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A Plea for Symmetry: From the Sciences of Religion to the Sciences of Science*

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Prefatory Note: The paper "A Plea for Symmetry" was originally intended for publication, back in 1993, in a journal dedicated to the scientific study of religion and to the dialogue religion-science. Several contingencies impeded that goal, and the paper remained in my files since then. However, as the new century begins, I think its basic argument still is very relevant. Indeed, as the field of "science-religion" studies developed, not many authors turned their attention to the historicity of both subjects. But the broader scene has changed since them. First, the "science wars" ravaged the North-American academic world, casting some suspicion on the political underpinnings of many science studies. Second, the latter became more institutionalized, and the field developed much since then, and so its intestine fights. Third, the history of science, cognitive studies, and evolutionary epistemology, have developed in a more positive way, requiring extensive study. Fourth, the study of religion itself has undergone some change, being today more dependent on the biological sciences. Fifth, scientists today are more open to declare their own religious persuasions, and to recognize the religious overtones of the scientific activity. As for myself, my own increased awareness of religious studies has changed the ways through which I structure my thought on the subject matter. All in all, I think the paper in question needs some revision, and I would like to encourage the likely readers of these e-pages to send criticisms, remarks, and suggestions to improve the argument.

Last, but not the least, I do think the paper makes a contribution to the idea that religion, and religious studies in particular, have a critical stance toward other areas of scholarship. In this sense, even if the paper knows no further revision whatsoever, it still has a place in this issue of REVER.

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Nota Preliminar: O artigo "A Plea for Symmetry" foi originalmente pensado para publicação, no ano de 1993, em um periódico dedicado ao estudo científico da religião e ao diálogo religião-ciência. Várias contingências impediram este projeto, e o artigo permaneceu em uma gaveta desde então. Entretanto, ao adentrarmos este novo século, penso que o argumento central do artigo permanece muito relevante. Com efeito, ao desenvolver-se o campo denominado de "estudos de ciência e religião" nestes últimos anos, não muitos autores dedicaram sua atenção à historicidade dos dois lados em diálogo. Mas o cenário mais geral tem mudado desde então. Primeiro, as "guerras de ciência" tem grassado pelo mundo acadêmico norte-americano, lançando alguma suspeita nas motivações políticas de muitos estudos da ciência. Segundo, estes últimos tornaram-se mais institucionalizados, e o campo tem se desenvolvido desde então, revelando ao mesmo tempo a complexidade de suas lutas intestinas. Terceiro, a história da ciência, os estudos da cognição e a epistemologia evolucionária tem se desenvolvido de uma forma mais positiva, requerendo um estudo mais extensivo. Quarto, o próprio estudo da religião tem passado por uma certa mudança, estando hoje mais dependente das ciências biológicas. Quinto, de uma maneira curiosa um número crescente de cientistas tem manifestado suas preferências religiosas, e admitido que ressonâncias religiosas subjazem à prática científica. Quanto a mim próprio, devo admitir que minha crescente percepção do campo dos estudos da religião tem modificado a maneira pela qual estruturo meu pensamento no que tange ao tema do artigo. Tudo considerado, penso que tal artigo precisa ser revisto, e eu gostaria de solicitar aos possíveis leitores destas páginas eletrônicas que enviem críticas, comentários e sugestões para a melhoria do argumento.

Enfim, mas de modo algum menos importante, penso que este artigo contribui de certa forma para a idéia de que a religião, e as ciências da religião em particular, possuem uma instância crítica relativamente a outras áreas do conhecimento. Neste sentido, mesmo se este artigo nunca passar pela revisão desejada, ele ainda terá um lugar no presente número de REVER.

What enables the dialogue between science and theology? In a time when "science and religion" appears as an emerging discipline, this question is of a major importance. Many

possible answers have been given to it, yet I would like to underline one that in my estimation has received little attention: a methodological principle, that of symmetry, which asks for a third party to look at both disciplines and help to disclose the structures that underlie them.

The principle of symmetry states that, when both science and religion are regarded as human activities, the explanations for their structure and their dynamics are basically the same. Although it looks like a truism, practice has shown that this symmetry is frequently overlooked, and people keep insisting on the differences between these human constructs[1]. This is all the more true when we look to the development of the social sciences in the past century or so. We will soon notice that the study of science itself was for long kept separated from other sociological studies, and only in the past two decades they have been leveled out[2]. Our purpose here is not to present this development in detail, but rather to expand on a few lessons that can be drawn from it.

The first aspect that should be brought to attention is that both science and religion not only *have* a history, but *are* also historical in the full sense of the term (i.e., are marked by contingency, relativism and human freedom)[3]. While they claimed for themselves some sort

1 It is never too much to insist that these two activities *are* different, both at the ontological and at the ontic levels. The principle of symmetry, as stated here, is basically a methodological one.

2 The following quotation indicates neatly what is at stake with the methodological principle of symmetry: "The puzzling attitude towards science would be explicable if it were being treated as sacred [remembering Durkheim's distinction between the sacred and the profane], and as such, something to be kept at a respectful distance. This is perhaps why its attributes are held to transcend and defy comparison with all that is not science but merely belief, prejudice, habit, error or confusion. The workings of science are then assumed to proceed from principles neither grounded in, nor comparable with, those operating in the profane world of politics and power. . . . Is it not strange to use a religious metaphor to illuminate science? Are they not antagonistic principles? The metaphor may seem both inappropriate and offensive. Those who find in science the very epitome of knowledge are unlikely to grant religion equal validity and so may be expected to view the comparison with distaste. *This reaction would miss the point which is to make a comparison between two spheres of social life, and to suggest that similar principles are at work in both* [emphasis mine]. The aim is not to diminish one or the other, or to embarrass the practitioners of either field. Religious behaviour is built around the distinction between the sacred and the profane and the manifestations of this distinction are similar to the stance frequently taken towards science. This point of contact means that other insights about religion may also be applicable" (Bloor 1991, 47).

3 The difference is better understood when we look back at the development of German historicism. As a reaction to the rationalism of the 18th century, which tended to measure the past by the norms of the Enlightenment, scholars of the 19th century were concerned with the comprehension of the past in its uniqueness. As it is indicated by Iggers, "'the special quality of history does not consist in the statement of general laws or principles,' but in the grasp, so far as possible, of the 'infinite variety of particular historical forms immersed in the passage of time.'" (Iggers 1973, 458). It is also a rejection of progressivism, the conception of a unilinear development of human civilization leading either to the highest religion or to the highest science (although this last assertion was not applied to the natural sciences). Description and contextualization were major tenets of this historic outlook. The danger of relativism and skepticism were already spotted in the beginning of our century--see Iggers 1973. When it comes to the social, the difference between the "have" and

of transhuman authority, their common assumption was of a previously existing essence that unfolded within history. Religion was to be derived from God, and science from Nature--thus the metaphor, "Book of Revelation" and "Book of Nature"[4]. This was an uncritical symmetry, both books being thought of as ultimately written by God. As soon, however, as the Scriptures were historicized (shown to be *relative* to specific historic and cultural contexts) and thus disregarded as authoritative, the asymmetry emerged. Now we are witnessing a new period of symmetry, arisen from the historicization of science itself.

The main dilemma involved in these changes is the need for an explanation and the fear of being "explained away." Drawing from the difference *explanans* (that which explains)--*explanandum* (that which is explained), developed in the philosophy of science, any social analysis of either religion or science is seen to be reductive. There is an understandably strong resistance against allegedly scientific conclusions that point to these activities as "nothing but" an expression of something more primordial in culture, yet relative to different contexts[5]. The argument that ensues will stress the importance of this point.

The Fate of Religion in Modernity

Let us first consider the case of religion in order to understand this shift. That religion has a history is something that is known from antiquity--usually a history of how the true religion of a people came about, or how the priestly power is to be justified in the light of historical events. With the advent of modernity, however, religion gradually became *naturalized* and *historicized*--it started to be regarded, not as a god-given state of affairs, where the profane should mimic the sacred, but rather as a natural phenomenon or as the product of human volition that could be studied objectively. Reductive explanations came almost as a matter of necessity. This transition was accomplished in steps. With the Reformation, the locus of justification became one's faith--the beginning of modern subjectivity. This turn to the

the "is" may be stated as following: "It is not that science has its 'social aspects,' thus implying that a residual (hard core) kernel of science proceeds untainted by extraneous non-scientific (i.e. 'social') factors, but that science is itself constitutively social" (Woolgar 1988, 13). The same idea holds for religion.

4 For a brief history of the use of this metaphor, see Pedersen 1992.

5 Durkheim, despite all his sophistication, paved the way to this sort of reductionism with assertions like these: "it is not surprising, therefore, that the same facts are all functions of the nature of society, if the divinity is nothing else than the society transfigured. . . . As the gods are nothing but the personified collective ideals . . . In a word, it is inevitable that the peoples die when the gods die, as the gods are nothing but the peoples thought symbolically" (Durkheim 1913, 69).

individual was further warranted by the Cartesian *cogito*. Hume wrote a ground-breaking "Natural History of Religion." Lessing, on the other hand, is a turning point in the study of the Scriptures and tradition[6]. Schleiermacher, moreover, emphasized the religious disposition in the human being with his concept of 'feeling.' Feuerbach radicalized this trend by locating the essence of religion and its doctrines in the human--a completely natural phenomenon, with no external referent whatsoever. By the end of the nineteenth century a complementary historicism gained momentum: religion as historical phenomenon, with the works of Dilthey, Von Harnack, and Troeltsch coming to our minds. The Christian dogma itself was historicized (and thus relativized), losing its seminal role.

The study of religion was further naturalized with the "masters of suspicion," Marx, Nietzsche and Freud, and with the emergence of modern anthropology by the second half of the 19th century[7]. This last turn meant, according to modern interpretation, not only that Christianity lost any claims to truth or superiority, but also that there was no other basis to establish the truth of religion than the evolutionary process and its analogous in historical terms. Even though contemporary studies of religion tend to soften the bold and clear-cut assertions of the pioneers, a point of no return has been reached and all theology has now to face these studies seriously.

Classifying now questions about religion in terms of origin, function, meaning, and truth, we may say that religious people eventually came to accept social scientific explanations about the origin and function of religion, but many still refuse to give up authority in the explanation of its meaning and truth. As it is also truth for the natural sciences, however, there are no pre-established limits on the scope of explanation yielded by the social sciences, and there is often the presumption that they will in due time provide an exhaustive account of religious phenomena. But as these are well-known controversies[8], we will not dwell on them here,

6 It should be remarked that Lessing follows the tradition of 17th and 18th centuries deism, with its suspicion of history as a source of religious convictions. Religion here is naturalized in the sense that its dogmas are screened and translated into propositions acceptable by natural reason.

7 For an assessment of this crucial period in the history of interpretation of religion and its relationship to our present moment, see Glock and Hammond (1973), and Sharpe (1986).

8 For an account of these disputes that in practice implies the dismissal of theology as an independent academic discipline, see Segal (1989). See also Preus (1987) for a historical account.

going rather to the parallels in science studies, which only in the last few decades have been developed.

Science Deified

Profanization is not the privilege of iconoclasts, heretics, blasphemers and despisers. As a matter of fact, one of the first tasks of social scientists is to bring down to earth what human beings placed in the highest of heavens--it is part and parcel of the scientific method itself. Why then it took so long to use this methodological tool to analyze science itself? Be it because the institutionalization of the sciences is a recent fact in history, or else because of their successes and the role they played in the ideological struggles in modern history (a socio-political cause, therefore), the sciences managed to keep their image of "sacred cows" until the second half of the 20th century[9]. In fact, even though the social sciences were already well established in the first half, their practitioners, for a variety of reasons, ascribed to science a special role in society, a certain immunity from the vagaries of history[10]. Another way to posit the asymmetry is to adopt a double standard for the interpretation of discourse: sociologists explain the reality represented by one social group, not in terms of what its components say, but on the basis of their action; exception was made, however, with regard the scientific community, and in this case the discourse of its components was taken at face value[11].

9 The title of this section is borrowed, in fact, from the title of a very thorough study of the meaning and deification of science in Western culture--see Olson (1990).

10 Manheim and Durkheim are well known examples of scholars who posited an asymmetry between science and religion. According to Mulkay, "The concepts and conclusions of science, he [Durkheim] maintains, are increasingly adopted because they are true and not simply, as is primarily the case with religious beliefs, because they are collective [(*The Elementary Forms of Religious Life*), 437]" (Mulkay 1979, 4). Mulkay summarizes his historical introduction as follows: ". . . although most [traditional] sociologists of science have discussed science in general terms, they have repeatedly rejected in principle the possibility that the form or content of scientific knowledge, as distinct from its incidence or reception, might be in some way socially contingent. Instead, they have argued strongly, albeit with occasional uncertainty, that the substance of scientific knowledge is independent of social influence and they have tried to justify this assertion on philosophical grounds. They have claimed, in short, that science is a special sociological case because it has a special epistemological status. Because this line of reasoning has been generally accepted, sociologists have left the close analysis of scientific knowledge to philosophers of science and to the historians of ideas" (Ibid., 2).

11 In a way, this is inevitable for any discipline in its tentative beginnings. As it was pointed by Solla Price years ago, "But who ever heard of a science critic [in the same sense as in art critic]? The mystique of science is such that whenever we want an opinion about it we turn automatically to the scientist himself. The generals of science, it is presumed, must find from their own ranks their strategists and tacticians, their administrators, historians and economists. . . Thus the para-scientific professions (to use the phrase coined by Sarton) have often been filled by persons excreted from the research front of science, and historical writings and political statements are regarded

The adoption of a double standard reflects a distinctive reverence toward science, as pointed out at note *2* above, and a previous commitment to an outdated epistemology. Although the imagery of a "sacred cow" is somewhat disparaging, it illustrates nicely this very human attempt to spare a slice of reality from the corruption of our finitude and guilt. Remembering Otto's contention that the Holy for human beings is both fascinating and awesome, the ambivalence toward science of both the general public and the social scientists becomes understandable. As a perceptive commentator stated:

> Because every article [about science and scientists] contained multiple expressions of these attributes, the coupling of various traits--extraordinary intelligence, persistence, foresight, modesty--created a powerful, overarching image. One aspect of this image (reinforced by descriptions of scientists' mental and physical strength) combined respect with fear. The nonscientist could only stand and stare and admire the scientist's strength. The other aspect reflected the audience's speculative expectations. They waited to see what this Goliath, science, would do for (or to) society, and thus their attitude combined confidence in the scientists' abilities with the hope that the scientists' actions would be beneficial for society (LaFollette 1990, 76).

What this same author call the "myth of differentness" (Ibid., 77) resembles the notion that the sacred has to do with what is separated, detached from the profane and the ordinary, reiterating the theological (and even ecclesiastical) overtones that marked earlier accounts of science's place in society. The account of social scientists points in the same direction:

> What complicates the problem in the case [of the study of] multiples and priority is that the study calls for detached examination of the behavior of some scientists by other scientists. Even to assemble the facts of the case is to be charged with blemishing the

as a fair occupation for scientists *emeriti*. The situation is complicated by the fact that science has a strong autonomy of excellence that makes it select its own eminent representatives whenever a spokesman, an interpreter, or a leader of public policy is demanded. Only such a man, it is often said, would have the confidence of the peer group of scientists. . . . The dangers and fallacies of such a policy are particularly evident to a world that has now seen several decades of *ex cathedra* pronouncements by scientists about the vital matters of bomb and fallout, nuclear power and automation, population explosions and crises in information and education. Hurt as it might, one must admit some truth to the platitude that the scientist outside his chosen discipline reverts to the status of layman. As such he may be wise or foolish, well trained or untrained in the new field in which he chooses to discourse. It is certainly relevant to ask how much (if anything) an expert *in* science knows *about* science by virtue of his training and experience. It is also important to know whether there exists some special wisdom and training about science, some legitimate and scholarly way in which one can consistently gain increased understanding of the way in which science works and is related through its practitioners, institutions, and products with the rest of our society" (Price 1964, 196,197).

> record of undeniably great men of science; as though one were a raker of muck that a gentleman would pass by in silence. Even more, to investigate the subject systematically is to be regarded not merely as a muckraker, but as a muckmaker[12].

Scientists have for long recognized the ambivalence toward science outside the inner circle of scientists, but thought that with better education and good-will the problem would disappear--see, e.g., Weaver (1955) and Wolfle (1957). On the other hand they themselves were ambivalent toward the sacralization of science, sometimes paying only lip service to its "just-another-human-activity" character--see the perceptive comment by Standen (1950) 26.

Moving now to the entrenched epistemological beliefs assumed by social scientists in the analysis of science itself, the most outstanding of them all is the distinctive role allegedly played by the "hard facts of Nature" in determining the nature and content of science. As M.Mulkay describes it:

> A fundamental distinction must be made, therefore, between observational laws and theoretical laws (Nagel, 1961, ch.5). The latter are revisable and dispensable, but the former are not. . . . The basic, observational laws of science are considered to be true, primary and certain, because they are built into the fabric of the natural world. . . . The social origin of scientific knowledge is almost completely irrelevant to its content, for the latter is determined by the nature of the physical world itself (Mulkay 1979, 21).

This epistemology, based usually on a naive inductionism, has at its core some sharp dichotomies: context of discovery-context of justification, theoretical-observational statements, activity-content, and so on. A value judgment is also involved here, insofar as only the latter component of each of these pairs is regarded as actually "what really is" science[13]. This polarity (which in structural terms resembles indeed the one between profane

12 Merton 1973, 391-92. LaFollette also points out that scientists were spared from the muckraking that was common in many American magazines of the first half of this century--see LaFollete 1990, 172. For all practical means, "muckraking" and "iconoclasm" may be taken as synonyms.

13 The following statement by a well-known philosopher of science nicely illustrates this point: "To what extent, then, should an established scientific deductive system be regarded . . . as giving an objective account of the facts of nature? . . . The form of a statement of a scientific hypothesis, and its use to express a general proposition, is a human device; what is due to Nature are the observable facts which refute or fail to refute the scientific hypothesis . . . [in science] we hand over to Nature the task of deciding whether any of the contingent lowest-level conclusions are false. This objective test of falsity it is which makes the deductive system, in whose construction we have very great freedom, a deductive system of scientific hypotheses. Man proposes a system of hypotheses: Nature disposes of its truth or falsity. Man invents a scientific system, and then discovers whether or not it accords with observed fact" (Braithwaite 1953, 367, 368). For a discussion of the shortcomings of

and sacred) presupposes a god-given entity, floating over and above the social constructions and pitfalls of human beings and warranting the objectivity of scientific statements[14]. A division of tasks emerges between the normative discipline which deals with what is necessary and logical, namely, philosophy of science, and the empirical disciplines dealing with what is contingent and dependent on human whim, namely, history and sociology of science. As a sociologist of the functionalist school of Merton concluded not long ago:

> We have seen that although there is a possibility for an interactional sociology of scientific activity, the possibilities for either an interactional or institutional sociology of the conceptual and theoretical contents of science are extremely limited (Ben-David 1984, 13-14)[15].

It is easy to see that an asymmetry between the understanding of science and the understanding of religion emerges out of this presupposition. The following statement by a scientist well illustrates this point:

> *Science*, as I use the word here expresses the point of view that insists on a rational explanation of the experience of apprehending phenomena by experiments and observations, leading to the formulation of explanatory theories that can be publicly validated. Its emphasis is facts and their public verification of overall hypotheses, theories, and doctrines.

inductionism, see Chalmers (1982). For the gradual expansion of scientific empiricism into full-blown scientism, see Sorell (1991).

14 We may also consider the following quotation: "A fundamental feature of science is its ideal of objectivity, an ideal that subjects all scientific statements to the test of impartial criteria, recognizing no authority of persons in the realm of cognition. . . . [science] has given us a new appreciation of reason itself . . . of responsibility of belief, embodied not only in a firm commitment to impartial principles by which one's own assertions are to be measured, but in a further commitment to make those principles ever more comprehensive and rigorous. . . . [of great human significance is] the moral import of science; its dynamic articulation of the impulse to responsible belief, and its suggestions of the hope of an increased rationality and responsibility in all realms of conduct and thought" (Scheffler 1967, 1,4). The "myth of differentness" could not be better expressed.

15 This asymmetry and division of tasks, again, has in practice religious overtones. As it was recently pictured: "In the traditional philosophy of science, these contrasts are described as two different 'contexts' of science: the internal and rational context of justification versus the external and empirical context of discovery. The internal side is the sacred side of science. The priestly philosophical guardians must declare this territory taboo and protect it against intrusions from the profane realm and its vulgar spokespersons, the sociologists." Fuchs (1993) 10.

> The word *religion* in this paper means a group shared system of thought and action which orients the person in his ultimate concern physically, socially, and spiritually to Cosmic Reality, the philosophic name for *God* (Shrader 1964, 224-25).

Three striking distinctions are here drawn between science and religion. First, science has to do with public knowledge, whereas religion has to do with belief, the faith and morals of a group. Second, whereas science is ultimately guided by the hard facts of nature, and so the inquirer recedes to the background, religion is something that is group-shared, a human activity where the feelings and actions of the individual in his/her community are paramount. Finally, science is displayed in its ideal state, as it ought to be, whereas religion appears as it actually is in the eyes of an impassioned inquirer. Even though these definitions are not properly wrong, our contemporary understanding finds them terribly inadequate.

Science Desacralized

It was only in the seventies that inquirers broke with this epistemological straight-jacket and finally felt free to go behind the discourse, as Toto peeked behind the curtain at Oz, in search of the chains of causality that linked the behavior of scientists to the outcome of their efforts[16]. Several causes have contributed to this breakthrough. First, it was the new visibility that science itself acquired after World War II, turning it into a public (and political) matter, open to the same kind of scrutiny and discussion that afflicts other ones.

Second, science has been *historicized*, i.e., historians and philosophers have gradually been showing how theories, methods and aims of science evolve, change and are affirmed in accordance with historical trends, both internal and external to the scientific community itself. As opposed to traditional historians such as Sarton, who declared that "the history of science is the history of mankind's unit, of its sublime purpose, of its gradual redemption" (as quoted in Thackray 1974, vii), contemporary professional historians of science (and Thomas Kuhn's *The Structure of Scientific Revolutions*--Kuhn (1970)--is a watershed in this respect[17]) are committed neither to any latter-day distinction between "salvation history" and "world history,"

16 The list of pioneers that worked before is, of course, very long. Besides the now obvious reference to Kuhn and Hanson, we should also cite Fleck (1979) and Ravetz (1971) as people who studied the construction of facts through the social negotiations of scientists. The seventies, however, mark the beginning of the establishment of definite methodologies and the institutionalization of the field.

17 And this is so regardless of our opinions about the soundness of particular assertions of Kuhn or of the book as a whole--see Giere (1988) 32.

nor to show that the history of science is little more than the unfolding of man's conquest over a previously given Nature.

But emphasis is to be given here to another development in the understanding of science, namely, the post-Mertonian social studies of science. As it has been seen above, standard sociological practice treats different forms of knowledge as empirical phenomena. Knowledge is understood as "customarily accepted belief," that is, it is evaluated in terms of custom and consensus among definite social groups. Exception was taken, however, with regard scientific knowledge. In this case a fixed natural world was presupposed--it was Nature, rather than sociological processes, which determined the way for scientific knowledge to proceed. Evaluation should follow observation, experiment and rational inference.

When the exception is removed, however, natural sciences are no longer seen as possessing a special epistemological warrant, which would turn sociological analysis irrelevant. Following philosophical analyses which have shown that all observation is theory-laden and so theory is underdetermined by experimental evidence, contemporary inquirers seek to show the complex (and social) nature of evaluation in science. Negotiation and decision rather than inference are highlighted.

The absence of Nature as a final arbiter implies in relativism as a methodological heuristic. The methodological prescriptions advanced by D. Bloor in the middle seventies are now famous. According to him, the sociology of scientific knowledge should proceed as follows:

1. It would be causal, that is, concerned with the conditions that bring about belief or states of knowledge. Naturally there will be other types of causes apart from social ones that will cooperate in bringing about belief.
2. It would be impartial with respect to truth and falsity, rationality or irrationality, success or failure. Both sides of these dichotomies will require explanation.
3. It would be symmetrical in its style of explanation. The same types of cause would explain, say, true and false beliefs.
4. It would be reflexive. In principle its patterns of explanation would have to be applicable to sociology itself. Like the requirement of symmetry this is a response to the need to seek for general explanations. It is an obvious requirement of principle

> because otherwise sociology would be a standing refutation of its own theories (Bloor 1991, 7).

As it was mentioned above, this is not a new program, and it has been applied to religious beliefs and theological knowledge for over a century. Methodologically speaking, therefore, in both cases the inquirer refrains from making value judgments, either as a presupposition or as part of the argument, about the truth of theoretical statements or the reliability of the subjects being studied. The underlying concern is more empirical and less normative, as opposed to traditional accounts of both science and religion.

Several schools of thought have emerged, sharing the same relativistic heuristic but differing on the scope and the practices regarded as vital for the shaping of scientific knowledge. For example, following the lead of H.M. Collins, one approach focus on small groups of scientists engaged in a scientific controversy. Another group is represented by B. Latour, which seek to describe how scientific facts are constructed and deconstructed in the course of routine laboratory work. Still another trend focuses on the social shaping (interest analysis) of scientific knowledge, resorting more extensively to historical studies. D. Bloor and B. Barnes are to be mentioned in this respect. There is also resort to ethnological techniques (e.g., M. Douglas' "grid-group" analysis) and discourse analysis, which describe how interpretations are constructed within the scientific community. People like S. Woolgar and A. Brannigan are representative of this strand[18].

In sum, these approaches regard science as part and parcel of culture. As T. Pinch puts it,

> It can be seen that there is much agreement in the sociology of scientific knowledge over the underlying assumption that scientific knowledge can be treated as a social construct and that science is not special in any important epistemological sense (Pinch 1990, 96).

The sharp distinction of the neo-positivists between the contexts of discovery and of justification was shown to be untenable by historical and philosophical studies, implying that there is no natural world working as a final arbiter in scientific matters. As soon as this was accomplished, the way was paved for sociological inquiry that shows the contingency not only

18 Accounts of recent trends in the social studies of science can be found in Mulkay (1979), Knorr-Cetina (1983), Woolgar (1988), Olby (1990), Bloor (1991), Webster (1991), Pickering (1992), Cole (1992), and McMullin (1992).

of discoveries (expressed, e.g., by the emergence of geniuses in history) but also of the public validation of scientific knowledge (both in the form of theories and models, and of experimental facts). The absence of an arbiter also implies a much more complex and richer view of how controversies arise and how consensus is achieved within science--see Engelhardt and Caplan (1987), and Cole (1992).

It should be added that scientific knowledge, besides being historicized and socialized, has also been *naturalized*--epistemology becomes less normative and more descriptive (without necessarily falling into nominalism), showing the evolutionary traits of scientific knowledge[19]. Evolution becomes both a metaphor for a process that involves blind variation and natural selection, relativizing its teleological and conscious character, and a theory with its concepts and operational definitions, which takes the dynamics of scientific knowledge as the organism being studied.

Evolutionary epistemology also draws its inspiration and its tools from the cognitive sciences, which have experienced a remarkable development in the past two decades. Models are elaborated out of cognitive psychology, artificial intelligence, and neurosciences. Its basic interest is to steer a middle way between the empirical and the normative, the subjective and the objective, the socio-psychological and the logical, science-in-the-making and science validated. It is a way to put Nature back in the realm of science without turning either one into a supernatural entity and at the same time preserving the tolerance for ambiguity that renders as inadequate any static idea of consensus[20]. An even briefer mention should be made to a new trend in science studies: "Social Epistemology," which aims at linking the sociology of

19 One of the pioneers in this field is Donald Campbell, with his studies in the psychology of knowledge processes (see, e.g., Campbell 1974 and, more recently, Campbell 1993).

20 For studies in this new field, see De Mey (1992), Giere (1988), Giere (1992) and Hull (1988). For the inevitable and even positive role of ambiguity in scientific discourse, the following quotation is revealing: "From the perspective of finished knowledge, systematic ambiguity is a fault to be decried and immediately eliminated. From the perspective of knowledge acquisition as a temporal process being carried on by fallible human beings whose careers have an inevitable temporal limit, it may be an evil, but it is at the very least a necessary evil. In fact, I find that such equivocation in science is not in the least evil but a powerful method of conceptual improvement. Often, I was forced to conclude that the standards dictated by philosophers of science, if taken literally, would destroy the very mechanisms that produce the characteristics of science that philosophers values so highly" (Hull 1988, 7). One of Hull's reviewers had the following to say: "I like the idea that the intrinsic dynamic ambiguity and heterogeneity of research programs could be interpreted as a *necessary* consequence of the nature of science as an evolutionary process, rather than as a problem of inadequate classificatory methodology" (Fleck 1992, 245). Two remarks are appropriate at this point: first, the dichotomy between the contexts of discovery and justification, as noted above, is shown to be self-defeating for the sciences. Second, any claims that *coherence* is a mark of scientific explanation should be properly qualified.

scientific knowledge with social sciences in a broader sense, so as to match normative epistemology and science policy--see Fuller (1992) for a summary of this approach.

Conclusion

The main purpose of this paper was to suggest the symmetries between science and religion that are revealed by a social scientific approach. As soon as no "sacred cows" are allowed, both fields are dealt with as human activities, and regarded as natural, historical and social phenomena. When it comes, therefore, to explanations as to the origin, function, meaning and truth of both fields, no forbidden limits can be established by their practitioners. This does not mean that they have nothing to say about the meaning and truth of their crafts and activities, it only means that in order to avoid self-deception it is necessary to allow for a fair and unrestricted evaluation from the outside.

The first and foremost principle of symmetry is methodological relativism and the ensuing possibility of pluralism. The latter is now widely acknowledged by both scholars and religious leaders, and only now we begin to understand what pluralism means for the sciences. In either case, of course, it is *not* implied that "anything goes." But, as we indicated above, the study of controversies and the processes aiming at a consensus may indicate the degree of tolerance and pluralism permissible in both science and religion. As inference or deduction do not work mechanically or unequivocally, negotiation and decision based on faith (respected the differences) play a not negligible role in defining the truth of religious or scientific statements, especially those of far-reaching significance. In both cases, different interpretative possibilities are allowed, and so any statements or explanations experience a history of their own, with an open future. Evolutionary explanations, on the other hand, may further expose the common roots and common mechanisms shared by science and religion.

Desacralization of science and religion does not mean, on the other hand, that the bipartite division of the cosmos into sacred and profane should be discarded as a matter of principle. Quite to the contrary, every truth, goodness and beauty exacts a sense of reverence from human beings, and if the sacred is expelled from the front door, it will return with demonic power through the back door[21]. The point of this argument is to indicate the limits of both an

21 Quite a few scientists have witnessed to this sense of the sacred in certain situations in time and space. See, for example, this compelling account by Robert Jastrow: "As one comes into the dome [of the Mount Wilson Observatory], the roomy spaces of that vast, seven-story interior make one feel one is entering a cathedral

uncritical symmetry and a lop-sided asymmetry that prevailed for so long. That science and religion both witness to the truth is not at stake here, even though this witness should be permanently explored, analyzed and reevaluated[22]. Avoiding a double standard has also a moral import--it gives us a sense of humility, a sense that, in face of the awesome majesty that we are contemplating, we are dust and to dust we shall return.

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dedicated to mankind's quest for understanding of the Cosmos" (Jastrow 1992, 7).

22 The character of this "witness" is to be ascertained by what Campbell has called "the second phase" of the sociology of scientific knowledge, the effort to "improve the competence-of-reference of beliefs to their presumed referents." (Campbell 1993, 97). In all cases the presumed referent would act as a coselector of the knowledge about it. This second phase, however, is still in its gestational stage.

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