# The A Priori Object

## *Summary*

A set of outward gradients is expected of all objects even before they are observed. These include the Certainty, Density, Velocity, and other physical gradients. Organisms are objects and so these gradients constrain their evolution. This opens a path to augmenting Charles Darwin's theory of biological evolution in a manner allowing testable predictions.

### *The Certainty Gradient*

There are many stories about life's unfolding. Some may be called scientific and others revelation, but all presume the existence of distinguishable entities — of objects, for example. All objects (things) share an important property: A distinguishable object cannot exist with uniform certainty everywhere. Otherwise the object, existing uniformly everywhere, would be indistinguishable from anything else. An object exists with less certainty in all directions away from where it is, and it exists most certainly when and where it is observed. Thus even though it is difficult to be absolutely certain of anything it is possible to report an outwardly declining certainty of existence in objects. There is in objects a **Certainty or Probability Gradient: Proceeding outward through an object the certainty of its existence eventually declines and the certainty of its nonexistence rises.** In other words, **past some point the *a priori* probability of an object's continued existence declines outward.** An everyday object may be substantially contained in a sufficiently large sphere. The Certainty Gradient is the central gradient of the present *A-Priori-Object Theory.*

### *Implications for Physics*

The *a priori* properties of objects yield a number of expectations about the physical universe. First, because the certainty of an object's existence is always greatest in the present, it follows that **the past must always appear to favor the creation of objects, and the future their destruction.** Aging and impermanence are inevitable. However, the Certainty Gradient puts no limit on the *amount* of time an object may sustain itself through mechanisms of repair and copying.

A second expectation is of *generalized inertia:* The most probable place to find part of an object is near another part — in both space and time, with nearness determined by the object's scale. Thus a mountain is likely to persist as a mountain, whereas a lightning bolt that has persisted for only moments is as yet expected to persist for only moments. If there were no generalized inertia mountains often would change suddenly in major ways. Although observations can alter expectations, inertia is expected *a priori* — prior to observation — in any of an object's characteristics. Novel behaviors are possible in spite of inertia, of course: They are simply less probable. Generalized inertia appears later in the form of *adaptive inertia*.

The Certainty Gradient and others described below represent *a priori* expectation for all objects. In other words, the gradients reflect *actual average behavior* of objects even in the absence of detailed observation, or of any observation at all.

***Correlated Physical Gradients***

Various basic physical gradients correlate with the Certainty Gradient. These include the Density, Velocity and Local Correlate Gradients. I call this alignment of gradients, and their effects, *Gradient Correlation*.

Where an object does not exist it cannot be dense. Thus there is in objects a radial **Density Gradient: Past some point an object's density declines outward.** A particular object's density *may* rise outward — locally — but it *must* decline outward eventually. This is so at many scales surrounding the scale of everyday objects. It is also so whether the density is of parts, events, features or stuff: An object cannot have parts, features or events where it does not exist. Even in crystals surface parts lack outer neighbors and so exist in relative sparseness. The Density Gradient is the first of many that correlate with the Certainty Gradient, ultimately limiting evolutionary possibilities and giving Gradient Correlation its name.

The correlated gradients apply for objects of all kinds, whether they are connected objects or not. In collective objects like populations the Density Gradient appears as an expected outward decline in population density. It is worth stressing that the outward decline in population density is expected *a priori*, that is, prior to any observation of the population: Surface sparseness is simply a property of objects.

It takes room to move about and so greater motion is associated with the larger dimensions of an object. Thus there is expected in objects a **Velocity Gradient: The velocity of moving parts is expected to rise outward in an object.** The Velocity Gradient can be seen in other ways. For example, central parts of an object *may* move, but surface parts passing the threshold of correlation with the object *must* move. If an object is most identified with its parts that remain dense and persistent in many frames of reference, then those parts must move relatively little with respect to each other as long as the object exists, and the Density Gradient provides that dense parts tend to be more central than sparse parts. In a simple sense the Velocity Gradient extends even beyond the bounds of an object because motion relative to a defining central object is motion relative to what is effectively stationary. The Velocity Gradient is a very interesting gradient, and can be seen in many other ways.

Where an object does not exist there can be no local correlates of its existence because there is nothing there to correlate *to*. Thus there is in objects a **Local Correlate or Causal Gradient: There is expected *a priori* an outward decline in local correlates or causes of an object's existence.** Because the probability of existence declines outward, all causes must appear on average to favor the destruction of outward-moving parts, and the sustenance of inward-moving parts.

Where there is great certainty there is little information to be gained through further observation. The Certainty Gradient ranges from relative certainty of existence to relative certainty of non-existence. Uncertainty is at a maximum midway. Thus there is in objects an **Information Belt: Object-correlated information is expected to rise to a maximum midway down an object's Certainty Gradient, and to decline from there outward.** Where the probability of existence is high parts tend to be stable and where low, short-lived and so newer on the whole. Thus in objects an **Information Stability Gradient proceeds outward from stable to novel information.**

Atoms are internally sparse. Thus density declines not only as one moves outward from an object to larger scales, but also to some extent as one probes an object at finer scales. This suggests that some or all of the other gradients may apply microscopically as well. The behavior of the gradients at small scales merits close study.