

## (One and Many =) Integration in Experience

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1. Sensory data as interpreted by the brain seem invariably to fragmented perception of the universe. We experience distinct objects as separate. When these are many, we can assign a cardinal number to it by making correspondence. We talk of five flowers and five fingers by making such a correspondence. This perception of discreteness and correspondence gives us the concept of cardinal numbers. Note that while the distinction is a fragmentation, while correspondence is an integrative function.
2. The notion of change itself involves two distinct perceptions of any entity at two different times and makes them correspond. Motion is therefore a composite perception. Even our perception of time is in terms of motion (and vice versa); motion requires time. It is the comparison of distinct configurations like the hands of a watch that enable us to recognize and measure time. Instead of two we may have many objects, but their motions are subsumed under one time. The "progression" of time is inevitable = this time may be called "profane time" following Mircea Eliade.
3. What if our perception is not fragmented? Listening to absorbing music, being involved very deeply in solving a problem enticed by the setting sun; these are times when time ceases to be. We are lost to ourselves. Profane time ceases and "sacred time" obtains. Time is movement without fragmentation in such times. The late A. K. Ranramijan had pointed out that the time in myths is also sacred time. Sacred time is when there is movement without fragmentation. The vedantins would point out that the ego (the "doer" or "perceiver") ceases and only the experience is there.
4. In physics we are concerned with motion and concerned with distinct, separated entities. One pair of these may be taken as the clock; and with respect to the time measured on the clock we describe motion. The logical continuation of this is to treat assembles of particles, and thus both rigid and deformable bodies. Classical mechanics was example par excellence of fragmented perceptions as a model for the world around us. Even in such an extreme case there is an integrative principle: instead of describing actual trajectories we shift attention to the "laws of motion". The initial conditions may vary, but the laws are general. Behind every observed motion there is an abstract law of conditioned origination.
5. When classical mechanics was extended to include fluid motion, the separateness is no longer in the forefront as the correlated motion (at least in nonturbulent motion). Among such motions are waves; waves are extended yet they move. Huyghen's principle illustrates the global aspect of a wave: every point in a "wave-front" contributes to the wave amplitude in the subsequent wavefronts. The wave is an indivisible entity; if we try to break it into elementary mechanical motion, the wave ceases to be.  
  
Because of the holistic nature of wave propagation, there could be correlatiaons of distinct sections of the wavefront. We have the van Ciffert-Zernike theorem on the buildup of mutual coherence by extended propagation. There are also the phenomena of holography; a simple instance of it is image formation by a lens (or lens system). If we break off a portion of the lens, the image is not destroyed in any part, but only the overall quality of the image suffers.
6. The seesawing between discrete (localized) and continuous (coherent, delocalized) functioning is evident not only in physics but even in the study of brain functioning. Penfrel's experiments associated specific locations with specific functions but Pribram notes that ablation of regions of

the cortex does not destroy functions but only affects the quality of functioning. Pribram therefore has the holographic model of brain function.

[Written in the left margin of this draft: Statistics Bose and Fermi 3+1 formalism. Thermodynamics of vacuum's oscillators]

7. What happens in physics and neurophysiology also happens in our use of the language. Phrases and even words have meaning, but the significance may be contextual. [Husband to wife: If I am going down with my myslip (?), my last thought would be you, versus: If I am..., my last thought...] ["Proceed on leave"] Judean syllogism with five limbs vs. Aristotelian 3-limb syllogism.

8. But the mystery of how once becomes two and two become one gets into a new level of significance in quantum mechanics. In classical physics of a two-part system, the kinematic (one-time) description is a direct product. But in quantum theory this is no longer true. The first systematic statement of such a holistic nature was S. N. Bose's theory of strictly identical particles (photons) which now bears his name. He thus distilled the contents of Planck's oscillators and Einstein's quanta into the Bose statistics. This was even before quantum mechanics was formulated.

In quantum mechanics such indivisibility (?) was first clearly stated by Schrödinger and he called it quantum entanglement.

9. Entanglement implies that a pure state of a composite system when analyzed in terms of the states of the individual components exhibits a non-dynamic correlation. Such a system was used in the EPR discussion of the question of completeness of quantum theory. A simple model due to Bohm considers discrete spin labels to characterize the states of the subsystem. If for example the initial configuration was a spin 0 combination of the two spin 1/2 objects, the composite state would be anti-symmetric. The individual spins would average out to zero, but there would be perfect anti-correlation between the two spins. As EPR themselves suggested, this may mean that the composite system cannot be "localized" in terms of the two spins. This is an entangled state. The two spins have a correlation which looks like instant communication between widely separated objects.

In recent times such entanglements are used in quantum-computing protocols, in particular in quantum teleportation (of quantum states).

10. We ourselves are composite systems not only physico-chemically or anatomically but also in our functioning. Often we are "of two minds"; if this fragmentation is not subject to a higher level of integration, we become schizophrenics and multiple personalities. We maintain a delicate balancing act. "I am ok if you are ok."

But from a more fundamental viewpoint all this is in the waking state. But despite the richness of the waking awareness we can be dreaming, or be in deep sleep. What is the integration of these? When we wake up, who wakes up? Not the dreamer. Then where did the dreamer go?

The integration of these is the subject of Mandukya upanishad.

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