

## Ensemble Averages

In statistical mechanics, the ensemble average is defined as the average of a quantity that is a function of the individual states of the system. A property, such as temperature, is calculated by averaging over the instantaneous properties of the fluctuating system. Each replica can be microscopically different, but the ensemble average is a stable characterization of the system. The Ergodic Hypothesis postulates that we can make the implicit assumption that an ensemble average (which relates to many replicas of the system) is the same as an average over time of one replica (the system we are studying).

In his series of works “Illuminated Averages”, Jim Cambell has produced the aesthetic equivalent of ‘ensemble averages’. His work “Dynamism of an Automobile”, for instance, displays an image of ‘automobileness’, or Welle’s Breakfast Table Scene in “Citizen Kane”. However, unlike statistical mechanics, the image is an ensemble average not only of the car or breakfast table, but also of the viewer’s visual perception. The physicist can resolve the system at very small time steps, limited only by the Heisenberg Uncertainty principle. But the artist has the freedom to time shift and average in other ways.

The way that the brain constructs a perception of time is a complicated affair. If the brain needs to get a reliable sense of a sequence of events, it has to wait until the slowest brain signal or process is completed, on the scale of tenths of seconds. As pointed out by David Eagleman “This window of delay means that awareness is post-dictive, incorporating data from a window of time after an event and delivering a retrospective interpretation of what happened”.(1) On the long time scales, the brain through the interplay of short and long term memory, preserves key invariants but discards many of the varying aspects of a scene. When presented a very slowly changing scene, a viewer can be made to ignore very substantial changes in the scene as long as overall structure of the scene is preserved. Are Campbell’s images slowly changing? Or do they successfully fix meaningful “ensemble averages”. His work “Wuthering Heights Random House 1945” inverts the argument. Only the microstates, the individual pages of the text, have any stable meaning. The ensemble average destroys the message.

Human beings function, live and perceive, bracketed by scales of time between the shortest perceptible events on the scale of tenths of seconds to the length of human memory over a lifetime. Artefacts are the only way we can access time outside of this range. Of course the phenomenal universe functions over the whole range of time from the femtoseconds of nano-science to the 15 billion duration of the universe. Ramon Guardans (2) has written at length how the accident of human time scales has biased our views of what is going on in the world, and how the work of artists helps us access the world outside the window of time we can access directly. Jim Cambell’s Illuminated Averages are not what they seem to be.

1. David Eagleman, The Edge, "Brain Time" 6.24.09:  
[http://www.edge.org/3rd\\_culture/eagleman09/eagleman09\\_index.html](http://www.edge.org/3rd_culture/eagleman09/eagleman09_index.html)
2. Guardans, R.; Czegledy, N. (2009). Oriented Flows: The Molecular Biology and Political Economy of the Stew, Leonardo, MIT press, vol. 42, Num. 2, 145-150.