

# *A Critical Point for Science?*

Lecture to the Cambridge University Physics Society  
March 5th., 2008

Brian D. Josephson

TCM Group, Cavendish Laboratory  
Cambridge CB3 0HE, UK

<http://www.tcm.phy.cam.ac.uk/~bdj10>

# Basic themes:

- Current physics implicitly assumes matter is fundamental, life and mentality being secondary
- There are reasons for thinking that such a picture may be incomplete, leading to error
- A new conceptual foundation reverses the order of things, making life and mentality more basic than matter.

# Wheeler's picture

(see *The Goldilocks Enigma* by Paul Davies)

- Cosmos > Life > Mind > Cosmos

Picture based on 'participatory observers'

# Thanks to:



Samantha  
Parton



Stu  
Kauffman



Steve  
Rosen



Tethys  
Carpenter

# Picture Credits

Parton and Rosen: Brian Josephson

Carpenter: Simon Keynes

Kauffman:

<http://www.science.tamu.edu/story3.asp?storyID=465>

# Physics has always presumed matter

Newtonian mechanics

e-m theory/classical mechanics

Basic QM

Quantum field theory

String/M theory

- *Matter ('things') features at every stage*

# What is/may be left out

- Observer problem
- Life (complementarity)
- Higher cognitive capacities
- Paranormal phenomena

# Observer issue

What we see is *not* what we get (from the theory)

[many worlds problem: the statistical interpretation helps only if one avoids looking too closely!]

# Life issue

Measuring a biosystem may change its properties (Bohr)

QM provides no clear specification for dealing with 'unprepared systems'; there is no clarity regarding 'quantum organisation'.

# Higher-capacities problem

Again, there is little clarity as to how one might explain, e.g.:

- Mathematical insight
- Musical appreciation
- ESP, etc.

# Gravity problem

- Gravity can't be fitted into Standard Model
- Extending this to fit makes 'What You See' still further from 'What You Get From The Theory' (many extra dimensions)

# The epicycle saga

- Epicycles gave quantitatively correct results but were ultimately seen not to be the right approach: ‘magnitudes are not everything!’
- Might science similarly be wrong re mind and life?

# Which is more fundamental?

- Usual view: matter is more fundamental, and life emerges from it
- Alternative: life, mentality etc. emerge from a more fundamental level of existence

# Wheeler's picture

- Cosmos > Life > Mind > Cosmos

Picture based on 'participatory observers'

Problem: idea too vague

Remedy: find a more advanced  
formulation of the idea!

# How to make life/mind fundamental?

- Start with a fundamental theory of life  
Use this as the basis for everything  
(instead of starting with a conventional theory)

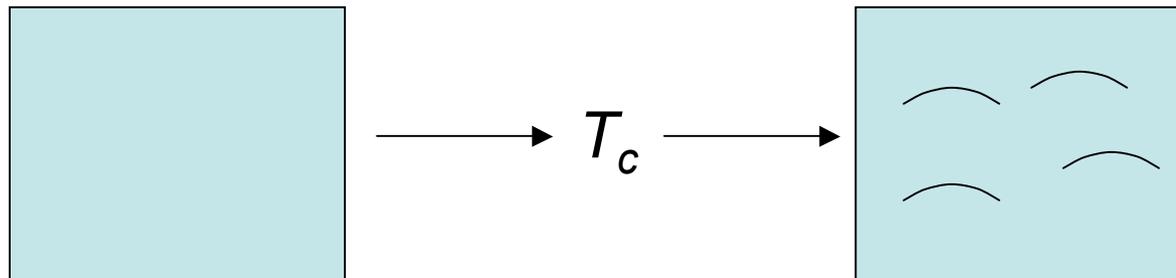
# The spinoff, given a proper theory:

- ‘Mind’ would decide what a universe should be like, not ingenious schemes dreamt up by physicists following the latest bandwaggon!
- Mind decides on basis of what would best support life, > biofriendly universe.

# The Critical Point

Origin of critical-point idea: Samantha Parton on musical creativity (from interview with Triste magazine):

*“when you stare into that space and that deepness, you get close to the place where things begin, and that's a [good] place to be ... [for making music]”*



# Then ...

... an article by Stuart Kauffman et al. in Nature reminded me that I had in my office a copy of Kauffman's book 'The Origins of Order'!

# A different order of things

- Kauffman proposes that life happens at ‘the edge of chaos’, a situation poised between order and disorder
- Bohm refers to ‘unmanifest order’ becoming manifest
- Rosen refers instead to ‘apeiron’, a ‘primal chaos’, from which order springs

# Some key concepts

- Edge of chaos
- Structures
- Differential stability
- Attractor
- 'Smart systems'

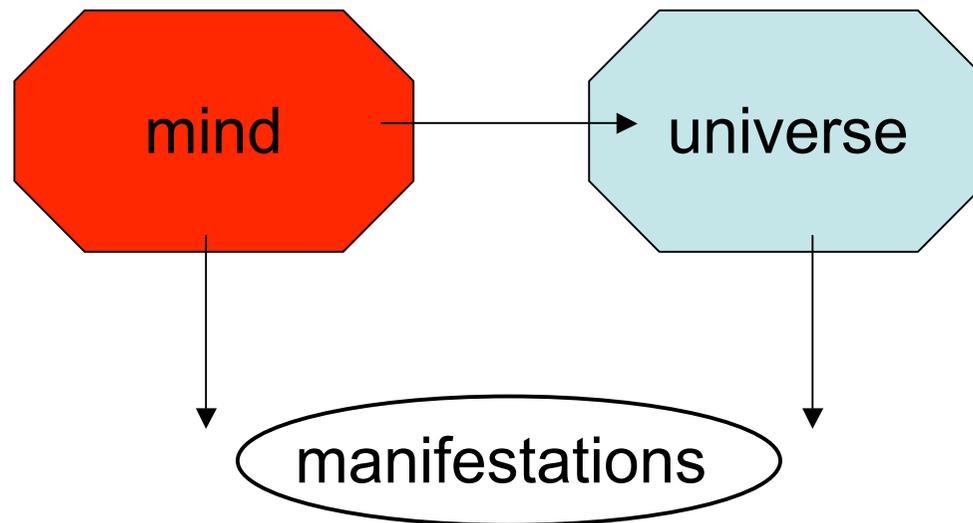


# Smart systems

- Stable
- Cooperate to form smart complexes
- 'do things', compute (= I/O + dynamics)
- Communicate, make requests, anticipation
- Mutual support in a group
- Societies live longer
- Melt-freeze strategy at edge of chaos
- Development of specialisations

# Manifestations of mind

- Direct; or
- Indirect via universes



# Minds and universes

- ‘Deep’ life can use mind to build universes
- Mind needs universes that
  - a) It knows how to build (symmetry?)
  - b) Are useful
- Elegance as such is not of interest!

# Space and time

- Space: a resource that things can move around in, provides proximity, separation, place
- Scientist time: a resource that assists synchronisation, 'being on time': time like that shown by a clock, not 'actual time'

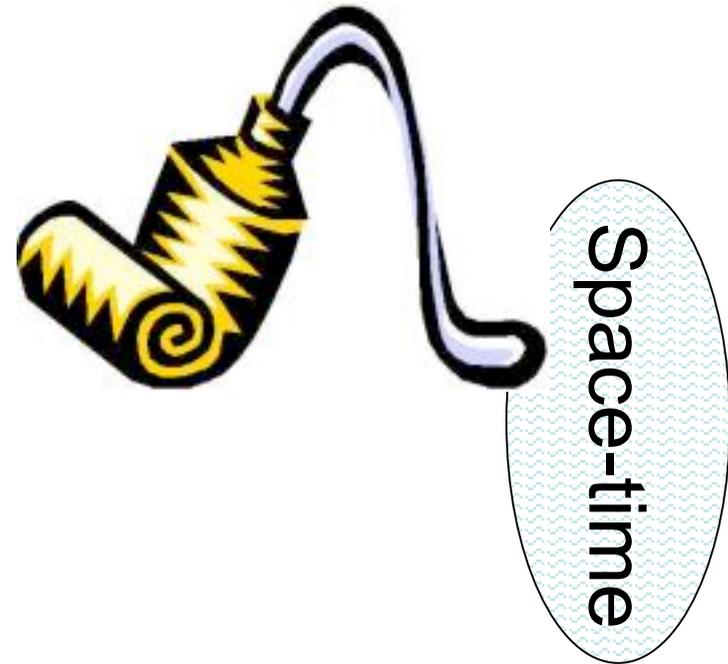
# Space and time are non-trivial!

Space: act of becoming separate

Time: cycles

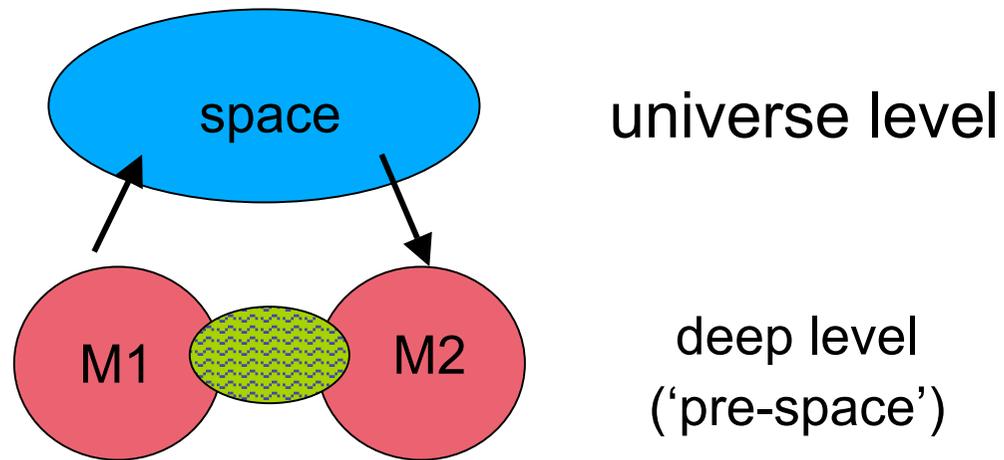
Space and time represent organisation  
(Rosen, after Heidegger)

# Space-time going cheap!



Universes are created, and organised — somehow!  
(cf. flocking of birds, termites' nests)

# ESP



# Creativity

- Can all of creativity (e.g. higher maths, subtle music) be understood biologically?
- Does it instead come from our deeper source?

# Source of music?

- Place where things begin
- Comprehensible 'germs'
- Like a gene, function in a computer program
- Elementary components that can perform tasks and which we can learn to combine

# What are the components of mind?

- Atoms of mind are the units of intelligence, elementary ideas, are 'physical' at this deep level, come from self-organisation.
- Ideas are systems with a specific inner dynamics, manifesting in their ability to organise and to create.

# In conclusion

- We have proposed an extension of science
- Where will this lead?
- Will strange, taboo ideas become a respectable part of science?

Telepathy, 'memory of water', 'cold fusion'?

Scientific theology, intelligent design?

Occult Sciences Tripos? CU Institute of Astrology?

# References (books)

- Stuart Kauffman: the Origins of Order
- Paul Davies: the Goldilocks Enigma
- Steven Rosen: the Self-Evolving Cosmos

# References (web)

- Video lecture: [Can the Physicists' Description of Reality be Considered Complete?](#)
- [Limits to the Universality of Quantum Theory](#)
- [Beyond Quantum Theory: a realist psychobiological interpretation of physical reality](#) (with Michael Conrad and Dipankar Home)
- [String Theory, Universal Mind and the Paranormal](#)
- [What can Music tell us about the Nature of the Mind: a Platonic Model](#) (with Tethys Carpenter)
- “The place where things begin”: [Samantha Parton interview](#) in Triste magazine