



MARS TO EARTH

Microbial universe within us

Mars research to find buried water



Radar sounding technology developed to explore the subsurface of Mars may soon be used to find water buried deep beneath Earth's deserts

A NASA-led team has used radar sounding technology developed to explore the subsurface of Mars to create high-resolution maps of freshwater aquifers buried deep beneath an Earth desert, in the first use of airborne sounding radar for aquifer mapping.

The research may help scientists better locate and map Earth's desert aquifers, understand current and past hydrological conditions in Earth's deserts and assess how climate change is impacting them. Deserts cover roughly 20 percent of Earth's land surface, including highly populated regions in the Arabian Peninsula, North Africa, west and central Asia and the southwestern United States.

An international team led by research scientist Essam Heggy of NASA's Jet Propulsion Laboratory, Pasadena, Calif., recently traveled to northern Kuwait to map the depth and extent of aquifers in arid environments using an airborne sounding radar prototype. The 40-megahertz, low-frequency sounding radar was provided by the California Institute of Technology in Pasadena; and the Institut de Physique du Globe de Paris, France. Heggy's team was joined by personnel from the Kuwait Institute for Scientific Research (KISR), Kuwait City.

For two weeks, the team flew a helicopter equipped with the radar on 12 low-altitude passes (1,000 feet, or 305 meters) over two well-known freshwater aquifers, probing the desert subsurface down to the water table at depths ranging from 66 to 213 feet (20 to 65 meters). The researchers successfully demonstrated that the radar could locate subsurface aquifers, probe variations in the depth of the water table, and identify locations where water flowed into and out of the aquifers.

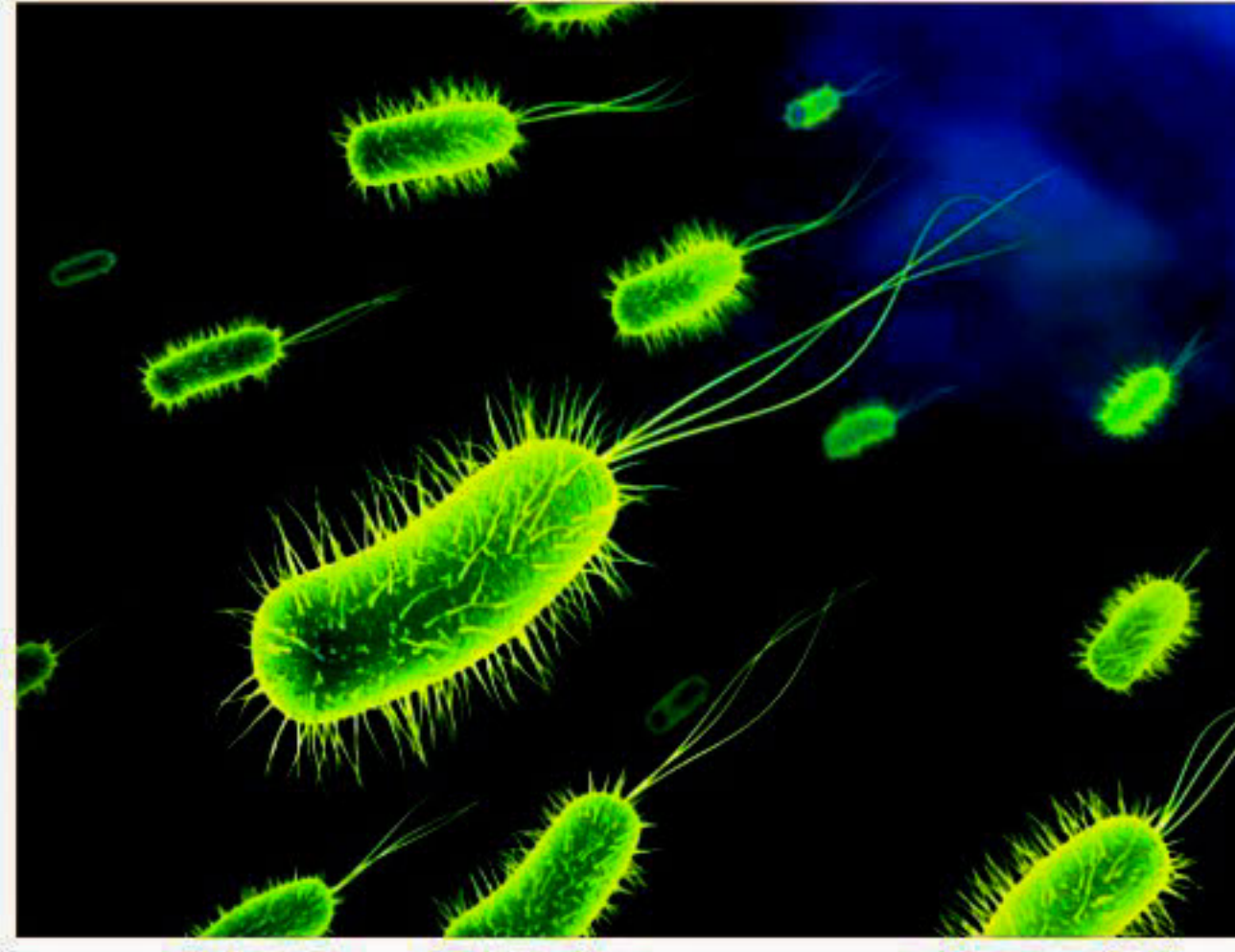
Source: Science Daily

MD. RIJUL HOSSAIN

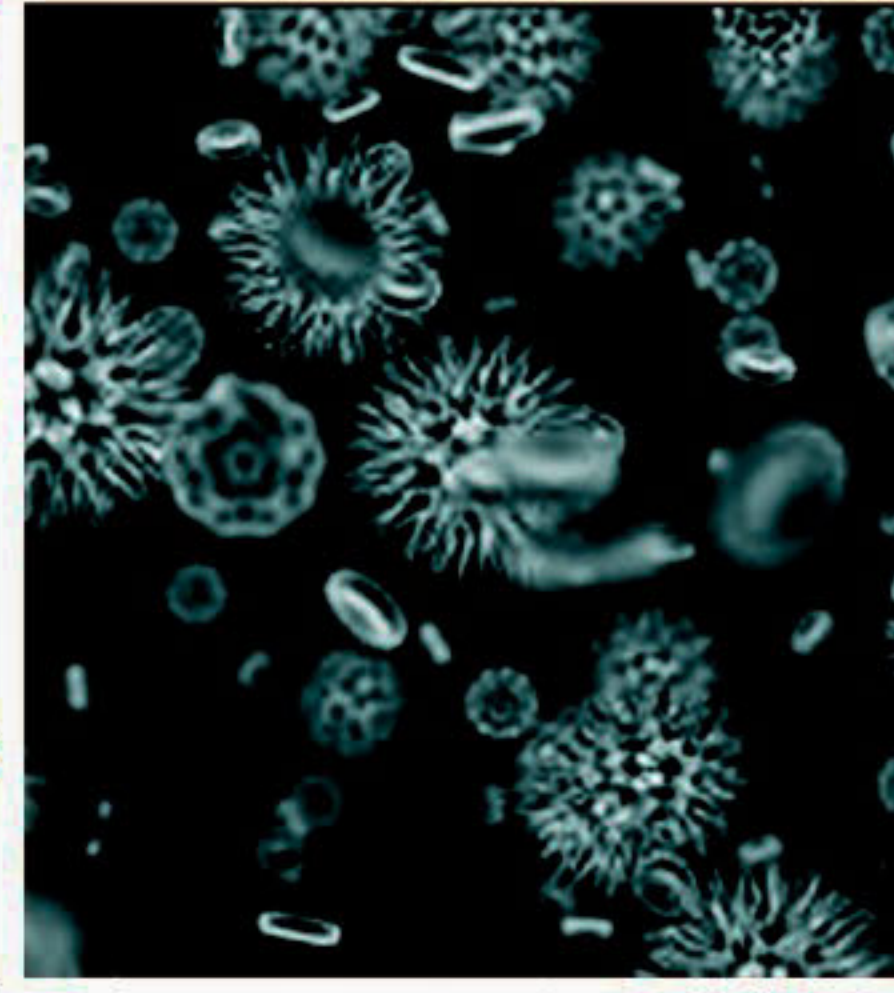
WE are what we eat. In fact, our bugs are also what we eat. There is a unique universe of microorganisms in our body residing on skin and inside our gut. The number of bacteria in our gut actually exceeds the number of cells in human body by 10 fold. This complex ecosystem plays immense role for maintaining good health in individuals. They are called commensals. The gut microbial community is effectively an "organ within an organ", says microbiologist Jeffrey Gordon of Washington University at St. Louis. The mix of microbes inside affects how we metabolize food and probably has substantial impact on our health.

Scientists observed how the teeming tide of microbes inside the body plays an essential role in human health and how it might be fine tuned to address illnesses such as diabetes, obesity and inflammatory bowel disease. The kinds of microbes in our intestine are affected by our dietary preferences. The intestinal tracts of individuals who typically eat a high fat, high protein diet harbor a high number of one kind of bacteria. On the other hand, those who favored carbohydrates and vegetables had higher number of another type. "

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Occasionally harmful microbes invade the body and cause diseases.



The human body is teeming with life, harboring friendly microbes.

This is really interesting and tantalizing science. It is sort of like you have the carnivore gut and herbivore gut," says Weinstock, a genetics professor at Washington University at St. Louis and a leader of the ongoing Human Microbiome Project. Previous research had shown that people can be grouped into different categories by their intestinal bacteria. In 2010, one study revealed the differences in gut microflora between children in Europe and rural Africa, who have a markedly different diet. Although diet controls this flora inside the body, it

comes to this stabilized position gradually from the birth. "Everyone is born sterile", says Andrew Gewirtz of Emory University, noting that colonization starts during birth. The flora depends on the method of delivery of the baby (vaginal versus caesarian), place of delivery (home or hospital), maternal diet etc and, later, exposure to antibiotics and steroids. Moreover, intestinal bacteria patterns change during stress and diseases. The harmful bacteria or pathogens compete with the good ones and if their number is large, they eventually win over the good

ones. At times of stress and adverse body conditions, the pathogens emerged and may cause problems in digestion. Mostly, they come from the intake of food and drinks, especially when these are stale and contaminated.

Indeed, the interaction between the friendly bacteria and the pathogens are of immense interest to the scientists due to their effect on human health. The beneficial bacteria help in digestion, producing vitamins for the host (such as biotin and vitamin K) and even producing hormones to direct the host to store fats.

However, the harmful ones are involved in developing disease like diabetes, obesity etc. As discussed earlier, the diet is responsible for the patterns of microbes in individuals with people on high protein-fat diets tending to have more the type of bacteria called Bacteroides, and others, the vegetarians, having more microbes from the genus Prevotella. And everyone is different in terms of the composition of their microflora, "It's almost sort of like a fingerprint", Weinstock says. It is a curious, mutually convenient relationship that has emerged over thousands of years between the tiny bugs and their flesh-and-blood hosts and they influence host's activity and health even by turning on or off certain genes in them and they are unique. Recently, scientists are taking genomic approaches to analyze the gut microbe genes and already completed a catalogue of some 3.3 million human gut microbe genes. More study with the genes will, hopefully, help us to get a better insight of the interaction between the microbes and human and how they are associated with our health. They, indeed, are our friends, especially, the good ones.

The writer is a Lecturer in Biotechnology at BRAC University.



THRU' THE LOOKING GLASS

Mirror on the universe

DEBASHISH CHAKRABARTY

ONE and a half million kilometers from Earth, a superb observatory is quietly reshaping our understanding of how nebulae coalesce into stars. Its primary instrument is the largest space telescope ever launched, a 3.5 m diameter monster designed for infrared photometry and spectroscopy. This is the Herschel Space Observatory, and over its planned three-year lifetime, this European Space Agency (ESA) mission will study cool objects throughout the universe, including comets, galaxies and nebulae.

The observatory owes its name in part to the astronomer William Herschel, who discovered infrared light (then called "caloric rays") in 1800. Born in 1738 in Hanover, Germany, Herschel began his career as a musician, and followed his father's example by joining the band of the Hanoverian Guard. After finding that the military life was not for him, in 1755 he deserted and moved to England. There, his interest in music was gradually eclipsed by another childhood love: astronomy. He would go on to become "the most celebrated of all astronomers of the universe", according to his contemporary Jérôme de Lalande.

William, however, was not the only Herschel. The ESA observatory is also named for his spinster sister Caroline, who joined him in England in 1772. Initially brought over to work as a housekeeper and general dogsbody, when astronomy took over William's life, it also took over Caroline's. After starting as her brother's assistant, Caroline gradually developed into an observer and astronomer in her own right. In 1786 she became the first woman to discover a comet, and she would go on to discover at least seven (possibly eight) more.

It is fitting, then, that the two Herschels are jointly the subjects of Discoverers of the Universe, a new biography by Michael Hoskin of Churchill College, Cambridge. Hoskin has also written several previous works on the Herschels, and in this book, he discusses not only their science, but also their place in the wider scientific community, the narrower but richer universe of their daily lives, and their sometimes complicated relationship.

During the decade following Caroline's arrival, William gained a reputation as a skilful astronomer, observing variable stars, measuring the height of lunar mountains and creating a catalogue of double stars. Then, in 1781, he made the discovery that put him firmly among astronomy's greats. Within months of his finding "a curious either nebulous star or perhaps a comet" in Gemini, it was established that this was a planet beyond Saturn—the first planet to be



The European Space Agency's Herschel Space Observatory (formerly called Far Infrared and Submillimetre Telescope or FIRST) has the largest single mirror ever built for a space telescope.

found since antiquity. In an evening, William had doubled the scale of the solar system. But what should the new world be called? This was before there was an International Astronomical Union to decide such things, so William named it after his king (and fellow Hanoverian), George III. In the rest of the world, though, the prospect of a British monarch being immortalized in the heavens was not greeted with enthusiasm, and by the 1850s even the British had accepted the planet's alternative name: Uranus, after the Greek god of the sky.

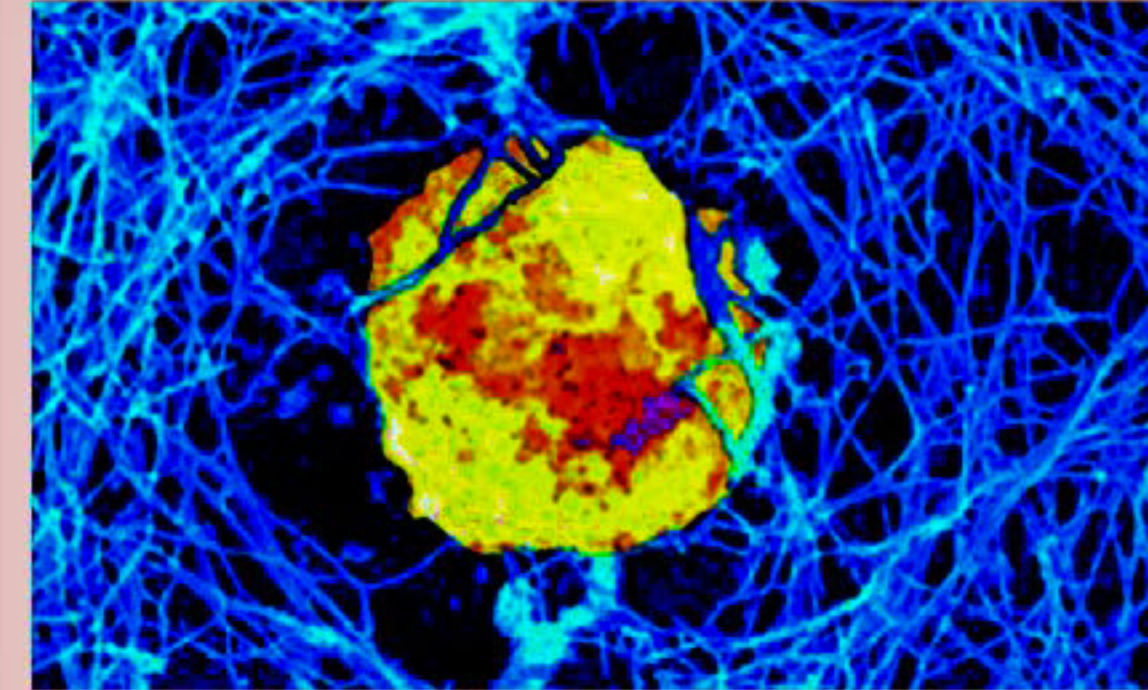
William's choice did, however, bring him to the king's attention. Not yet a victim of the mental illness that was to blight his later life, in the 1780s George III was a patron of the sciences, and he had a genuine fascination with astronomy. William was duly appointed "Astronomer to his Majesty", with a salary of £500 and a residence at Datchet near Windsor (though the house was in such a derelict state that he soon moved to a more comfortable one in Slough).

The writer is a student of Computer Science and Engineering, BRAC University.



POISON PELLET

Caught in the act



A high-powered microscope image reveals that molecule filaments (blue) move aside to guide an immune cell's poison pill (yellow) out where it can kill the enemy

MICROSCOPIC images of disease-fighting cells may one day help treat immune deficiency disorders. Jordan Orange of the Children's Hospital of Philadelphia and colleagues used a superpowerful new microscope to watch how immune cells called natural killer cells feed a poison pill called a lytic granule to tumors or virus-infected cells. Scientists used to think a big hole in the middle of a dense mesh of spaghetti-like molecules called F-actin let granules stream out of the natural killer cell. But the new study, published online September 13 in PLoS Biology, shows that the meshwork parts just enough to let single lytic granules pass, with F-actin helping squeeze the granule through. People with immune deficiency disorders may have defects that prevent lytic granules from exiting the natural killer cell.

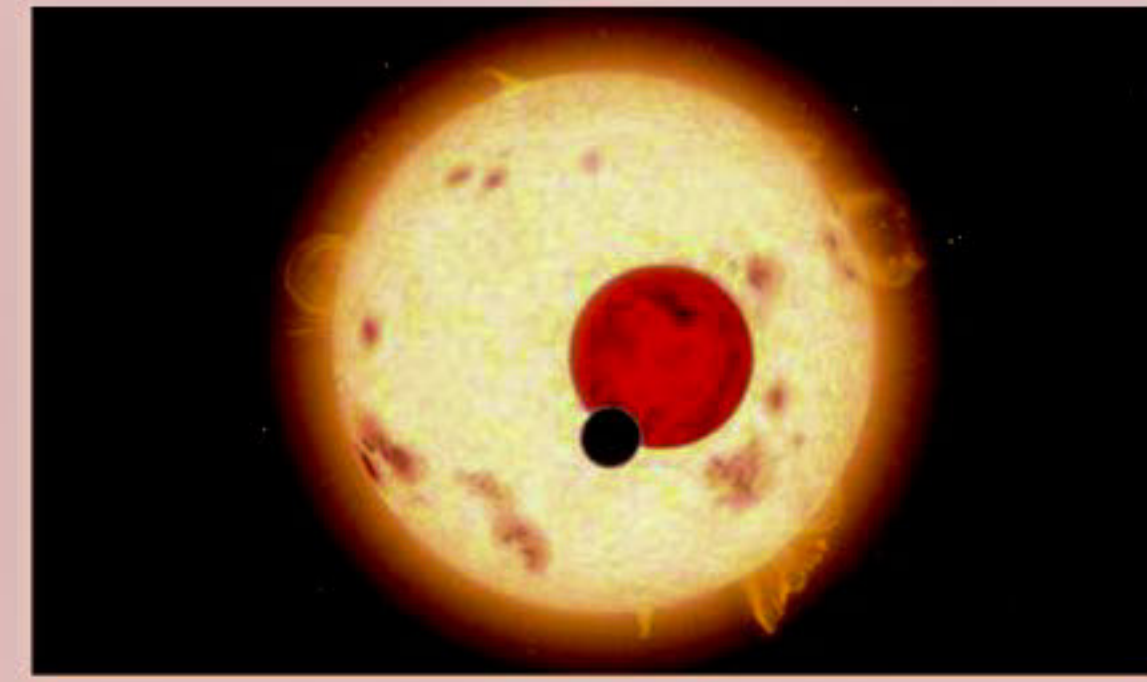
The H5N1 avian influenza virus may get its killing power from its host. It hasn't been clear whether humans die from having lots of viruses in their lungs or from making too many inflammation-producing chemicals. Now researchers at St. Jude Children's Research Hospital in Memphis, Tenn., and Roche Pharmaceuticals in Palo Alto, Calif., have evidence from studies in mice that the victim's own genetic makeup determines how well the virus grows in the lungs. Genetically susceptible mouse strains had more viruses in their lungs than resistant strains, the team reports online September 6 in mBio.

Source: Science News.



DOUBLE SUNS

Shadows in pairs



The newly discovered Kepler-16b (small black sphere) orbits two suns.

ONCE confined to science fiction, a planet circling two stars has left the cinema and landed in reality: Scientists have spied a Saturn-sized world, called Kepler-16b, orbiting a binary star system.

The sunset on Kepler-16b would look something like the iconic double sunset depicted in Star Wars, only better, says astrophysicist Laurance Doyle of the SETI Institute in Mountain View, Calif. "Nature is always more amazing," says Doyle, coauthor of a Sept. 16 Science paper that describes Kepler-16b. "There, you'd get a different sunset every day!"

The two suns are different sizes, different colors, and always changing places. Every 41 days, these dancing stars complete a circle around one another, periodically eclipsing each other and reversing their position in the sky. The bigger star is orange and about 69 percent the mass of the sun, and the smaller star is quite red and only 20 percent the sun's mass.

The finding also reinforces astronomers' growing realization that planets are hardy galactic residents capable of surviving nearly any conditions. Planets have been found orbiting pulsars, surviving supernova explosions, wandering through interstellar space and maybe even forming near black holes. The newly discovered planet takes 229 Earth days to complete its orbit around its two stars. The planet is thought to be half gas, half rock and ice and similar to Saturn in both mass and size, the scientists report. No word on rings yet, but Doyle says he is looking for exo-moons orbiting the planet.

"This is a really important discovery," says astronomer Andrew Howard of the University of California, Berkeley. "When the theorists and modelers sit down and predict the family of things that should happen, this is one of them," he says, referring to a binary star system with planets. "But it's still so new and different that it still shocks at least me."

Source: Science News



THE CATACLYSM

Dino-killing cosmic impact



A cosmic impact at the end of the Cretaceous that wiped out non-avian dinosaurs seems to have decimated primitive birds as well

Source: Live Science

Although birds survived the mass extinction that claimed their brethren, the rest of the dinosaurs, birds did not emerge unscathed, scientists now find.

Apparently many ancient lineages of birds died off at the end of the Age of Dinosaurs, researchers added.

Nearly all the modern bird groups, from owls to penguins and so on, began to emerge within 15 million years after the rest of the dinosaurs went extinct. These birds are subtly but significantly different from many of the ancient lineages that existed before a cosmic impact at the end of the Cretaceous period about 65 million years ago wreaked havoc around the globe.



DO YOU KNOW?

What percentage of people are lefty?



13% of people are left-handed, up from 11% a few decades ago. The story that right-handed people live, on average, nine years longer than left-handed people is a myth.

The word for left in French means gauche and in Latin it means sinister. The Latin word for right is dexter, from which came "dexterous". Ambidextrous means literally "both right."

In medieval times, left-handed people could not become knights

because it was thought that they were descendants of the devil, it is said. Spiral staircases in castles ran clockwise to allow knights all right-handed to battle intruders effectively.