

Is there life on other worlds?

Lecture delivered at the Seshadripuram High School

on 13/9/45

My President & Gentlemen,

I am very happy to be amidst you again for the third time, and address you on a scientific topic. your Secretary has commanded that I should not speak on a topic of pure mathematics, and I have decided to obey him not because I consider pure mathematics unworthy of being talked about, but because I am afraid the dazzling brilliance, if properly presented, of this Queen of the Sciences as pure mathematics is called might blind you in admiration, and create in you contempt for the other Sciences. My first inclination was to talk to you ^{on} about the atomic bomb, about which you must have heard and read so much in the last few weeks, but I am afraid the time is rather inopportune. you are celebrating the Ganapathi week, and on an auspicious occasion like this to talk about an agent of destruction which has dwarfed man's moral stature, and made us feel ashamed of belonging to the ^{very} natural order homo sapiens is, ~~inconsiderate~~, in my opinion, downright blasphemy. I shall not attempt it. I want to deal with a topic which has held men's imagination from time immemorial, a topic not because of any sordid motives but of murdering his fellowmen, nor because of any vulgar curiosity or idle fancy but born out of the conviction of the profoundest thinkers, of men of the highest scientific equipment. I want to speak to you this evening about the very intriguing question as to whether there is life anywhere on the Universe other than the Earth or is there life on other Worlds?

This is not a new question. It is as old as man himself and has had a strange fascination for man. Primitive ~~man~~ We come across

many allusions in ancient mythology wherein such belief is almost axiomatic.
To give an appropriate example, consider the incident in सप्तमोऽध्यायः wherein God Ganesh curses Chandra But all such references are vague & have no scientific background. As long as the Earth was supposed to be flat with heaven above & hell below, there is no meaning precise meaning in talking of life in other worlds. It is only when we were sure of other worlds existing that meaning could be attached to the QM - Bruno & Galileo - Kepler & Newton - Speculations follow - Herschel thought ☉ was abode of living creatures of 1000 miles long - Swedenborg the mystic had visions of other worlds

1. Spirits from Mercury : they are desirous to appear as crystalline globes & have great abstract knowledge. Conversation between angels of the Earth & Mercurial spirits
2. It is well known to spirits & angels that there are inhabitants in the moon & in the moons of Jupiter & Saturn. Even those who have not seen & conversed with spirits (like me) who are far from them entertain no doubt of their being inhabited, for they too are earths, & where there is an earth there is man, man being the end for which every earth exists & without an end nothing was made by the Great Creator.
3. Moon - Men here have thunderous voices & speak from the abdomen.
4. Jupiter - - giants on bigger planets, dwarfs on smaller ones - reverse like

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$$\left. \begin{aligned} \frac{\partial \phi}{\partial y} - \frac{d}{ds} \left(\phi \frac{dy}{ds} \right) &= 0 \\ \frac{\partial \phi}{\partial z} - \frac{d}{ds} \left(\phi \frac{dz}{ds} \right) &= 0 \\ \frac{\partial \phi}{\partial x} - \frac{d}{ds} \left(\phi \frac{dx}{ds} \right) &= 0 \end{aligned} \right\}$$

$$\int \phi ds$$

$$\int \phi \sqrt{1+y'^2} dx$$

$$\frac{\partial \phi}{\partial y} \sqrt{1+y'^2} - \frac{d}{dx} \left(\phi \cdot \frac{y'}{\sqrt{1+y'^2}} \right)$$

$$\frac{\partial \phi}{\partial y} - \frac{d}{ds} \left(\phi \frac{dy}{ds} \right) = 0$$

$$\frac{\partial \phi}{\partial \left(\frac{dy}{ds} \right)} = \phi \frac{dx}{ds}$$

$$\frac{\partial \phi}{\partial x} - \frac{d}{ds} \left(\phi \frac{dx}{ds} \right) = 0$$

$$\phi = \frac{1}{v} = \frac{1}{\sqrt{\left(\frac{dx}{ds} \right)^2 + \left(\frac{dy}{ds} \right)^2}}$$

$$\frac{d}{ds} \left(\phi \frac{dx}{ds} \right) = \frac{d\phi}{ds} \cdot \frac{dx}{ds} + \phi \frac{d^2x}{ds^2}$$

$$= \left(\frac{\partial \phi}{\partial x} \cdot \frac{dx}{ds} + - \right) \frac{dx}{ds} + \phi \frac{d^2x}{ds^2}$$

$$= \frac{\partial \phi}{\partial x} \frac{dx}{ds} =$$

$$\phi ds = \frac{ds}{v}$$

$$ds^2 = dx^2 + dy^2$$

$$ds \cdot \delta(ds) = dx \cdot \delta x + dy \cdot \delta y$$

$$d(ds)$$

$$\delta \int \phi ds$$

$$\int \delta \phi ds + \phi \delta(ds)$$

$$\int \delta \phi ds + \phi \delta(ds)$$

do

$$\int \delta \phi ds + \phi \left(\frac{dx}{ds} \delta x + \dots \right)$$

$$\left(\frac{\partial \phi}{\partial x} \delta x + - \right) ds +$$

Jacobs: question does not arise in ancient cosmology - Possibility in the Kepler - Newton view - Direct seeing of human beings on moon requires telescopes of aperture 10,000 to 100,000 inches - Similarly for other planets, conditions for visual communication - apparent 'Canals' of Mars - physical suitability for life - Jupiter & other superior planets species of life - Jupiter etc - Mars - Moon - Venus - Mercury - Summary & conclusion re. solar system - Existence of 10^3 or 10^6 millions of planets & possibility of life on them

Haslett: Basic essentials for existence of life, oxygen & water & suitable temperature - Underground cities if surface be too cold - only Mars & Venus likely - Mars warm enough, has an atmosphere, has O_2 , H_2O , canals & seems doubtful ~~to~~ - view on Mars if Martians existed - Venus, only CO_2 slightly detected, maybe O_2 & H_2O - planets of other suns

C. T. Chase: Difficulties of visual observation - physical conditions, ~~for~~ growth of bacteria, moderate temp, O_2 , H_2O , CO_2 , NH_3 ; higher forms chlorophyll & protoplasm - Lipman's observations - astronomer's conditions to be satisfied for life as we know it - Instruments used, surface gravity, Doppler effect, Spectroscope, thermocouple - Mercury - Venus - Mars does contain some ~~water~~, probably has forms of vegetable & just possibly animal life - Jupiter & Saturn.

Synopsis.

Strange fascination of subject - mythological references, $\mu\tau\sigma\tau$ & $\epsilon\tau\alpha$ - vagueness in flat cosmology, Bruno & Galileo - Kepler & Newton Cosmology, more definite - wild speculations, Swedenborg, Brewster (Sun) - Impossibility of visual communication, Moon & Mars', Canals (optical illusion) - physical conditions for suitability of life, Doweled & Barnard. biological conditions N , bacteria, plankton, stone bacteria, T , O_2 , H_2O , CO_2 , NH_3 , chlorophyll & protoplasm for higher forms, Lipman's observation not confirmed - Jupiter & extra-jovian planets, $-138^\circ C$, ice layer 6000 miles, atmosphere several 1000 miles thick & pressure 10^6 terrestrial atmospheres, contains poisonous gases methane & ammonia

