

## Interview with William Stoeger

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Stoeger is a staff scientist for the Vatican Observatory Research Group (VORG) at the University of Arizona, Tucson, specializing in theoretical cosmology, high-energy astrophysics, and interdisciplinary studies relating to science, philosophy and theology.

He was ordained to the priesthood in 1972. Afterwards he pursued doctoral studies in astrophysics in Cambridge University, England, and completed his PhD in 1979. From 1976 to 1979 he was a research associate with the theoretical gravitational physics group at the University of Maryland, College Park, Maryland. Stoeger has been active in lecturing and teaching at the University of Arizona, where he is adjunct associate professor, at the University of San Francisco, and at the Vatican Observatory Summer Schools. He is a member of the American Physical Society, the American Astronomical Society, and the Society for General Relativity and Gravitation. He is on the Board of the Center for Theology and the Natural Sciences (CTNS). Author of *The laws of nature, the range of human knowledge and divine action.*, published in 1996 in the USA. He was in Brazil lecturing at PUC/SP, PUC/RJ, ITESP/SP, UNESP and USP in October 2002 (when the same book was published in Portuguese). The Post-graduation Program of Studies in Sciences of Religion at PUC in São Paulo has had the privilege of listening to William Stoeger's conference, "Our experience of knowing in Science and Spirituality"; Stoeger has given this interview to Maria José Caldeira do Amaral, Maria Marta Alcântara de Oliveira and Waldecy Tenório, especially to the magazine *Último Andar/ Caderno de Pesquisas em Ciências da Religião*, that is published each six months by Educ, São Paulo, year 6, #8 – 2003, ISSN 1415-899X, where it can be read in Portuguese. It is published here in English.

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William Stoeger é cientista do Grupo de Pesquisas do Observatório do Vaticano (VORG). Especialista em Cosmologia Teórica, Astrofísica de altas energias e estudos interdisciplinares relacionados com a Ciência, a Filosofia e a Teologia. Em 1972 foi

ordenado Presbítero. É doutor em Astrofísica pela Universidade de Cambridge desde 1979. Entre 1976 e 1979 foi pesquisador associado ao grupo de física gravitacional teórica da Universidade de Maryland, em College Park, Maryland. É membro da Sociedade Americana de Física, de Astronomia e da Sociedade Internacional de Relatividade Geral e Gravitacão. Leciona na Universidade do Arizona, na Universidade de São Francisco. É, também, membro do Conselho do Centro de Teologia e Ciências Naturais (CTNS). Autor do livro *As Leis da Natureza – Conhecimento humano e ação divina*, publicado, em 2002, pela Paulinas Editora, São Paulo. Em Outubro de 2002, esteve no Brasil, proferindo um ciclo de Palestras na PUC/SP, PUC/RJ, ITESP/SP, UNESP e USP. O Programa de Estudos Pós-Graduados em Ciências da Religião da PUC de São Paulo teve o privilégio de ouvir a conferência realizada por William Stoeger, “Nossa Experiência do Conhecer em Ciência e Espiritualidade”; Stoeger concedeu esta entrevista a Maria José Caldeira do Amaral, Maria Marta Alcântara de Oliveira e Waldecy Tenório, especialmente para a Revista *Último Andar/Caderno de Pesquisa em Ciências da Religião*, publicação semestral, editora Educ, São Paulo, ano 6. N 8 – 2003, ISSN 1415-899X, na qual está publicada em português. Publicamos a mesma aqui em inglês.

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***A bit of biography. Do you have any curious stories? In 1961 you entered the Society of Jesus. What voices did you hear when you were 20?***

Well, I guess several things are important, one or two things. One would be that from the time I was a boy I was always very interested in both religion and science. I grew up within a devout Roman Catholic family. But many of my relatives, who were also devout Roman Catholics, were heavily involved in engineering and science: some in engineering, aeronautics, or space engineering and some in agricultural sciences. So I never felt, I never experienced, that there was a conflict between science and religion. Many of my relatives who were involved in science, particularly on my Mother’s side of the family, were always very involved in science and working in the church, that sort of thing. That obviously had some effect. However, there is an interesting story that many people know. I was taught by sisters, by nuns, who were not always very happy with some of the things I would say about science and evolution. When I was a boy, probably about eleven or so, they would say:

“Well, you know you can’t really believe in evolution”. One of my granduncles, who was an agricultural expert, gave me a book for Christmas on paleontology and the theory of evolution. So I read this book and I found it very fascinating, but I also had lots of guilt about reading it. So I used to hide it under my bed, and only take it out at night to read it. Then when I was at High School, my first year of High School, I was taught by Franciscans, and one of them taught us religious studies. One of the first things he taught us was there was no conflict between evolution and Christian belief. He said that the only thing that made any sense was to hold that evolution was a fact. So I no longer felt guilty about reading this book. That was about three years after my granduncle had given it to me. That was sort of my one crisis between science and religion. That was the only crisis.

### ***1961 - The Society of Jesus.***

I entered the Jesuits when I was seventeen and so when I was 20, I had already been a Jesuit for about two and a half years. I guess at that time I was very convinced that I had a vocation to be a Jesuit and a priest and I was beginning, with my Jesuit superiors, to decide what I should specialize in. At that time I wasn’t sure whether to specialize in the sciences, in theology or in classical studies. At that time we did a great deal of classical studies right after entering the Jesuits, including a lot of Latin and Greek, and Latin literature and Greek literature, English literature. Anyhow, when I was 20, I wasn’t yet clear. I was beginning to think, though, that I would probably concentrate on Science. Even though I also ended up concentrating quite a bit on philosophy and theology as well.

There’s a funny story much later, just before I was being ordained. I was ordained in 1972. But maybe six months or maybe a year before that, 1971, I already had a Masters Degree in Physics, I was sort of in the process of deciding or discerning with the help of my Jesuit superiors and other people whether or not to go on to do a PhD in astrophysics and cosmology. It was clear that I would have an opportunity to go to Cambridge to study if I wished, because there was a professor at the University of California, who was very well known, with whom I worked part-time and who was very anxious to help me continue my studies and wanted me to go to Cambridge. But there were some of the Jesuit professors at the Jesuit school of Theology at Berkeley who were quite strong on saying that I should do

Theology and not go more into Science. So I was talking to my Provincial (he is an interesting person, and an experimental psychologist) He said, "If you can do anything besides theology, do it because I already have too many theologians I do not know what to do with."

***About religious experience. How was your conversion? Was it like Saint Paul falling from the horse or just a discrete presence hinting to your heart?***

I think the latter, discreet presence hinting to my heart, because I grew up believing in God, being involved in Religion. But I guess part of the conversion experience would have been coming to realize, as I was entering the Jesuits and particularly after I was a Jesuit, that faith was much more of a personal commitment and personal relationship than simply believing in dogmatic statements. That was a very freeing experience. The foundation of it is personal and not institutional. If it is not personal, then the institutional doesn't make sense. It comes afterwards.

***Academic formation. Theology, philosophy, physics... How did it/they happen? How can you put together those things?***

With some difficulty, but I think they naturally must go together because, as I will say in my talk, we are human beings, and as human beings, we yearn for integration, and also as a culture, we yearn for cultural integration. But human knowledge and human experience both personal and cultural experience and knowledge, consists of many different things. It consists of our knowledge from the arts, from the sciences, and theology. Even if somebody doesn't believe in God, they have deep experiences of the transcendent and of deep harmonies and values and absolute norms of truth and beauty and goodness that function in their lives, and all these things are very important. There are many different ways of knowing and experiencing and many different ways of validating what we know and experience. Philosophy, if it is really genuine and if it is really adequate, must be critically open to all that people can experience. And part of philosophy's job or function is to show how they fit together. One of the things that I think is quite important in helping them fit together is to come to a recognition of the different strengths and weaknesses of each type

of experience or knowledge -- you might say the competencies and limitations of each. You know that philosophy itself and theology and the sciences as separate disciplines have certain competencies, those are areas of knowledge and experience that they are very good at uncovering. On the other hand, each of those disciplines also has limitations. For instance, the sciences, though they are very good at uncovering the detailed processes and relationships and structures in the physical and chemical world, are not very good at all at dealing with ultimate questions or with the personal relationships or with what gives meaning and orientation to our lives. On the other hand, philosophy and theology can be quite good at that, but are not very good at all at doing what science does. I think that when we come to recognize the different strengths and weaknesses of the methodologies and assumptions of each way of knowing and experiencing, there then can be a process of seeing how they can fit together.

***Who do you think wins: the philosopher, the theologian or the cosmologist?***

No one. It depends on what particular thing you are talking about. There is also the huge problem, which I didn't mention until now, of hermeneutics and interpretation. There can be theologically helpful ideas, you know, that really do help a person with simple belief. These will be genuine mythic expressions of their belief. Coming to relate them to scientific knowledge requires an interpretation somewhat different from that according to which people first understood them. That does not mean that the myth is wrong. It just means that perhaps the literal or the logos expression of the myth has to be more sophisticated and more nuanced. Science can at least help in effecting this, even though it cannot completely provide it. The sciences can push or challenge the theologian or the believer to a much more purified form of logical or articulated expression. This only happens as the different ways of knowing and experience interact.

Going back to Augustine and other Father of the church, there has always been this very interesting image of the two books by which we know the truth about God and nature. There is the book of Sacred Scripture, but also the book of nature. By reading and understanding the book of scriptures and by reading and understanding the book of nature we come to know the truth. Both give us information about God, about Nature, about the world. If we

properly understand each, then they will not contradict one another. If we fail to properly understand each, then they may very well contradict, just because we misunderstood what they are saying. Probably the most difficult thing is to properly understand and interpret texts, and we see that with scripture. How do you interpret scripture? Well, obviously one of the key things you have to be able to do is to know something about the culture and what type of literature you are dealing with. You talked about The Song of Songs. Well, that's poetry, love poetry. The first eleven chapters of the book of genesis is really a creation story, or creation-flood story, and is not to be understood as history. It is not a historical literary genre. That does not mean that it's not truth, but the truth is not historical, or scientific. The truth is primarily theological through myth.

### ***The importance of Biblical interpretation to science.***

Well, biblical interpretation is obviously important to theology and certainly to Christian and Jewish believers. But it is indeed also important to science. If the Bible is properly interpreted, then it becomes clear that what the Bible is teaching is not in direct conflict with science. The scientists who are believers do not have to reject the Bible or their science. It is particularly true and I think it is clear that there is nothing in the Bible that is really intended to be scientific knowledge. To presume that there is would lead, and has led, to serious misinterpretations. Everything that was written in the Bible was written long before there was really anything like strict scientific investigation and reporting. The different languages and perspectives of the Bible reflect the common sense understanding of the world and the Universe at the time they were written and also make use of the myths and stories and narrations that were common at that time. It depends on what section of the Bible you are talking about. Obviously the first eleven chapters of Genesis were not in any way historical. There is what we call Patriarchal history which is more historical, but not historical in the sense that it uses the same historical methods or insistence on fact we do today. It includes legends, stories, myths, along with some historical based material. I am not saying that in order to be inspired by scripture, in order to allow scripture to nourish your spiritual life, you need to know all this, but I think in many cases it helps to realize what the background is and to realize particularly what the theological message is. Part of the trouble is that, if you misinterpret the first chapter of Genesis, then you are unable to focus on the

theological message and it gets confused with what you thought were the actual facts that are being described.

***Have you heard anything like Weber's talk about science as vocation?***

I think science is definitely a vocation. There is little doubt about that. I think it's a very important vocation. People who become the best scientists are the people who really do see it as a vocation. It is a vocation to know and to understand, but not a vocation to control nature. Besides science there is technology, which in some ways uses or explores scientific knowledge in order either to improve our way of living or to make a profit or both or to harness nature in all the ways we have. Although I think part of the vocation of the scientist can be to discover things that will help people, part of the vocation of the scientist is simply to help people understand nature and ourselves, the world around us, where we came from and where we are going. That nourishes our imaginations, which is important for theology -- nourishing our sense of wonder and sense of awe. Cosmology, astronomy and also biology strongly contribute in this way.

***In your researches, have you ever met the author of Psalm 8, the one who says:  
"When I consider Your heavens, the work of Your fingers, the moon and the stars,  
which You have ordained; what is man that You take thought of him..."?***

Yes, I think that is a very important, this is the wonder at who we are, and implies that science only gives a very limited picture of who we are. If you just rely on the natural sciences you really can't recover the deep meaning of what a human being is and what human life is. There is much more that we experience ourselves as human beings to be than science can give us in terms of personal relationships, in terms of our relationship to God -- that we are made on the image and likeness of God, that we have an ability to know and understand. Science so far cannot really give us an adequate picture of what are knowing and our existence as human being really is. Science doesn't really have a good answer to the question "what is a human being?" It can tell you about the human genome, but the human genome doesn't define a human being.

A good example of this that I would like to reflect upon is that all the scientific knowledge we have from the physics, chemistry and biology is not enough to endow our existence with meaning, orientation and significance. Perhaps in the distant future what the sciences give us will help more to that end. But now, in order to derive meaning, significance and orientation about who we are and about what nature is, we need something much more than the sciences. We need philosophy, we need theology, we need the arts, we need other areas of human experience.

Weinberg has said (he won the Nobel Prize and is one of the really outstanding scientists in the world today. He probably knows more about physics than anyone else) on a number of occasions that the more we understand about the Universe and about, from the Sciences, and about its origins and where it is going, the more meaningless and pointless it seems. That's a clear indication that the scientific knowledge is not enough to give meaning and significance to the Universe.

***When you say that, do you mean that science may change?***

I don't think that science, or the sciences as they are practiced, will ever give us adequate meaning. However, I also believe that, if a person reflects from a theological and philosophical point of view on the sciences -- with the illumination theology and philosophy can provide -- they can help us discover meaning and orientation. But they cannot do so on their own, because their scope and their methods are too limited.

***Prigogine puts together in the same title (in his book) three different concepts: science, reason and passion. Is there passion in your work? How is a cosmologist's work?***

Yes, I think so. I believe there has to be passion in any vocation or any research, not only in research, but also in teaching. If there is no passion it means that it is not important to you. You have to be genuinely excited about something in order to do it. If you are interested in art, in dancing, or in singing, it is not just a commitment. It is something that you find deeply fulfilling, deeply nourishing and energizing. There is meaning in it for you.

Cosmology is really both a branch in physics and a branch in astronomy. Much of it is done in collaboration with other people. Because you are constantly reading and discussing with other people, you are constantly learning and reflecting on what other people have done. It involves coming to understand and interpret data from astronomy and particle physics, and other areas of physics, in order to develop a better understanding of the Universe and its history from the very beginning, from the big bang until now, and even what will become of it as it continues to expand. Some of the work I do is connected with taking that information and trying to improve our models or theories about the Universe and about the processes which are important for its unfolding. On the basis of those models, we try to understand more. So there is this constant interplay between theory and observation or experiment. It seems clear that we are gradually coming to know more and more about how the Universe began and developed. One of the primary things is that the Universe evolved. It was not always what it is now. Even though we do not know what the Big Bang was, we are almost sure that it was not the very beginning. Science cannot tell you what came before. We do know, however, that from right after the Big Bang until now the Universe has been expanding and cooling. When it began to expand it was very, very simple. It was just an expanding ball of hot gas. It was also very smooth, very homogeneous. There were no stars and no galaxies. And there were only three elements: there was only hydrogen, helium and lithium. And so you could not have any complicated chemistry or life. It was only later when the Universe cooled sufficiently that stars and galaxies condensed out of the gas. The stars then manufactured the heavier elements: carbon and oxygen and iron and copper. It was only after you had at least the first generation of stars that you could even have the possibility of life. So cosmic evolution, this expansion and cooling of the Universe and the formation of stars and heavy elements, was absolutely essential to provide the building blocks for chemical evolution and biological evolution. If you look at this from a theological point of view, some people will say that means that God did not have a hand on it. The point is that God is working through the laws of nature and through the evolutionary processes: physics, chemistry and biology. Somehow God established the laws of nature, the regularities and processes, the relationships and gave them their dynamism so that they were or would be able to do this. This is how God created. That is the wonder of it all. And this is happening in many other places in the Universe right now. There are at least three

hundred billion galaxies that we know of. And in each of the galaxies there are of the order of several hundred billion stars, and so you know there are three hundred billion times three hundred billion stars in the Universe. Some of those stars are sort of like our sun. There are many places therefore where you could have evolution occurring that leads to life.

***How do you join the depth and the intention of theology as science too?***

I think that the depth and wonder in some ways is similar to the depth and wonder of theology, but in other ways it is different because the depth and wonder in science is about the mystery of matter and the mystery of the intricacy of the inter-relationships in nature and in the Universe. In some ways that is what the sciences give to theology, but theology in addition reflects on the depth and wonder of God's love, together with the fact that, though God is Creator of this vast Universe, God also comes very close to us as human beings -- that God as a caring God comes close to us in Jesus. So there is a deep wonder there: God's vulnerability, God's intimacy with creation, which cannot be discovered through the sciences, but can be somehow discovered through theology and through our deepest human experiences. There are certain key things that the sciences including cosmology and biology emphasize that are also found in Christian theology. The first is relationality. In the sciences it is very clear that as we come to understand nature a key aspect is the incredibly rich and multi-layered relationalities and inter-relationalities there are all the way up to human beings. Interestingly enough from Christian theology it is very clear that relationality is also very important -- that even God is relational, a Trinity. There is a certain consonance between the emphasis that God places on relationality and the relationality that is found in nature.

Relationality is very important, but there are a couple other things, as well: One of them has come to be known as the "autonomy of nature" -- "the relative autonomy of nature" -- which some also refer to in English as "formational and functional integrity of nature". This idea has not been discussed in theology, but, interestingly enough, some important early Church Fathers and theologians, including St. Augustine and St. Basil the Great, introduced it in their commentaries on creation. God gives nature a certain autonomy or integrity. God respects nature and us so much that He allows nature to be and function the way it is. God

does not constantly have to interfere in nature. So God endows nature with dynamism and with its own capacity for development, which then it is able to pursue on its own, still dependent on God for ultimate being but able to be itself. That prepares for human freedom and human autonomy. The other side of this is God's deep respect for the individuality and the sacredness of nature and the things in nature. What that prepares for at a high level is that human beings can enter freely into a relationship with God, not in a forced or compelled way, which means that it leads towards a genuine communion with God and with other people. So you have relationality, you have the autonomy or integrity of nature. You also have the third thing that is quite important and very mysterious -- the transience and fragility of nature, especially complex nature, and the fact of death and suffering. In some ways that is really a key issue for believers, for who God is, and for who we are. One of the things it leads to is a recognition that creation and nature as we know it, even through the amazing discoveries of the sciences today, is radically incomplete. Its completion is in a way that none of us understand even from the theological point of view. The completion and fulfillment of nature and the Universe will only be achieved after nature and all that belongs to it somehow go through the mystery of death. Theology says quite a bit about going through death and resurrection, recapitulating in our lives the death and resurrection of Christ, but we do not know what that means concretely. We have not been through it yet.

***Is the cosmologist afraid of the silence in the infinite spaces as Pascal was?***

Not really. This whole question of the infinite is actually one that you see now talked about in cosmology a great deal. It is also a philosophical question that has not been adequately resolved. I have recently written some things about infinity and problems with infinity. The thing is that cosmologists deal almost matter of factly with the notion of infinite space, and even in some ways with the notion of infinite time, even though our observable Universe, the part of the Universe we can see and have access to, is certainly finite -- simply because the time since the Big bang is a finite time, at most maybe fifteen billion years. The farthest we can see now is about Fifteen billion light years -- the distance light travels in fifteen billion years. It sounds like a lot, but we know that the Universe is bigger than that, the actual Universe is bigger than we can see.

The things to remember is that when you look farther into space you are looking farther back in time. The information that we are getting from far out in the Universe is the information about how things were in some cases as much as fourteen or fifteen billion years ago. The models that we use of the larger Universe embrace this observable Universe, which is only fifteen billion light years in radius. Many of the models we use for the larger Universe as a whole are models that have infinite space, and then the question is: Can space really be infinite? That is really an unsolved philosophical question, as I have already said. There are some arguments that seem to demonstrate that time cannot be infinite -- time in the past cannot be infinite -- but there are no arguments that I know that demonstrate that space cannot be infinite. It is certainly not necessary that space be infinite. There can be ways in which space could curve around itself and just form sort of a connected structure that would not have any edge to it. It almost certainly has no edge, but, as I have said, it could still be finite. A good example is just a sphere: think of the two dimensional surfaces of the sphere, do not worry about the inside. It does not have an edge, but it is finite. A bug can walk around on the surface of the sphere and the bug never comes to an edge or boundary. That is what happens to us on Earth: if we walk around the surface of the earth we never fall off, we never come to an edge and yet it is finite. If we go far enough we always come back to where we were before. It could be that the whole Universe is that way.

***Does this have any connection with the Anthropic Principle?***

Not directly. The question of infinite space and time does not have too much to do with the anthropic principle. But the anthropic principle is very interesting and somewhat important for other reasons. It really is not a principle. In many ways it is not a recognized part of cosmology, and it is a very controversial. Basically it is a philosophical idea that was born from cosmology, and is still often talked about and debated among cosmologists. The best way of explaining it is to say that the anthropic principle is the recognition that the Universe and the laws that are important to the universe seem to have been fine tuned or set up precisely for life. Fine-tuning is an important concept because it means that if you had changed any number of values, of parameters or constants just by a little bit, the Universe would be completely different and life would not have been able to develop. For instance, if

the gravitational constant, the strength of gravity, would have been either a little bit more or a little bit less than it is, the universe could not have formed stars and might either have expanded too fast or too slow for anything interesting to happen. If the gravitational constant were a little bit too large, then everything in the Universe would have expanded for just a little while, and maybe it might have broken up into something like stars for a short time, but then they would have all collapsed to black hole quite quickly and nothing interesting would have happened. If the gravitational constant, instead, had been too weak, then the Universe just would have expanded very quickly and no stars would have ever formed. Gravity would not have been strong enough to bring matter together to form stars and then there would have been no heavy elements to form life. There are literally hundreds of things that you could change a little bit and things would be much different. That is what I mean when I say it appears that the universe has been fine tuned -- the constants and the laws of nature themselves were set up just right so that life could develop -- or complexity could develop, which means ultimately life.

### ***It makes me think about God...***

There are indeed a number of people who have attempted to develop a new proof of the existence of God using the anthropic principle.

### ***Stephen Hawking?***

He talks about God.

There are other people who avoid bringing God into the Anthropic-Principle discussion from the point of view of cosmology -- avoid talking about God. What they will do, instead, is to postulate one intermediate explanation is that there is an ensemble, a collection, of many Universes. If you have a collection of many Universes, one of which would be our own, the Anthropic principle would provide such an intermediate explanation in the sense that, if you imagine this collection of Universes had all possible values of the cosmological parameters and the fundamental constants, then at least some of the universes in the ensemble would be like ours and admit life. Actually there is an emerging understanding within very recent cosmology that the existence of such an ensemble is very likely. Trying to understand the

Big Bang you naturally get a collection of many Universes at the beginning. The reason why it does not replace God, however, is simply because you just postpone the ultimate question. You still can ask: why you have this collection of Universes to begin with; what is the origin of the regularities or the laws of nature in the whole system of many Universes and so you still have to answer: Why is there something rather than nothing? Why is there any order at all? Why is this order rather than some other order? You cannot really avoid the God question from a philosophical point of view; but of course many scientists just concentrate on doing science. So they prescind from the God question.

***Do cosmologists have any recent news about God?***

No, except I guess, I do not know if it is recent, but the way I would say it is that God is much bigger than most people think. And certainly astronomy and cosmology have contributed to expanding our concept of God.

***Teilhard de Chardin saw science filled with mysticism. Do you feel as if you were Teilhard de Chardin's brother?***

Sure, I am his son. I think that most scientists, even though some of them would not be believers, see the Universe as a very mysterious and sacred place. Many of scientists do believe in God, even though they may not be affiliated with any given church. I think most scientists at a deep level have a great deal of wonder and a certain amount of what you would call mysticism. Certainly Einstein did. When you read his reflections, you will see that Einstein's life, as well as the lives of other well-known scientists, was filled with wonder, with deep respect for nature and for other people.

***Did Saint Ignatius think/expect that his sons would get so far?***

Probably. One of the principles of Ignatius spirituality is finding God in all things, and so I think that Saint Ignatius certainly thought that would happen. There were Jesuits even in Saint Ignatius's time who were well versed in mathematics and in the sciences. So I think that is true. Saint Ignatius himself apparently used to spend time contemplating the stars on the roof. Apparently there is a place on the roof near Saint Ignatius's church in Rome where

you could not see much of the sky, but he used to go there to receive inspiration from the stars.

***What is the difference between your approach to science and spirituality and that of Fritjof Capra, Amit Goswami, Brian Swimme, Thomas Berry and others who claim a higher degree of mystical awareness?***

I am more familiar with Brian Swimme and Thomas Berry. I think I would feel that my approach would be more consonant with theirs. I know a bit about Fritjof Capra. (I am not familiar with Goswami. I have heard the name, but I do not know what he says.) What I would say would certainly be quite similar to Brian Swimme and Thomas Berry. I know Brian Swimme quite well and I talk with him periodically. There is really not much difference between Brian Swimme, Thomas Berry and myself, except that I tend to be more philosophical, and I am still a practicing cosmologist, whereas Brian Swimme, though he has a PhD in physics, does not do scientific research any more. He spends most his time teaching and writing creation centered spirituality, which I think is quite good. I would say also that being more philosophical, I try to be much more precise in what the competencies and limits of the different disciplines are and how they interact with one another, and not simply say "science shows us this". Sometimes science does not directly show an important aspect of reality. Science may, instead, give us the information and understanding which gradually leads us to discover and reflect upon a special feature of reality it does not directly reveal. It leads us to that. I try to go through the steps and to be quite clear where scientific methodology stops and where philosophical methodology begins and where philosophical methodology either stops or brings in divine revelation. Some theologians, and especially others, will accuse Brian Swimme and Thomas Berry of being new age. I do not think that is true at all. If you really understand what they are doing, it is not anywhere close to new age. They are not simply affirming that there are magical powers within creation, as new age proponents would do, but rather base their insights on science and their reflections on science. They allow science to critique and to reveal what is actually happening in our Universe. Furthermore, they are very much interested in the consonances with the theology, just as I am. Certainly in terms of environmental concerns and our solidarity as human beings with creation, that is very well founded, scientifically. We are products of evolution --

we are part of nature. What we do with nature technologically has a tremendous impact on nature itself. My main point is I do not think you should dismiss Swimme and Berry, as many people do.

***Do they nurture new age?***

Some of it sounds like it is new age. The other thing is; they are not trying to be professional theologians. Sometimes, maybe even oftentimes, they may develop a spirituality or mysticism which seems not to be theologically well founded. They really do not show the connections theologically and philosophically the way that some theologians and philosophical theologians would like them to, and so these theologians will dismiss Swimme and Berry's work as not being theologically adequate. I would say it is not theologically adequate, but they are not intending it to be. They are, indeed, trying to give a vision or new story of creation which is inspired by our knowledge of the Universe and in harmony with the deepest elements of Christian spirituality. There is a lot of theology implicit, but they are not attempting to be theologically and philosophically rigorous. That is really work for theologians themselves to do. Maybe they will not come to the same precise conclusions, but they will come to similar conclusions.

***As a conclusion: I would like to hear a cosmologist's profession of faith.***

It is not that much different from anybody else's. I would say that there would be a lot in common with other believers. The difference would be that I would articulate it differently and perhaps more carefully. Apparently, God was deeply and immanently present in everything, but present in a way that did not contradict the dynamisms and the integrity of nature. God was present in the struggling, at the core of nature as it unfolds, and in its functioning, even through the all the tragedies, sufferings and deaths that creation undergoes. God is not simply one who is constantly controlling and manipulating things. I do not personally think God constantly controls things, I think God continually holds things in existence, but I do not think God exerts God's infinite power continuously in order to change things to be different from what nature is doing. I believe God is working through nature. Not that God, in virtue of God's personal relationships with people and groups of people, does



not in some way make God's presence experienced in a special way through certain revealed signs. I think that happens. Basically God does not change the processes of nature in any radical way. But then the question is: what is nature? The processes and relationships of "nature" are much richer than what we know. I will say briefly in my talk this afternoon. There are the laws of nature we understand and the laws of nature we do not understand. God works through both.

I hope that is helpful.