



The Truth of Science for Justice and Peace

Keynote address and respondents' remarks at the CSPO conference "The Rightful Place of Science?"

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Abstract

CSPO's conference *The Rightful Place of Science?*, May 16-19, 2010, brought together scholars, policy makers, writers, and students with varied perspectives to consider how science and technology can best serve humanity. This CSPO report presents the text of the keynote presentation by Monsignor Marcelo Sánchez Sorondo, chancellor of the Pontifical Academy of Sciences, who explores just what is "the truth of science." Monsignor Sorondo argues that theoretical truth can be found in the natural sciences, that good and justice are involved in the activity of scientific reason, and it is through these things that we can bring about peace. Science's mandate, therefore, is to reveal truths about nature to human beings, which both reshapes the mind and produces justice. Justice then produces peace, but this peace is fragile, and must be continuously defended and rebuilt, partially by science. Respondent Carl Mitcham explored the Thomist approach to understanding the rightful place of science, as presented in the Monsignor's talk. Insofar as Thomism rightly asks us to qualify the scientific pursuit of truth in multiple ways, including the placing of the scientific enterprise in the broader context of questions about goodness and justice, it also points toward the often unexamined role of religion in helping to adjudicate the rightful place of science. Respondent Heather Douglas added that the decision to do science, and the decision of which science to do, requires a moral sensibility, and can have moral consequences. Science is a human endeavor. The knowledge science produces is a form of power. Science can provide new ways to act in the world, productively or destructively. It can alter the way we understand ourselves and the world. And it can serve the interests of the many or the few.

The Truth of Science for Justice and Peace

Marcelo Sánchez Sorondo, Chancellor, Pontifical Academy of Sciences

The Truth of the Sciences

'The truth will set you free': these words from the Gospel enjoy perennial validity and illuminate with divine light the endeavours of the scientist who refuses to subordinate his commitment and his research to anything but the truth. Truth is the goal of the whole universe: *finis totius Universi est veritas*, as one of the greatest thinkers of all time, Thomas Aquinas, wrote. The truth of all beings, their forms and their laws are hidden in the bosom of the Universe, which yearns for its truth to be discovered by the human intellect.¹

In my opinion, theoretical truth – in its historic journey towards the recognition of its autonomy – can be encountered not only in theoretical philosophy or in theology, but also and increasingly in the sciences of nature, considered in their full range of topics. It is what Claude Allègre has pointed out in an excellent book in which he draws the balance of the discoveries of this century starting with the computer, and going on to biology (DNA's double helix), information technology, quantum mechanics, the chemical explosion (this is his wording), astrophysics, the order of chaos and, last but not least, the neurosciences. The common denominator is the idea of *discovery* and discovery is an organised form of the *observation of nature*.²

I would like to insist on the term *nature*. Indeed, it has enabled us to put mathematics back in its slot as a discipline of forms, numbers and relations as rational constructs pursued for themselves and not as constituting *the science of reference*. As Claude Allègre writes, "contrary to the sciences of nature, mathematics does not develop by virtue of an oscillation between observation and theoretical model". This is probably the reason for the perhaps excessive and certainly controversial title – *La défaite de Platon* – he has given to this extraordinary overview of science in the 20th century.³ With the sciences of nature what is at stake is the knowledge of what is real and it is truth that qualifies the relation of theory to what is real in the sciences of nature.

The second reason for concentrating on the sciences of nature to make the demand for truth arise in its theoretical purity is provided by Jean Ladrière throughout all of his epistemological works and, more in particular, in an essay entitled *Herméneutique et épistémologie* published by Paul Ricoeur in the book *Les métamorphoses de la raison herméneutique*.⁴ He does not try to distinguish the project of the sciences of nature from that of the mathematical subjects, but from that of the human sciences that can rightly demand to derive an explanation from comprehension. These human sciences – he says – do not have as their theme the idea of nature as a system of phenomena regulated by laws, but the idea of action as a transforming initiative. Regarding action, "the recommended strategy consists in going from the objectivated forms towards their production, in short in redoing in the opposite direction the process of objectivation (...). Therefore, rebuilding such a project means recalling the meaning of what initially was only an enigmatic object, interpreted as a trace and constituting a problem starting from such an interpretation" (p. 109). Thus it would be a serious mistake – and this mistake might be the temptation of a sketchy and nebulous hermeneutical thought – to believe that the whole problem of the status of science

¹ *Contra Gentiles*, Bk. I, Ch. I.

² Cf. AA.VV., *Paths of Discovery*, The Pontifical Academy of Sciences, Acta 18, Vatican City, 2006.

³ Claude Allègre, *La Défaite de Platon ou la science du XXe siècle*, Fayard, Paris 1995, p. 429.

⁴ Jean Ladrière, *Herméneutique et épistémologie*, in P. Ricoeur, *Les métamorphoses de la raison herméneutique*, éd. du Cerf, Paris 1991.

can be rebuilt on the model of the de-subjectivation of the products of action. The need for such a result is extremely rigorous: it is believed that we can plausibly reconstruct the “very trajectory that leads from certain initiatives to certain situations. Now, what makes the reconstitution plausible is the fact that we can recognise ourselves in it, that is to say that when it is presented to us it appears to us as a course of events that we could have experienced, like a process in which we might have acted or, in any case, co-acted” (p. 110).

Now, the fact that the initiative that produces the observed processes is entirely unknown to us, because it is extraneous, makes it possible for nature to be nature and not action. This is why we only have observation and explanation through laws. To quote Ladrière: “the source, here, is no longer action, it is law, that is to say nature itself whose law is considered capable of expressing an internal constitution and, if we can say so, an immanent intention. Now, the only way to effectively prove that an observed process can be subsumed under a law is to reconstitute it effectively starting from this very law. Such reconstitution – the famous *sôdzein ta phainomena* – is nothing else but a doubling of what nature has already produced on its own, the generation of a second process that should be a faithful image of the former; it is a simulation, unreal in itself, of what effectively took place” (p. 111). Therefore it is a copy of nature. In other words, the scientist, unlike the philosopher and mathematician, imitates nature, and the proof is that when imitation does not follow nature's profound laws, nature itself rejects it. Precisely because of the fact that we cannot understand the production of nature as an action similar to those that initiate from us – something that could be believed until Galilei and Newton – we must observe, experiment, explain and copy nature itself.

Unable to understand nature as an objectivation of an initiative similar to our own – of ourselves as agent beings – it is necessary for us to *explain* it “by appealing to the general notion of law, inasmuch as this notion provides a content to the idea of nature” (p. 113). Law, therefore, is present in the phenomenon that we would not be capable of producing with action or understanding through narration; it is present in it “as its own internal reason. And the explanation consists in exhibiting this reason, following the sense of implication, from the phenomenon towards its own condition” (*ibidem*).

In this radical initial situation epistemology finds a justification of its own autonomy; it happens to diversify the forms of explanation following the nature of the invoked principle of legality; it will thus speak of explanation by subsumption, by reduction, by genesis, by finalities. Thus we situate ourselves along the journey of the notion of truth appropriate to the sciences of nature, if we extrapolate the element common to these different forms of explanation, that element that constitutes precisely the clarifying moment of an explanation: “We ask for an explanation to dissolve the opacity of the fact that, in its singularity, it is only a pure apparition in the general field of experience” (p. 116).

At this stage of the reflection we find the role of models and the general process of modellisation. It occupies the place left empty by the comprehension of the action for which we take the initiative. Moreover, it bears the weight of the pretension of truth in the scientific sense of the term. The empty place is occupied by imagination which produces models: “It is precisely necessary to operate on another support compared to the one of the real bodies, on a support capable of sustaining the work of the imagination. It is the model, the abstract object, built according to perfectly well-know procedures, that is considered capable of constituting a sufficiently faithful representation, albeit a simplified one, of reality” (*ibidem*). Once again we find mathematics, discarded as a paradigm of truth, as a means to build *models*,

that are not mathematical objects but figurative representations of the legality of what is real and which require testing or copying or reproducing the processes of nature in a laboratory.⁵

From Truth to Justice

I think we have said enough to draw at least a general outline of scientific truth; its fate is essentially linked to the *representation of the model*, an issue that has become central in epistemology. To this end, during the course of the development of sciences in the prodigious 20th century, nothing will come to deny the formal definition of the truth of science as the adaptation of the mind to the reality of the phenomenon of nature. Truth as *sôdzein ta phainomena*. And no idea of justice (or good) is necessarily implied by this idea of adaptation in oscillation, which Claude Allègre mentioned above, between theory and observation. There is no idea of justice inasmuch as we consider exclusively the *propositional* form of the observation protocols, of the construction of the model, of the verification and denial procedures applied to the alleged theoretical enunciations.

Things change – and the idea of justice stands out at the end of the journey we are about to undertake – if we consider *episteme* no longer just a network of propositions, which Frege said we should be able to write on a wall, but as a *project*. A hermeneutics of reason becomes possible, charged with the very project of *episteme*: “properly speaking, this is where – says Jean Ladrière – the task of a reflection begins that will be afraid of reading, in those same works in which the mathematical project is inscribed, what this very project really is, what carries it, what inspires it, what calls it. Here the properly hermeneutical task separates from the methodology of the explanation, modellisation makes room for reflection, the articulated clarity of the operation makes room for the uncertain decoding of a step that traces its path as it moves forward along it” (p. 123). The idea of project is already situated at the border between the theoretical and the practical. The threshold is crossed if this idea of epistemic project is connected to that of the founding moment, in which “a willingness starting from which something new begins” is underlined (p. 124).

Well, this is precisely where truth and justice intersect and convert into one another. And truth is intended in a broader sense with respect to the propositional truth deriving from verification operations or to the representative models by which theories become accessible to the human being. This is truth as the common horizon to the comprehension of the operations that lead to the action and to the explanation of natural facts and, moreover, to the comprehension of the fact of being in the world, against the backdrop of which the comprehension of action and nature is outlined. Why justice? Because along all of this scale that goes from the project to the task, passing through the unpredictable, a community of research is implied.

⁵ With the application of the mathematical models to the scientific method, modern physics has perfected the conditions of images in which the phenomena of nature are intentionally reflected and, more in general, the contingency of matter. The application of mathematics to the physical method had perhaps been envisaged by St Thomas himself: “The principles of mathematics are applicable to natural things, but not vice versa, because physics presupposes mathematics; but the converse is not true, as is clear in the third book of *De Caelo et Mundo*. So there are three levels of sciences concerning natural and mathematical entities. Some are purely natural and treat of the properties of natural things as such, like physics, agriculture, and the like. Others are purely mathematical and treat of quantities absolutely, as geometry considers magnitude and arithmetic numbers. Still others are intermediate, and these apply mathematical principles to natural things; for instance, music, astronomy, and the like. These sciences, however, have a closer affinity to mathematics, because in their thinking that which is physical is, as it were, material, whereas that which is mathematical is, as it were, formal. For example, music considers sounds, not inasmuch as they are sounds, but inasmuch as they are proportionable according to numbers; and the same holds in other sciences. Thus they demonstrate their conclusions concerning natural things, but by means of mathematics” (*In Boeth. De Trinitate*, q. 5, 3 ad 6).

This level is exactly where good and human justice are involved in the activity of scientific reason recognised as the vocation, task and mission of the scientist.

This is well known at the level of the science of nature, in which the scientific community is the collective subject of research, with its teams, its rivalry, its power struggles, but also its vocational unity before the other powers, its exercise of professional responsibility before technical applications, in short the search for its place in the totality of *episteme*, among theology, philosophy, ethics and politics.

This is precisely the level in which justice is involved in this enterprise of reason recognised as a task. And it is implied at the same time as the intersubjective structure of practical reason is implied, which is common to the scientific community, to technology and to politics. Justice, in all of these cases, consists essentially in the equal access to speech, in the duty of sharing the best arguments, in the obligation of listening to the other side in all conflictual situations and in the recognition of the human rights of the person and the consequent *ius gentium*. In short, the conflictual-consensual statute of *research* – at all levels – indicates the space of justice.

Bernard of Clairvaux, one of the strongest personalities in history, who came down from the loftiest peaks of mysticism to share divine and human truth with the ecclesial and civil society of his time, as a true master of love and knowledge, described the different types of men and women of culture always found in history. According to St Bernard there are five motives that lead human beings to study: ‘There are people who only wish to know for the sake of knowing: this is base curiosity. Others wish to know in order that they themselves may be known: this is shameful vanity, and such people cannot escape the mockery of the satirical poet who said about their likes: “For you, knowing is nothing unless someone else knows that you know”. Then there are those who acquire knowledge in order to re-sell it, and for example to make money or gain honours from it: their motive is distasteful. But some wish to know in order to edify: this is charity. Others in order to be edified: this is wisdom. Only those who belong to these last two categories do not misuse knowledge, since they only seek to understand in order to do good’.⁶

The words of St Bernard the mystic indicate a profound grasp of what motivates those who engage in culture, and they are more than ever relevant in order to remind both the teachers of thought as well as their disciples of the true purpose of knowledge. St Bernard explained that the motor of practical reason is justice and good. St Bernard of Clairvaux raised knowledge to the level of love, to the level of charity and understanding: *Sunt qui scire volunt ut aedificent et charitas est*.

The thematisation of justice in the field of the search for the truth has been brought to a level of radicality that makes the idea of justice worthy of being elevated, in many ways, from the condition of simple virtue among other virtues to that of a transcendental, equal to the truth. In a nutshell, in my opinion there are five directions along which justice has been considered a sign of theoretical practice of sciences belonging to the field of practical reason.

First of all, there are Husserl's pressing invitations, in the last part of his life, to *responsibility*, which he believes belongs to the final level of transcendental phenomenology. Of course this endeavour is supportive of a claim defined as “final foundation”; however, it is worthy of note that this very demand involves what Husserl calls the *responsibility of oneself* for the self-founding action. Now, Husserl did not ignore the intersubjective dimension of this theoretical-practical action of self-responsible foundation. All the work connected with *The Crisis of European Sciences* tends towards a raising of the awareness of the temporal and historical dimensions, that ends up assigning this responsibility to a culture, the

⁶ St. Bernardus, *Sermo XXXVI in Cantica*, PL, CLXXXIII, 968.

European one, and to a community, that he calls “arcontic” of the thinkers that bear the weight of the transcendental task. The fact that justice is the virtue implicitly designed as the final ethical mark of this responsibility shared by a historically-situated community is not far-fetched.

With K.O. Apel and J. Habermas' discourse ethics – *Diskursethik* – this mobilisation of the virtue of justice no longer remains implicit; it is clearly required by the very practice of discourse; justice is the moral rule underlying any discourse, upheld by the idea directing the search for a *consensus* and moved by an exchange of arguments without limitations or constrictions. The well-known formula of the jurists – *audi alteram partem* – leaves the restricted environment of the court to cover the entire space of public discussion.

The third significant reference, i.e. the hermeneutics of reason, foreseen by Paul Ricoeur and Ladrière, who was my privileged guide in the first part of this paper, cannot fail to encounter the transcendental of justice. In his book, which I have extensively quoted, justice is expressly nominated towards the end, when the foundation of the epistemic task is compared to that of technique and to that of politics. With regard to the task of reason, he writes that “...this having to be is in itself structurally connected with an unrepresentable [contrary to the abovementioned modellisation], in which the sense of the task to carry out – which cannot be assimilated to any effective foundation of a finite nature – is dissimulated, although we tried to think of it as the horizon of truth, of justice and, at times, even of beauty” (p. 124).

Moreover, the foremost contemporary philosopher who has tried to elaborate a global ethics of technological civilisation is Hans Jonas. He is persuaded that faced with the “Prometheus Unchained” of today's civilisation, which is threatening the very survival of the planet, it is indispensable to develop a new ethics of responsibility that takes into account the long-term effects of our actions, that is to say the extra human world and the future generations.⁷

Last but not least, the fifth reference is of a theological nature and derives from the Magisterium of the Popes of all times, but especially in these last one hundred years of the Pontifical Academy of Sciences and Social Sciences: practical reason, also in its relationship with the theoretical activity of science, needs to be purified by the grace of Christ, since it is continuously inclined to egoism because of sin, both individual and social, and gives rise to hotbeds of injustice in the world.⁸

From Justice to Truth

Considering that the theoretical truth of science recalls justice, I shall continue with the dialectic current which, starting from the self-sufficiency of the idea of goodness developed in the notion of justice, continues by a further reference to the idea of truth.

Life, if it is to be human life, is originally evaluated and the evaluations are originally qualified in terms of *good* or *evil*, just or unjust. There is no way of seeking a supplementary truth liable to legitimate the injunction of good and justice. This is where St Thomas comes to our aid, by maintaining that, since the first unprovable principle of theoretical reason is that affirmation and negation are incompatible and thus that the supreme law of thought is the principle of non contradiction, therefore the first principle of action

⁷ Cf. H. Jonas, *The Imperative of Responsibility: In Search of an Ethics for the Technological Age*, The University of Chicago Press, Chicago, 1984.

⁸ *Papal Addresses*, Introduction, biographies of the Popes and ed. Marcelo Sánchez Sorondo, Pontifical Academy of Sciences, *Scripta Varia* 100, Vatican City 2003.

is founded on the distinction between good and evil and, thus, on the principle of *bonum est faciendum et malum vitandum*.⁹

In order to find the truth in the notion of good and justice it is necessary to look to the anthropological presuppositions or fundamental anthropology, which determine entry of the human being into ethics. These fundamental presuppositions are those by virtue of which man is considered existentially *capable* of receiving the injunction of good and justice. The originality of the existential sphere in which this capacity moves is a completely original situation that we may call the emergence of freedom and, with it, of all human rights. Christian thought – well before the moderns and with the same, or more awareness than them, regarding the independence of the human subject – had called freedom the *motor omnium* of a person's capacities and the principle of that person's independence (therefore *capax* as *causa sui*) both before nature and society, and before God. Speaking of capacity and freedom, assertions are made that refer to what man is in his way of being, therefore if it is true that he is made to be accessible to a moral, legal or political problem, be it merit – or demerit – worthy, or broadly speaking, to a problem of value and rights.

This is where the true function of attestation intervenes. It operates with the first natural principles of reason but it moves them within the transcendent truth that is God the Creator and the soul as a spiritual free subject. Thus even the soul lies hidden in the bosom of each of us, but it makes its presence felt with the action of which the I *capax* or the self is the beginning and end.¹⁰

I am reminded of the famous text of *Kritik d. praktischen Vernunft*: 'two things fill my spirit with an ever new and increasing admiration and veneration, the more my reflection increases: the starry sky above me and the moral law inside me'.¹¹ He has no uncertainty or doubt: 'I see them both before me and I connect them immediately with consciousness of my existence'.¹² We can say that it is a form of belief, a *Glauben*, in the non doxic sense of the term, if we reserve the term *doxa* for a degree lower than *episteme* and in the order of the phenomena of nature and also in that of human phenomena liable to being treated they themselves as observable. The belief proper of attestation is of another order; it is of the order of conviction and confidence; its opposite is suspicion, not doubt, or doubt as suspicion (P. Ricoeur); it cannot be denied, but refused; it cannot be re-established and strengthened if not through resorting again to attestation, and is rescued by the approval of the other, indeed thanks to some kind of gracious divine support. In this context to which fundamental anthropology refers, one can observe that one is dealing with a truth that is closely connected with the fundamental conviction that the human being has of himself and which is not temporary as is the case with the acquisitions of the arts and sciences and philosophy itself with which, however, it has a close relationship, and thus one speaks of 'philosophical anthropology' to refer to its specific genre of knowledge through reflection that takes place by stages.¹³

⁹ Cf. S. Th, I-II, 94, 2.

¹⁰ "Each one experiences within himself that he has a soul and that acts of the soul are within him", i.e. "Unusquisque in se ipso experitur se animam habere et actus animae sibi inesse" (St Thomas, *De Veritate*, q. 10, 8 ad 8).

¹¹ Kant, Immanuel, *Kritik der praktischen Vernunft*, (ed. Felix Meiner, Hamburg 1990, p. 289); *The Critique of Practical Reason*. English translation available from Internet (with my adjustments): <http://www.gutenberg.org/dirs/etext04/ikcpr10.txt>

¹² *Loc. cit.*

¹³ The fact that sensitive knowledge precedes intellectual knowledge in the human being, the sensitive origin of human intellectual knowledge and the affirmation that the soul (the profound self of each of us) can come to know itself as spiritual only through the intellectual species that are abstract from the sensitive one, have prevented most of the time not only the understanding but also the actual reading of the texts of St Thomas who focuses on the real issue in question and shows that "the principle of human knowledge comes from sense. However, it is not necessary for everything that man knows to be submitted to sense or that it is immediately known only by means of a sensitive effect". Indeed, he affirms what we may call the decisive epistemological position of the Socratic principle of "know yourself": "The very intellect knows itself by means of its own act, which is not submitted to sense. In the same way, it also knows the interior

As you can see, the correlation between good or justice and truth is very special. The capacity precedes attestation and in this sense it is of an ontological level; it is the one that is precisely postulated by the attestation as its referent. We could speak of existential possibilities that arise from a practical injunction.

Peace is the Work of Truth and Justice

At this very grave moment in history, we must go from the truth to the good-justice, and from the good-justice to the truth. We must implement that circular movement that goes from the truth of science to the human good of justice and from justice to anthropological and scientific truth. Together with St Bernard we have to ask for the charity of knowledge and the knowledge of charity which “builds peace”. Peace is a gift of God offered to men and women of goodwill. St Bernard’s words are now addressed to all men and women of goodwill no matter their faith, and first and foremost to Christian men and women.

The science which brings together those engaged in research, specialists and workers, which mobilises political and economic powers, which transforms society at all levels and in all its institutions, has a task today which is proving more urgent and indispensable than ever, namely the task of cooperating in preserving and building up peace.

From the depths of centuries past there rises the voice of an unarmed prophet, Isaiah: ‘They shall beat their swords into ploughshares and their spears into pruning hooks’.¹⁴

In recent times, at a moment when war was imminent, there rose with biblical force the prophetic voice of an unarmed Pope, Pius XI, who quoted the Psalm: *Dissipa gentes quae bella volunt*.¹⁵

Unarmed prophets have been the object of derision in every age, especially on the part of shrewd politicians, the supporters of power. But today shouldn’t our civilisation recognise that humanity needs them? Shouldn’t they alone be heard by the whole of the world’s scientific community, so that the laboratories and factories of death may give place to laboratories of life? The scientist can exercise his or her freedom to choose the field of his or her own research. When, in a particular historical situation, it is all but inevitable that a certain form of scientific research will be used for purposes of aggression, he or she must make a choice that will enable him or her to work for the good of people, for the building up of peace. An example of this is one of the most distinguished members of the Pontifical Academy of Sciences, Franco Rasetti, a friend of Enrico Fermi, who firmly opposed the use of nuclear energy in war on the eve of the final stages of the Second World War and stated that, “Physics cannot sell its soul to the devil”.¹⁶ By refusing certain fields of research which, under concrete historical circumstances, are inevitably going to be devoted to deadly purposes, the scientists of the whole world should come together in a common readiness to disarm science and to form a providential force for peace.

act of will, since will is somewhat moved by the intellectual act and since intellectual act is caused in another way by will, like the effect is known by means of the cause and the cause by means of the effect” i.e. “principium humanae cognitionis est a sensu; non tamen oportet quod quidquid ab homine cognoscitur, sit sensui subiectum, vel per effectum sensibilem immediate cognoscatur; nam et ipse intellectus intelligit seipsum per actum suum, qui non est sensui subiectus: similiter etiam et interiorem actum voluntatis intelligit, in quantum per actum intellectus quodammodo movetur voluntas, et alio modo actus intellectus causatur a voluntate, ut dictum est, sicut effectus cognoscitur per causam, et causa per effectum” (*De Malo*, q. 6 ad 18).

¹⁴ *Is* 2:4.

¹⁵ *Ps* 67:31.

¹⁶ Cf. Nicola Cabibbo, *Commemoration of Franco Rasetti*, in “The Cultural Values of Sciences”, The Pontifical Academy of Sciences, *Scripta Varia* 105, Vatican City 2003, p. XXXIV.

Faced with this great patient in danger of death which is humanity as a whole, scientists, in collaboration with all the other members of the world of culture and with the social institutions, must carry out a work of salvation analogous to that of the doctor who has sworn to use all his powers to heal the sick.

Peace is born not only from the elimination of theatres of war. Even if all the latter were eliminated others would inevitably appear, if injustice and oppression continue to govern the world. Peace is born of justice: *Opus iustitiae pax*.¹⁷

Now science, which seeks the truth and is free from all ideologies, can and must promote justice in the world; while not remaining a slave of the economically privileged peoples, it can and must spread everywhere, in order to ensure, through appropriate technological means, that all peoples and all individuals are given their due. The modern world awaits the liberation of science that is a result of the liberation of the mind and heart. The globalised world makes it possible more than ever to join forces in defending truth and freedom to build world peace through justice.

With an acute sense of history, the Second Vatican Council warned us of this: 'The common good of people is in its basic sense determined by the eternal law. Still the concrete demands of this common good are constantly changing as time goes on. Hence peace is never attained once and for all, but must be built up ceaselessly'.¹⁸

Pax perpetuo aedificanda: peace has to be ceaselessly built up. Peace is a continuous effort which is entrusted to research, to technological applications aimed at promoting justice, through the authority of the sciences, with that freedom of thought and will that enables other choices to be made to contrast violence and the exploitation of research and discoveries against justice and human rights. Pope Benedict XVI adds that "Peace is a gift that God entrusts to the responsibility of human beings, so that they may cultivate it through dialogue and respect for everyone's rights, reconciliation and forgiveness".¹⁹

¹⁷ Is 32:17.

¹⁸ *Gaudium et Spes*, n. 78

¹⁹ Pope Benedict XVI, *Angelus*, 28 March 2010.

Respondent's Remarks on Monsignor Sorondo's Keynote Address

by Carl Mitcham, Professor, Liberal Arts and International Studies, Colorado School of Mines

Monsignor Marcelo Sánchez Sorondo has offered a deft presentation of the Thomist approach to understanding the rightful place of science. This is an approach that is seldom if ever part of contemporary conversations about science, technology, and society. But it is a welcome intervention in what are otherwise sometimes stale disputes about social constructionism or networks of actors. His presentation also inserts into our discussion, although somewhat obliquely, the question of religion. In an effort to help us appreciate both points, I venture two brief interpretative comments.

The first comment concerns Thomism itself. The Thomist approach derives, of course, from the thought of Thomas Aquinas, who died in 1274, probably before the age of 50. Yet during more than three decades of intense study and teaching as a Dominican friar, and the production of a remarkable body of reflective scholasticism, he created what has been described as a distinctly Christian synthesis of Platonism and Aristotelianism, commonly considered the two major schools of premodern European philosophy. Wide appreciation of the radicalness of Thomas' thought has not always been well served by his reputation as a follower of Aristotle — who was reviled by founders of modern natural science as diverse as Copernicus, Galileo, Bacon, and Descartes — or by his canonization as the official philosopher of the Catholic Church. For philosophy, institutional recognition can be the kiss of irrelevance if not of death.

The 20th century, however, witnessed a creative resurrection of Thomism. One can identify at least three major strands in this rediscovery. First, was the neo-Thomism of such French and German scholars as Etienne Gilson (with its historical orientation), Jacques Maritain (with an epistemological orientation), and Karl Rahner (influenced by Kant and Heidegger). Second, was the analytic Thomism of such British philosophers as Elizabeth Anscombe, Peter Geach and Anthony Kenny. Third, has been the radical orthodoxy Thomism of Catherine Pickstock and others. Indeed, in the United States, Alasdair MacIntyre, in the course of criticizing the approaches to moral theory typical of the scientific Enlightenment and Nietzschean genealogy — while developing his own Thomist defense of tradition — has actually suggested there are “too many Thomisms.”

I mention all these debates and names to give some hint of the rich and varied context from within which Monsignor Sánchez speaks. Our contemporary discourse on the rightful place of science is all too often more narrow than we appreciate. The truth is that in all these Thomist communities of discourse there has been — sometimes more and sometimes less explicitly — a consistent engagement with the nature and meaning of modern natural science that has been largely ignored, not only by STS studies but also by the more standard histories and philosophies of science. CSPO is to be commended for its remarkably pluralist efforts to engage a diversity of perspectives.

The most basic aspect of Thomist thought that is relevant to any reflection on the proper place of science may be crudely summarized as follows: According to Thomas and the tradition he represents, philosophy begins not in critical doubt — as it does in modernity and in science — but in an opening to and reception of what is, that is, of being. The human mind is at its most fundamental level perfected or realized by openness to and transformation by reality — rather than by the tool-using transformation of reality. As an existent itself, the human being participates in being in a special way, such that its own existence becomes actualized to the highest degree by cognition of reality. Reality in turn manifests itself to humans in covertible forms as the true (being as manifested to the intellect), the good (being as

manifested to the appetite), and the beautiful (being as manifested to the senses). Truth, goodness, and beauty are simply three distinctive ways that one reality manifests itself to the human person. However, because most human beings are oriented more toward the appetitive than the intellectual or the sensitive lives, there is some sense in which the good provides a privileged access to that which is, so that the appearance of the good rightly trumps the appearance of the true and the beautiful. It is this dynamic that I take Monsignor Sánchez to have referenced — and which, in a society highly influenced by science and technology, deserves special analysis.

The Thomist analysis further refuses to accept science in terms of its own self-presentation. This is a dimension of Thomism that might well have been more strongly emphasized. That is, although modern science famously presents itself in realist terms as the most reliable form of knowledge of what is, given its initiating critical stance, science exhibits a creative dimension that Thomist criticism can challenge. In modern science the mind is creator more than creature. In Thomism, all creativity is subordinate to receptivity, not the other way around. This gives Thomism a non-skeptical basis for criticizing science and placing scientific truth at the service of the good in a more general manner than any empiricism or pragmatism.

Let me make this point more forcefully as follows: The most common way to criticize science is in terms of its outcomes. Outcomes criticism in turn can focus either on a failure of science to produce a promised product (the hype problem) or a failure to meet a social need or desire (the social value problem). The social value problem can be further elaborated in terms of returns on investment, trade-offs, and benefit-risks. But it is more difficult to criticize science when an outcome is achieved as promised and appears to meet a human need or desire. Thomism, however, claims to be able to subject human needs and desires to critical assessment in terms of virtue. Some needs or desires are better than others in that they are more receptive to and honoring of that which is — and therefore more hospitable to human perfection or flourishing.

There are, of course, many difficulties with this argument. Nevertheless, in discourse concerning science-society relationships and the proper place of science — the proper place of science not simply in society but in a spectrum or plethora of human activities — the Thomist perspective should not be rejected outright, without an effort to consider its potential for political and policy enlightenment. When Monsignor Sánchez invokes the Christian virtue theory of Bernard of Clairvaux, who subjected knowledge production to spiritual discernment, he invites us to revisit a tension between what the great monastic historian Jean Leclercq identified as that between the love of learning and the desire for God. This is a tension which, in non-theistic terms, can also be found in Buddhism and in many other religious traditions. The Dalai Lama, despite his openness to some forms of science, has also been quite firm about criticizing others, without limiting himself to issues of birth control or evolution.

That was my first and longest comment: a provisional apology for and invitation to consider Thomist philosophy as an approach to discovering the rightful place of science. A second comment concerns the related issue of religion. Insofar as Thomism rightly asks us to qualify the scientific pursuit of truth in multiple ways, including the placing of the scientific enterprise in the broader context of questions about goodness and justice, it also points toward the often unexamined role of religion in helping to adjudicate the rightful place of science. Religion is an often marginalized dimension of science-society relationships — marginalized, that is, except by such CSPO scholars as Jameson Wetmore.

Religious thought and practice, especially the religious thought and practice of Judaism and Christianity, have historically exercised a major influence on the course of scientific development in the European tradition. Sometimes, I fear, representatives of Christianity are only too anxious to affirm the Christian

origins of science and compatibilities between the two. Reference could be made here especially to many winners of the Templeton Prize for Progress in Religion. But religious experience and practice also offer major and often under-appreciated perspectives for the assessment of modern science. What Gina Kolata presented as a special evidence-based way of being in the world comparable in significance and influence to that of art — even though she unfortunately debased her own approach to that presentation as one of entertainment rather than edification — can in truth conflict with other ways of being in the world. Not all evidence is equally evidential.

Finally, moreover, the structural differentiation of culture that has given us the autonomies of various realms of human experience — from science and religion to politics, economics, and art — at some point and at some level (personally or culturally) call for reintegration. It is this reintegration that is the ultimate challenge posed by the question of the rightful place of science. It is also a challenge to which religious thought and institutions make a legitimate contribution. The only criticism of Thomism that I would offer in this regard, is that it has too often pulled its punches. But the presentation by Monsignor Sánchez this morning points in another direction, one that eschews cultural accommodation and entertainment in favor of investigation and edification.

Respondent's Remarks on Monsignor Sorondo's Keynote Address

by Heather Douglas, Associate Professor, Philosophy, University of Tennessee

Monsignor Sánchez Sorondo has presented us with a nuanced view of the relationships between truth, justice, and power in science. I want to elaborate on these themes, drawing from his Excellency's eloquent talk.

As his Excellency noted, there is no idea of justice contained within the natural sciences as a set of propositions. In the descriptive account of the world science provides, no moral "oughts" lurk. But if we consider the pursuit of truth as a project, the importance of justice emerges.

First, justice is required to structure the communal discourse essential to the practice of science. The fair treatment of one's fellow scientists' arguments, the open access for all to the forum of science, and the respect for human rights in the practice of science all require a commitment to justice. So a community bound by clear moral precepts is a requirement for science as a practice.

But there is also the decision to do science, and, the decision of which science to do, that requires a moral sensibility. This moral sensibility must be directed outwards, beyond the boundaries of the scientific community, to the broader society in which science functions. Monsignor Sánchez Sorondo makes this clear with his quote from Bernard of Clairvaux:

"There are people who only wish to know for the sake of knowing: this is base curiosity. Others wish to know in order that they themselves may be known: this is shameful vanity, and such people cannot escape the mockery of the satirical poet who said about their likes: 'For you, knowing is nothing unless someone else knows that you know.' Then there are those who acquire knowledge in order to re-sell it, and for example to make money or gain honours from it: their motive is distasteful. But some wish to know in order to edify: this is charity. Others in order to be edified: this is wisdom. Only those who belong to these last two categories do not misuse knowledge, since they only seek to understand in order to do good." (Quoted on pp. 5-6, from St. Bernardus, *Sermo XXXVI in Cantica*, PL, CLXXXIII, 968.)

Pursuing knowledge merely for personal gain in fame or wealth is morally base, but so is doing so just for one's personal curiosity, as St. Bernard suggested. Contrary to the pure-science ideal, pursuing knowledge just because one can is inadequate justification for the venture. This does not mean that pursuing knowledge for its own sake is to be completely shunned. As St. Bernard tells us, the best reasons to pursue knowledge are in order to edify or be edified, and truth about the world can, of itself, be edifying. But when scientific knowledge ceases to be edifying, for example when it merely reinforces the ideologies of the status quo or provides a ready path to harm others, no moral cover is to be found under the cloak of curiosity or the pursuit of truth. A reexamination of how one's research project is framed, and whose interests it serves, is in order.

The choice of what research to pursue is perhaps the most important choice a scientist makes. Scientists often insist they must be free to make these choices, but if they are granted that freedom, they must then bear the responsibility that comes with the choice, including the potential for moral condemnation. While the propositions of scientific knowledge do not contain "oughts" within them, they are not morally or politically neutral. Empirical claims, such as what humans essentially are or how the environment actually works or what the universe's basic functioning consists of, have moral valence in three ways. 1) Scientific knowledge can serve as key justifications for moral decisions, providing an empirical basis on which a

moral ought can gain traction. For example, once we know we are transforming the world's climate in ways that can seriously harm the poorest among us, we have a new moral imperative to act in certain ways. Because of science's authority concerning the natural world, this moral valence is never far removed. 2) Scientific knowledge can extend the power of humanity to act in the world for good or ill. Science is in continual interaction and mutual production with technology. Knowledge generates technology, and technology generates knowledge. This increases humanity's ability to act in the world in both constructive and destructive ways. 3) Because of endemic empirical uncertainty, scientific knowledge must rest in part on value claims. This last point needs elaboration first.

While science aims at truth, it does not always succeed. The history of science is littered with its missteps, from the crystalline spheres which held the planets in their epicyclic wanderings, to light's oscillating aether, to the essentialist hormonal theories of the 20th century, to eugenicist claims made in the name of the fiction of racial superiority. Some of these missteps held no harm beyond leading scientists astray for a while (sometimes they even helped organize scientific inquiry), but others were pronounced with the full weight of scientific authority behind them, and people were harmed as a result. Injustice flourished with the stamp of scientific approval. Rather than speaking truth to power, science has spoken supposed truths alongside power, aiding the unjust status quo.

Because scientists wield an authority that is a kind of power, they had best be sure their claims are made carefully, with adequate justification and sufficient evidence already gleaned, particularly when results conform with popular ideologies. Scientists must keep in mind that they may be wrong and that those who trust their authority may be harmed by accepting inaccurate but prematurely proclaimed scientific work. And what counts as sufficient evidence is not just set by standards internal to science. It should matter to scientists what the consequences of error across society are in a particular case. The authority of science that moves society to act should be taken into account before scientific claims are made.

Even if science produced only truth, if empirical uncertainty were avoidable, science is not always an instrument of justice. Science can do harm when it gets things right too. A poignant example illustrates this point. Scientists in Australia have developed a laser based technique for uranium enrichment. While this technique will make the enrichment of uranium for nuclear power plants more efficient, it will also make the enrichment of uranium for nuclear weapons easier to hide. Thus, the new technique comes with serious nuclear weapons proliferation risks. It is no surprise that a technology that makes it easier to perform uranium enrichment increases the risk of nuclear weapons proliferation—anyone in the field knows this, and understands the attendant risks. Now that the knowledge has been generated, we are facing the problem of keeping it classified, keeping the details of the knowledge secret. Given the past history of the leaking and spreading of nuclear secrets, it seems doubtful we will be successful. A very dangerous world looms before us.

What is the correct moral assessment of this example? Using the rubric from St. Bernard, no one is edified by this scientific work. The knowledge was produced for all the wrong reasons, and with little apparent regard for accompanying risks. The scientists who completed the work cannot claim responsibility for the technological success and avoid the responsibility for the ills that are likely to follow. Both are foreseeable, and because we are responsible for both what we intend and what we do not, limited by what we can foresee and prevent, the price of freedom is clear. Scientists cannot hide behind their pure curiosity as an excuse for producing knowledge that will, in all likelihood, harm the innocent or concentrate power. If they can foresee it, they are responsible for it, and they proceed in their choices with that burden.

Such cautionary tales should not discourage scientists from speaking unpopular truths. While science can produce nightmares through both truth and error, science can also be transformative. At its best, science speaks essential truth, clearly and without fear, to power (economic, political, social), even when power does not want to hear what science has to say. It tells us things we may prefer were not true (e.g. that our widely used refrigerants are damaging the stratospheric ozone layer), but that nevertheless we need to know. This is the source of the authority of science, its courage to see the world with the clearest eyes a community can manage. Its authority rests on its empirical stance, its willingness to let issues be decided first and foremost by evidence and reason, not preference or ideology. This freedom from capture by the usual political powers allows it to speak truth to power and become its own power. Science's power rests on this critical capacity, this openness to evidence and argument, that the moral precepts of the scientific community aim to further and protect. We know now that its practice requires a diversity of voices speaking and being heard in open forums of debate.

This freedom from capture does not mean, however, that it is morally acceptable to pursue every curiosity or to pursue obviously dangerous knowledge just because one can. Having complete freedom and no responsibility for the projects one pursues is not central to the critical capacity at the seat of science, and is an anathema to the society in which science functions. Scientists are powerful actors and bear the burden of responsibility for their choices, including which science to do.

The power of science is thus directed, not neutral. The choices made by men and women doing science shape the course of science, either in the service of justice and the good, or not. If left unreflected upon, science will most likely serve the already powerful. New knowledge and technologies tend to go to the powerful first, where they can exacerbate inequalities and thus serve the end of injustice. If a scientist develops knowledge and accompanying technologies, the scientist needs to be concerned with who will get to use these technologies and whether they will help humanity or harm it. To attempt to avoid this problem by saying-- "It is not my problem, I just produce knowledge. How it is used is up to society"-- is a bankrupt attempt to avoid the burden of responsibility for what one creates. The scientist must think— who will benefit from this research? What ends will the truths serve? Am I serving the interests of humanity or am I merely serving the interests of the powerful?

What we must remember, what his Excellency is reminding us, is that the knowledge science produces is a form of power (which is why science has the capacity to speak to power). Science can provide new ways to act in the world, productively or destructively. It can alter the way we understand ourselves and the world. And it can serve the interests of the many or the few. In a world run by the powerful, the scientist should count herself among that elite. With great power comes great responsibility.

Science is not a truth production machine. It is a human endeavor, flawed and occasionally blind to its flaws. Yet it is the best tool we have for understanding the nature of our world. As such, science wields important authority and critical power, and can do both harm and good, amplified across the world.

About CSPO

The Consortium for Science, Policy and Outcomes at Arizona State University is an interdisciplinary intellectual network aimed at enhancing the contribution of science and technology to society's pursuit of equality, justice, freedom and overall quality of life. CSPO creates knowledge and methods, educates students, cultivates public discourse and fosters policies to help decision makers and institutions grapple with the immense power and importance of science and technology as society charts a course for the future. CSPO's unique and productive synthesis of theoretical, empirical and problem-oriented research and tool development is driven by three guiding ideas: desired outcomes can drive science; the value in society of new knowledge is determined by how it is used, and by whom; and the definition of the problem helps determine the relevance of the research. CSPO believes that politics and the ideas, institutions and the people behind them – and not science alone – determine the outcomes of science and technology in society. In this view, science policy is vastly more complex – as well as more interesting and malleable – than merely setting a budget for scientific research and development.

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