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Proceedings of the 2nd Hellenic Cosmology Meeting, held in the National Observatory of Athens, Penteli, 19–20 April 2001

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PREFACE

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Since the dawn of human civilisation natural phenomena have been subject to observation and investigation by the humans who initially ascribed to them 'divine' powers. Gods of 'good' and 'evil' were created according to the usefulness or not of such unexplained, at the time, phenomena. As their understanding of the world developed and deepened, the divine powers, religious beliefs, superstitions and mysticism gave their place to the knowledge, limited that it may be, of physical reality. However, many issues have been and still are out of grasp of human understanding. These issues have always been at the center of philosophical, theological, and more recently, scientific debate.

It is to us incredible that many of the conclusions concerning the true scientific explanation of the external world, to which the ancient Greeks arrived purely on the basis of abstract thought, came so near to modern scientific ideas and also form the basis of modern science. We cannot but stand with amazement at the original thoughts of *Archimedes* who, among his many extraordinary achievements in mathematics and physics, calculated (cf. *The Sand Reckoner*) the mass density of the observable universe and came up with a figure that is in complete agreement with current estimates coming from observational cosmology. The philosopher *Anaximander* of Miletus, a student of Thales, propounded the view that the earth remains in the center of the Universe suspended freely and without support (contrary to what was thought by most other philosophers of the time) due to the fact that it is at equal distances from the rest of the Universe. The atomic theory of *Democritus* and his teacher *Leukipus*, the teachings of *Parmenides* regarding the spherical shape of the earth, that nothing is born out of nothing and that anything cannot be reduced to nothing (which reminds us of an energy conservation law), the opinion of *Empedocles* that light propagates with finite velocity (contrary to *Aristotle* who believed that light is the outcome of a qualitative and instantaneous change of the environment) etc, are only a

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small, selected fraction of what was known to our ancestors. Furthermore and despite the dominance of the Aristotelian thought, *Aristarchos of Samos* (310 - 230 BC), head of the Peripatic School in $\sim$ 288 BC, was the first to put forward the heliocentric hypothesis:

"ὑποτίθεται γάρ τά μέν ἀπλανέα τῶν ἀστρων καί τόν ἀλιον μένειν ἀκίνητον, τάν δέ γᾶν περιφέρεσθαι περί τόν ἀλιον κατά κύκλου περιφέρειαν, ὸς έστιν έν μέσω τῶ δρόμω κείμενος"

Cosmology, the science dealing with the nature, origin, structure and nowadays the evolution of the Universe, is as old as human civilisation. Many civilisations pursued knowledge in this subject: Among others the Greeks, the Indians, the Arabs and much later the Europeans who brought back to light, contrary to the religious fanaticism of the time, the heliocentric system (Copernicus). The laws of planetary motion formulated by Kepler received a sound mathematical justification when the law of gravitation was discovered by Hooke and Newton. This marks the beginning of the modern era of scientific thought.

Modern Cosmology begins with Einstein's discovery of General Relativity in 1916, and Hubble's discovery in 1929 of the recession of distant galaxies with velocities proportional to their distance. These two leads, one theoretical and the other observational, continue to this day to be responsible for the current interest in this subject.

We initiated several years ago an attempt to bring together once every couple of years the small but scattered Greek Cosmology Community as well as a few European Cosmologists, in order to exchange views and opinions and to generate collaborative efforts. This book contains papers corresponding to the talks given at the 2nd Hellenic Cosmology Meeting held at the National Observatory in Athens, in April 19-20, 2001, as well as an invited special contribution by Rien van de Weygaert. The two themes advanced during the very lively works of that meeting, one centering around theoretical aspects of Cosmology and the other focussing on observational Cosmology, are reflected in this volume.

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