of Merton's normative system and the new trends it is possible to observe the following. The norms of the scientific ethos constitute the epistemological and professional-ethical *prescriptions* in science, whereas the above new anti-norm systems establish discrepancy between morality at different stages of science progress and requirements of this ethical *prescription*. The Mertonian theory of the ethos of science comprises the prescriptive part without which science cannot function.

The norms worked out by R. Merton reflect the ideals of scientific inquiry that have not become obsolete.

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Pitirim Sorokin and the Matthew Effect in Mexico: a Reflection on Merton's Sociology of Science

Keywords: Robert Merton, Pitirim Sorokin, Sociology of Science, Development, Matthew Effect, Mexico, Altruism

> [T]he Copernican revolution in the sociology of science... truth is socially and historically constructed.
>
> *R. Merton (1938)*

> It is precisely the psychosocial aspects of man, his [sic] meaningful behaviour, communication, and control, which are neither revealed by, nor can be explained by, a physical account of some of his physical operations.
>
> *P. Sorokin (1956)*

Introduction

In our current age of reflexive social science (Burawoy 2005), we recognize that we are asked to hold a different vocabulary than what was possible at the beginning of 'modern, western science' (MWS) in Europe. This was the era when Francis Bacon (1597) wrote: "knowledge is power." Scientific times have changed much since then.

R. Merton, a U. S. American in the midst of the 20th century 'Cold War,' closer to our current era, wrote: "science is power" (1962b: 19). A more 'developed' nation-state, according to this definition, is a country with more and better 'science' and 'technology' which could then exploit the most modern forms of knowledge for power.

These implications follow: If we learn science we will gain power. If we do science, we will become more powerful. The key question at the core of this paper then is whether

or not our individual and collective *anthropic* powers, represented in both quotations by Merton and Sorokin above, can be used in various processes to improve the quality of human life and development around the world. This is the field studied by sociology of development and systems in/with which sociologists are involved. 'Science for development' and 'science for human dignity' are therefore our two main themes 'behind the scenes' in this paper, which are employed to speak to people globally, through this new dual-language Journal in Russia.

The 'industrial age' has peaked and declined already in the 'developed west,' particularly since the end of World War II (cf. 'the Great Patriotic War') and in many cases also since the Cold War. In the 'developed west' and in most 'highly developed countries' (including Russia and Mexico), we now live in the Electronic-Information (EI) Age. For many years we have lived in an age of 'Big Science' (de Solla Price 1962), i. e. the science that fuels industry and industrial development. Merton fixed his eye on this and discovered "two sets of contrary forces, approving and opposing science as a large-scale social activity" (1962b: 17). In this Merton identified a social dimension of 'doing science,' the flexing of human powers (and their/our personal and group interests) for knowledge that has both offensive and defensive aspects. He continued to translate and elaborate this unique finding in sociology of science (SoS) to new audiences throughout his career.

'Doing science' and the results that come from it are now considered as important features of developing socially and culturally as nations and peoples. Even if this perspective comes from within the mainstream, contemporary, 'western' canon, it is nevertheless separate from the Euro-Enlightenment notion of 'Science' as abstract, ideal or 'pure' knowledge, a 'secular good' unto itself, which is practiced in a social, cultural, ethical, religious, linguistic, and/or political vacuum. The latter perspective today is rarely held. The former follows through on views that 'science is a process' and that 'science begins in action,' which we believe helps to 'humanise' (or *anthrop*ise) it. Now, the phrase 'doing science' is considered more 'objective' in a reflexive sociological sense, than the old view of 'Science' considered as a road to utopia.

In this shared year of Merton's birth with the two Mexican Revolutions (1810 & 1910), this paper gives space for Canadian and Mexican voices on Merton's sociology of science (SoS). We might joke that we are looking at the elephant from different sides, or with a tail instead of a trunk, but what allows us to make this connection safely is through a common respect for Russian ideas, which highlights the Sorokin-Merton relationship. Merton made SoS respectable and visible in the U. S. American academic tradition and in the (English-language or 'western') sociological tradition generally speaking, although several of his main ideas came first from Sorokin. Our thesis question is as follows: in what ways did Merton influence SoS on the global scale?

What is Sociology of Science (SoS)?

The first two questions any student in a SoS classroom should be asked, are: Which science(s)/scientist(s)? Whose science(s)/scientist(s)? The power of the (inter-)disciplinary lenses we employ in this inquiry follows *after* these questions, as does much of the sub-field of SoS. Observers must always first establish the formal and first/final significance, and the efficient and material cause(s) of the 'science' or 'scientist' in question.

We take a position somewhat similar to sociologist of science Harry Collins, when he says, "Science has been oversold" (2005: 7). Science, we contend, is not always as 'big' globally anymore as some societies or groups perceive it to be. There are also 'middle' and 'small' sciences that involve people around the world in the action of 'doing science', of inventing or innovating technologies, and of achieving development in more or less socially-accountable ways. Natural-physical sciences (NPSs) cannot function as a universal scale by which to measure humanity now that we have 'unpacked' the meaning of 'scientism' (more on this below). We recognize now that science is inevitably influenced by and influences people at all social levels and that it is a 'type of knowledge' among others that are taught in the modern university.

We consider that amplifying and strengthening the diversity of 'sciences' (including natural-physical and human-social sciences — NPSs & HSSs) practiced at local and regional levels, in addition to building mass-funded sciences (NPSs & HSSs) at national and international levels can be a good thing that improves the present and future health and wellness of human communities and individuals. This possibility involves all human persons in the shared earthly eco-system. It is this topic, taken in the scope of 'sociology of science' (SoS) in a celebration of Robert Merton's life, works and relations that we now address.

SoS — National Comparisons

There are multiple streams, schools and traditions in SoS. This multiplicity is due to national as well as to economic and ideological differences or to varying material and technological conditions among participants. Some nations, and some centres within nations, are, if it can be said within the proper context, 'more scientific' than others, which means that others are 'less scientific' too. Thus, when seeking a discussion of SoS on a global scale, we first acknowledge that local and regional traditions need to be highlighted and brought into the conversation in the context of their domestic and international contributions to the field. The science produced in one national tradition might not feed-into 'big' science on a global scale, but may be nevertheless valuable for 'medium' and 'small' scientific progress and have consequences for many in the periphery.

Some sociological historians have noted the centrality of the U.S.A. in developing the general field — SoS. "Thus it was in America that the sociology of science, in the strict sense of the term, was born in its early Mertonian version, developed within an empirical perspective of limited breadth," notes Statera. "It is thus to America that we must turn to observe the development of the discipline, first casting our eye on Merton" (1998: 63). The institutional and/or formal-systematic building and collective organisation of actors, participants-in and observers-of the field's discourses and communications, including the strategic apparatus and publications that developed within U. S. American sociology to support the sub-discipline SoS was impressive.

Statera speaks of the Mertonians as a "legion of sociologists of science who elaborated the theoretical and empirical analysis of the normative structure of science" (1998: 65). But there were also constant references to political, economic and social conditions surrounding the modern University/Academy, upon which the directions and targets of the Mertonian research program, were focused. "I believe the Mertonian-style sociology of science was a

creature of the middle years of the Twentieth Century," says Collins, "it was a response to fascism and the horrors it had wrought" (1999: 2). With this in mind, we must not forget that the Cold War (U.S.A. vs. U.S.S.R., and satellites) served as a backdrop for most of Merton's works in SoS.

In Merton's view, people were more likely to originate/invent SoS in a totalitarian state than in a democratic one, the latter in which 'science' in the 'modern, western' (MWS) sense has come to be almost synonymous with 'democratic' and 'beneficial for humankind, everywhere and always' (Fuller 2010). Instead, no, wrote Merton, "science has become a 'social problem,' like war, or the perennial decline of the family, or the periodic event of economic depressions." ... "When something is widely defined as a social problem in modern Western society, it becomes a proper object for study" (1962a: 17). But Sorokin would prefer to call this a pathological reason and label it 'pathological sociology' and attribute its focus on negativity and deviance to a distorted quantophrenia, the enigma of 'sensate[1]' cultures (see below).

Is it easier to conduct research in the sociology of science and technology in the 'developed west' than in developing countries? If so, this raises again the issue of material and technological conditions that influence the way research is done, in addition to cultural and political surroundings. "The politicizing of science in Nazi Germany and in Soviet Russia, for instance," notes Merton, "has aroused the interest of many in identifying the particular kinds of social contexts in which sciences thrives, a problem central to the sociology of science" (1962a: 16). Indeed, this indicates that Merton is well aware that 'science studies' and even 'sociology of science' (SoS) so-defined came from Russia (or another of the formerly-communist countries), in an environment which considered the social and cultural influences on 'doing science' more closely and carefully as 'important for collective society' than in a laissez-faire, individualistic, market-oriented system.

One clarifying point is worth noting here. When sociologists make comparative studies, such as this one, they need not necessarily take the nation-state as their primary unit of analysis, i.e. the comparison of nationality-based traditions. Elsewhere[2] we have identified the 'Big Four' national traditions — U. S. American, British, German and French — a grouping we can now apply in our scholarly approach: Russians, Canadians and Mexicans seek to negotiate the terms of our engagement with global sociology via our contacts with great figures and communities in and from the Big Four. But we also seek contact with/from people in non-Big Four traditions and to nurture the local and regional talents trained in our home tradition(s).

It may thus be a surprise, or perhaps only to 'western' sociologists of science that have virtually un-opened the non-western or 'other' scholarly canons, that 'SoS' was a term first coined in the Russian language. The rise of 'science studies' (*naukovedeniye*, 1912) began in Russia before it began in 'the west,' through the work of Bogdanov, with the founding of tektology, an early form of 'systems science.' It was later that 'sociology of science' (*sotsiologia nauki*) was coined by Borichevsky, in 1926, before Merton had arrived on the scene. It is uncertain, however, if Borichevsky had read Weber (e. g. "Science as a Vocation," 1919)

[1] "Any system of sensate truth and reality implies a *denial of, or an utterly indifferent attitude toward, any supersensory reality or value*. By definition, supersensory reality either is nonexistent or, if it exists, is unknowable to us and therefore equivalent to the nonexistent." — Sorokin (1941: 86).

[2] Sandstrom 2010.

when he coined SoS, as translations of academic works into and out of Russia, particularly from 1914–1923, were considerably interrupted. Our next task is to discuss some of Merton's major contributions to SoS in the period 1938–1973.

Merton's SoS across Time and Space

Science is public, not private.
R. Merton (1973)

The most significant contribution that Merton made to SoS comes from his leadership and participation in sociological studies of science during the years 1938–1973. The time frame coincides with a significant part of the so-called Cold War in which 'development' was competed for in the 'space race' and other features of the military-industrial complex. The prestige of science, as a result of technological and systems applications of scientific innovations and discoveries, made it easy for 'modern westerners' to fall into an ideology of 'scientism' and the numbness of automation. There had to be some way to circumscribe the power of 'scientific method' used in or funded by the public sphere, but it was nowhere to be found.

Yet even in the U.S.A., a country where individualism and capitalism are nurtured in the attitudes of school children, the suggestion that 'science' could be a private activity was unpopular. Science needs to be at least minimally designed by the public (e.g. its elected representatives) to ensure social-accountability and it needs to be financed by the national purse to enable long-term planning and projects that could not occur without the collective efforts and contributions of a community, province, region or nation-state. The 'publicness' of science explains for Merton the importance for science to be supported by society in order for it to grow and prosper, i.e. for the betterment of humanity, beyond the boundaries of individual communities.

In 1973, as he did in 1938, which covers the main years he worked on SoS, Merton gave a definition for the 'development of science.' Noteworthy are the specific small changes in this particular passage, 45 years later:

> "The persistent development of science occurs only in societies of a certain order, subject to a peculiar complex of tacit presuppositions and institutional constraints" (1938: 322).
>
> "The **substantial and** persistent development of science occurs only in societies of a certain **kind**, which provide both **cultural and material conditions** for that development" (1973: 182) (bolding added).

By distinguishing 'kind' from 'order,' speaking of 'cultural and material conditions' instead of 'institutional constraints' and highlighting the 'substantial development of science,' Merton in the twilight years of his major period of focus on SoS, opened up a pathway into this conversation we are now having on the global scale. Merton's work enables us, as authors, to take a common approach, though we are separated both by time, space, place, and nationality. We are united as sociologists of science to consider the core work of a man whose presence in the field from the late 1930's to 1970s is a significant wonder.

In this sociology of science approach to Merton's contribution and categories, we enlist the help of Russian — U. S. American sociologist Pitirim Sorokin, one of Merton's teachers, which leads us into a conversation that distinguishes cultural from material conditions and needs. Distinguishing the cultural and material influences on science and the effects of science on society and culture shows how a cultural-materialistic ideological position towards science is always incomplete for understanding ourselves and the world in SoS. Looking at both material and cultural development fits into the wider realm in which the paper is framed: on the global varieties of human-social development.

Merton, Sorokin and Altruism in SoS

> However much Sorokin may on occasion seem to take joy in the system of truth described as characteristic of an idealistic culture, he nevertheless *practices* under the rules of a sensate system[1].
>
> *R. Merton*

> The beginning of the systematic scientific study of altruism can be attributed to the work of Pitirim A. Sorokin in the 1950s[2].
>
> *Tiryakian et al.*

To briefly address the student-teacher encounter between Merton and Sorokin at Harvard in the 1930s and 40s, we can look at Merton's dissertation, which Sorokin did not fully support, as one significant marker in their co-contribution to SoS on a broad scale. Was Merton closer to Weber's "Protestant Ethic and the Spirit of Capitalism" view, as his similar thesis suggested, than to Sorokin's Orthodox-Integralist view? How much of Merton's SoS actually came from the prior work of Sorokin? In what ways did Merton move forward in his SoS with the help of Sorokin?

We would like to read more on the relation between Merton and Sorokin during the latter's experience with philanthropic work and writing on the topic of 'altruism' and 'good neighbours.' A recent collective paper on "Altruism and Social Solidarity" by a group of distinguished scholars did not mention Merton's influence on the field. But we consider Merton's 'Matthew Effect' (1968) as an effort to imbue sociology with a hidden work ethic, in the spirit of Sorokin. The Matthew Effect does not act merely as an instrument to point out injustices, exploitation and inequalities, but it also aims to generate equalizing mechanisms that can transform a social-cultural system through planning and design that yields positive results.

Indeed, one feature of both Merton and Sorokin is their insistence that 'science' cannot serve coherently as a 'worldview-defining paradigm,' like some people in the 'modern west' have made it out to be. In other words, to study 'modern, western science' (MWS) comprehensively, one must also take into account both philosophy and religion alongside it, in addition to society, culture, politics, language, economics, etc.

[1] 1990: 66.

[2] 2006: 69.

Of special interest to us in this paper is an article that Merton wrote together with Bernard Barber (1990), titled: "Sorokin's Formulations in the Sociology of Science." Here we read in Merton strong words of criticism for Sorokin's overall coherence and unity and for his post-materialistic evaluations in sociology of knowledge (SoK). Yet, Merton also shows great respect for his teacher, a master sociologist, a dual-citizen, world ambassador, who deeply influenced the field of sociology and SoS as one of the last grand theorists.

Merton notes that Sorokin "considers that particular theories of science as well as the rate of scientific advance are dependent upon these underlying cultural premises" (1990: 48). For Sorokin, the prevailing 'cultural super-system' to a considerable extent indicates or decides 'which science' is or perhaps even 'can be' studied and/or developed in a given local, regional and/or national setting (this might be called 'social selection,' in a Mertonian evolutionary framework). We will return to this below, but it is enough to show that Sorokin accepts a degree of socio-cultural constructivism and in some cases even of environmental determinism when it comes to the study of 'science' in the realm of HSS. This reveals a possible pre-cursor[1] to the 'discovery' by Merton that 'doing science' is influenced by society and culture.

When observing the field today, we note two views of the common disciplinary core and how to approach 'science' as sociologists. We recognize two sides of the same topic in the combined Merton-Sorokin contribution to SoS. 1) Investigating the individual and social (collective) meaning(s) of sciences and technologies, including NPSs and HSSs, in relation to ideologies and worldviews, and 2) Studying the institutionalisation, systematisation, organisation and management (operations) of 'science' in societies, cultures and nations, along with its relation to religion and politics, big business, the military, media, etc. Merton's emphasis was more on the 2nd approach than the 1st, following his Parsonian structural-functionalist turn, while Sorokin instead grappled more with the 1st approach and less with the 2nd, which happened when he began to eschew the quantitative-empiricist approach to sociology as his career developed in the U.S.A.

In suggesting that SoS is subsumed by empiricism, one privileges a certain definition of the field that challenges the value of theoretical or other non-empirical aspects in sociology of science[2]. The sociology that Sorokin promoted was "a generalizing science of the superorganic or sociocultural reality[3]." By adding the prefix 'super-' to 'organic,' Sorokin followed the Russian and French sociological traditions in looking at society like an *organism*, but which required an additional level of identification to coincide with the 'higher consciousness,' 'special character' or 'spiritual status' of human beings. By identifying 'culture' as an example of the 'super-organic,' Sorokin made a traditional distinction in that would allow future global researchers to follow him in opening up a discourse that involves 'ideational' aspects of culture and society that influence how science is done[4] to come-of-age once again.

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[1] Other precursors include Russian historian of science Boris Hessen ("Science at the Crossroads," 1931) and German Max Weber's "Science as a Vocation" (1919), in addition to Borichevsky and Marx/Engels.

[2] "The definition of the object and method of the sociology of science, its academic institutionalization, its spread and popularization, can be almost entirely attributed to Merton." — Statera (1998: 61).

[3] 1965: 838.

[4] "The scientists of Ideational culture would be more interested in the study of spiritual, mental, and psychological phenomena...Scientists of Sensate culture would probably by more interested in the purely material phenomena." – Sorokin (Social and Cultural Dynamics. Vol. 2. N. Y. : American Book Co., 1937. P. 13).

Sorokin knew where he was living (Russian in the 'developed west') and in what era, when he wrote in the Introduction to one of his greatest works, "in my study I shall intentionally follow the 'empirical system of truth' which must be convincing to such a partisan of 'scientism'[1]." He knew that his writing would gain recognition in the U.S.A. only if it included empirical 'proofs' which are gathered through statistics, data collection and social experiments; only if sociology appeared to be 'scientific' based on a NPS model. Of course, this precautionary tactic would be no longer necessary today because of what has happened to the reputation of 'scientism' as ideology. Sorokin would have been pleased to see the ideology of scientism fall from its 'sensate supremacy,' as has slowly happened since the dropping of bombs in Hiroshima and Nagasaki (e.g. his annual lectures regularly reminded students of material-global destruction). The idea that 'science' has all of the answers to life's questions and can possibly solve all of humanity's problems and needs is a proposition that has been dethroned and deconstructed.

In addition to Sorokin's lack of patience with 'quantophrenia' — the empiricist bid to quantify everything about human-social existence as the only legitimate means of 'measuring' every type of value that matters to people — he was also seeking evidence to validate the super-sensory in human socio-cultural reality. The question for people today is: what other kinds of knowledge than natural-physical (cf. modern, western) scientific knowledge may contribute to a healthier and/or happier life for people, lived in community, and at peace with one's environment, seeking personal and collective development or enlightenment (e. g. indigenous knowledge) as a nation?

Sorokin might ask: 'Why does it matter if a sensate culture is shifting back toward the ideational?' One answer is because it helps us to establish proper criteria and limits for responsible *qualitative* analyses in the sciences. Sociology has been welcoming *qualitative* analyses already for decades, in addition to using *quantitative* methods and collecting data. By combining strengths (e. g. empirical and theoretical), the institutionalization of sociology does not necessarily correspond to growth in the use of *quantifiable*-only methods, an approach that can lead to the ideologies of 'pragmatism' and 'scientism.' Instead, more *qualitative* research is required to fill in the gaps created by the former predominance of *quantitative* methods, wherein a new *reflexive* understanding by scientists them-selves can be included in 'doing science.' Today, to hear Sorokin write reflexively or speak to an audience under the spell of 'scientism' is such a great need in some places that Merton's notion of practising "under the rules of a sensate system" would no longer hold across the board.

Sorokin undoubtedly practiced "under the rules of a sensate system" in the U.S.A. Yet, all the while he continued to advocate an integral[2] perspective which could be applied around the world. He sought a holistic model that could be adaptable with any cultural super-system; a 'non-western' perspective.

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[1] Social and Cultural Dynamics. Vol. 2. P. 12.

[2] "The integral study of the psychosocial world contains in itself all the main methods of investigating and understanding psychosocial reality: the empirical, the logico-mathematical, and the intuitional...the integral approach to the understanding of the psychosocial universe is fuller and more adequate than any single method of cognition...there should be closest cooperation and unification of all three methods into one integral conception of reality, an integral system of truth, and an integral method of cognition. Only such an integral way can lead today's psychosocial science out of the blind alley onto the royal road of a recreated sociology and psychology." — Sorokin (1956: 317).

"Sorokin's integral perspective incorporates ideas from religious and philosophical traditions within the frame of reference and practice of social science," write Tiryakian et al. (2006: 76). The research that can and could be done with an 'integral perspective' taken as the basic framework in which to 'do sociology' on the topic of science studies and SoS is based on the necessary connection between 'doing science' and accepting that *some aspects of knowledge in human culture are 'by their natural character' best understood as 'ideational,' or at least 'idealistic.'* Note: this differs from the idealism vs. materialism dialectic at play with Marx, Habermas, Luhmann, M. Harris, G. Lenski, S. Sanderson, et al. Instead, topics in the realm of SoS inevitably include human values, beliefs, ideologies, emotions, intuitions, ethics (e.g. labour/work), languages, teleological dispositions, i.e. positive sociology combined with a reflexive *anthropic* method[1].

Indeed, one reason some observers thought Sorokin had gone senile in the 1950s was his return to study psycho-social realities[2] and especially the topic of 'altruism.' The relevance of reconnecting sociology in his later years with philosophy and religion was obvious to Sorokin, though the latter two had been de-prioritised during his 'empirical period,' when appearing to be 'positive,' i.e. quantitative and 'scientific' in the NPS sense. Yet, this return for Sorokin to the study of human love and altruism (i.e. unselfishness and sacrifice for others) was direly needed in the realm of sociology, even if it took place under a guise that did not often involve the term 'socialism.' It nevertheless reflected something that Merton would also later briefly explore in the so-called Matthew Effect (article first published 1968, the year Sorokin died); altruism in the distribution of human talents at the core of HSSs.

Merton, Mexico and the Matthew Effect in Science

When speaking about the 'Matthew Effect' in science, we offer a parallel analysis with the 'centre' and the 'periphery,' concepts taken from the world systems approach of Wallerstein and others. The Matthew Effect establishes that when an imbalance exists between two groups, the differences tend to be enlarged, causing the 'privileged' group (i. e. the 'haves') to each time gain more, while the not-privileged group (i. e. the 'have nots') tends to remain in a perpetually less-favourable situation, and thus the imbalance. The technical term for this in sociology is 'stratification' and the discourse is one of 'equality' and in the social-political-economic-cultural spheres, freedom to develop or to 'self-determine' (cf. 'sovereignty'). Merton's usage of the term 'Matthew Effect' in 1968, however, was particularly focussed on the reward system in science and science communication; i. e. that prominent scientists get more than their share of credit for producing works, based on the hierarchical structure of the system.

The centre-periphery effect observed between the systems of science and technology of 'developed' versus 'developing countries' was a recurrent theme thoroughly studied during the second half of the 20th century that has come of age again in recent years. Jiménez (1988) observed that the same effect also takes place within countries. In a study made in Mexico in the 1980's about productivity at the level of national research units, an imbalance was found between the units located in the 'centre' (Metropolitan area of Mexico City) and the 'periphery,' defined as the rest of the country (Jiménez, 1991).

[1] See Sandstrom's "Evolution and/or Extension" (2011, Forthcoming).

[2] From 1917–1922, Sorokin taught sociology at the psycho-neurological institute in St. Petersburg.

In this study, we reported the characteristics of effects with respect to five major scientific fields: agro-sciences, medical sciences, engineering sciences, natural and exact sciences, and social and human sciences. It was shown that natural and exact sciences and medical sciences, which are in the centre, are the most active participants in 'big international science.' At the same time, being active and visible participants in scientific and academic events on the global scale, with a budget and laboratory or experimental equipment and resources, implies there are various scales in terms of the players involved at the 'core' and the 'periphery' in all scientific fields.

Another aspect of the imbalance that the study shows is a more accentuated lack of resources in the agro-sciences, both in the centre and periphery. The medical sciences suffer a similar abandonment in the periphery. The imbalance is also shown in the number of units dedicated to each scientific field. The small number of units dedicated to agro-sciences and medicine is notorious compared to the rest of the sciences, including the social sciences and humanities. This incongruence is in sharp contrast with the felt needs of developing populations in terms of food production, public health and education.

It may be observed by some that science in the periphery is 'younger' than at the centre. The growth of scientific establishments in the 1970's in Mexico was relatively homogeneous in the centre and periphery. However, starting from the 80's, growth in provincial institutions was approximately doubled, reflecting a federal government policy to decentralize the country's scientific activities. However, data allow us to confirm that the new provincial units have not had the 'proper support,' either in terms of infrastructure or in the availability of scientists and technicians. In other words, the provincial units have been founded rather as 'secondary units'. This distribution in the category of primary and secondary units, according to the Matthew Effect, tends to be perpetuated in the realm of scientific practise and position. A re-vitalized life-cycle of scientific creation and production can be followed to allow for developing sectors, regions or countries to 'catch-up' or 'move ahead' in their development by improving their efficiency and production in ways that are consistent with the inner needs and desires of the people.

Our recommendation then and still now is to continue growth of scientific centres in the provinces, as opposed to in the Metropolis, particularly with respect to agro-sciences and medicine. However, these new units should be equipped with at least the same equipment available in the Metropolis, and acquire similar quality specialists to do research for development, right from the beginning. Likewise, the provincial institutional science centres should dedicate themselves to the solution of local and regional scientific problems, regardless if they are apparently not called 'mainstream science'. These units and centres will gain themselves credit at the top of international science by solving problems not touched by big international centres, as they produce original research that can be applied to solve crucial local and regional problems in developing countries. There are problems in many parts of the world that can benefit from 'peripheral' or middle-small scale scientific research. Omitting peoples' efforts condemns these centres and units to remain at a 'lower level', where it is extremely difficult to change their category, as the Matthew Effect predicts.

The source of the 'Matthew Effect' reminds us of several sides to the story. According to the Matthew Gospel, before going on a journey, the master gives money to three servants, in different amounts, "each according to his ability." Two of the three servants put their money to work and when the master returns, they offer to him their gains. The third servant did not put the money to work, but just hid it, to give back to the owner without interest or gain of

any sort. Thus, the master took this 'wicked' servant's money to give to the 'blessed' servant who gained the most and he punished the servant who gained nothing with his 'talents.'

In other words, the opportunity for development, investment, growth, innovation, etc. was made available to all three persons in the parable. It was the result of one person's choice, considered within the context of the culture and the story's domain, however, to hide and not to invest or to put the money to work that resulted in the supposed 'Matthew Effect' taking place: those who have more already, getting even more. The 'teaching' moment from the parable, then, is to recognize the talents that people are given and to do the best we can with what we have.

In Merton's words, "The Matthew effect consists of accruing greater increments of recognition for particular scientific contributions to scientists of considerable reputation and the withholding of such recognition from scientists who have not yet made their mark" (1973: 446). This can be considered in different ways. The Gospel of Matthew (NIV) reads: "For whoever has will be given more, and they will have in abundance. Whoever does not have, even what they have will be taken from them."

This scripture passage can be interpreted in the context of SoS. It can be seen as rewarding those who make 'achievements' in the field or as misallocating 'credit' for scientific work based on institutional inequalities. Are all 'scientists' created equal and, if not, then by what criteria should it be decided that one person should (normatively) receive more (i.e. status, wealth, position, etc.) than another? In most cases, it allows those who receive less to grumble (i.e. complain, protest) about being lower 'on the totem pole' and about their unfortunate situation or turn of fate.

An easy way to speak of the Matthew Effect in folk language is: 'You did well with what you had and helped others as often as you could.' This approach would fit with Merton's recognition of inequality and his charitable notions without falling into the communalist mentality of Marx or Marx-Lenin-Stalin-Mao. The topic of individual need and community-social responsibility still remains at the heart of socio-economic theories and also of real everyday life inequalities and relationships with others. How we strive to solve the problems of statecraft and stewardship in years to come will partially determine the fruit of efforts made to improve human-social systems and individual understandings of those systems using sociological tools and activities.

The 'mutual aid' scenario, with which Sorokin was very familiar given that it was first widely discussed in the same city of his University studies and about which much recent discussion has taken place in tune with *green* social sympathies, is applicable across the boundaries of centre and periphery. "Mutual aid was a daily routine," notes Sorokin, "which permeated the life of the community" (1963: 14).

On the one hand, Merton redeemed himself from Sorokin's quantophrenia and hypercompetition that had defined the major period of his contribution, by offering "a contribution to social theory, a counter-weight to «materialist» determinism[1]" (1987: 130). On the other hand, Merton, instead of materialism advocated a "combination of *rationalism and empiricism* which is so pronounced in the Puritan ethic," saying that it "forms the essence of the spirit of modern science[2]." Merton was trying to express the spirit of MWS through

[1] The Emergence and Maturation of the Sociology of Science Bernard Barber // Science & Technology Studies. 1987. Vol. 5. № 3/4 (Autumn–Winter). P. 129–133.

[2] Social Theory and Social Structure. N. Y. : Free Press, 1968. Chapter XIV : Puritanism, Pietism and Science. P. 91.

U. S. American sociological glasses. This U. S. Americo-centrism, however, ultimately limited Merton's SoS reach on the global scale.

One practical example of a Canadian and a Mexican finding common ground with Mertonian terms is with respect to the North American Free Trade Agreement (NAFTA) in light of the 'Matthew Effect.' The idea that the 'haves' somehow normatively 'should' get to have more is discussed in the context of a global balance of powers and new trade channels that opens a bridge to Latin America and Asia, removing over-dependency on the hyper-consumerist/debt-ridden economy of the U.S.A. that many people around the world today think is unsustainable. Would NAFTA have been considered 'fair' or 'sustainable' by Merton as a reference to the 'Matthew Effect' as a normative justification for inequality and sweat shops?

Local, Regional and National Science Systems Development

The field of SoS is applied reflexively in this paper to look at Russian, U. S. American and Mexican SoSs. Several questions are raised regarding the effects of the environmental-material and technological conditions on the development of science: Why didn't Russia or Mexico have the conditions to create a 'scientific revolution' or 'modernization' of knowledge production, acquisition and diffusion as 'early,' i. e. 17th or 18th centuries, as did England, then the U.S.A. and later Canada?

The question of when Russia and Mexico finally had their 'scientific revolutions' and/or how these 'revolutions' are still progressing, and of their general and/or specific contrasts with the over-lapping 'scientific revolutions' achieved in England, the U.S.A. and Canada, along with other parts of Europe and (at that time) the colonies, is an open one. Russia's 'scientific and technological revolution' (*nauchni i technologicheski revolutsia)* happened roughly during the 1950–70's and is cited regularly in the science studies literature, throughout the Soviet period and continuing today.

In Mexico, the rapid growth of elementary education took place from the 1930's–50's, modernization in higher education took place from the 60's–80's and swift growth in S&T, especially with the construction of regional science centres, too place from the 70's–80's. To developing countries like Mexico, it is not simply a matter of importing and imitating scientific culture as a package or formula of success from abroad. It is also a matter of dedicating important resources to solve crucial local/regional/national problems in terms of water, pollution, agriculture, education, health research. By identifying and working on problems derived from local/regional/national needs, the 'science' being done does not necessarily coincide between developing and developed countries. It is thus the case that Mexico's biggest problem is applying what is already known, in addition to Mexican and other regional scientists making new innovations and inventions to help solve local, regional and national problems.

Just giving a country some new technologies to use does not guarantee an improvement in their human development. "[T]here is no correlation between progress in technique and progress in civilization[1]," said Toynbee. The heart of the people must centre on a developmental plan that is suitable and achievable by the needs and desires of the people. If Mexicans want to develop, they will; if they don't, they won't. This is the social reification message; that people speak together as one.

[1] *Toynbee A. J.* A Study of History, 1948. Vol. 3. P. 173–174

Merton depended heavily on the particularly 'western' version of science and 'scientific sociology,' which is steeped in the analytical and empirical traditions and tied together with a Darwinian evolutionary perspective to insist that science is automatically progressing and that human development happens because the fittest survive and the rest die out. We believe that Merton was wrong to hold this perspective because it leads to civilisational discrimination as well as government and market policies that actively contribute to the inability of the periphery to 'catch-up' at an achievable speed to the centre. These are the social-cultural and political tensions that arise between communities, regions, nations and international organizations when speaking about what is fair and issues of justice and peace-building, which occur in various degrees and in various forms around the world.

Conclusion

Mexican and Canadian perspectives differ on the legacy of Merton in the USA and around the world. Mexico has experienced the Matthew Effect directly in terms of imbalances between the centre and the periphery. The question is about whether or not Mexicans can find the other side of the parable to make good use of the talents they are given. The additional requirement of course, is fair trade and fairness in general in the new post-unipolar geo-political world we are in today (2010).

Merton's 'Matthew Effect' has both lessons for teaching and for learning in the case of Mexico's scientific development and in the redistribution of rewards for scientific achievements, including those made in the developing world that aim to tackle development challenges and problems. The potential solutions or contributions this can make to help balance the playing field between 'big science, middle science and small science' in terms of social accountability instead of market-determinism are significant in breadth and scope. Although 'developing world' problems are less commonly on the radar of scientists in developed or 'mainstream science' scenarios, this does not mean that those middle and small science approaches cannot be included in the mainstream for their contribution to global knowledge.

We agree with Merton when he writes: "The continuity of science requires the active participation of interested and capable persons in scientific pursuits. But this support of science is assured only by appropriate cultural conditions" (1973: 254). It is up to the active participation of citizens, in whatever country and in whichever environmental or surrounding conditions, to immerse them-selves and their children in science or in the process of 'doing science' in various fields and settings. What must be realized from Merton's contribution, is that 'science' is not a 'universal method,' but is rather a changing methodology that is influenced, in respectively different spheres, by social, cultural, economic, political, religious and linguistic pressures and factors that mould and shape the 'science' in a formal sense. This aspect of 'doing science' should not be forgotten or a naïve 'objectivist' perspective maintained around the holy shrine of 'scientific practice.' SoS has de-mystified the sacred realm of the brilliant and genius 'scientist,' who walks around in a lab-coat, with a beaker and their hair partly blown back. The reality of the human equation in science is now visible.

Many questions, however, remain: What kind of 'science' does each particular society, community or nation-state need and desire? How can this 'ideal' be determined and realized

by individuals and groups relative to their own perceived needs and desires, in their quest for a higher quality of life? How do social systems, structures, networks, institutions, etc. 'get organized' and what role do individuals, managers, monitors, teams, etc. play through the influence of leaders, followers and groups interacting in this work-life situation? We refuse to accept that since work is often associated with a Marxist approach that it cannot be studied outside of a Marxist framework that looks to dignify human relations through a non-evolutionary social systems narrative.

"The development of a systematic approach to the study of altruism and solidarity with global society as the primary unit of analysis is a potentially vital focus in the sociology of globalization," says Tiryakian et al. Such a prospect seems to answer at least two features of the SoS discussion in this paper. First, it speaks to the Matthew Effect when elevated to the theme of international or inter-society relations, alongside of personal actions and attitudes towards others. Second, it opens up a discussion of philosophy alongside of science and religion, which allows more voices to be heard, which are bursting at the seams in this information-electronic age of simultaneous communications and social networks. The inclusion of altruism as a foundational concept in human-social science wrestles it free from invasion by socio-biology and ethology and allows for sciences, including both natural and social sciences, to cooperate with philosophy and ideology or religion more respectfully.

"Science must not suffer itself to become the handmaiden of theology or economy or state," Merton reminds us. "The function of this sentiment is likewise to preserve the autonomy of science. For if such extra-scientific criteria of the value of science as presumable consonance with religious doctrines or economic utility or political appropriateness are adopted, science becomes acceptable only insofar as it meets these criteria." (1938: 328) With a warning like this, we can be sure that scientism will be held under check by those who study SoS.

Guarding the 'developed west' from and warning the 'developing rest' about the ideology of scientism is a serious and legitimate challenge in our era. In hindsight, this could turn out to be seen as one of SoS's greatest contributions to knowledge and a signpost in the *anthropic* age of science.

References

Barber, B. (1962a) Science and the Social Order / foreword by R. Merton. 2nd ed. N. Y. : The Free Press.

Ben-David, J. (1971) The Scientist's role in society: a comparative study. Prentice-Hall, Inc., Englewood Cliffs.

Bunge, M. (1999) Sociology of Science: From Marx to Merton and Beyond. // The Sociology-Philosophy Connection. New Jersey : Transaction Publishers.

Campos, M. A., Jiménez, J. (1994) La ciencia y la tecnología en México: un factor marginado en la sociedad mexicana // Los Grandes Problemas de la Ciencia y la Tecnología / R. Varela, L. Mayer, compiladores. Universidad Autónoma Metropolitana, UNAM. P. 171–186.

Cata o, G. (2003) Robert K. Merton // Espacio Abierto. Vol. 12. № 4. P. 471–492.

Collini, S. (2000) C. P. Snow's Las Dos Culturas (The Two Cultures). Buenos Aires : Nueva Visión, (Introd.).

Collins, H. (2005) The Uses of Sociology of Science for Scientists and Educators // Springer Distinguished Lecture, International History and Philosophy of Science Teaching Group (IHSPT), Conference, University of Leeds. July 17.

Feyerabend, P. (1975) How to Defend Society against Science. URL:http://www.galilean-library.org/manuscript.php?postid=43842

Fuller, S. Science. (2010) The Art of Living Series / ed. by M. Vernon. Durham : Acumen.

Fuller, S. (2005) The New Sociological Imagination.

Jeffries, V., Johnston, B. W., Nichols, L. T., Oliner, S. P., Tiryakian, E., Weinstein, J. (2006) Altruism and Social Solidarity: Envisioning a Field of Specialization // The American Sociologist. Fall.

Jiménez, J. (1991) La ciencia en el centro y la periferia: problema hacia 'adentro' y hacia 'afuera' // El Sistema de Ciencia y Tecnología en México / eds. M. A. Campos y J. Jiménez. UNAM. P. 71–104.

Jiménez, J. (1993) Distribución de tareas científicas y tecnológicas en México // Prospectiva social y revolución científico-tecnológica / eds. M. A. Campos y R. Varela. Universidad Autónoma Metropolitana. P. 105–116.

Jiménez, J. (1994) Development of Science and Technology within Modern Global Transformations (the Experience of Mexico) (en ruso) // Science and Science of Science. Ukrainian Academy of Science. Vol. 4 P. 41–46.

Jiménez, J., Campos, M. A., Diaz-Francés, E. (1988) Efecto Mateo en la Problemática Centro — Periferia de la Ciencia en México // Memorias del Tercer Foro de Estadística. IIMAS, CIMAT, Facultad de Matemáticas, Universidad de Guanajuato. Guanajuato, Gto., 128–139. 12–14 de septiembre de 1988. También publicado en Comunicaciones Técnicas, IIMAS, UNAM. Serie Naranja, № 537.

Jiménez, J., Campos, M. A., Escalante, J. C. (1991) Distribution of Scientific Tasks between Center and Periphery in Mexico // Social Science Information.Vol. 30. P. 471–482.

Merton, R., Barber, B. (1990) Sorokin's Formulations in the Sociology of Science // Social Studies of Science / B. Barber. L. : Transaction.

Merton, R. K. (1971) The Sociology of Science: theoretical and empirical investigations. Chicago: University of Chicago Press.

Merton, R. K. (1968) The Matthew Effect in Science. // Science. Vol. 159 (3810). P. 56–63.

Merton, R. K. (1962b) The Sociology of Science / eds. B. Barber and W.Hirsh. New Jersey : Free Press.

Merton, R. K. (1938) Science and the Social Order // Philosophy of Science. Vol. 5. № 3. P. 321–337.

Merton, R. K. (1938) Science, Technology and Society in Seventeenth Century England // Osiris. Vol. 4. № 2. P. 360–632.

Sandstrom, G. (2010) A Comparative Analysis of Sociology as a Scientific and Academic Discipline in Russia and Canada : Candidate of Science, dissertation. St. Petersburg, Russia (unpublished). 205 p.

Sorokin, P. (1965) Sociology of Today, Yesterday and Tomorrow // American Sociological Review. Vol. 30. № 6.

Sorokin, P. A. (1961) Quest for an Integral System of Sociology // Memoire du XIX Congres International de Sociologie. Vol. 3. (Mexico: Comite Organisateur du XIX Congres International de Sociologie). P. 71–108.

Statera, G. (1998) Merton and the Sociology of Science in Europe // Robert Merton and Contemporary Sociology / eds. C. Mongardiani and S. Taboni. New Jersey : Transaction.

Tiryakian, E. (1999) Pitirim A. Sorokin, My Teacher: Prophet of Late Modernity // International Symposium in Honour of Pitirim A. Sorokin, Institute of Economics, Russian Academy of Sciences, Moscow and St. Petersburg, February 4–6.

Weber, M. (1989 [1919]) Max Weber's Science as a Vocation / eds. P. Lassman, I. Velody ; transl. M. John, L. : Unwin Hyman.