sheridan. New York: Vintage Books.

Foucault, M. (2003), *Society Must be Defended:* Lectures at the College de France, 1975–76. Mauro Bertani and Alessandro Fontana (eds.), Francois Ewald and Alessandro Fontana (gen. eds.), Arnold I. Davidson (English Series ed.), David Macey (tr.). New York: Picador.

Jahanian, F. (2013), "The Promise of Big Data," at http://cendi.dtic.mil/presentations/07_10_13_WACTLAR.pdf

Microsoft Research (2009), "The Fourth Paradigm: Data-Intensive Scientific Discovery," at http://research.microsoft.com/enus/collaboration/fourthparadigm/

Monahan, T., and R. Torres (2010), *Schools under Surveillance: Cultures of Control in Public Education.* New Brunswick, NJ: Rutgers University Press.

Nyst, C., and A. Crowe (2014), *Unmasking the Five Eyes' Global Surveillance Practices*. Global Information Society Watch, at http://giswatch.org/sites/default/files/gisw2014_communications_surveillance.pdf

O'Regan, G. (2008), *A Brief History of Computing.* Dordrecht: Springer.

Peters, M. A. (2012), "Bio-informational Capitalism," *Thesis Eleven* 110(1): 98–111.

Peters, M. A. (2014), "The University in the Epoch of Digital Reason: Fast Knowledge in the Circuits of Cybernetic Capitalism," in P. Gibbs, O.-H. Ylijoki, C. Guzmán-Valenzuela, and R. Barnett (eds.), *Universities in the Time of Flux*: *An Exploration of Time and Temporality in University Life.* London: Routledge, 15–43.

Peters, M. A., and T. (A.C.) Besley (2006), *Building Knowledge Cultures: Education and Development in the Age of Knowledge Capitalism*. Lanham, Boulder, New York, Oxford: Rowman & Littlefield.

Peters, M. A., and E. Bulut (eds.) (2011), *Cognitive Capitalism, Education and the Question of Digital Labor.* New York: Peter Lang.

Peters, M. A., and P. Roberts (2011), *The Virtues of Openness*: *Education, Science and Scholarship in a Digital Age.* Boulder, CO: Paradigm Publishers.

Peters, M. A., R. Britez, and E. Bulut (2010), "Cybernetic Capitalism, Informationalism, and Cognitive Labor," *Geopolitics, History and International Relations* 1(2): 11–40.

Peters, M. A., J. M. Paraskeva, and T. (A.C.) Besley (eds.) (2015), *The Global Financial Crisis and the Restructuring of Education.* New York: Peter Lang.

Special Online Collection: Dealing with Data, Science, at http://www.sciencemag.org/site/special/data/

Stankovic, R. S., and J. Astola (2011), *From Boolean Logic to Switching Circuits and Automata: Towards Modern Information Technology.* Dordrecht: Springer.

Steigler, B. (2014), "The Digital Future of the University," http://blogs.mediapart.fr/blog/bernard-stiegler/071113/lavenir-numerique-de-luniversite

Taylor, E. (2012), *Surveillance Schools: Security, Discipline and Control in Contemporary Education.* New York: Palgrave Macmillan.

The Economist, "The Data Deluge," at http://www.economist.com/node/15579717

Umpleby, S. (2005), "A History of the Cybernetics Movement in the United States," *Journal of the Washington Academy of Sciences* 91(2): 54–66.

UNESCO (2012), "Learning Analytics," Policy Brief, at http://iite.unesco.org/pics/publications/en/files/3214711.pdf

Walker, S., and P. Davies (2013), "The Algorithmic Origins of Life," *Journal of the Royal Society Interface* 10(79): 20120869. http://dx.doi.org/10.1098/rsif.2012.0869

Zuboff, S. (1989), *In the Age of the Smart Machine: The future of Work and Power.* New York: Basic Books.

Zuboff, S. (2014), "A Digital Declaration," at http://www.faz.net/aktuell/feuilleton/debatten/the-digital-debate/shoshan-zuboff-on-big-data-as-surveillance-capitalism-13152525.html