

(2) Gamow's One-Bounce: universe has always existed, but bounces once in its history (at big bang).
-Big-bang was a bounce from a previous contraction
-Universe was initially (infinite time in past) a uniform distribution of hydrogen gas which gradually contracted to bounce just once at the big bang.

(3) Opik's Oscillating: universe has always existed, expanding and contracting with last bounce at (last) big bang. [Sciama 98-127; Motz 307-08; J&T 267-82]
-Until just a couple of years ago, this was most popular view, favored by such as Asimov and Sagan.
-The universe has always existed, expanding and contracting every 100 billion years or so forever.
-Rather close to Hindu view of cosmology.

g. The oscillating model faces several problems:

(1) Stopping expansion: as yet no evidence for sufficient matter to overcome expansion and start necessary collapse. [J&T 278-81]
-If universe is to oscillate, it must stop expanding.
-Assumed there is enough matter for its gravity to overcome expansion energy.
-Current observations (incl amt of heavy H produced in big bang) suggest there is only about 10% of amt needed.

(2) Stopping collapse: present evidence indicates that no known force could stop collapse from becoming black hole instead of big bang. [Dicke 66-67; Jastrow 29]
-Recently Stephen Hawking showed theoretically that universe would not bounce if it were to collapse.

(3) Oscillating eternally: all known physical systems have tendency to lose usable energy, so oscillation would become smaller and smaller, damping to zero in finite time. [Schatzman 245]
-Compare behavior of bouncing ball

h. The one-bounce model faces at least two problems:

(1) How will an almost infinitely large universe collapse to one point?
-How does all of universe know where to collapse to?
-Something like behavior of ripples from pebble dropped in pond if you film and then run film backwards.

(2) Why would it take an infinite time to do so?
-Know of no natural forces that start out infinitely slowly and build up in such a way as to take infinite