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Statement by Professor Michał Heller at the Templeton Prize news conference, March 12th, 2008

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Gottfried Wilhelm Leibniz is my philosophical hero. I am proud (but not quite happy) that I share with this great philosopher at least one feature. He was a master in spreading, not to say dissipating, his genius into too many fields of interest. If he had a greater ability to concentrate on fewer problems, he would have become not only a precursor but also a real creator of several momentous scientific achievements. But in such a case, the history of philosophy would be poorer by one of its greatest thinkers. This is not to say that in my case the history of philosophy would lose anything. This is only to stress the fact that I am interested in too many things.

Amongst my numerous fascinations, two have most imposed themselves and proven more time resistant than others: science and religion. I am also too ambitious. I always wanted to do the most important things, and what can be more important than science and religion? Science gives us Knowledge, and religion gives us Meaning. Both are prerequisites of the decent existence. The paradox is that these two great values seem often to be in conflict. I am frequently asked how I could reconcile them with each other. When such a question is posed

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by a scientist or a philosopher, I invariably wonder how educated people could be so blind not to see that science does nothing else but exploits God's creation. To see what I mean, let us go to Leibniz.

In one of his essays, entitled *Dialogus*, in the margin we find a short sentence written by Leibniz's hand. It reads: "When God calculates and thinks things through, the world is made." Everybody has some experience in dealing with numbers, and everybody, at least sometimes, experiences a feeling of necessity involved in the process of calculating. We can easily be led astray when thinking about everyday matters or pondering all pros and cons when facing an important decision, but when we have to add or multiply even big numbers everything goes almost mechanically. This is a routine work, and if we are cautious enough there is no doubt as far as the final result is concerned. However, the true mathematical thinking begins when one has to solve a real problem, that is to say, to identify a mathematical structure that would match the conditions of the problem, to understand principles of its functioning, to grasp connections with other mathematical structures, and to deduce the consequences implied by the logic of the problem. Such manipulations of structures are always immersed into various calculations since calculations form a natural language of mathematical structures.

It is more or less such an image that we should associate with Leibniz's metaphor of calculating God. Things thought through by God should be identified with mathematical structures interpreted as structures of the world. Since for God to plan is the same as to implement the plan, when "God calculates and thinks things through," the world is created.

We have mastered a lot of calculation techniques. We are able to think things through in our human way. Can we imitate God in His creating activity?

In 1915 Albert Einstein wrote down his famous equations of gravitational field. The road leading to them was painful and laborious—a combination of deep thinking and tedious work of doing calculations. From the beginning Einstein saw an inadequacy of time-honored New-

ton's theory of gravity: it did not fit into a spatio-temporal pattern of special relativity, a synthesis of classical mechanics and Maxwell's electrodynamical theory. He was hunting for some empirical clues that would narrow the field of possibilities. He found some in the question: Why is inertial mass equal to gravitational mass in spite of the fact that, in Newton's theory, they are completely independent concepts? He tried to implement his ideas into a mathematical model. Several attempts failed. At a certain stage, he understood that he could not go further without studying tensorial calculus and Riemannian geometry. It is the matter distribution that generates space-time geometry, and the space-time geometry that determines motions of matter. How to express this illuminating idea in the form of mathematical equations? When finally, after many weeks of exhausting work, the equations emerged before his astonished eyes, the new world has been created.

In the beginning, only three, numerically small, empirical effects corroborated Einstein's new theory. But the world, newly created by Einstein, has soon become an independent reality. Yet in his early work, the field equations suggested to Einstein the existence of solutions describing an expanding universe. He discarded them by modifying his original equations, but in less than two decades it turned out that the equations were wiser than Einstein himself: measurements of galactic spectra have revealed that, indeed, the universe is expanding. In the subsequent period, lasting until now, theoretical physicists and mathematicians have found a host of new solutions to Einstein's equations and interpreted them as representing gravitational waves, cosmic strings, neutron stars, stationary and rotating black holes, gravitational lensing, dark matter and dark energy, late stages of life of massive stars, and various aspects of cosmic evolution. In Einstein's time nobody would have even suspected the existence of such objects and processes, but all of them have been found by astronomers in the real universe.

Perhaps now we better understand Leibniz's idea of God creating the universe by thinking mathematical structures through. We should only free the above sketched image of creating physical theories from

all human constraints and limitations, and take into account a theological truth that for God to intend is to obtain the result, and to obtain the result is to instantiate it. Einstein was not far from Leibniz's idea when he was saying that the only goal of science is to decode the Mind of God present in the structure of the universe.

And what about chancy or random events? Do they destroy mathematical harmony of the universe, and introduce into it elements of chaos and disorder? Is chance a rival force of God's creative Mind, a sort of manicheistic principle fighting against goals of creation? But what is chance? It is an event of low probability which happens in spite of the fact that it is of low probability. If one wants to determine whether an event is of low or high probability, one must use the calculus of probability, and the calculus of probability is a mathematical theory as good as any other mathematical theory. Chance and random processes are elements of the mathematical blueprint of the universe in the same way as other aspects of the world architecture.

Mathematical structures that are parts of the composition determining the functioning of the universe are called laws of physics. It is a very subtle composition indeed. Like in any masterly symphony, elements of chance and necessity are interwoven with each other and together span the structure of the whole. Elements of necessity determine the pattern of possibilities and dynamical paths of becoming, but they leave enough room for chancy events to make this becoming rich and individual.

Adherents of the so-called intelligent design ideology commit a grave theological error. They claim that scientific theories, that ascribe the great role to chance and random events in the evolutionary processes, should be replaced, or supplemented, by theories acknowledging the thread of intelligent design in the universe. Such views are theologically erroneous. They implicitly revive the old manicheistic error postulating the existence of two forces acting against each other: God and an inert matter; in this case, chance and intelligent design. There is no opposition here. Within the all-comprising Mind of God

what we call chance and random events is well composed into the symphony of creation.

When contemplating the universe, the question imposes itself: Does the universe need to have a cause? It is clear that causal explanations are a vital part of the scientific method. Various processes in the universe can be displayed as a succession of states in such a way that the preceding state is a cause of the succeeding one. If we look deeper at such processes, we see that there is always a dynamical law prescribing how one state should generate another state. But dynamical laws are expressed in the form of mathematical equations, and if we ask about the cause of the universe we should ask about a cause of mathematical laws. By doing so we are back in the Great Blueprint of God's thinking the universe. The question on ultimate causality is translated into another Leibniz's question: "Why is there something rather than nothing?" (from his *Principles of Nature and Grace*). When asking this question, we are not asking about a cause like all other causes. We are asking about the root of all possible causes.

When thinking about science as deciphering the Mind of God, we should not forget that science is also a collective product of human brains, and the human brain is itself the most complex and sophisticated product of the universe. It is in the human brain that the world's structure has reached its focal point—the ability to reflect upon itself. Science is but a collective effort of the Human Mind to read the Mind of God from question marks out of which we and the world around us seem to be made. To place ourselves in this double entanglement is to experience that we are a part of the Great Mystery. Another name for this Mystery is the Humble Approach to reality—the motto of all John Templeton Foundation activities. The true humility does not consist in pretending that we are feeble and insignificant, but in the audacious acknowledgement that we are an essential part of the Greatest Mystery of all—of the entanglement of the Human Mind with the Mind of God.