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SCIENTIFIC CONTRIBUTION

Towards a genealogy of pharmacological practice

Ricardo Camargo[1] · **Nicolás Ried**[2]

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Abstract Following Foucault's work on disciplinary power and biopolitics, this article maps an initial cartography of the research areas to be traced by a genealogy of pharmacological practice. Pharmacology, as a practical activity, refers to the creation, production and sale of drugs/medication. This work identifies five lines of research that, although often disconnected from each other, may be observed in the specialized literature: (1) pharmaceuticalization; (2) regulation of the pharmaceutical industry; (3) the political-economic structure of the pharmaceutical industry; (4) consumption/consumerism of medications; (5) and bio-knowledge. The article suggests that a systematic analysis of these areas leads one to consider pharmacological practice a sui generis apparatus of power, which reaches beyond the purely disciplinary and biopolitical levels to encompass molecular configurations, thereby giving rise not only to new types of government over life, but also to new struggles for life, extending from molecular to population-wide levels.

Keywords Pharmacological practice · Genealogy · Disciplinary power · Biopolitics · Molecular politics

✉ Ricardo Camargo
rcamargobrito@gmail.com

Nicolás Ried
nicolasried@gmail.com

[1] Faculty of Social and Juridical Sciences, Universidad de Talca, Santa Elena 2222, San Joaquín, Santiago, Chile

[2] Nucleus on Biopolitics and Ideology (NIBI), Universidad de Chile, Pío Nono N° 1, Providencia, Santiago, Chile

Beyond discipline and biopolitics

In the closing class of his seminar *Society Must be Defended*, *Lectures at the Collège de France* (*1975–1976*), Michel Foucault describes the movement that took place in nineteenth century Europe from sovereign power to power over life. Therefore, while sovereign power is governed by the aphorism 'make die and let live', the new power over life is guided by the principle 'make live and let die' (Foucault 2003, p. 241). The counterpoint, according to Foucault, is that this new power, directly over life, is exercised in order to produce or encourage specific types of life (while at the same time ignoring others or letting them die). Foucault mentions two main currents of this biopower: disciplinary technologies—that is, techniques of power centred on individuals' bodies— and 'a "biopolitics"[1] of the human race', which aims to regulate the population (Foucault 2003, p. 243; 2007, p. 1). If discipline guides individuals by working on the body, then regulatory mechanisms ensure the regularization of life, and of man's or the species' biological processes. In this way, these regulatory mechanisms give rise to what Foucault calls a 'technology of biopower' (Foucault 2003, p. 247). The purpose of biopolitics and disciplinary power is 'to maximize and extract forces' (Foucault 2003, p. 246) from life, whether from individuals/bodies or from man/the species, giving rise to biopower in its general sense (Castro 2011a, p. 47) or what Foucault also called 'somato-power' (1994 t. III, p. 231). This norm will give rise to a normalizing society, which is not, therefore, purely disciplinary, but rather

[1] Biopolitics refers to a power that does not exclude disciplinary technology, but rather, encapsulates it, integrating and partially modifying it; although it operates on another level (Foucault 2003, p. 242).

one 'in which the norm of discipline and the norm of regulation intersect along an orthogonal articulation' (Foucault 2003, p. 253).

The articulation between discipline and biopolitics has been highlighted in recent literature as a singular characteristic of contemporary fields of power (Castro 2011a, p. 52, b, pp. 55–56; Lemke et al. 2011, p. 36; Nealon 2008, p. 45; Reid 2011; Revel 2008, p. 36; Taylor 2011, pp. 44–45). In particular, medical practice in this regard emerges as a field where the occurrence of this articulation can be best observed. In effect, 'medicine—for Foucault—is a power-knowledge that can be applied to both the body and the population, both the organism and biological processes, and it will therefore have both disciplinary effects and regulatory effects' (Foucault 2003, p. 252). However, Foucault did not live to see the remarkable advances to be made by medical knowledge/power at the end of the final quarter of the twentieth century, with the development of 'life sciences', especially molecular biology and its biomedical and biotechnological (including pharmacological) applications. These transformations have been widely documented over the last 30 years (Armstrong 1983, 1995; Arney and Bergen 1984; Clarke et al. 2003; Engelhardt and Towers 1979; Feinstein 1967; and Starr 1982).

All this research has highlighted the growing control exercised by molecular biology, and in particular by its technological applications, due to their creation of new types of optimums for healthy living, which are anchored in molecular therapy. In turn, the corresponding impact of these bioscientific transformations on the normalization of the organic and biological life of bodies and populations, as well as their social impact on the emergence of a 'new way of life' have been researched by Nikolas Rose over the last three decades (1985, 1989, 1996, 1999, 2007a; Rose and Miller 2008; Rose and Abi-Rached 2013), and by Sarah Franklin (1995, 2000, 2005). According to Rose (2007a, pp. 5–6), five transformations have taken place around bioscience directly influencing the emergence of a new way of life, namely: (a) *molecularization*; (b) *optimization*; (c) *subjectivization*; (d) *somatic expertise*; and (e) *economies of vitality*, that is, the development of a new type of capitalist economy (biocapitalism) that makes biovalue (life as value) its main source of income. It is precisely in connection with the latter where pharmacology—understood as the group of disciplines, procedures, knowledge and economic activities focused on the creation, production and sale of drugs/medications, especially in its contemporary phase (the last quarter of the twentieth century onwards)—makes its appearance among the transformations experienced by power over life, due to its key role in the development of the so-called 'vitality economies' and its growing influence over the other mutations analyzed by Rose (2007a, pp. 9–39).

However, this paper suggests that a more integrated theoretical vision such as Foucault's genealogy could lead to an appreciation of pharmacological practices as one of the main apparatuses of this new type of power, which goes beyond the purely disciplinary and biopolitical aspects and extends to the molecular level. Such practices would be a key feature of the society to come and may be observed not only in the rise of new (molecular) technology for creating productive life, but also in new types of resistances, as this article sustains.

Before charting this new apparatus of pharmacological power, it should be clarified that the notion of genealogy used here is that developed by Foucault (1970), which labels the analysis of power as an 'apparatus' or *dispositif*, that is, a node of 'elements as heterogeneous as discourses, types of treatment, administrative measures and laws, regulatory dispositions, architectural ordinances, etc.' (Foucault 2005, pp. 404–405). The notion of the apparatus is highly useful for the analysis of pharmacological practice, as it allows the examination of heterogeneous discursive elements (political discourses, medical and scientific knowledge, philosophical discourses) to be associated with elements considered by Foucault to be non-discursive (institutions, laws, regulations, administrative dispositions, directives, procedures, companies). In the study of pharmacological practice, a question of interest will be how a specific and sophisticated bio-knowledge (pharmacology) has given rise to technologies of power that have been placed into tension by the strategic demands made on them by the pharmaceutical industry, and vice versa, or, in other words, which are the positive power relationships this relationship has created, and which are those it has excluded. Specifically, a study of pharmacological practice as an apparatus includes two related aspects: (a) new technologies of power and (b) struggles of resistance or counterpower. Regarding the first, the aim is to characterize, as completely as possible, the new technologies of power that act on life from the molecular level up, before incorporating the body and finally encompassing the whole population. Such technologies represent a new biopolitics, different to that described by Foucault as disciplinary power and government of populations. We argue that its expression will be molecular, and more particularly neuromolecular, through the self-management of medicines and techniques of power over one's own body.

Towards a genealogy of pharmacological practice

The relationship between pharmacology, individuals and society has been subject to critical inquiries in recent decades as evidenced by several studies (Abraham 1995; Braithwaite 1984; Fraser et al. 2009; Gabe and Bury 1988). More recently, research on this area has undergone rapid expansion (Abraham 2002, 2008; Busfield 2007a; Conrad 2005, p. 145;

Williams et al. 2009a, b), due to widespread interest in the thesis that we are facing significant growth in the role that medications play in people's lives. In the literature, this process has been described as 'pharmaceuticalization' (Abraham 2009, 2010; Fox and Ward 2009), 'the 'pharmaceutical person' (Marshall 2009), or the 'pharmaceutical imagination' (Martin 2006). All of these expressions refer to 'the process by which social, behavioural or bodily conditions are treated or deemed to be in need of treatment, with medical drugs by doctors or patients' (Abraham 2009, p. 934). Other authors, describing the same phenomenon, prefer to speak of 'the transformation of human conditions, capacities or capabilities into pharmaceutical matters of treatment or enhancement' (Williams et al. 2009a, b, p. 37). In any case, it is important to note that pharmaceuticalization differs from 'medicalization' which has been studied for much longer and that is usually defined as 'a process by which non-medical problems become defined and treated as medical problems, usually in terms of illness or disorders' (Conrad 1992, p. 209; Rose 2007b, p. 701).[2] Despite there being close links between both processes, there are two distinctive areas of difference that justify pharmaceuticalization being treated as an autonomous concept. Indeed, as Abraham (2010, p. 605) has highlighted, pharmaceuticalization can take place without the expansion of medicalization, because the use of some drugs may increase in order to treat existing medical conditions, meaning that no new transformation of a non-medical problem into a medical problem takes place, as required by the notion of medicalization. In turn, pharmaceuticalization can also occur without medicalization because the medical profession is excluded from the selection, purchase and use of drugs by self-medicated individuals. Now, it should noted here that such differences between pharmaceuticalization and medicalization [the latter traditionally attributed to medical power by Conrad and Schneider (1992), Freidson (1970), Parsons (1951), Zola (1972)], have arisen due to the emergence of an apparatus other than that of medicalization, precisely pharmacological power, which makes use of a wide range of new technologies to create what has been described in the specialized literature as 'the pharmaceuticalization of domestic life' where both 'the bedroom and the kitchen are now foci for pharmaceutical marketing and consumption' (Fox and Ward 2009, p. 41).

But what are the new technologies of power with which the pharmacological apparatus *operates*? No clearly systematized answer to these questions appears in the specialized literature. Further still, tracing the genealogy of said technologies of power would mean following at least five specific lines upon which research in social sciences on drugs has focused, all of which, however, tend to be relatively autonomous from each other. The first line of research in the specialized literature has focused on the aforementioned processes of pharmaceuticalization (Blech 2006; Healy 2006; Law 2006; Lexchin 2006; Moynihan 2002; Moynihan et al. 2002; Moynihan and Henry 2006; Phillips 2006; and Tiefer 2006). Research here has attempted to show how pharmaceutical companies, pressure groups, and the media, in collaboration with doctors, are not only producers of drugs but are also to a certain extent disease mongers who manufacture the disease that is to be treated by these drugs (Williams et al. 2009a, b). In other words, pharmaceuticalization is a whole array of practices aimed at creating a desire to consume medicine amongst individuals who thereby become a new self-medicated subject. These techniques range from induced expert advice (medical prescriptions) to mass media advertising.

The second line of research consists of investigations on the development of the pharmaceutical industry both in regulatory terms and in clinical trials. It is led by John Abraham's studies (1993, 1995, 1997, 2002, 2007; Abraham and Davis 2005; Abraham and Lewis 2002; Abraham and Reed 2001; Abraham and Sheppard 1999), which reveal the surreptitious influence exercised by the pharmaceutical industry on the regulatory frameworks (based on a neoliberal ideology) that govern it, rendering such regulations insufficient for the defence of public health. Meanwhile, Busfield (2007a) has researched what he calls the 'fabrication of scientific facts' in clinical drug trials [the thesis which originated Abraham's response (2007) and Busfield's (2007b) subsequent replica]. In turn, Goldacre (2012) has recently revealed (negligent and willful) malpractice by pharmaceutical companies while carrying out the clinical trials required in order for regulatory bodies to approve new medication. Other more pragmatic studies (Badcott 2013) observe that the pharmaceutical industry has become crucial for scientific-pharmacological progress, while also advocating for the adoption of a broader ethical basis for the industry's activities, such as *a triple bottom line policy*, in order to compensate for its shortcomings. In turn, other authors reject centralized regulation outright…because 'the role of the executive in bypassing regulations creates a parallel industry of subsidiary regulations to counter such bypassing' (Calinas-Correia 2013, p. 305).

A third line of research comprises the work around the political-economic structure of the contemporary pharmaceutical industry, whether characterized as globalized (Abraham and Reed 2003) or merely Westernized (Busfield 2003). In any case, this research has focused on linked subareas, namely: (a) the recent practice of subcontracting clinical drug trials to developing countries where regulatory standards are weaker and where there is a greater

[2] Note that Foucault discussed themes related to medicalization in his classic work *The Birth of the Clinic*, as well as in his course *Psychiatric Power*. Pharmaceuticalization is, however, a more recent phenomenon to which Foucault was unable to dedicate significant research effort.

availability of potential volunteers for clinical drug trials, as work by Shah (2007), and Petryna (2009) has shown; and (b) the unequal political economy of the pharmaceutical industry that prioritizes markets in developed countries and marginalizes or discriminates against markets in underdeveloped countries, as has been highlighted in investigations by Busfield (2007a), Petryna et al. (2006), and Shah (2007). This in turn has given rise to related research focusing on new forms of socio-political identification based on health-related struggles by groups of patients or local communities, a phenomenon described as 'biological citizenship' by Petryna (2002), Petryna et al. (2006), Biehl (2004), and mainly by Rose (2007a), Rose and Novas (2005). Elsewhere this line of research has also been followed in investigations on patients living with AIDS, such as Cuevas Valenzuela and Pérez Zamora's recent study (2011), and Cuevas's work with deaf patients (2013).

A fourth line of research has explored drug consumption and drug-related consumerist behaviour patterns (Edgard 2013). Here the focus has moved from a 'social audit' of medication use (Dunnel and Cartwright 1972) to an exploration of the social meaning of medication (in the eighties and nineties of the last century), especially anti-hypertension medications (Morgan 1996) and benzodiazepine tranquilizers (Helman 1981; Gabe and Lipshitz-Phillips 1982, 1984; Gabe and Thorogood 1986). Along these lines, a range of studies have been carried out on the extent to which the social meaning of medication with drugs is marked by consumers' gender and ethnicity (Cooperstock and Lennard 1979; Gabe and Thorogood 1986; Ettorre and Riska 1995). More recently, research in this area has focused on what has been regarded as the emergence of a user or consumer who is expert in medications, who is thoughtful, has specific knowledge, and is able to evaluate risks and benefits on an equal footing with professionals (Fox et al. 2005a, 2007; Stevenson et al. 2009). The position of this expert consumer has often been strengthened by government policies, as Taylor and Bury's research (2007) has observed in the UK, also noted by Edgard 2013. Meanwhile, still another line of research has followed how users act collectively to represent their interests as patients, consumers of medication and/or members of social movements in the public health area (Kelleher 2004; Brown et al. 2004). In the pharmaceutical area in particular, research has focused on the complex relationship that is emerging between patient groups demanding greater access and lower costs on the one hand, and the pharmaceutical companies that produce medication on the other. This relationship is manifested in the capture of the agendas of these groups by pharmaceutical companies, in order to indirectly exercise pressure for subsidized public medication purchases, thereby ensuring a captive market (Edgard 2013; Jones 2009). Finally, a fifth line of research has focused on what we will call 'bio-knowledge' (or life sciences), that is, new developments in bioscience, biomedicine and biotechnology, including pharmacology, and their impacts on individual and social life. Research in this area has been led by Nikolas Rose (2007a), who has sustained the thesis of a growing politicization of all forms of life due to the rapid growth of this bio-knowledge. This politicization of life or 'ethopolitics' (Lemke et al. 2011, pp. 100–103)—beginning with the 'molecurization' of bioscience—, includes, for Rose, new debates on the status of the human being, the formation of a new biosocial identity, new forms of (biological) citizenship, and the reconfiguration of the borders between the normal and the abnormal, health and sickness (Williams et al. 2009a, b). Furthermore, for Rose, medication has become central to defining how behaviour is governed. Individuals are obliged to carry out 'constant risk management, in order to monitor and assess their humour, emotions, cognition, in accordance with evermore refined and constant processes of self-scrutiny' (Rose 2007a, p. 223). In brief, the point made by these investigations is that the growing importance of medication in governing behaviour is due to the explosive and innovative development of the aforementioned bio-knowledge. Furthermore, Rose and Abi-Rached (2013) have extensively portrayed one of the most favoured scientific fields for pharmacological intervention: neuroscience. They conclude by arguing that 'a number of key mutations—conceptual, technological, economic, and biopolitical—have enabled the neurosciences to leave the enclosed space of the laboratory and gain traction in the world outside' (Rose and Abi-Rached 2013, p. 9). Indeed, the conjugation of neuroscience and neuro-pharmacology is likely to be at the vanguard of this new apparatus of molecular power that is now in need of more detailed description.

The question of the new apparatus of 'disciplinary-molecular-biopower'

These five lines of research (pharmaceuticalization, regulation of the pharmaceutical industry, the political-economic structure of the pharmaceutical industry, drug consumption/consumerism, and bio-knowledge (pharmacology) hint at the emergence of a contemporary apparatus of power.

This new apparatus operates within a continuum that begins with the molecular processes subject to intervention since the emergence of bioscientific knowledge and the associated pharmacological applications, incorporates the (self) discipline of bodies of individual consumers of medications, and finally ends in a new kind of biopolitical government over populations, one which manufactures the desire for a certain life—the optimizable life—by means of a process of 'pharmaceuticalization' (Rose 2007a). We will tentatively label this new type of widespread and continuous

power that has emerged in contemporary society from the last quarter of the twentieth century onwards 'molecular/disciplinary biopower'. This expression refers to a power acting not only at the level of individuals' bodies (discipline); and on the multiplicities of populations (biopolitics)—a matter already explored by Foucault—, but also at the level of human molecular (including genetic) configurations, thereby giving rise to what has also been called a 'macromolecular-politics' (Flower and Heath 1993, p. 29) or a 'recombinant biopolitics' (Dillon and Reid 2001, p. 44).

A key feature of this molecular biopower deals with the new internal space where the creation of life is now positioned. In effect, if classic biopower—exercised over the individual-body and individual-species—intended—as Foucault observes—to make live (and let die), it always did so using a previously 'given' material, namely, the previously constituted individual/individuals who was/were the object/s of intervention. Therefore, the life 'produced' by classic biopower is always a symbolized life, that is, the inscription of a given organism into a symbolic universe that socially signifies that organism, this giving rise to productive life. Although the distance between the previously given individual as an organic being and the resulting (symbolic) subject as a productive being is indistinguishable for practical effects, it does, however, place a limit on the application of 'classic' biopower; a limit consisting of the outer physical rigidity of the body castigated by discipline or regularized by biopolitics, thus restricting the possibilities for modification (or governmentality). For all the intensity that a classical apparatus of biopower may exercise, it is always employed over the outer surface of a biologically pre-constituted organism, which was where it met its limit. The inside of the said organic-biological surface was a forbidden space for classic biopower. The new molecular biopower, on the other hand, makes the distinction between the outer and inner image of a live organism obsolete. Furthermore, it will be exercised—at least according to the theoretical frameworks that discuss it—from the very beginning as a power of *creation ex-nihilo*, that is, a power that does not only produce symbolic life from a given *bios*, but which intervenes directly in the production of a certain original type of *bios*: it constitutes novel biological life, just as a god might.

A convenient way to observe the deployment of this new kind of molecular biopower is to analyze both spheres where it may be seen: technologies and rationalities on the one hand, and resistances or counter power on the other.

Technologies and rationalities of molecular biopower

The technologies associated with this molecular biopower will act beyond the state (Rose and Miller 2008, p. 10). Likewise, the new rationalities that arise will operate by giving human beings the expertise to govern themselves by making use of their autonomy, individual responsibility and free choice (ibid., p. 18) while at the same time enclosing individuals within a pharmacological apparatus created by the overabundance of prescribed medical drugs. Therefore, we argue that these new practices of governance emerge in individuals themselves and in how they govern themselves, and are expressed in their empowerment over their own bodies, but that at the same time, as part of these practices, prescribed and self-prescribed medical drugs play a special role as facilitators, giving rise to a new a sort of molecular pharmaceuticalized power.

An illustration of this are specialized expert patient programs, where a type of 'governing the economy at a distance' may be seen, or where, in in other words, 'domination involves the exercise of a form of intellectual mastery made possible by those at a centre having information about persons and events distant from them' (Rose and Miller 2008, p. 34). Appealing to the philosophy of self-management, the expert patient program aims for patients to acquire expertise and knowledge about the treatment of their diseases (Morden et al. 2012; Fox et al. 2005a, Badcott 2005), while also creating communities of patients who help each other. However, this reveals a paradox, as even though self-care seeks the 'empowerment' of individuals over their bodies, the said individuals do not gain a sense that they are in control of their lives, because although the program delivers skills, it does not foster responsibilities (Wilson 2001; Wilson et al. 2007) and depends heavily on self-administered medical drugs. This highlights one of the key deficiencies of empowerment: to achieve objectives along the path towards stabilizing or overcoming a disease, a patient must know his or her body and own his or her self, in order to control and medicate that self and anticipate its reactions. An example of this are the virtual communities that offer advice on administering medicines and preventing secondary effects by sharing information, which stand in stark contrast to the situation faced by those unable to exercise this 'empowerment' due to their physical and mental 'disability', as Naue (2008) argues in the case of Alzheimer's patients.

Another favoured field for molecular intervention is neuroscience, which focuses on mental diseases and their psycho-pharmacology and where knowledge linking psychiatry with the medicalization of individuals is created. In this regard, according to Rose and Abi-Rached, the future of biopolitics lies in how we are shaped by neuro-ontology, that is, the shaping of our brains (2013, p. 22). In this way, what Foucault once described as the shaping of the physical bodies, is now moving away from the corporeal towards an embodied mind, in other words, the brain. Therefore, in addition to creating collaborative communities, it can now be observed that the new technologies of power mediated by medication aspire not only to instil

knowledge of the disease, but also to empower individuals, whether as professionals (Juritzen et al. 2013) or patients. Whether this results in a relatively autonomous and original constitution of the self or a relatively imposed and controlled government of selves remains open to discussion.

An illustration of this is the case of women attempting to lose weight using Xenical and discussing their disease in a specialized forum such as X-Online, a space used as a complement to appointments with medical professionals, and which has even led to changes in the relationships between specialists and patients while at the same time reinforcing the tendency towards both medicalization and pharmaceuticalization.

In any case, neuroscience is currently the area of intervention that best exemplifies the theatre of operations of this new biopower and where the greatest potential for intervention may presently be found, by preventing psychiatric disorders that neuroscience has insisted and literally 'shown' are located in the neural circuits of our brains by using new visualization technologies such as magnetic resonance imaging, and in particular, functional magnetic resonance imaging (fMRI). Despite Rose and Abi-Rached's conclusion (2013, pp. 225–226) that 'the hopes that advances in basic neurobiological knowledge would translate into radical improvements in our capacities to understand and treat troubled and troublesome individuals have largely been disappointed,' the fact is, the rationale exercised by contemporary neuroscience seeking 'to screen and intervene' (Rose and Abi-Rached 2013, p. 15) our neurological circuits seems to be irreversible. Evidence of this are the lavishly funded European (*The Human Brain Project*) and American (*The Brain Initiative*) research programs implemented in 2013 that will compete in coming years to offer the best neuron intervention technologies. This race further strengthens pharmacological power, which has emerged as an apparatus of power that is on the brink of inaugurating the era of the 'post-organic man' (Sibilia 2005), who will leave behind the limits previously placed by the immutability of the soma and be able to explore new forms of existence such as information flows, circuits, and connections essentially reproducible through simulation platforms such as those of the Neuromorphic Computing System (NCS).[3] Therefore, bioscientific knowledge and its associated technologies would enable a qualitative extension of the government of individuals, hypothetically ranging from the molecular to population-wide levels. In fact, discipline, which works on the body, and regulatory mechanisms, which act on man's/the species' biological processes, seem to be blazing a trail for new far-reaching flexible-ruled mechanisms that are neither disciplinary nor regulatory but radically *gestational.* This sets the stage for an apparatus of biopower that will open the way for interventions through which life itself will be upgraded, not least in the newly-opened fields of molecular structures, neuronal circuits and genetic configurations. An example of this are biomarkers, normally defined as 'a characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention' (Biomarkers Definition Working Group 2001, p. 91). Biomarkers are currently being researched to enable early interventions at a molecular level in order to predict human behaviour and psychiatric disorders (Singh and Rose 2009). However, from the perspective of a new apparatus of biopower, biomarkers could also be considered one of the most advanced technologies of intervention which, when associated with pharmacology, will make way for the manufacturing of molecular lives, modeled in the image of desirable human behavior and psychiatric condition. In other words, a gestational life.

Towards new forms of resistance to a molecular biopower

A second dimension inaugurated by gestational molecular biopower may be found in new struggles against power, or in the novel lifestyles that are beginning to occupy the now accepted 'molecular' extension of politics. In particular, it is not far-fetched to expect the appearance of counter-powers that will struggle against the future techniques of 'soul control' implemented at the molecular level predicted by Rose and Abi-Rached (2013, pp. 190–191) such as 'screening programs…for antisocial conduct that involve biomarkers (genetic profiling, brain imaging, etc. or endophenotypes, such as hormone levels'. For now, these intervention technologies have proven difficult to apply and validate.

Analyzing any such counter-power to molecular biopower will first require observation of how the apparatus of pharmacological power gives rise to alternate productivities (practices of resistance and aesthetic practices), as these may prove to be fertile ground for new counter-powers, and may even, ultimately, usher in an era of new organic life. In the specific case of practices of resistance, the main thrust can be found in the creation of new forms of resistance to the different ways molecular

[3] Note that The Human Brain Project includes a subproject named Neromorphic Computing that aims 'to design, implement and operate a Neuromorphic Computing Platform that allows non-expert neuroscientists and engineers to perform experiments with configurable Neuromorphic Computing Systems (NCS) implementing simplified versions of brain models developed on the Brain Simulation Platforms as well as on genetic circuit models' (https://www.humanbrainproject.eu/neuromorphic-computing-platform consulted on February 2, 2014).

biopower is exercised (Wilson 2001). Consequently, resistance is articulated as a way in which both life and body practices can be reappropriated, despite legal prohibitions and expert guidelines, or in other words, how the 'horizon of intelligibility' in which these practices are found can be modified (Camargo 2010, p. 326). Here, it is fitting to reflect on at least two forms of the above type of resistance: one as a mechanism to appropriate an identity and another as a mechanism to deny all identity. An example of the first are 'pro-anorexia' movements, consisting of groups of anorexic women who resignify their 'anorexic' status from being a pathological condition to a new way of life, thus overcoming medicalized and psychologized conceptions of this practice (Fox et al. 2005a). In this case, those diagnosed with anorexia reappropriate their condition and use medications such as Xenical to face the disease as part a group of apparatuses for managing their own lives (Fox et al. 2005b) after recognizing or 'confessing' (Foucault 2011, pp. 372–374) their status as anorexics. The technique used by participants in pro-anorexia movements consists of accepting the heteronomizing category anorexic, but resignifying it, therefore no longer seeing it as a disease or pathology, but rather adopting it as an identity.

To illustrate the second form of resistance, in this case driven by a logic of experimentation, in her book *Testo yonqui. Sexo drogas y biopolítica* [*Testo-junkie. Sex drugs and biopolitics*] (Preciado 2013), Preciado describes experiments with her own body, self-administering high dosages of testosterone in gel, thus experimentally disarticulating entire systems of prohibitions that configure the pharmacological, gender and body identities associated with the consumption of this hormone. Preciado calls this system the 'pharmacopornographic era', which she characterizes as being unable to 'function without the circulation of an enormous quantity of semiotechnical flow: the flow of hormones, the flow of silicone, and the flow of digital, textual and representational content…, in other words, without the constant trafficking of gender biocodes. In this sexual political economy, the normalization of difference depends on the control, reappropiation and use of these flows of gender' (Preciado 2013, p. 97).

Preciado's practice of self-administering prohibited dosages of testosterone creates an upheaval in standard notions of sexuality based on defining a man by his hormonal composition—simply inconceivable if the object of that definition is in a female body—thereby preventing her from being categorized as either, while also disarticulating the possibility of categorizing her as sick or criminal due to her limited consumption of the hormone. Both the non-prescribed use of Xenical by pro-anorexia movements and Beatriz Preciado's self-administering of testosterone are practices of 'molecular resistance', which consists of imagining new ways to interact with power and resist the construction of determined subjectivities from the molecular level of the bios, raising questions about how the horizon of intelligibility of life itself is changing.

Therefore, as a new molecular biopower, pharmacological practices will make way for a radically new scenario that for the time being can only be conceived of in general terms by asking questions (many of which are now beginning to occupy the research agenda in social sciences), namely: what kind of life has led to the emergence of an apparatus of pharmacological power intervening from the molecular to population-wide levels? Similarly, on the other side of the coin, what practices of freedom will arise to confront this intervention, whether at the molecular, body or population-wide levels and what type of post-pharmacological life can be imagined as a result of these practices?

Finally, the existence of new technologies of power at the molecular level raises questions about the new status of biopolitics and its relationship with the subject. It would now seem that the question has more to do with the objective of these new rationalities: are they mechanisms to distribute (self) knowledge about pharmacological self-care, for example, and therefore create biologically empowered subjects in accordance with the neoliberal aegis? Or could molecular intervention be compatible with biological self-care and therefore a new and more inclusive 'practice of freedom'? Furthermore, the objective and character of this 'empowerment' deserves further contemplation, that is, whether as a radically biological renunciation of the self (the contemporary equivalent of what Foucault described in his analysis of monastic Christianity), or as an aesthetic delimitation of the self in response to interpellation by an intrusive apparatus; a 'practice of freedom', although a less demanding and less proactive one, given that it operates on the level of molecular intervention. In any case, if this interpellation is now molecular, and if it begins from the very gestation of biological life, the mere possibility of a practice of freedom seems utopian or at least problematic.

A possible escape from such a troubling scenario may be found in specific analyses of forms of pharmacological resistance that attempt to go beyond the horizon of intelligibility of molecular intervention. If we consider Beatriz Preciado's work, for example, we find that her questioning of the horizon of intelligibility where resistance takes place is crucial, given that her practices of pharmacological experimentation (testosterone) open the way to radically new forms of self-construction—by experimentation—which challenge not only the set of identities imposed on biological life, but also the very idea that life can be subject to identification, including queer identification. This is because after experimentation has taken place, the result is life in a post-human sense (literally, beyond the etymology

of human biology) and autonomous lives lived in an ethical way (Verkerk 2001). It is evident that in order to reflect on these practices in a political sense, it will be necessary to study not only the apparatuses, technologies and resistances that produce certain specific subjectivities (*à la* Foucault), but also the practices that question these apparatuses in terms of their horizon of intelligibility and that allow new forms of (human and post-human) life to arise. This means coming to terms with the idea of experimenting on life itself, and coming to terms with its death and monstrous or alien-human consequences; a biologically radical alter-life. This is indeed a fascinating and new space for radical politics, which awaits further exploration.

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