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Michio Kaku - The Universe in a Nutshell

Michio Kaku, a professor of theoretical physics at the City University of New York, begins by enumerating the advances in human technology, which were made possible by people researching physics. He says that people 100 years ago would see modern technology as magic, and it's wielders as wizards. Similarly, if we were to see technology from 100 years in the future, we might percieve it like powers akin to the ones of Greek gods.

Professor Kaku tells of people like Aristotle, who thought of superstitious reasons to explain the behavior of physical objects. These theories were seen as true until Galileo and Newton began modern physics with their theories. Isaac Newton dared to overturn these speculations, not only by discovering the universal force of gravitation, but also by inventing calculus and a new type of telescope. Edmund Haley, a wealthy merchant, marveled at Newton's discoveries, and offered to fund the publication of his work - “Principia Mathematica”. And as such Newton's three laws of motion made the industrial revolution possible.

The discovery of the electromagnetic force, with help of people like Michael Faraday and James Clerk Maxwell, caused the electric revolution. Rapid miniaturization of electronics and creation of the internet followed shortly. Where there is internet, there is prosperity, science and entertainment. Mr. Kaku points out that the internet itself is only a byproduct of the electromagnetic force.

Next, Mr. Kaku says how Einstein and others helped discover the secret of the stars, the strongest forces of the universe - the weak and strong nuclear forces. With an elegant equation Albert Einstein described how subatomic particles could be created as a result of smashing atoms in a particle accelerator. Mr. Kaku also mentions how he built his own accelerator in high school, and how Edward Teller, the creator of the hydrogen bomb became interested in his inventions. It was Mr. Teller who made it possible for young Michio Kaku to begin research by going to Harvard with a scholarship.

After the four fundamental forces, antimatter became the focus of research. Mr. Kaku explains, that for all matter there is a counterpart - antimatter. When regular matter and antimatter collide, they produce the greatest source of energy in the universe. The standard model aims to describe both matter and antimatter, and currently is the best model of reality physicists have. Mr. Kaku says the standard model is a working, but very ugly theory, and that physicists expect to replace it with the string theory - a higher version of this model.

Mr. Kaku explains that the string theory is a theory of everything. It can describe the four physical forces in a way similar to music. String field theory summarizes the string theory with Mr. Kaku's own equation. To test it, scientists are building the greatest human machine - the Large Hadron Collider at CERN in Switzerland. It will allow for the discovery of new particles. In particular, the Higgs-Boson and super particles.

Michio Kaku hopes to unlock the secrets of the Big Bang with the string theory, as Einstein's equations are insufficient in that case. String theory, however, allows to describe the universe even before the Big Bang. It says that there are multiple universes, which can be seen as ever expanding bubbles. Michio Kaku explains that there should also be other bubbles besides ours. When two universes collide, they

create another universe. Eventually we might even have a way to travel between these universes through a wormhole, or use them as a means of time travel. As such scientists like Stephen Hawking are trying to find if it is physically possible to actually go through a wormhole.

Mr. Kaku explains that dark energy and dark matter form most of our universe. It made the Big Bang happen. The higher elements, of which humans and the Earth consist of, make up merely 0.03% of the universe. However, no one knows what dark matter actually is. Michio Kaku says that theories like string theory give us a clue, but only young physicists can unravel the secret of dark matter and dark energy.

681 words