

Buddhism and Physics

**Interdependence, from
classical causality to
quantum entanglement**

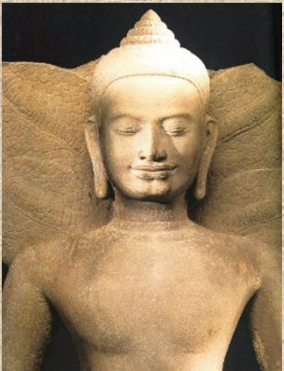
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What are we comparing?

- **Not** two **Views** of the world, **not** two *metaphysical pictures* (Buddhist and scientific)
- **Not** two ways (internal and external, experiential and experimental) of probing into the true *essence of reality*
- **Rather:** Two of the most **radical critiques of metaphysical views and essentialism** that have been proposed in the history of human thought

Suspension of « Views », Suspension of metaphysics (1) Buddhism

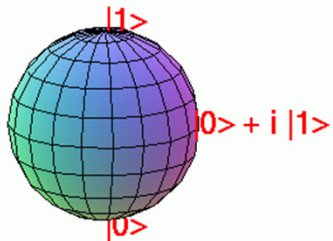


- **The Buddha's Parable of the Arrow:** "If you were shot by a poison arrow, and a doctor was summoned to extract it, what would you do? Would you ask such questions as who shot the arrow, from which tribe did he come, who made the arrow, who made the poison, etc., or would you have the doctor immediately pull out the arrow? »
- **The silences of the Buddha** (about the “avyâkrtavastunî” or undetermined = “Modes of reconstructing the past and speculating about the future”).
- *Reductio ad absurdum* of “views” by Prasangika Madhyamaka.
- *Ultimate truth cannot be captured by a metaphysical picture expressed in words or symbols*

Suspension of « Views », Suspension of metaphysics (2) Quantum Physics



Niels Bohr,
1885-1962



Quantum
Information

- Bohr (1927): Quantum mechanics is a mathematical **symbolism** intended to **predict probabilistically the outcome of experiments** (Under this minimal interpretation, no “paradoxes” are left)
- **Recent developments:**
 - Quantum mechanics as a theory of *the limits of available experimental information* (Quantum Computing)
 - New tests of Bell-like inequalities in A. Zeilinger’s lab (Vienna): put more **pressure on the assumption of “realism”** than on the assumption of “locality”

5 similar steps in the intellectual history of Buddhism and Physics

1. Transition from the paradigm of **substance** to the paradigm of **causality** ;
2. Replacement of **productive causality** by **lawlike successions** ;
3. Transition from causal and lawlike successions to **co-emergence** ;
4. **Criticism of ontological view of co-emergence**, and claim that co-emergence itself is relative to the cognitive act that posits it (“co-emergence co-emerges”) ;
5. **Silent return to the practices of life**, or agnostic return to the practices of experimental science.

Step 1: from substance to causality in early Buddhism



- In early Buddhism: Twelve links of dependent origination, from ignorance to aging and death
- Epistemological consequences:
 - **Every (impermanent) phenomenon arises from causes and conditions.** To explain regularities, it is enough to assume causal connection between instantaneous phenomena.
 - No need of permanent beings (substances or selves). **Causes replace substances.**
- **Causes:** “*Hetu*”, derives from “*Hi*”, = “to throw ahead”, “to hurl”, “to set in motion”

Step 1: from substance to causality in early physics

- The descent of Aristotle
 - **Inherence** of essential predicates to substances
 - “**Substantial form**” : an essential characteristic of substance that persists unaltered through change. Substantial forms are supposed to *explain* the effects of substances: “Glass tends to break because it has the (substantial) form of fragility”.
- René Descartes
 - Substantial forms are fake explanations of phenomena
 - Replace them by **Mechanical explanations** in terms of motion and collisions of bodies



René Descartes
(1596-1650)

Step 2: from productive causes to regular successions

“When this is present, that is present
From the arising of this, that arises
When this is absent, that is absent
On the cessation of this, that ceases”

Samyutta Nikâya



- **Newton** (1643-1727): In physics no metaphysical causes, but mathematical laws of phenomena



- **Hume** (1711-1776): Experience teaches us the **usual association** of phenomena, not their generative causes (if any).

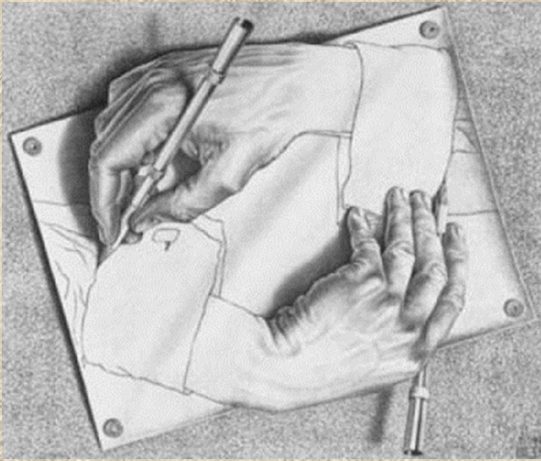
Step 3 (In Buddhism): From regular successions to co-relativity

- “(...) It is just as if there stood two **sheaves of reeds leaning one against the other** (...) If I were to pull towards me one of those sheaves of reeds, the other would fall ; if I were to pull towards me the other, the former would fall”.
Samyutta-Nikâya.
- The property “leaning against” of one sheave of reeds **co-arises** with the similar property of the other sheave of reeds.



Step 3 (In Buddhism)

Co-relativity and its consequences



In Madhyamaka: equivalence of

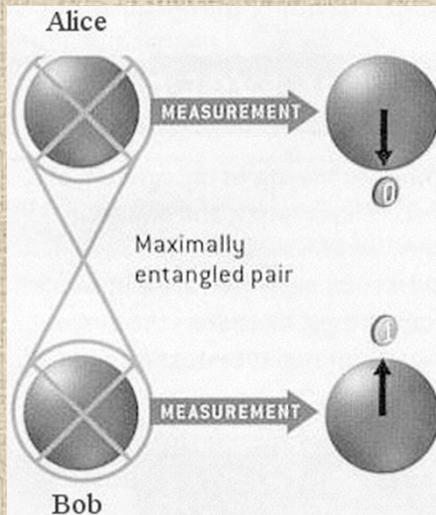
pratītyasamutpāda, or interdependence, with:

- *idaṃpratyayamātra* (“the measure (or extent) of going-with-this”)
- *paratantra* (“woven-of-the-other”)
- *paraparasiddha* (“established by one another”).

No own-being but inter-being?

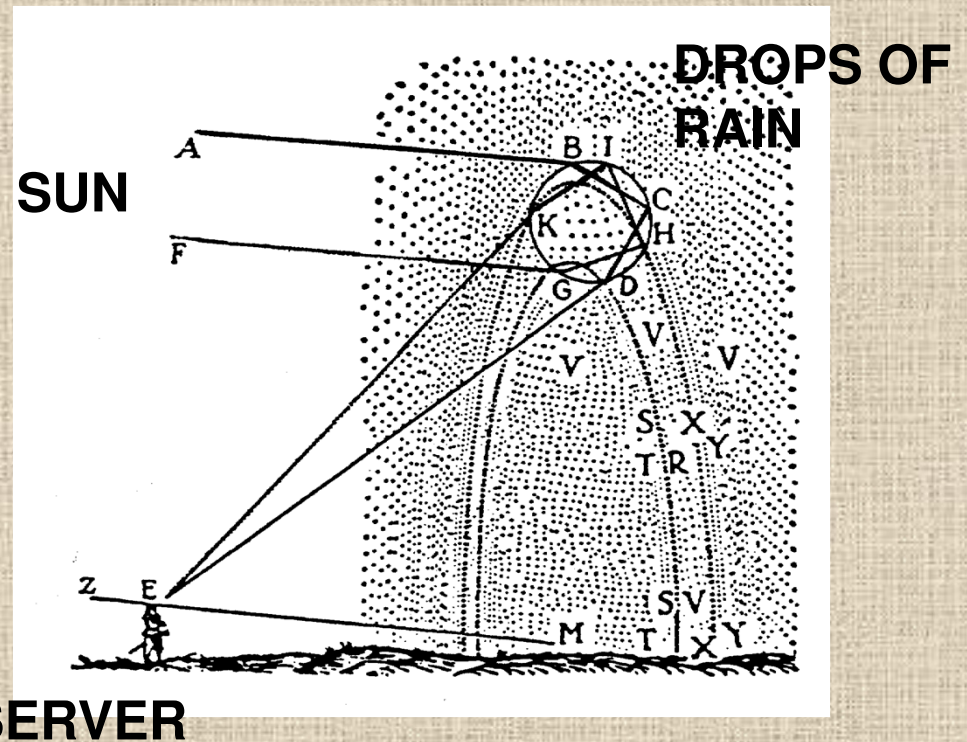
- Criticism of own-being => criticism of productive causality:
- “When neither existents nor non-existents, nor existent non-existents are established, how could one propose a ‘productive cause’” ? Nāgârjuna, MMK, I, 7

Step 3 (In Physics): Entanglement

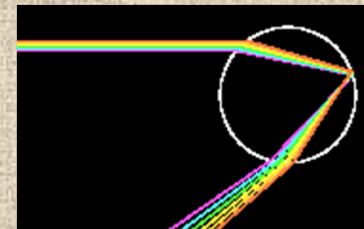


- Co-relativity of **properties** in a two-spin $1/2$ -particles system with an entangled state:
 - The property “z-component of spin” (up or down) has *no existence of its own* in each particle, but only *relative to* the corresponding property in the other particle.
 - **“Correlations have physical reality; that which they correlate does not”**. D. Mermin, 1998
- Co-relativity of **identity**, and then **entities**, in the same system, *if no spatial criterion of individuality is available*
- Quantum entanglement is not underpinned by productive causes (Suarez & Gisin)

**“Particles have the mode of existence of
RAINBOWS” (J-M. Lévy-Leblond, B. d’Espagnat)**



René Descartes, 1637



Step 4: Don't reify co-relativity

- The temptation is to reify again:
- **In Buddhism:** “The ultimate nature of reality *is* emptiness”, “The world *is* a meshwork of dependently arisen phenomena” ?
- **In physics:** “The world *is* an inseparable whole”, “Reality *is* pure structure”, “The relations *are* real, the *relata* are not” ?
- D. Mermin (1998): “correlations have physical reality”, “correlations are fundamental, irreducible and objective”

Step 4: Don't reify co-relativity

- Nâgârjuna:
 - “If there is no essence (*svabhâva*), there is no other-essence (*parabhâva*)”.
 - “There is nothing that is non-empty. How could there be something empty ?”.
- *Interdependance itself is dependently arisen, emptiness itself is empty.*
- A. Cabello (1999):
 - Proof, by Bell-like theorem, that **relational** local element of **realities** yield consequences which are contrary to quantum predictions, just as **intrinsic** local elements of reality!
- *Relational realism fares no better than property realism*

In search of the *common root* of interdependance and quantum entanglement

- Why do these two radical *deconstructions of metaphysical views* turn out to be so similar?
- D. Finkelstein's cogent suggestion: *hyper-sensitivity of both domains of investigation to cognitive probing*.
- When we observe a thought, it disappears. When we observe a micro-state it is “reduced”, “collapsed” or “projected”.
- The search for invariants must either be renounced to, or *deflected at a level where changes can be neglected for all practical purposes*:
 - Level of **conventional truth** in Buddhism and in Hume's empiricism
 - Level of **statistics** in quantum mechanics