Discourses on the body, the 'human motor', energy and fatigue: cultural hybridations in *fin-de-siècle* Argentina

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Received for publication in August 2009.
Approved for publication in March 2010.

Translated by Derrick Guy Phillips.

ROLDÁN, Diego P. Discourses on the body, the 'human motor', energy and fatigue: cultural hybridations in *fin-de-siècle* Argentina. *História, Ciências, Saúde – Manguinhos*, Rio de Janeiro, v.17., n.3, jul.-set. 2010. Available at: http:www.scielo.br.

Abstract

This work investigates some discourses that emerged about the body, the 'human motor', energy and fatigue in Argentina between the late nineteenth and early twentieth centuries. Based on this inquiry an attempt is made to show how the hybrid nature of these scientifically purified formulations participated in the construction of biopolitical knowledge (organic economy) that projected the body in relation to production (capitalism) and the nation (state). Similarly, it analyzes the discourses on fatigue and training in an attempt to pinpoint limitations of areas of knowledge based on a Cartesian split.

Keywords: body; fatigue; training; eugenics; Argentina.

> John Ruskin reproached men of business for having lost sight of the fact that the worker is an "engine" whose motive power is a Soul, and that the force of this very peculiar agent, as an unknown quantity, enters into all the political economist's equations ... the true veins of wealth are purple – and not in rock, but in flesh – perhaps even that the final outcome and consummation of all wealth is in the producing of as many full-breathed, bright-eyed, and happy-hearted human creatures as possible.
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> Alfredo Palacios, La fatiga y sus proyecciones sociales, 1944.[1]

In the late nineteenth century, a significant segment of the European intellectual milieu felt that the shadow of decadence loomed large over their era. A lack of forcefulness overwhelmed the *fin-de-siècle* spirit and a single word reflected the situation: fatigue. The French advocate of rational gymnastics, Philippe Tissié (1914, p.45), noted: "This generation was born fatigued; it is the result of a century of convulsions." Years before, Schopenhauer and Nietzsche announced the advent of European nihilism. The harbingers of industrial progress and labor productivity saw the limit of their illusions in fatigue; dreams that were nightmares for the workers. The destruction of bodies and social decadence are the consequences of efforts to overcome the invisible line of fatigue. Behind the establishment of the industrial system, the productivist utopia was seduced by the steely nineteenth-century silhouette of an indefatigable body. The body-machine was considered capable of sustaining the increase in production, thereby lessening the effects of debilitation. The fantasies projected onto the body by the nineteenth-century mechanicist (of the Cartesian clock) and machine-like (of the external combustion engine) metaphors did not give rise to simple objectifications. The vital or human surplus remained unexplained, hermetic and ungovernable from this interpretive standpoint.

Productivity and fatigue were calculable (measurable) from a new constellation of knowledge. Political physiology as a variant of political economics was the consequence of an unstable combination of chemistry, physics and medicine, manipulated by political tools of social and economic management. That knowledges and disciplines saw the body as an instrument for work, establishing the 'European science of work.' Anson Rabinbach (1990) illuminated the construction of this field. The author analyzed a purified transition on the concept of exhaustion. A transition was made from a moral-religious to a scientific-materialist matrix of interpretation. From torpor and melancholy, prevalent during the Middle Ages, the trend switches to apathy and then to fatigue. If torpor, melancholy and apathy were linked to religious and moral ideas, fatigue was related to the materialist (albeit transcendental) reassessment that presupposed the conceptualization of energy (*Kraft*). The interest and the possibilities of this article are very far from seeking to challenge the validity of that general hypothesis. Despite this, I will attempt to show how this path of reconfiguration was considerably less clear and distinct, less pure and more convoluted.

The study of scientific viewpoints on the body as a 'human motor' and organism allows us to observe the social relations and attitudes of meaning that forged these

metaphors. Similarly, the analysis of these discourses leads us to the contexts of enunciation that made these analogies culturally relevant and politically operational. Concern about the body did not arise from the discoveries of energy and the application of the laws of thermodynamics to the physiological economy. Instead, it was inspired by the irreplaceable nature of the body in all forms of work. Naturally, the social configuration rests on the body, with its immaterial constraints propagated through chains of interdependencies that bind social relations (Le Breton, 2002a, 2002b). Men at the turn of the century sought to understand and regulate the body's energies (perceived as a human motor) that govern the work processes. The purpose was to organize ways of life that rendered viable the combination of the productive optimum to the social optimum.

The scope of this paper is to explore some discourses on the body, the human motor, and energy (fatigue and work) produced by Mosso, Tissié and Lagrange (in the Old World) and by Bialet Massé, Bunge, Romero Brest and Palacios (in Argentina). The intention is to show the crossovers and redefinitions of categories, assumptions and interpretations (sociocultural uses of discourse), showing the effects of a strengthening and dissemination that the hybrid nature (Latour, 2007) gave to the science of work during the period under analysis. This incomplete purification (if indeed it can exist in any other manner) made possible the legitimation of ideas about morals, race and nation, based on a practical-discursive field presumably disconnected from these universes of reflection. Paradoxically, the science of work and fatigue achieved the greatest socio-political impregnation by a movement that was also apparently contradictory; distancing from the *doxa* at the theoretical level but communing with it when formulating examples or drawing pragmatic conclusions. Regulating bodies to reform souls was a task that used cultural facilities older than the laws of thermodynamics, namely the ergograph (device which measures the amount of work done when a muscle contracts) and the asepsis of the laboratory. This article aims to show how these components of 'modern science,' lent a new legitimacy to 'old knowledge' (moral precepts and training techniques).

Fractals of a *fin-de-siècle* organic political economy

Energy, work and fatigue: the human motor, body, man and heritage

In 1893, Jorro Publishers launched the Spanish translation of the main work of the Turin physiologist Angelo Mosso. The title of this version was concise: *La fatiga* (*Fatigue*; Mosso, 1893). The lines of his presentation called for an economic definition of the body, it was "a book of organic economy, with countless applications for individuals and communities" (Salillas, 1893, p.VI). Mosso's theory of fatigue was inspired by the chemistry of Lavoisier (1862) and the thermodynamics of Helmholtz (1882), both combined with the physiology of Bernard (1865). The whole theory rested on its bourgeois economic, social and political organization.

Mosso classified the body as an imperfect engine. Its performance was fueled by the combustion of organic matter synthesized in the presence of oxygen (nutrition). From this process emerged work (energy) and emanations of heat (body temperature), accompanied by toxic substances (carbon monoxide and lactic acid). The laboratory made

a metaphor of the body as chemical reactions were produced in it, while the combined use of the laws of thermodynamics and physiology tended to explain them. Fatigue was manifested as a chemical phenomenon, as breathing and the blood-purifying organs (liver and kidneys) played an important role.[2]

The semantic marriage between joints and gears, muscles and motors arose in ergonomic factories and laboratories. The similarities between the mechanism and the organism were openly expressed. The metaphor of the 'human motor' turned into a heuristic analogy (Amar, 1914), although its revelatory power did not prove unlimited. Although the corporal homeostasis was assimilated to the equilibrium of the human motor, the shadow of fatigue (entropy) defied a totally homologous comparison. The machine was able to produce a constant number of kilograms-force with the precise addition of fuel. A well nourished body (based on proteins, lipids, carbohydrates and glucose) was incapable of such a feat (Mosso, 1893, p.212).

According to Mosso, work should not exceed the threshold of fatigue. If this occurred, the elimination of toxins produced and deposited in the body would be impossible, thereby affecting the quality of production. Fatigue resulted in substandard work. The fact of continuing to work while suffering from fatigue was a risk to the physical and psychological integrity of the worker. In the long term, the reiterated accumulation of toxins in the body produced severe physiological disorders.

Fatigue was generated by the poisoning of the body, which was unable to dispose of lactic and carbonic acids. In the short term, the symptoms were neurasthenia, mental strain, *surménage* (overwork) and madness. When fatigue became chronic, it could lead to hereditary anatomical and physiological defects. Fatigue affected not only the individual but also the community as a whole. Fatigued men and women were considered to engender prostrated offspring. Eating habits and factory work left biological traces. By means of mechanisms that were as inexplicable as they were effective, the environment became incorporated in the body. Environmental conditions weighed heavily on the shoulders or contributed to increasing the stature of workers.

Mosso linked the idea of industrial progress with its counterpart of biological decadence. In one of the modern contradictions, economic strength was achieved at the expense of infant mortality and degeneration.[3] Slowing birth rates, increased deaths, lower life expectancy and the proliferation of abnormalities and deformities were the biological indicators of the reverse side of progress.

In *La fatiga*, the ideas of Morel (1857) were completed by fragments of neo-Lamarckism, through key concepts: the inheritance of acquired characteristics and the atrophy of unused functions (Lamarck, 1986). Furthermore, degeneration was linked to Darwinian formulations concerning the struggle for existence (Darwin, 1993, 1997). The selection process, in the context of that struggle, was inevitable and even desirable. The Spanish exponent of *La fatiga*, affirmed that progress should exclude "sentimentalism" as this would necessarily result in casualties. Several lives would inevitably be lost.[4]

The decadence of the species was being achieved in several ways. Not only did factory production engender toxic side-effects and degrade men, women and children physically and intellectually, but also leisure, lack of objectives and idleness intoxicated the 'organic

capital'. The bodies of aristocrats, accustomed to long periods of inactivity, were a fertile ground for all the 'moral vices' (Foucault, 2000, p.144). The body was seen as an accumulator of energy that must be discharged. The concept of corporal energy as a regular and constant flow made idleness a source of intoxication by the unnatural accumulation of lipids and toxins.

The new image of a productive and socially distinguished bourgeoisie was meant to ensure a certain physical strength – correct posture, breadth of shoulders and chest – and erase signs of languor. Sporting competitions, held between members of the bourgeoisie, and mass physical education directed at the subaltern class, constituted a barrier against degeneration (Mosso, 1894). In addition, the dissemination of physical activity inhibited the vice of youth, namely masturbation (Laqueur, 2007).

An organized life, regular activities, and efficient nutrition avoided fatigue. The curves of Mosso's ergograph portrayed the aphorisms that moralists had disseminated some years earlier (Smiles, 1889). The novelty consisted in the scientific (materialistic and experimental) basis of these assertions. A bad diet, lack of sleep, exaggerated emotions and intellectual fatigue sapped energy. Moral intuitions, which tended to curb these excesses, were certified by the combined validity of the laboratory, the experiment and the machine. The controllable reality of the laboratory contamination presumably purified of external contamination, coincided with less disciplined viewpoints regarding extra-scientific interests of the nineteenth-century moralists. However, their bases and mechanisms of reasoning were different (Latour, Woolgar, 1986).

Statistics organized and rendered bodies more controllable, and results were interpreted using racial filters. The quantifications about the population, promoted in France by Quetelet (1835), forged the idea of monitoring the contours of the body based on the Pythagorean reduction of the reality to the number. The series calculated and located arithmetically and geographically the evolution and involution of the organisms of the nation. These statistics became linked to anthropometric formulations indicated by Broca (1857). In the classifications at the time of conscription, physicians were able to assign 'biological numbers' to 'social organisms', figures that translated the 'vital power' of these beings distinguished by class, occupation, region, etc. (Niceforo, 1907).

The weight, height and, especially, the chest circumference became indicators of racial vigor. The numbers pinpointed some areas of decadence, detecting that they were more severe among the working classes with difficult living conditions. Diet, housing, clothing and the working conditions led to constitutionally debilitated organisms that were prey to disease, deformity and atrophy (Mosso, 1893, p.220-221). As a military physician, Mosso noted the havoc that poor living conditions and fatigue wreaked on the bodies of the Italian working classes (p.223).

Physical education emerged as a regenerative mechanism. Working class bodies needed to be standardized, augmented, domesticated and embellished (Mosso, 1898). Grace and energy came together in an imaginary amalgam capable of correcting the body and customs, thereby boosting the virility and strength of the population in a single movement (Vigarello, 2005; Mosso, 1996). Improving working conditions and the infrastructure for physical exercise advanced faster than the productive progress, contributing to the nation's racial

enhancement. Thus, manual labor (organic capital) was transformed into the ultimate wealth of the country. The body was seen from the standpoint of accumulation as a well fed and directed energy resource, which could become an efficient means of production (Foucault, 1999, 2007).

The army and factory demanded robust beings suitable for the deployment of energy. Men whose wills needed to be honed by physical and mental training in order to anticipate fatigue and control emotions. The paths towards the nationalization and spiritualization of labor were outlined, but many elements were still lacking to complete the picture (Andreassi, 2004).

Training: body and will

In 1899, two years after the original French edition was launched, the Spanish translation of *La fatigue et l'entraînement physique* appeared: *La fatiga y el adiestramiento físico* (Fatigue and physical training). The book written by the psychiatrist Philippe Tissié proposed clear guidelines to prevent the degeneration of the race brought about by fatigue. The regenerative capabilities of a set of physical practices, in favor of the morphological and characterological correction of human beings, was noted in that work: "Physical education is the great physical and moral regenerator" (Tissié, 1899).

According to Tissié (1899), training involved a set of techniques to produce a great deal of work without much fatigue. Through training, variables of direct proportionality such as work and fatigue could enhance their relationship. Training ensured health, strength and endurance, thereby becoming a branch of social hygiene. The fitness gained through the exercises would not only be utilized individually, but would also be transmitted to descendents by means of Lamarckism.

La fatiga y el adiestramiento físico complemented the work of Mosso (1893). In addition, it meshed in with the investigations, led by Lagrange (1889), of French physiology on exercise. Tissié voiced the usual mechanistic metaphors of the body, capable of making it the object of control and knowledge through the laws of chemistry, physics and physiology.

Although Tissié maintained many points of contact with his predecessors, his ideas progressed on how to train individuals to delay and diminish fatigue and its effects. The aim was to raise levels of adaptation and tolerance to hard and continued work. Tissié, in tandem with Ribot (1883), placed the origin of fatigue in the nervous system. Immoderate work provoked excitement of the nerves, causing hysteria, hypertrophic sleep, neurasthenia, annoyance, vexation, automatism, blind impulses, split personality, hallucinations, phobias, confabulation, echolalia and obsession. All these changes were both consequences and symptoms of fatigue.

Training regulated instability of the nervous system, delaying and attenuating the effects of fatigue. Furthermore, it was a working system that committed the body, but, above all, it required the cooperation and the strengthening of the will (Payot, 1894). According to Tissié, fortifying and correcting the body was the way to define character.

Training was seen as a school of will and morality (Durkheim, 1947). It was a corporal and mental learning process, sometimes quite tortuous, the foundation stones of which were asceticism and sacrifice (Durkheim, 1992; Wacquant, 2006). It was an externally oriented

practice that required the renunciation of pleasure and the sublimation of desire. Likewise, training required a daily battle with pain to vanquish it. When the repression of pleasure and the continued deployment of tolerance to effort were ingrained as permanent features in the states of body and mind, the suffering of training gave way to a certain degree of enjoyment (Elias, 1987). The deferment of pleasure led to the displacement and transformation of its object. Thus, fatigue, previously considered distressing and pitiful, could be more easily withstood until it turned to satisfaction. By means of training the body and mind in perpetual coordination, seemingly inaccessible thresholds of work could be achieved.

The figure of the coach, indispensable in the early stages, should diminish in importance as the process moved forward. His initial authoritarianism should be transformed into affectionate paternalism. Training was above all a process shaped by social relations that fostered an active body and mind. Once the external constraints were disabled, the process was registered in internalized enforcement mechanisms. The past of the nerves and muscles was only accessible to the body and consciousness after further training sessions.

By continuation of this practice, the external disciplines were assimilated until they became internalized. At one point in the training, the external direction could be replaced by another more intimate one. Tissié was interested in the passage of an external control to another internal form (from the body to the spirit; from the visible to the invisible), and self-discipline was the center of his concerns. The body showed its ability to adapt and change in days of repetitive work. While the muscles were toned, the will was a matter of temperance. In this manner, training was transformed by a mechanism that was only partially inaccessible to the *fin-de-siècle* physiologists and psychologists. It was a relatively permanent case of the body being transferred to the spirit and vice versa. In line with his theoretical framework, Tissié (1899, p.27) asserted that if performed according to his method and system, training was capable of leading to physical and moral improvement.

The marked inclination of Tissié toward physical education and the practice of sport enabled him to place physical and psychological phenomena in a close relationship. Body and mind were united by a perpetual feedback loop, though establishing a split there was not as simple as Cartesianism and positivism had imagined. The practical sense (Bourdieu, 2008) of Tissié emerged in his writing, unconsciously showing the limitations of Cartesian dualism to understand complex phenomena such as training (Bourdieu, 1999). Automatism governed unilaterally by the body was alien to the thinking of Tissié. His idea of the mind-body relationship was stronger than that of many of his contemporaries (Ryle, 2005).

According to Tissié, the body was moved by the will and the will existed at the mercy of the body, i.e. the mind was embodied and the body was mentalized. However, this complexification led to use of the body as a window of the process of moralization and normalization of the will and the character. Automatism in movements was apparent and could only occur after repeated and systematic work. It was neither natural nor innate. The illusory lack of effort to perform a corporal action was only the superficial reading of the effect of the movement. This phenomenological mirroring was arranged by adaptation of the muscles and nerves through systematic and ongoing training.

Fractals of an organic political economy in Argentina in the early twentieth century

The ways of comprehending the body, fatigue and training, in Argentina in the early twentieth century were indebted to the works of Mosso, Lagrange (1889) and Tissié. I focused the analysis on the books of Mosso (1893) and Tissié (1899) for their emblematic nature, due to the significant number of references and quotations that appear in studies of the body, training and work produced in Argentina. These bibliographic references were disseminated in the doctoral thesis of the creator of the 'Argentine system of physical education,' Enrique Romero Brest (1900). They then surfaced, with different connotations in the training manuals of the Argentine Army through to the mid-twentieth century (Dirección Nacional de Tiro, 1944). Identical references are visible in the physiology of the work of Bialet Massé, printed in the pages of his report on the status of the working class in the interior of Argentina entitled *Informe sobre el estado de la clase obrera en el interior de la República Argentina* (Report on the status of the working class in the interior of Argentina; Bialet Massé, 1987). Closely related to this work one can include the conceptualizations of social hygiene of labor produced by Augusto Bunge (1910) and the arguments developed by Alfredo Palacios, both in parliamentary debates on labor legislation (Palacios, 1910) and in the drafting of his work on fatigue and its social projections entitled *La fatiga y sus proyecciones sociales* (Fatigue and its social projections; Palacios, 1944).

I will now turn to a review of aspects of these standpoints, in order to embark on the process of reflection on the ways in which work, energy, body, fatigue, environmental conditions of life and physical training were envisaged in Argentina. Despite their general nature, these were the categories and classifications that guided and legitimized the regulatory action of the institutions and social agents in various areas of the country.[5]

Physical education as moral education (body & soul)

The doctoral thesis in medicine of Enrique Romero Brest marks a change in the traditional views on the topic. The candidate chose his subject matter from an area relatively untapped in Argentina in medical studies of the time[6], namely combining physiology, hygiene and education through the systematic practice of physical exercise. From the title alone, the emphasis is on the latter, albeit the answers to the questions the author raises about the Argentine educational system hinge on the subjects alluded to in the first two. Romero Brest criticized the national educational model[7]; as was the case with Tissié, he was disturbed by the emphasis of intellectual training, though for Romero this trend was not entirely negative. The physical education system which he advocated had a strong spiritual content, as expressed in his mature work (Romero Brest, 1938).

In order to prepare "men fit for the struggle of life," which was the goal of teaching in the mid-nineteenth century (Spencer, 1856), physical education was indispensable (Romero Brest, 1900, p.15). The future of the young nation was considered to be at stake in the construction of these formative tools. Improving the physical health of young people would ensure the future of a race comprised of "heterogeneous elements of pronounced cosmopolitanism" (p.55). The 'Argentine race', whose existence Romero placed in inverted commas, consisted of heterogeneous components of mass immigration. This racial mix could result in a strong breed or lead to racial decadence. Romero believed that progress or

retrogression did not depend on blind forces nor was it biologically determined, but that the impact of the methods and practices was decisive.

A livestock-rearing country such as Argentina had a successful track record in cattle breeding. Likewise, thanks to a network of farms, breeders, ranchers and racetracks it had managed to enhance the horse bloodlines in the territory. Consequently, if the matrix of the natural sciences dominated the social sciences, it seemed logical to submit the human species to racial enhancement procedures (Miranda, Vallejo, 2005, p.157-158).

Neo-Lamarckism had a marked influence on the thinking of Romero Brest. It was necessary to control the evolution of the race toward a positive goal through institutional efforts and the assistance of the State. Physical education became the cornerstone of that process. Furthermore, physical training allowed the control of energy, increased endurance and mitigated the negative influences of the environment and the struggle for life.

In Romero Brest's opinion, this venture should feature a 'new man' as the protagonist, molded by the technologies of physical training. This man should not only be strong enough to overcome the adversities of the world, but also bequeath his physical strength to future generations.

The close ties that bound body and spirit also determined strength and beauty. Physical education had the task of invigorating body and spirit, resulting in strong and beautiful youths, whose seed would be handed down from generation to generation. From the late nineteenth century onwards and through to 1945, educators did not suppress the dream of embodying the Greek utopia of bodies incorporating Apollonian and nationalist virtues in their students (Mosse, 2007).

The benefits of the systematic practice of physical exercise were numerous. The education of the body was an appropriate measure for hygiene, energy conservation and the building up of resistance. Furthermore, it distanced young people from the hidden vices (masturbation). The increase of resistance and the action of corporal education on character were the keys to individual and social success, the former in the struggle for existence and the latter in the moralization of youth (Romero Brest, 1900, p.31, 33, 38).

Romero Brest's prose bears witness to the convergence of morality and training. Fatigue avoided by physical activity distanced young people from the sterile dissipation of their organic potential. The vices of youths prepared the body to accommodate those of adulthood: tobacco, alcoholism and laziness. "It's a commonplace observation that exercise prevents many vices developed in these groups [popular gatherings and youths], diverting the imaginative current avid for pleasure that fatigues the organism" (Romero Brest, 1900, p.67).

Exercise, as the energetic catharsis of the 'human motor', served as technology of regulation, balance and control of the corporal mechanism and the character-building framework. Well managed, physical activity could provide the necessary mental and organic equilibrium to confront the fatigue caused by the struggle for existence.

Body and work: fatigue, environmental conditions, lifestyle and working hours

In early twentieth-century Argentina, the ideas regarding the body as a mechanism and the loss of energy at work were addressed by the physician and lawyer Juan Bialet Massé. Initially, this treatment was restricted to a manual of anatomy and physiology

(Bialet Massé, 1876). This horizon was broadened in the report on the living conditions of the working class, where the Catalan lawyer ratified the machine-like nature of the organism. Allusions to the steam engine and its work to illustrate the functioning of the body were recurrent in his prose. Based on this comparison, Bialet set out to submit the study of physiology to the scientific laws of mechanics and chemistry. This procedure transcended humanist reformism in labor regulation. *Informe...* was justified by the absence of political (subjective) interests and the universal (objective) validity of its premises couched in scientific discourse (Palermo, 2004). However, the separation of science from politics, typical of nineteenth-century thought, was only circumstantially ratified. Bialet's arguments were granted the legitimacy of scientific and statistical considerations, making the conclusions more sophisticated and distancing them from purely political or humanistic positions. However, Bialet indicated that the moral valuations, which started out as "vague intuitions" were almost always confirmed by observation and scientific experimentation. In this sense, Bialet's battle was directed against the knowledge of engineers, whose comparison of the worker to a machine was total, ruling out any medical (human) consideration on labor (p.200).

The findings of Bialet Massé were taken from sundry and heterodox sources.[8] Their hybridization resulted in a collage that is possibly contradictory to contemporary eyes. The Bible, the encyclical *Rerum Novarum* of Leo XIII, proverbs and sayings coexisted with the most advanced observations of positive physiology and experimental psychology. This coexistence was possible because all these statements enjoyed recognition, although some were reached by common sense and religion and others by their exposure and control in the *fin-de-siècle* scientific field (Terán, 2000). Bialet's ideas did not try to counteract the legacy of a deeply Catholic people, nor did they seek to impose scientific ideas in a country whose roots were different (Prieto, 2004). For this reason, he resorted to the path of hybridization. For example, for the Catalan man of letters, the biblical condemnation following the fall (by the sweat of your brow shall you earn your bread) was a natural condition of human beings. But such a state of nature, divested of its theological overtones, was to be found in the striated morphology of human musculature. The positive anatomy therefore ratified the Holy Scriptures.

Inactivity was deemed a risk to health. The organism exposed to 'pure idleness' rapidly fell in thrall of degeneration, initially manifested by the infiltration of fat in the muscle tissue. This gradually poisoned the blood, tissues and major organs, affecting the organism and behavior. The incubation of moral vices was one of the effects most invoked by idleness. The reserves of energy needed to circulate, as the body was considered an energy accumulator, a kind of dynamo that when overloaded had to be emptied in order to avoid unintentional and violent explosion.

> It has been said that *idleness is the mother of all vices* and this *philosophical truth*, witnessed by *empirical observation*, is manifested by *scientific observation* and verified by *recording devices* ... Inactivity, not only brutalizes but leads to imbecility; though since in this state there is a certain charge, which must be used up and renovated, and even when the subject does not want, it can be instantly discharged; *that which is not spent usefully is diverted to vice*; the currents are sent in the wrong direction; as *the popular expression so accurately puts*

> *it "What does not lead to God, leads to the devil."* Between virtue and vice, there are no more differences than the direction of the activity and the amount, when and how it is used ... There is no degeneration from which idleness can escape, and as every vice and every crime are the result of an anomalous state of the organism one can say that *the common aphorism is a scientific theorem* (Bialet Massé, 1987, p.545; italics added).

In the opinion of Bialet Massé and Romero Brest, the key was channeling the energy (*Kraft*) contained in the body. They differed in focus as Bialet preferred labor legislation while Romero concentrated on physical education. However, for both thinkers the excess or lack of activity constituted significant hygienic problems. The interpretive scheme of the physiology of Mosso was on both of their minds. Their preponderance was expressed in the effects of overwork, the production of toxins that were hard to eliminate and the gradual poisoning of the body deprived of rest and sleep. It is important to stress that Bialet and Romero hybridized their scientific discourses with moral propositions that enjoyed broad social prestige. Science in their approaches did not defy common sense. Instead, they preferred to confirm it and, by means of the strategy of participation, win over public opinion.

Fatigue, like unlimited leisure, inclined man toward vices. Alcoholism found adepts among workers used to long working days, poor environmental conditions and unsanitary housing (Clavijo, 1915). In this field it was necessary to find an Aristotelian middle ground. The optimum way of achieving a balance between nutrition, sleep and work consisted of constant efforts, the duration of which did not exceed eight hours. In addition, it was essential to have adequate conditions for restoring energy (energy for work) in the time devoted to rest (Carbonell, 1910).

For Bialet Massé, the eight-hour working day was the natural and organic order of things. By approving such a measure, the legislative chambers regulated human activity according to the demands of nature. Science and politics were mutually alienated: man and the universe were governed by universal laws prior to desire, will and action. However, Bialet considered that the rest provided by the eight-hour day was insufficient to purify the blood, muscles and prevent organic overload. A weekly day of rest was essential. When work required great muscular and nervous tension, it was necessary to have a seasonal break. These paid vacations should range between fifteen and thirty days.

The virtues of short days were considerable, as according to the Catalan physician and lawyer the benefits would be appreciated by society and the whole nation. With the eight-hour day and weekly day of rest, progress would transcend the economic sphere, thereby enhancing the national workforce. "There can be no strong, great and free people, where the workday is long and excessive" (Bialet Massé, 1987, p.546).

The definitions of Alfredo Palacios in the House of Representatives when he introduced the bill for a weekly rest day (1905) were not greatly different. Identical bibliographical references permeated the data and backed the interpretations. The proof, modulated by the physiology of labor and fatigue, was completed by moral arguments of a Catholic bent, although these were not made by Palacios. The exponents were the legislators who established the weekly rest day on Sunday, transforming the nomenclature of the project (Mases, 2005), thereby heeding the tradition inscribed in Genesis and the organization of Catholic religious services (Palacios, 1910).

During the Centennial celebrations, the report that Augusto Bunge (1910) wrote to the National Department of Labor was published. Unlike Bialet Massé, Bunge sought greater interaction between the theoretical background and field observations, though his political position was different. The manufacturing environment and housing conditions granted privileged access for the analysis of the biological weakness of the working classes. Bunge, who chose to use the statistics as a problem and not as a mere observation, stated that the indicators not only deserve to be revealed and displayed but also discussed and explained. Some analytical stances of Mosso (1893) were adopted by the Argentine physician.

In the late nineteenth and early twentieth centuries, the physical degradation of the working class sectors according to the standards of biopolitical visibility was detected in all capitalist countries. Its symptoms involved poor nutrition, lack of ventilation in the workplace and the home, monotony of the task, overcrowding and discomfort and excessive noise and dust. The atmosphere affected the body, producing individual and racial alterations (Bunge, 1910, p.12). Fifty years after its publication, the treatise by Morel (1857) on degeneration was used in Argentina.

Poor working conditions were blamed on the employer, but for Bunge no one was exclusively responsible. The workers were guilty of not improving and educating themselves and indulging in a flippant lifestyle with lack of foresight. Transforming these habits, ingrained in tradition, was a civilizing crusade spearheaded by moralists and hygienists. The vital resource for this conversion was seen as basic education for children. The adult workers were urged to spend their free time away from the bars and close to the public libraries. This approach coexisted with certain appeals to 'social justice' which, by means of labor legislation could avoid what Bunge called 'revolutionary justice' (Bunge, 1910, p.14).

The laborer was deprived of the (humanized) spiritual life due to monotonous and stultifying work routines. Evidence of the physiology of work and fatigue were invoked to support some reformist proposals. References to the work of Mosso (1893) appeared whenever Bunge (1910, p.33) decided to reflect on workplace-related toxins and the difficulty of removing them without having recourse to periods of rest.

Bunge drew the moralist rhetoric from the seminal work of Adam Smith. *The wealth of nations* was essentially predicated on its men (Foucault, 2007). The writings of the 'father of liberalism' helped to substantiate the need for a shorter workday and the betterment of working conditions (Bunge, 1910, p.28). Adam Smith was to Bunge what the Bible and *Rerum Novarum* were to Bialet Massé: authorities that are incongruous (albeit not antagonistic) with the central theme. However, they could be rhetorically used both to convince a reader who paid them heed and to sustain new arguments using older ideas. The procedure for their invocation consisted of making the reform proposal accessible to the public it was trying to convince and to the preceding ideological matrix that coexisted with reformism. It was a pragmatic use and unplanned overlapping of the logic of thought and wordplay.

If fatigue weakened human capital during production, its repercussions led to social debilitation. Fatigue was one of the major causes of the squandering of important possibilities for accumulation. The social benefits of short workdays were becoming

inaccessible to workers, impoverishing their social and economic relations. The endless workdays curtailed their hours of relaxation and the worker could not recover from the tension caused by work. Bunge advocated a shorter workday, though he demanded that workers accelerate the pace of production. Thus, despite reduced work time, productivity would be maintained.

A wage hike was compensated by an increase in production. The lack of rest and a demanding work schedule led to an increase in alcoholism. Repetitive work and poor living conditions diminished the intellectual capacity of the worker and his willpower wasted away. Without any prospects, the worker went to the bars to find solace from exhaustion and a less crowded space. But such relief was short-lived, as soon a new form of tiredness resulted from resorting to drink. The worker was caught in a vicious circle (Bunge, 1910, p.45).

The poisoning of fatigue and a poor diet was aggravated by alcohol. Along with other scientists of his time, Bunge speculated that alcoholic parents produced degenerate children. Only a combination of good lifestyle habits and hygienic living and working conditions could eradicate the decadence of the working class. Education and social reform were the tools that Bunge recommended to rebuild the physical and spiritual strength of the Argentine working classes.

As if a game of mirrors was involved, the same figures, the same names and identical considerations were repeated in all directions. The series of these books comprises a labyrinth, in which the reader goes around in circles unable to find the exit. The decorations vary and there are differences in thickness between the walls, but the writing stamped on them, as in any social game, can barely be considered individual. The uniqueness of these texts lies less in the process of conception than in the social practices and the hybridization of the scientific, political and moral languages.[9]

Bialet Massé (1987, p.1009) regretted that the physiological notions of work and rest remained restricted to a scientific aristocracy. However, this small group showed signs of a broad consensus in their views on the subject. All of them read similar literature and emphasized the need to pass systematic labor legislation, geared to establishing an eight-hour workday and a weekly rest period of twenty-four hours. Only the work of Palacios differed from the rest by experimenting in the laboratory to support his thesis. The creation of scientifically-based labor laws was the focus of his work at the Laboratory of the Physiology of Labor at the University of La Plata. Palacios proposed the setting up of experimental psychology laboratories and labor law classes in the workshops of the country (Hall, 1944, p.56).

Despite this gesture of radical empiricism, the dependence of his theoretical apparatus on Mosso's work was such that his experiments only provided new evidence for the studies on which he based his protocols. In this way, the political value exceeded the scientific value of the work.[10] But, as Schapin and Schaffer (2005, p.52) affirmed: "the problem of generating and protecting knowledge is a problem in politics, and, conversely, the problem of political order always involves solutions to the problem of knowledge." One of the characteristics of Palacios' work was expunging the regressive tone of some of his theoretical works, bringing them in line, sometimes forcibly, with the reformist political goals of his

scientific arguments.[11] Only his criticism of the Taylorist model for its lack of emphasis on the physiology of work, fatigue and humankind can be seen as novelties. However, the treatment of Taylorism drew on chapter XIII of the Treaty of Versailles, on ILO documents (Palacios, 1920), and Ioteyko's critique of Taylorism (1926). At an early stage, Bialet Massé also detected the reluctance of engineers (such as F.W. Taylor) in incorporating the suggestions of the science of work to their perceptive models (Palermo, 2004).

The policies aimed at protecting women during maternity and offspring were recorded by Palacios. In his view, if women worked during pregnancy, their children would inherit morbid tendencies. The children had problems at birth, being consequently fertile ground for tuberculosis. Phthisis primarily afflicted the working class because of the strenuous fatigue inherited from both parents (Armus, 2007). According to Palacios, the organic degradation acquired by chronic fatigue and poor environmental conditions of the working class sectors left the body open to infection. The socioeconomic conditions of the workers meant that tuberculosis – an environmental illness – was 'incurable' among them: "the mother who works during pregnancy will produce a weak, if not stunted and degenerate child ..." (Palacios, 1944, p. 310).

Palacios' recommendations in favor of rest before and after childbirth reduced the social bondage of women to social subordination, to biological reproduction and to the rearing of children. This affected the interests of the nation, because fatigue weighed upon the progeny (Palacios, 1910, p.106). Although their ideas were underpinned by progressive reformism, they did not shake off the assignment of a domestic role to women as being solely responsible for the education of children. Nevertheless, the offspring should be protected and their mothers assisted since both of them represented the key figures of the nation's future. Palacios' affirmations showed a eugenic tendency offset by the reformist interests of socialism. Despite this reformulation, the essence of these statements was in line with the same theory, which in other sociocultural contexts could acquire an entirely different meaning.

Conclusions

The analysis of several works by Mosso, Tissié, Bialet Massé, Romero Brest, Palacios and Bunge reveals a panorama replete with exploratory work, diagnoses and prescriptions on the body, energy, work and fatigue. The image of the body that is constructed by the cultural outlooks of the authors is imbued with the forces and the social relations of industrial capitalism. The idea of the body as a means of production (machine), of physical energy as capital (organic economy) and biological strength as racial vitality (eugenics) were to be found in all these works (albeit through different interpretations and configurations).

The study of the relationships between these works and the areas of intervention that they foreshadow seeks to show that the transition between the moral (religious-transcendental) and scientific (materialist-empiricist) ideas was not achieved through radical discontinuities. Earlier, I highlighted the (harmonic and complementary) coexistence of fragments of both forms of argument. The thinking of labor legislators turned to science

to justify the reform, namely a change that was also based on more deep-seated religious and moral ideas. Consequently, the improvement of working conditions was considered to have a positive impact on the moral condition of workers. Modifying the objective (material) world would of necessity lead to a subjective (spiritual) change. In this field, the ideas of the trainers of the body were projected on behavior and the spirit. Physical education teachers (as well as military drill instructors) assumed (although without invoking the flagellants) that the torments of the flesh, bodily suffering and asceticism were ways to temper the character and develop moral fiber.

The body-machine was just a metaphor: the objectivity (measurement) of fatigue imposed its conditions on the social engineering of the worker-soldier by transcending pain and pleasure (Roldan, 2006). In the studies reviewed, body and spirit are (de)composed with invisible bonds (barriers) in pursuit of organizing the subjects. Cartesian dualism provides the paradigm and dominates both trainers and jurists in the eyes of the physiologist. The model of strengthening and moralizing has a magical component as the relationship between body and mind remains inexplicable (unexplained). These discourses form a part of the practical orientation that contributed to the grooming of workers, consumers, citizens and soldiers, as a segment of the state and national construction in the late nineteenth and early twentieth centuries.

The preceding pages sought to show the ambiguous (hybrid) character of scientific discourse on the body at the turn of the century. This production of statements seems to be organized more around language games (uses) than conceptual indicators and purified theories. The organization of the discourse on the body depends therefore on the dynamics of its construction and of the social games of those involved, more than on the all-embracing and purified thinking of its architects (inserted, as they also are, in these and other social games) . Therefore, I have attempted to show how moral and cultural elements infiltrate themselves (without undergoing major changes) in the scientific networks. Perhaps the cultural and political dissemination and operability of such discourse in the state, national and social constructions of the twentieth century has depended (precisely) on these infiltrations and impurities.

ACKNOWLEDGMENTS

I appreciate the comments of the anonymous reviewers of this work and the critical reading of Cecilia M. Pascual.

NOTES

[1] All quotations in this article have been freely translated from the original Spanish.

[2] Mosso experimented on blood exchanges between two dogs, one of which was at rest and the other excited. The experiment consisted of the following protocol: in the bloodstream of a fully rested dog, blood from another exposed to excitement of an electrical current was injected. Noting that the first dog, after the transfusion, began to experience symptoms of fatigue, Mosso (1893, p.165-166) deduced that fatigue was caused by a toxin that was deposited in the blood.

[3] The ideas of degeneracy were established and disseminated by Morel (1857) in France, which was one of the locations where Mosso had studied in his youth in the mid-nineteenth century.

[4] In the first decades of the twentieth century, these ideas found their apogee in a work written by a lawyer and a doctor in Germany during the Weimar Republic. The discourse on radical eugenics and euthanasia, with much divulged in the United States, culminated in the publication by Binding and Hoche (1920). On eugenic discourse in Latin America and Argentina see the important compilation by Marisa Miranda and Gustavo Vallejo (2005).

[5] Due to the scope envisaged for this work, there is insufficient space to dwell on the disciplinary practices governed by the patriotic topic of target shooting, the physical regeneration of debilitated children in holiday camps, the construction of the first Municipal Stadium in Latin America for the practice of physical exercises by the people and the trajectory of education. To study the matter in depth, we refer the reader to the work of Aisenstein and Sharagrodsky (2006) and Roldán (2005, 2008).

[6] Although several theses had been presented on school hygiene, and this was a topic of considerable emphasis in hygienist discourse, similar concerns had not been channeled into the aspect of physical education.

[7] For further study on the proposals of Romero Brest, the best study conducted to date is that of Aisenstein and Sharagrodsky (2006).

[8] The heterodoxy of Bialet Massé with respect to his political and social ideas (especially his concept of Indian socialism) has been highlighted by Agustina Prieto (2004, 2006).

[9] In this respect, Wittgenstein (1999, p.43) stated: "The meaning of a word is its use in language."

[10] In order to assert the originality and value of the work, in the second edition (1924) Palacios published several letters from scientists and intellectuals of international renown. They all made complimentary comments about the book. One can witness the signatures of Santiago Ramón y Cajal, Gregorio Marañón and the disciples of Mosso, namely Mariano L. Patrizzi and Gabrielle Ferrari (Palacios, 1944, p.25-30).

[11] In particular, this operation is significant in reading the work of Nicephorus (Nicéforo, 1907; Palacios, 1944, p.49).

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