

High Points in Twentieth Century Astronomy.

- I. Status of science toward close of 19th cent.
 - A. Separation of science from philosophy.
 - 1. Antagonism between the two. (Quote Helmholtz H of S p 313.)
 - B. Separation of Science into sciences.
 - 1. Compartmentalistic knowledge.
 - C. Continued predominance of mechanistic influence which followed Newton's work.
 - D. The view expressed in 1894 that future work in physics would be in detail, all fundamental discoveries having been made.
- II. Twentieth century science beginning with discovery of X-ray.
 - A. Development of new concepts of radiant energy.
 - B. Radio-activity.
 - C. Interchangeability of energy and mass.
 - 1. One gram equals 9×10^{20} ergs
 - 2. One ton coal burned equals 5×10^{16} ergs
 - 3. One ton coal annihilated equals 9×10^{26} ergs
 - a. 18,000,000,000 times as much.
- III Theory of Relativity.
 - A. Most important development of the age.
 - B. Fundamental notions
 - 1. Time, space and matter inseparable..
 - 2. The use of space of more than three dimensions.
 - 3. The finitude of our cosmos.
 - 4. The use of Riemann geometry which was developed which was a pure rational development in pure mathematics.
 - 5. Interpretation of action of gravity not as a force but as a warping of space in vicinity of matter.
- IV. Age of Universe.
 - A. Methods by which age of earth is calculated.
 - 1. Ratio of uranium and uranium-lead gives age not less than 1,400 million years.
 - 2. Ratio of uranium and actino-uranium gives maximum figure of 3,400 million years
 - 3. Astronomical methods based on orbits.
 - a. Mercury from 1,000 million to 10,000 million years
 - b. Moon 4,000 million years.
 - 4. Estimated figure 2,000 million years.
 - B. Calculation of age of stars.
 - 1. Law of equipartition of energy in gases.
 - a. In case of air requires 1,000 millionth part of sec.
 - 2. Applied to stars calculation shows present stage of motion and momentum would require from 5 to 10 million million yrs.
 - 3. Checked by fact that sun would have had to have been impossibly large to have radiated more than 8 million million yrs. (More than 100⁶ times as large)
 - C. Age of universe as a whole cannot be infinite.
 - 1. A million universes turned to radiant energy would raise temp. of earth 160 degrees, above boiling. Impossible.
 - D. Age of nebulae.
 - 1. Life-expectation of atom on order of 100 million million yrs.
 - a. Hence probable age of present univers about 200 million million yrs.
 - E. Creation of universe outside time, space and matter.

V. Building of the Universe.

A. Molecular motion and gravitation.

1. Normal velocity of gas molecules about 500 ft. per sec.
2. To leave earth speed of 6.93 miles per sec required
3. To leave sun 380 miles per sec. required.

B. Condensation of molecules if of sufficient extent in gas would inhibit scattering of molecules.

Condensations effected by sound.

1. Hence significance of universe created by the Word.

D. Math. shows minimum weight for condensations to grow in gas of given density.

E. Density of primaeval Chaos calculated at 1.5×10^{-31}

1. Smallest self-sustaining condensation with molecular vel 500 yds per sec. 160,000,000 suns.

2. Nebulae only bodies falling in this range of magnitude.

F. Nebulae rotation and formation of detached bodies like stars

1. Calculated density of two nebulae 5×10^{-22} and 2×10^{-21}

2. Condensations maintained at about size of stars.

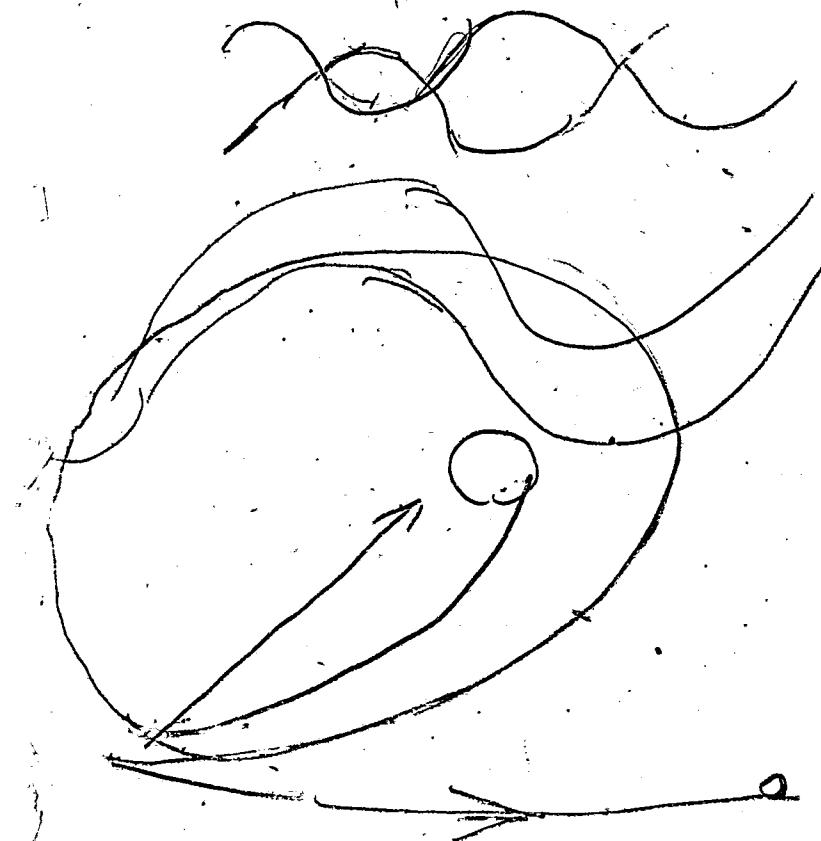
VI. The theory of uncertainty and the break-down of all mechanical pictures of the universe and matter.

A. For the physicist ponderable matter has disappeared and in its place stand mathematical relationships.

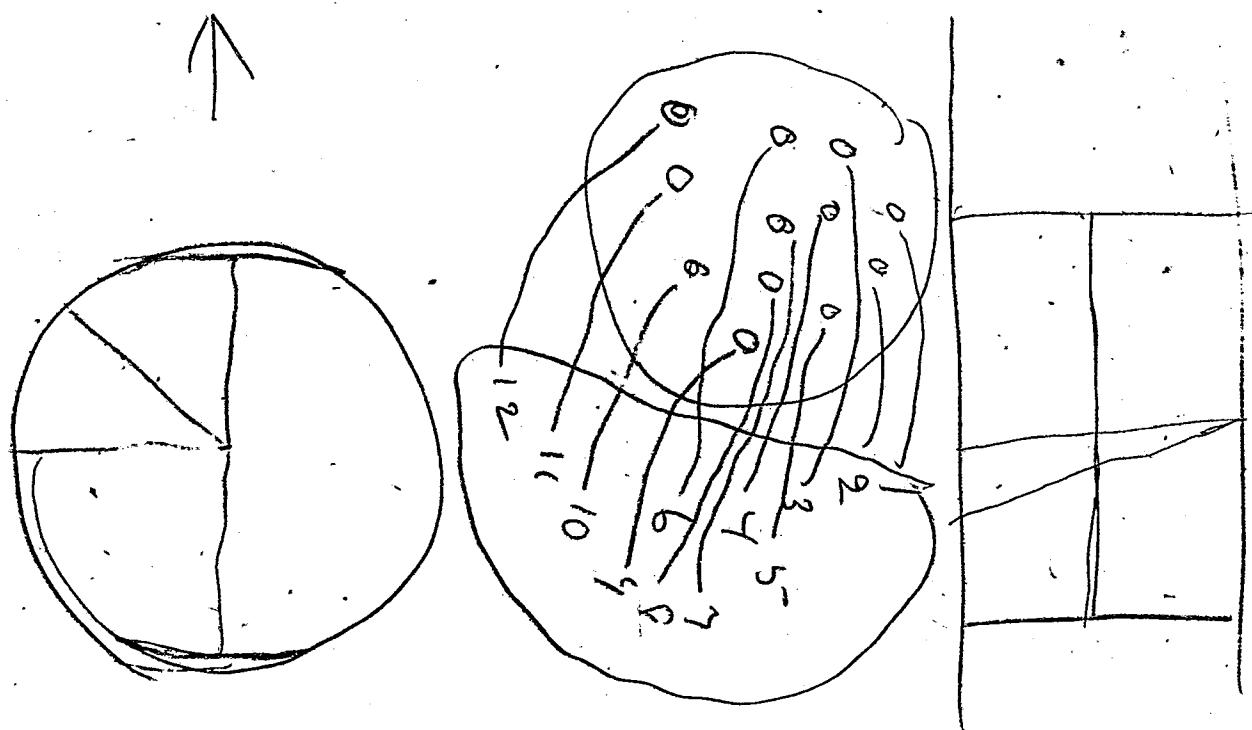
B. The universe appears to be a thought in the mind of a great Mathematician.

Quote pages 158-159 of Mysterious Universe.

$$m + \varepsilon = m_1 + \varepsilon_2$$



3600	24	14400	56400	31536000
7200		360	360	36000
		365	365	36500
			31536	3153600
				31536000
		432000	432000	4320000
		18400	18400	184000
		9200	9200	92000
				31536000



Astronomy Lecture

1. Theory of uncertainty - 133
2. Indeterminism may be due to effort to force happenings of many dimensions into smaller number of dimensions.
(Cf. occult doctrine of causal power from the Soul of Things). 133
3. Events in time and space "become" no other than a moving row of magical shapes that come and go.¹³⁴
4. all pictures which science draws today of nature that accord with observation are mathematical pictures.
5. General recognition today that we are not in contact with ultimate reality. 135
6. Nature's great book written in mathematical language
7. Plane of math. which is pure construction apart from experience is the plane which seems to best explain nature today. 136
8. Universe appears to be designed by pure mathematics
9. Nature fits mathematical interpretation better than that of biology or engineering. 140
10. Great architect appears to be pure mathematics. 141
11. Universe best pictured as consisting of pure thought of mathematical truths. 146

12. The objectivity of objects ~~subsists~~ arises from their subsisting in the mind of some Eternal Spirit". 147
13. The reality mathematical rather than "ideal" or "real". 148
14. Substantiality the creation of the universal mind as opposed to the individual mind. 150
15. If universe is one of thought then it must have been produced by act of thought. 154
16. Scientific theory compels us to think of creator as acting outside time and space. 155
17. At present stream of knowledge points toward a non-mechanical reality. 158
18. Mind begins to look, not as intruder, but as creator and governor of matter. 158.
19. Instead of mind being ~~the~~ function of matter it has come to appear that substantial matter is a manifestation of mind. 159
- 20..

"If the universe is a universe of thought, then its creation must have been an act of thought. Indeed the finiteness of time and space almost compel us, of themselves, to picture the creation as an act of thought; the determination of the constants such as the radius of the universe and the number of electrons it contained imply thought, whose richness is measured by the immensity of these quantities. Time and space, which form the setting for the thought, must have come into being as part of this act. Primitive cosmologies pictured a creator working in space and time, forging sun, moon and stars out of already existent raw material. Modern scientific theory compels us to think of the creator as working outside space and time, which are part of his creation, just as the artist is outside his canvass." 154.