Journal of Astrobiology and Outreach

Dr. Chandra Wickramasinghe

Editorial Board member

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UK

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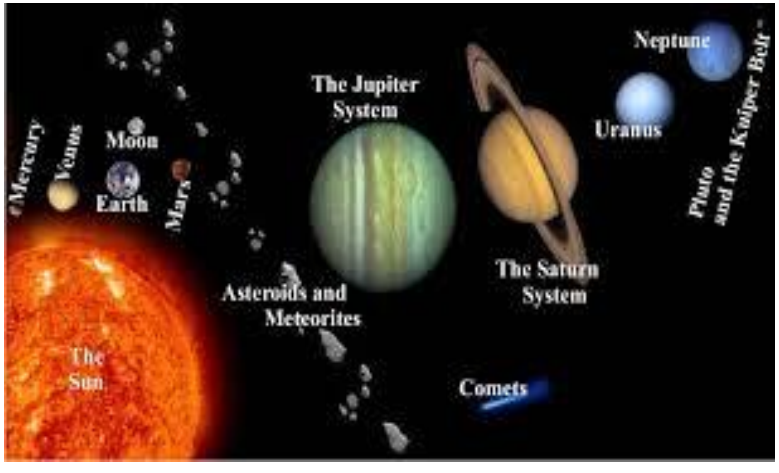
Biography

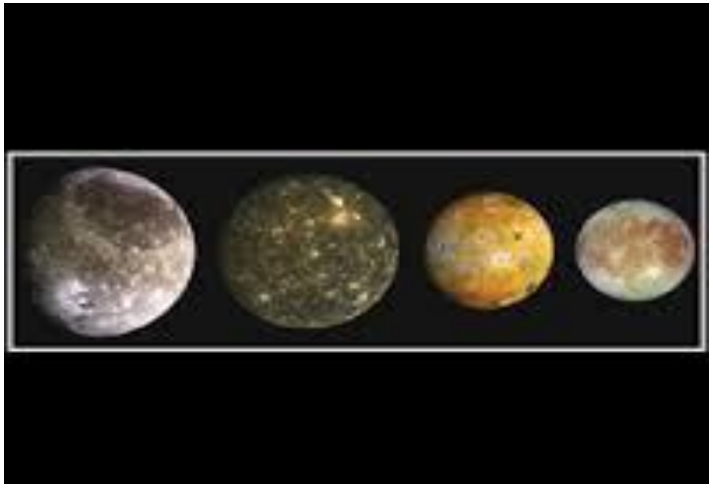
Dr. Chandra Wickramasinghe

- Professor Chandra Wickramasinghe is an internationally renowned astronomer who has made pioneering contributions to the theory of cosmic dust. In 1974 he first proposed the theory that dust in interstellar space and in comets was largely organic, a theory that has now been vindicated. In collaboration with Sir Fred Hoyle he propounded the theory of cometary panspermia. Jointly with Sir Fred Hoyle he was awarded the International Dag Hammarskjold Gold Medal for Science in 1986, and in 1992 he was decorated by the President of Sri Lanka with the titular honour of *Vidya Jyothi*. He was awarded the International Sahabdeen Prize for Science in 1996. He holds the ScD degree from the University of Cambridge and an honorary doctorate from the Soka University of Tokyo, Japan, an honorary doctorate from Ruhuna University of Sri Lanka, along with several other international distinctions. A Fellow of Jesus College Cambridge, 1962-1973; Staff Member of the Institute of Theoretical Astronomy in the University of Cambridge, 1965-1973; Professor and Head of the Department of Applied Mathematics and Astronomy, Cardiff University 1973-1990; Professor of Mathematics, Cardiff University 1990-2000; Director of the Cardiff Centre for Astrobiology, 2000-2010; Honorary Professor and Director of the Buckingham Centre for Astrobiology, University of Buckingham. An award-winning poet and the author or co-author of over 25 books and over 350 scientific papers, 70 of which are in Nature. He has held visiting professorial appointments in a large number of Universities world-wide and has at one time been advisor to the President of Sri Lanka and Founder Director of the Insititute of Fundamental Studies in Sri Lanka.

Research Interests

- Interstellar Matter,
- Infrared Astronomy,
- Light Scattering Theory,
- Applications Of Solid State Theory To Astronomy,
- The Early Solar System,
- Comets,
- Astrochemistry And The Origins Of Life,
- Astrobiology,
- Panspermia





Recent Publications

Bacterial morphologies supporting cometary panspermia – a reappraisal, N.C. Wickramasinghe, **International Journal of Astrobiology, 9, 119-129, 2011.**

ROSETTAs Prospects For Discovering Evidence Of Cometary Biology, N.C. Wickramasinghe**, Journal of Astrobiology & Outreach,2014.**

Life as a Cosmic Phenomenon: The Socio-Economic Control of a Scientific Paradigm, N Chandra Wickramasinghe and Gensuke Tokoro, **Journal of Astrobiology & Outreach,2014.**

Comets and the Origin of Life by Janaki Wickramasinghe, Chandra Wickramasinghe and William Napier., World Scientific, 2010

The Search for Our Cosmic Ancestry, Chandra Wickramasinghe, World Scientific, 2014

What is Astrobiology?

"Astrobiology is the study of life in the universe. It investigates the origin, evolution, distribution, & future of life on Earth, & the search for life beyond Earth. "

Astrobiology addresses three fundamental questions:

1) How does life begin & evolve?

2) Did life start on the Earth or did it start elsewhere?

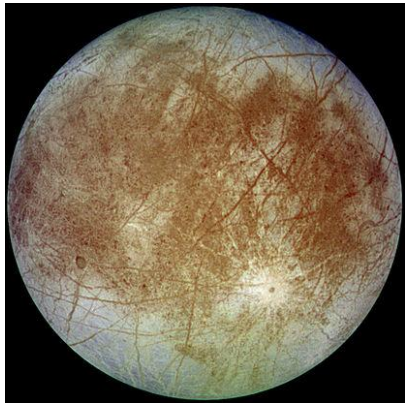
3) Is there life beyond Earth & how can we detect it?

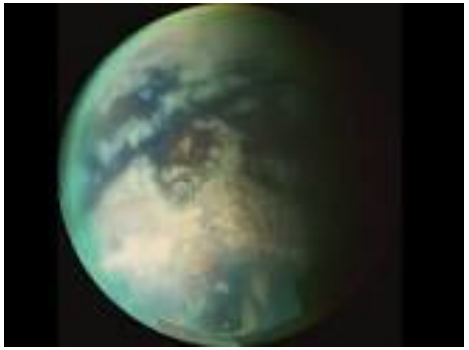
4) What is the future of life on Earth & in the universe?"

Astrobiology most importantly addresses the question of whether life exists beyond Earth, and how humans can detect it if it does!!

Life Elsewhere

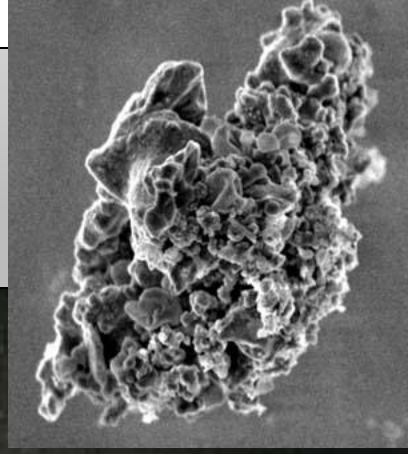
- Studies of life in extreme environments on Earth have led us to focus on some prime places to look for life
- Mars
- Europa (moon of Jupiter)
- Titan (moon of Saturn)
- Comets





Life in the Universe

Hubble Space Telescope image of Sedna- takes 10,500 years to circle the Sun!



Interplanetary Dust Particle -10 µm across made by dying and exploded stars

Our Solar System has planets, dwarf planets, moons, asteroids, comets, and interplanetary dust.

Milky Way galaxy has 100 billion (100,000,000,000) stars.
Universe has 100 billion (or more) galaxies.
Many stars have planets.
Some like Jupiter and Saturn.
Some may be like Earth.
Potential for a large number of Earth-like planets (ELPs).

Astrobiology, Incremental Data Accumulation, New Ideas & Understanding, Paradigm Shifts

NOTICE THE TIME FRAMES….

Search for Extrasolar Planets	~ 15 years
Deep Time: Reinterpreting Early Earth	< 5-10 years
Life on the Edge (extreme environments)	Late 70's Vents
The Rock that Started it all- Scientific Process	Mid 90's
Asteroids and Dinosaur Extinction	~ '79
Human Microbiomes	~ 5-10 years

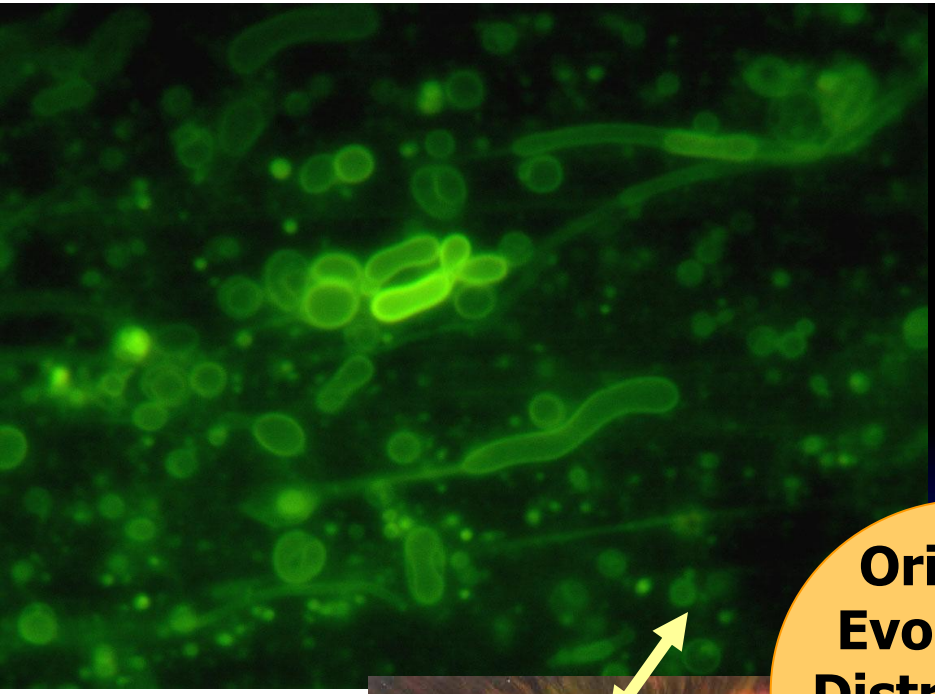
Astrobiology makes use of physics, chemistry, astronomy, biology, molecular biology, ecology, planetary science, geography, and geology to investigate the possibility of life on other worlds and help recognize biospheres that might be different from the biosphere on Earth.

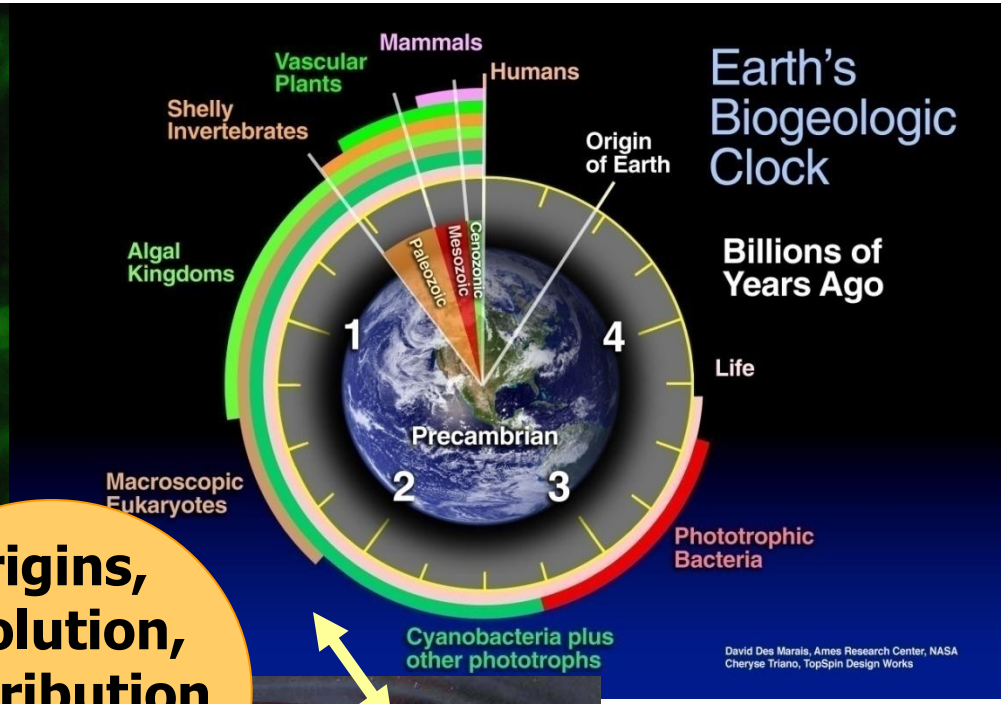
Astrobiology concerns itself with interpretation of existing scientific data; given more detailed and reliable data from other parts of the universe, the roots of astrobiology itself—physics, chemistry and biology—may have their theoretical bases challenged.

Although speculation is entertained to give context, astrobiology concerns itself primarily with hypotheses that fit firmly into existing scientific theories.

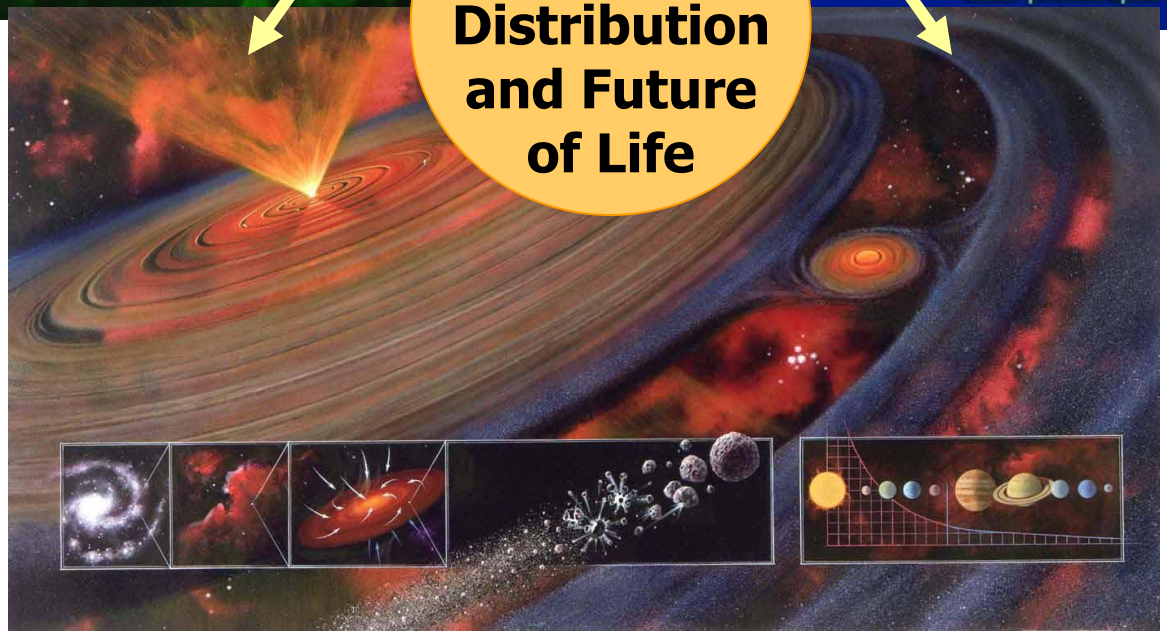
It has been proposed that viruses are likely to be encountered on other life-bearing planets. Efforts to discover current or past life on Mars is an active area of research, and is microbial life entering Earth at the present time

Astrobiology Unites Disciplines to Study Life in the Universe





Origins, Evolution, Distribution and Future of Life



While it is an emerging and developing field, the question of whether life exists elsewhere in the universe is a verifiable hypothesis and thus a valid line of scientific inquiry. Though once considered outside the mainstream of scientific inquiry, astrobiology has become a formalized field of study.

Earth is the only place in the universe known to harbor life. However, recent advances in planetary science have changed fundamental assumptions about the possibility of life in the universe, raising the estimates of habitable zones around other stars, along with the discovery of hundreds of extrasolar planets and new insights into the extreme habitats here on Earth, suggesting that there may be many more habitable places in the universe than considered possible until very recently.

On 4 November 2013, astronomers reported, based on *Kepler* space mission data, that there could be as many as 40 billion Earth-sized planets orbiting in the habitable zones of sun-like stars and red dwarf stars within the Milky Way Galaxy. 11 billion of these estimated planets may be orbiting sun-like stars.

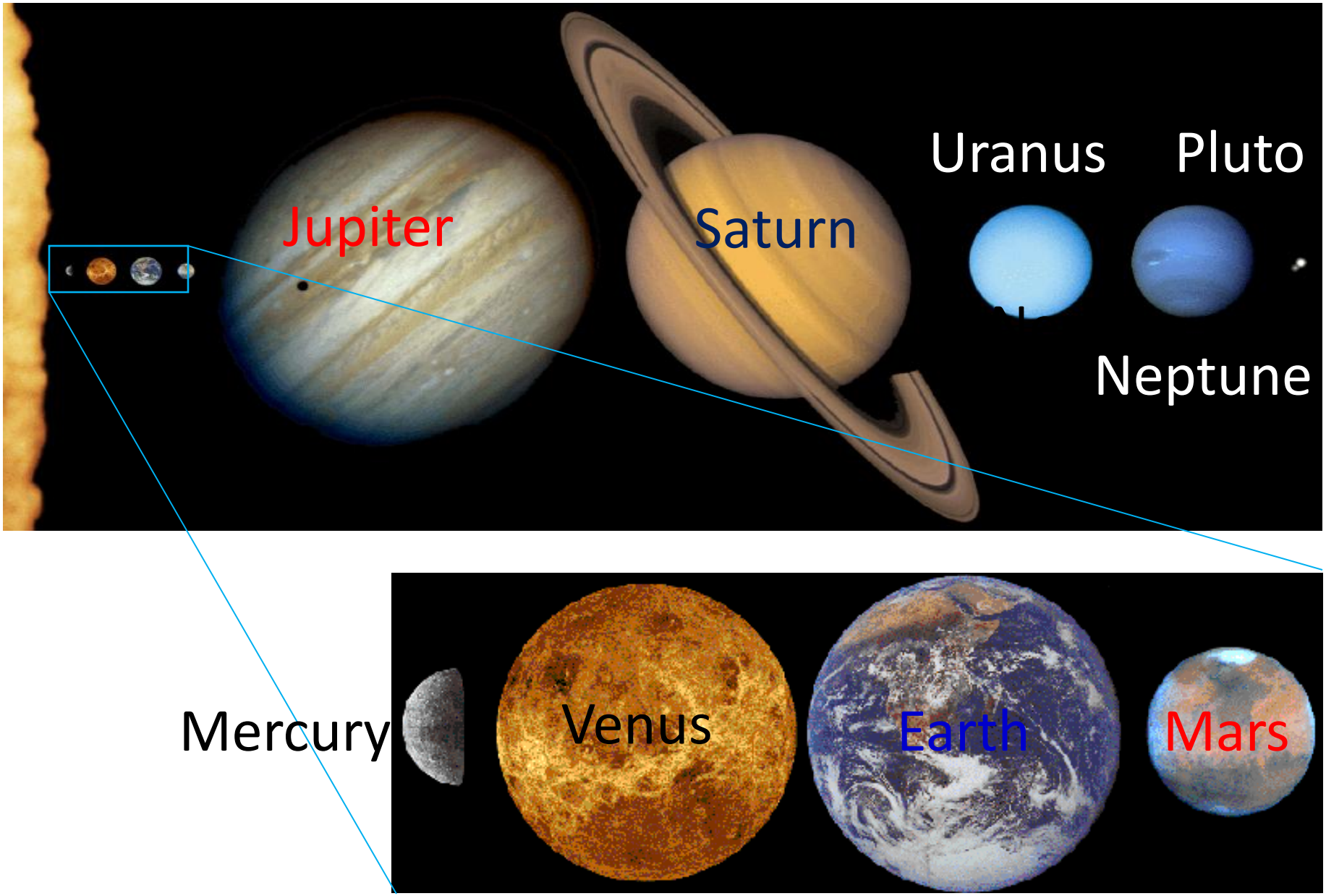
The Origin of Life on Earth

4 billion years ago

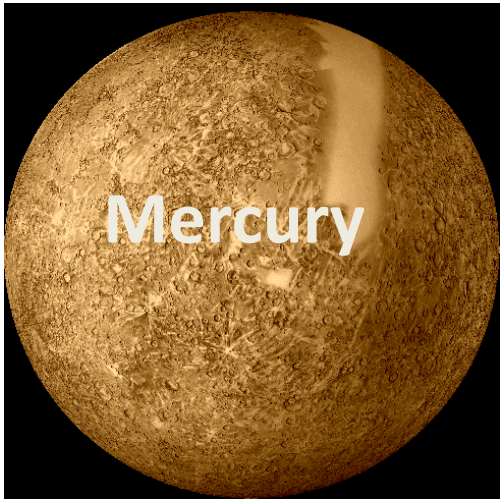
The nearest such planet may be 12 light-years away, according to the current estimates.

A particular focus of astrobiology research is the search for life on Mars. There is a growing body of evidence to suggest that Mars has previously had a considerable amount of water on its surface, water being considered an essential precursor to the development of carbon-based life. Evidence from the Viking Probes of 1978 still point to the tantalising possibility of extant life on Mars.

Our Solar System

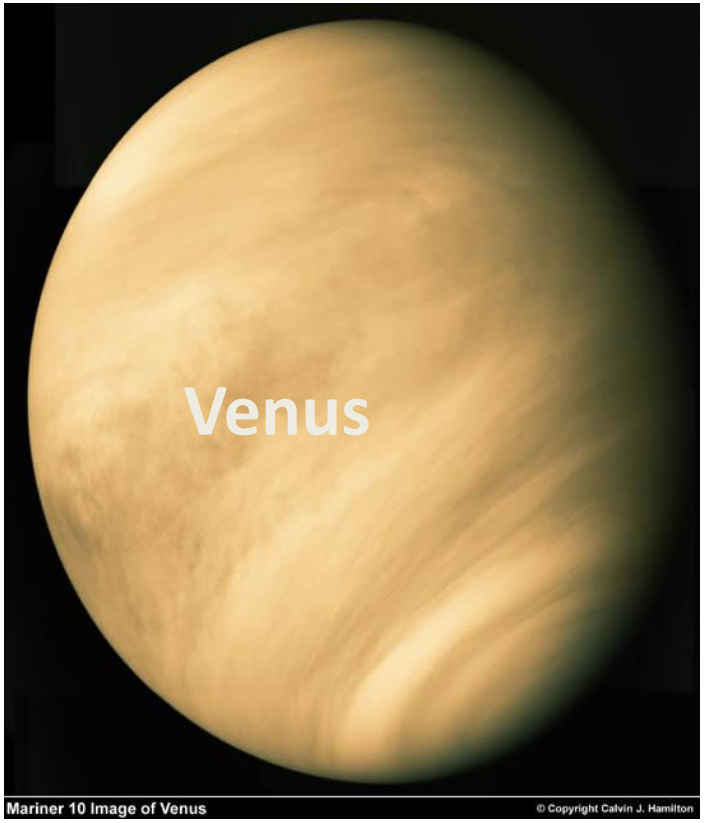


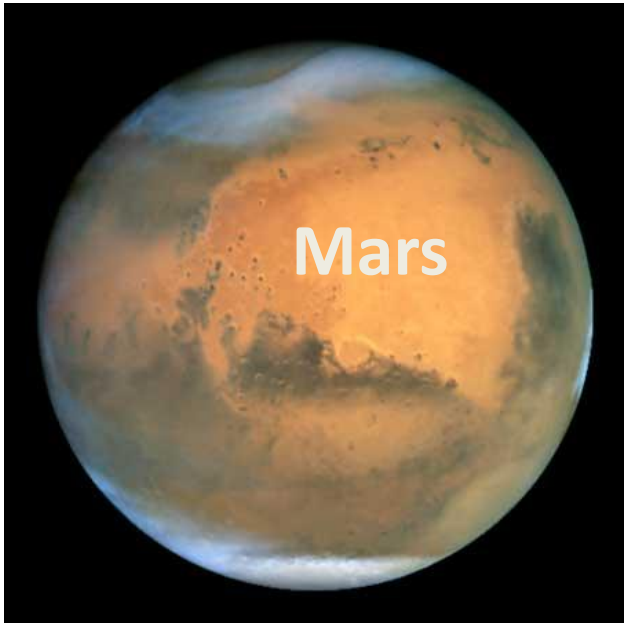
The Terrestrial Planets



Very near the Sun

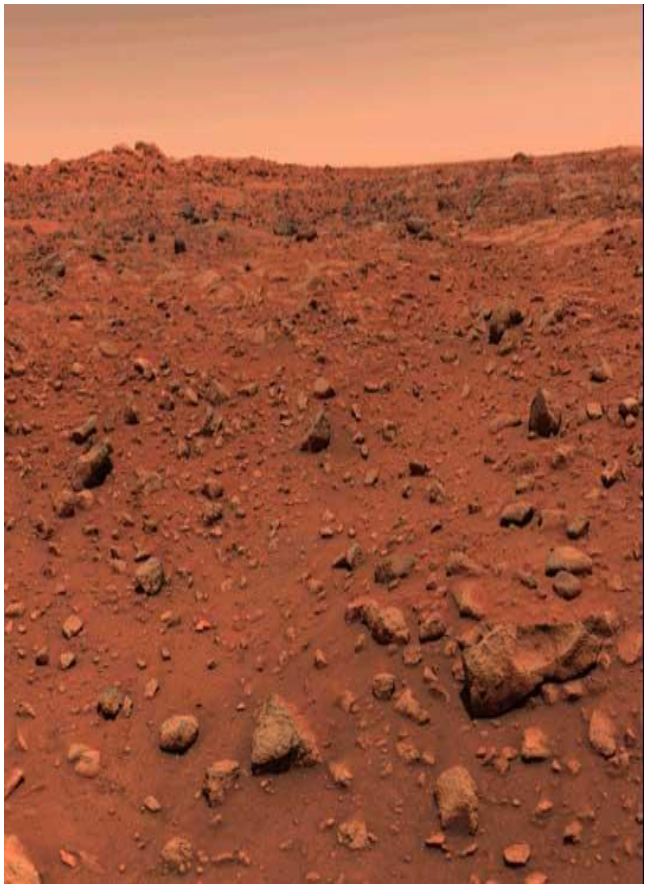
Very hot because its atmosphere



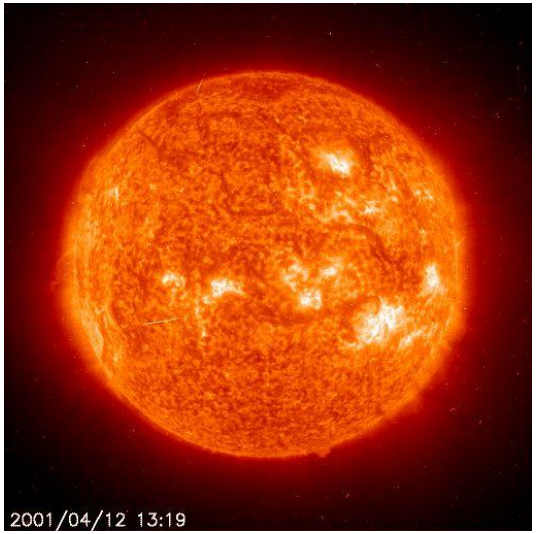


No atmosphere, cold but…

Mars



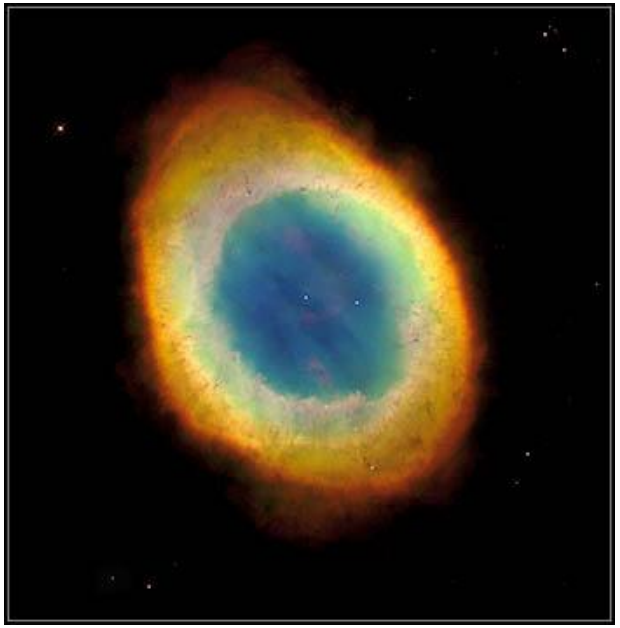
The life of the stars



Yellow dwarf
10 billion years

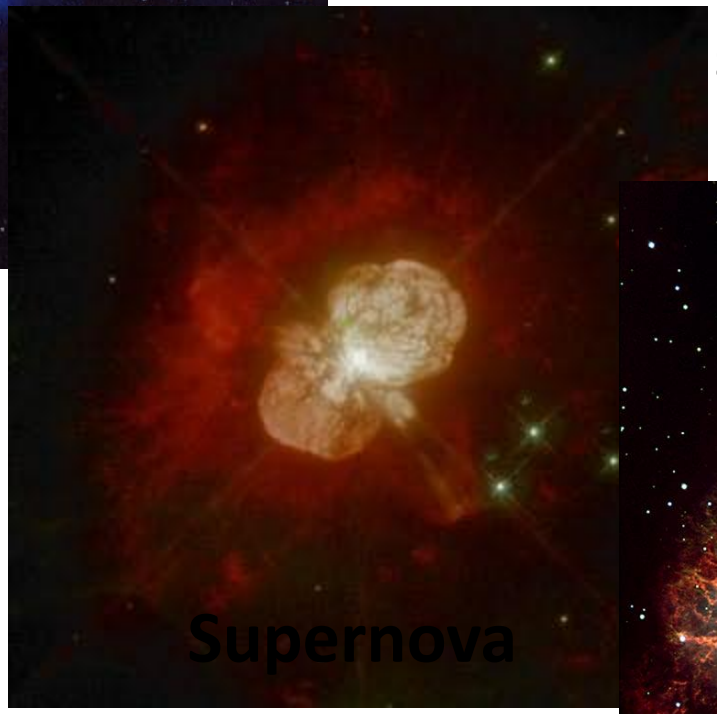
Red Giant

Panetary nebula
and white dwarf



The life of the stars

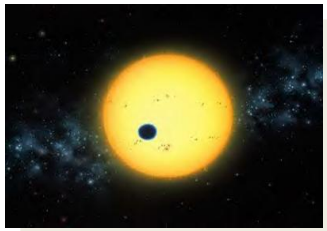
100 million years



Supernova remmanent and neutron star

Multiple Different Search Types

SETI Searches



Extrasolar/Habitable Planets

Exobiology in the Solar System

Multiple Different Search Types

SETI Searches

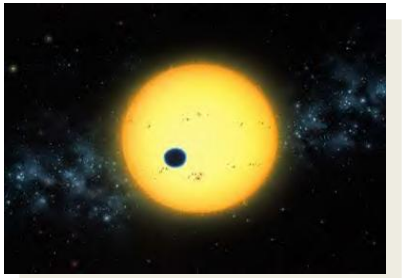
Radio-telescopes - within Galaxy

Discovery: Intelligent Life

Unknown Biology or Chemistry

Light Years Away (still exist?)

Aliens ???



Extrasolar/Habitable Planets

Telescopes - within Galaxy

Discovery: Other Solar Systems; Terrestrial Planets?

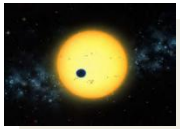
Information on Atmospheres (Compostion/Conditions?)

Maybe Habitable?

Life ???

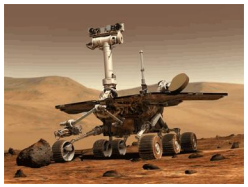
Multiple Different Search Types

SETI Searches

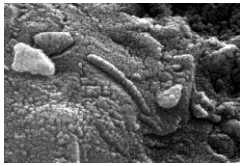


Extrasolar/Habitable Planets

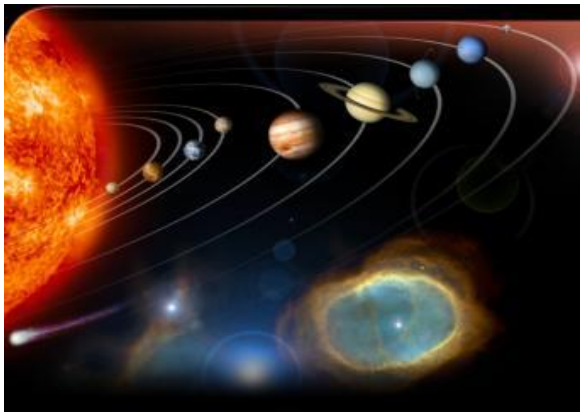
➢ Exobiology in the Solar System **



Missions -- *visits*



Meteorites -- Fossil Evidence?



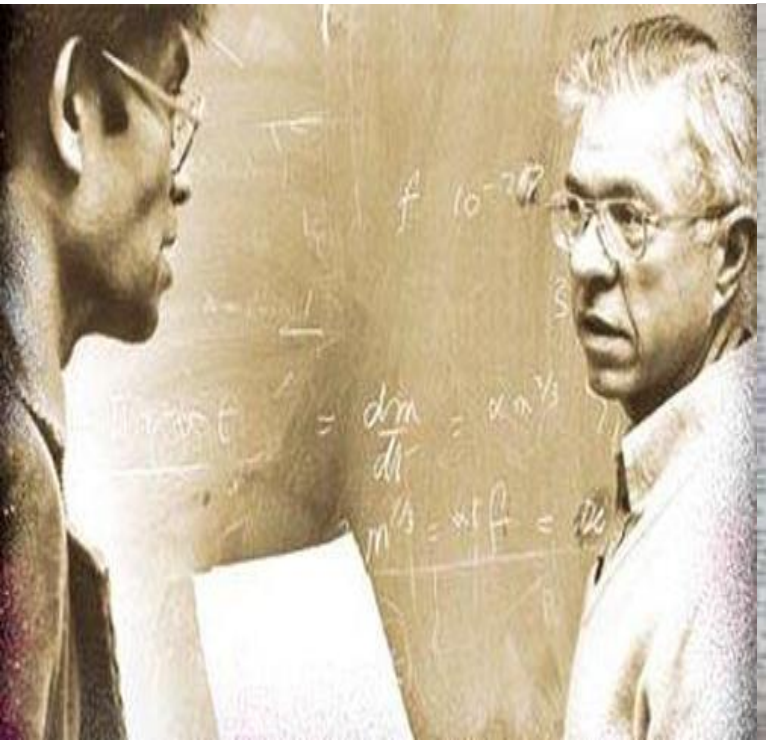
Cosmochemistry (Process; Replication)
Origin of Life Research (Lab Experiments)

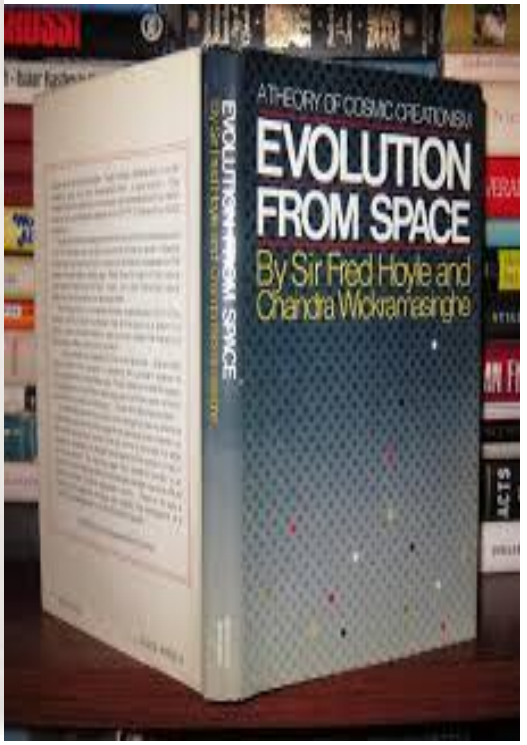
** ***Real Time; Potential for Cross Contamination; Biohazards***

According to Chandra Wickramasinghe,

- A paradigm shift with potentially profound implications has been taking place over the past 3 decades. The convergence of research in diverse disciplines points to life being a cosmic phenomenon
- A near-infinite information content of life appears to have evolved on a cosmological scale – over vast distances, and enormous spans of time.
- It appears highly unlikely that life could have emerged from chemicals in "some warm little pond" on the Earth; in contrast we maintain that every species of life on the Earth, including *Homo sapiens*, is in essence the result of an assembly of cosmologically derived viral genes.
- The ingress of such genes that continues to the present day led to their accommodation within the genomes of evolving lineages, sifted according to the "natural processes of selection", a mechanism first enunciated by Patrick Matthews and later used by Darwin. The evidence for this point of view has now grown to the point where we believe, it will soon need to be accepted by the majority of the scientific community.
- This is particularly critical, since we suggest that new diseases capable of threatening Man's existence could arrive to Earth from space.

Today, Wickramasinghe is recognized as the *father of modern-day astrobiology*. He is certainly the person who has done most to influence the global development of this newly emerging science which builds upon a substantial knowledge-base from the quite separate disciplines of mathematics, physics, biology and paleontology.



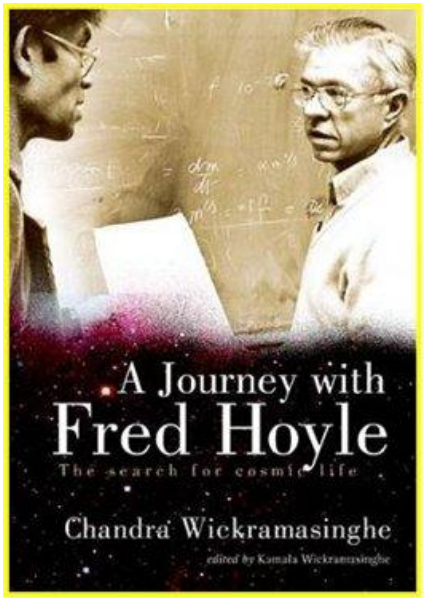


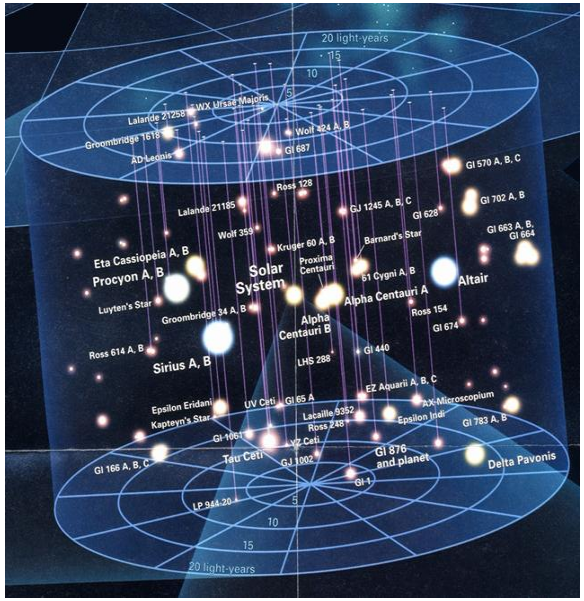
http://profchandra.org/ is the place you can know more in detail about Sir Chandra's research!!

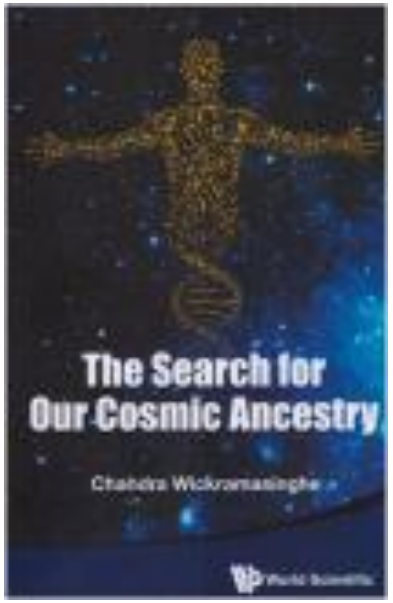
http://www.buckingham.ac.uk/directory/professor-chandra-wickramasinghe/

Professor Chandra Wickramasinghe, BSc (Ceylon), MA, PhD, ScD (Cantab), Hon DSc (Sri Lanka, Ruhuna), Hon DLitt (Tokyo, Soka), FIMA, FRAS, FRSA

Honorary Professor and Director of the Buckingham Centre for Astrobiology, University of Buckingham, UK; Visiting Professor, University of Peradeniya, Sri Lanka; Board Member and Director of Research, Institute for the Study of Panspermia and Astroeconomics, Gifu, Japan







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Professor N. Chandra Wickramasinghe

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