Text 9: Physics

A lot of things in the universe can be measured, but people want to know why they are that size. We know the mass of a quark and the charge of an electron. These are constants. It turns out that these numbers have to be exactly what they are, because if they were different, we would not be here. You me, and the physicists, we are part of the universe. We have to be here to make physics, so physics has to describe a universe where there can be people. Gravity is another problem for physics-because it is everywhere and acts on everything, including space itself. It is different from other forces like electricity, radiation, because you can't stop it or turn it off.

Modern physicists still look mostly at things we can't see. (They thing gravity might happen because of something no-one has ever detected called the Higg's boson). Either very small things in quantum physics or very big things like galaxies. Putting them together is the main problem of modern physics. The universe and space and time described by Einstein and the fuzzy fast-moving little sub-atomic particles and small things that might make them up. If you want to know how the universe began-with a tiny size but very big mass, then you need a theory that fits both together. At the moment, the theory suggests that the things we can see-stars and planets etc. make up only 5% of the universe. The rest is 25% "dark matter" and 70% "dark energy".

A theory that could explain all that would be a "theory of everything"-the real laws of nature. There are already suggestions of what it might be. Scientists think that the laws of nature might be rather simple, even though the real world is full of strange and beautifully complicated things. One suggestion is called "string theory", the idea is that inside every particle there is some energy that is like the string of a musical instrument-the way it vibrates makes a different sort of particle. At the moment they say there are 18 sorts.

Physicists say that string theory needs extra dimensions. There are other directions where energy can get carried away, and other particles which no one has seen. They try to find them in particle accelerators where protons go round in tunnels getting faster and faster until they reach almost exactly the speed of light.

"If I am walking with two other men, each of them will serve as my teacher. I will pick out the good points of the one and imitate them, and the bad points of the other and correct them in myself."

Confucius

Exercise 1: For each question, choose the best answer to go into the gap in the sentence.

We are……. of the universe	✓ part ✓ full ✓ main
Gravity is ……. other forces because we don't know how it works	✓ almost exactly ✓ different from ✓ part of
String theory says there must be ……dimensions	✓ another ✓ other ✓ others
Physicists …… study things that we can't see	✓ other ✓ mostly ✓ small
The real world is …… of strange and beautiful things	✓ part ✓ different ✓ full
The constants in physics are …… what they should be	✓ exactly ✓ particularly ✓ occasionally
We know that are …… things that can be measured	✓ a lot ✓ mostly ✓ full
Quantum science is a science of very ……. things	✓ extra ✓ a lot of ✓ small
Gravity is ……. problem for physics	✓ another ✓ other ✓ others
Uniting quantum theory and relativity is the ……. problem of modern physics	✓ mostly ✓ main ✓ exactly

Exercise 2: Match a word in A with a definition in B.

Example: 4 = q

A		The answer	B	
1	Aerodynamics		a	the branch of mathematics that deals with the relationships between the sides and angles of triangles
2	Aeronautics		b	the branch of physics dealing with how different forms of energy are related, esp. with how one form is converted to another
3	Algebra		c	the science of collecting, analyzing, and interpreting quantitative data
4	Architecture	**q**	d	the branch of mathematics concerned with measurements, properties, and relations of angles, lines, and solids
5	Arithmetic		e	the scientific study of the history, structures, and composition of the earth
6	Archaeology		f	the science that deals with matter and energy, with their properties and interactions
7	Biology		g	the scientific study of the properties of metals, the extraction of metals from their ores, and their preparation for use
8	Chemistry		h	the scientific study of motion and force
9	Dynamics		i	the science of number, quantity and space
10	Electronics		j	the branch of physics dealing with the applications of the mechanical and flow properties of liquids
11	Hydraulics		k	the science and technology dealing with the development and behavior of electrons in electronic devices such as transistors
12	Mathematics		l	a branch of mechanics dealing with matter and motion
13	Mechanics		m	the science dealing with the nature of substances and how they react with or relate to one another
14	Metallurgy		n	the scientific study of the life, structure, function, etc., of living organisms
15	Physics		o	the scientific study of the material remains of man's past
16	Geology		p	the branch of mathematics that deals with numbers and numerical calculations
17	Geometry		q	the art of science of designing buildings
18	Statistics		r	a branch of mathematics in which symbols represent unknown quantities
19	Thermodynamics		s	the scientific study and history of flight
20	Trigonometry		t	the study of the flow of air and its relation to the motion of solid bodies

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