

## 1. Exploring the Solar System. Stuart Eves.

### Mercury.

It is difficult to observe because of the heat from the sun. This caused paint flakes to detach from the spacecraft's sun shield, which interfered with the telescopic images. The surface is covered with craters, the large number of which indicates its age. The planet has a magnetic field. It appears to show volcanic features on its surface.

### Venus.

The atmospheric pressure is 90x that of the earth. Its temperature is very high 460 degrees. Russian Venera probes took surface pictures and an American spacecraft took radar images. The results show few impact craters indicating that the surface is relatively young. Volcanoes are present, which are bigger than earth volcanoes. A six-and-a-half times increase in the rotation of the planet has been detected.

### Mars.

The first probes were designed to look for microbes. The results suggested a positive conclusion, which could be the result of bacterial contamination of the spacecraft or could be due to a chemical reaction. Carbon dioxide, water and methane have all been detected. The methane has a seasonal appearance and disappears quickly suggesting bacterial activity. Dormant volcanoes are present such as the enormous Olympic Mons. Some reports suggest recent activity in this volcano.

### Ceres.

This is a dwarf planet, which is the largest object in the asteroid belt between Mars and Jupiter. It has a dark surface and impact craters. Ice geysers and an ice volcano called Ahuna Mons are present.

### Jupiter.

This is the largest of the planets. A red spot on its surface is a storm that is bigger than earth, which has been raging for at least 340 years. Lightning has been detected but not much water is present.

### Saturn.

The rings around Saturn are a well-known feature. The material in the rings is made up of particles of water ice with a little rock and dust, which are charged explaining their continued existence as rings. Storms occur in the Summer. Strange, hexagonal features around the poles exist.

### Uranus.

It has a ring called the Epsilon Ring. The magnetic field is tilted through 60 degrees from the planet's axis of rotation.

### Neptune.

It has a large, dark spot.

### Pluto.

There is a controversy as to whether it is a planet or a dwarf planet. The latest results suggest it is a planet again, which should please the inhabitants of the American state of Arizona who have insisted it always was a planet! It has a layered atmosphere.

**Tony Boniface**

## 2. Rise of the Mutants. Alison Woollard.

Alison began her talk by pointing out that we are all mutants, illustrated by a picture of several breeds of dog, which were created by selective breeding. The chemical nature of the genes, which give rise to mutations is a change in the base sequence of a DNA molecule. The four bases are adenine, thymine, guanine and uracil, which can be arranged in a linear sequence in groups of three bases making a genetic code for the synthesis of proteins. The double helix of a DNA molecule allows each strand of the helix to give rise to its complementary partner. DNA is found in the nuclei of cells allowing the production of identical copies in the daughter cells.

A gene mutation is a change in a single base pair in the DNA molecule. A mutation can be beneficial or harmful. The particulate nature of a gene was proved to be so by Mendel who bred peas and counted the different types of offspring. Charles Darwin (and Alfred Wallace) showed that the frequency of different forms of an organism in a population could be changed by natural selection because beneficial mutant forms produced more offspring. He postulated a tree of life from single celled species to more advanced plants and animals. During the process of evolution 99% of species have become extinct. The complete set of genes in the members of a species is called its genome, and a major advance in genetics was the determination of the base sequences of several organisms including humans.

This knowledge has enabled a greater understanding of the simpler inherited diseases and a realisation that many common conditions e.g. cancer are the result of mutations in many genes. The latest development in genetics is gene editing in which a gene can be deleted and replaced by the normal form of that gene. This could cure individuals, but it would not be inherited unless the edited form entered the sex cells or gametes as germ line mutations. The use of this technique requires ethical decisions controlling its use with discussion and understanding of the process by the general population. This talk was an excellent introduction to the very complex science of genetics.

**Tony Boniface**

### **3. Tim Spector: Microbiomes and Personalised Health**

Our first speaker had taken us into outer space but Tim Spector brought us back to inner space, in fact to the space inside each of us commonly referred to as our gut. Here 100 trillion microbes alongside 500 billion phages, which parasitize bacteria, are found. There are also fungi and other microbes present. This microbial flora could be considered to be another organ of the body. They are important not only to our digestion but they also affect our moods, appetite, metabolism, and our immune system. It also affects how we respond to immunotherapy and chemotherapy. Healthy people have a richer flora than those who are sick. There are also geographical differences. To obtain maximum diversity you should eat a large number of different foods during the week, avoid unnecessary antibiotics, emulsifiers and artificial sweeteners. Eating 'rubbish' food only for 10 days causes a 40% loss of the gut microbes.

Tim Spector studied 3000 twins over 10 years and found that a high fibre diet resulted in a lower weight gain, which was related to microbial diversity. It was found that in identical twins both lost approximately the same amount of weight but with fraternal twins the loss could vary quite considerably as they had different genes.

Finally there is no such thing as a one-size-fits-all diet. The ways we react to food are different yet flexible. Treat your own microbes as you would treat your garden. Give them plenty of fertilizer-prebiotics eg kefir, fibre and nutrients. Provide new food regularly, and avoid poisoning your garden with preservatives, antiseptic mouthwashes, antibiotics, junk food and too much sugar.

**Judith Boniface**