Redundancy, repeatability and …life

Let us consider a case: an element is deformed by environment impact. Destructive deformation of the element could cause the loss of its properties.

Let us now consider a situation when the element has internal structural resources. Redundancy of the element structure would enable the element to return to its previous condition and continue. The external impact does not change the element.

A second impact might occur with exactly the same outcome. (The first is unrepeatable.)

Further, let us consider a situation where the element has elemental properties of being alive, such as amoeba.

If it has sufficient resources available to use and waste to protect itself from the destructive energy of the environment impact, it will recover and continue existence - the amoeba exhibits redundancy.

If the external event is repeated, the amoeba can self-tune and be able to react to the impact faster, tolerate the event for longer, or suffer less damage as a consequence. External event might be periodic heat from sun, cold, water, warm after fire or gas etc.

Having sufficient *internal* redundancy capacity to tolerate *repeated external* events makes recovery possible in terms of time and the use of that redundancy. A sequence of impacts and element recovery is presented by Fig. 1.

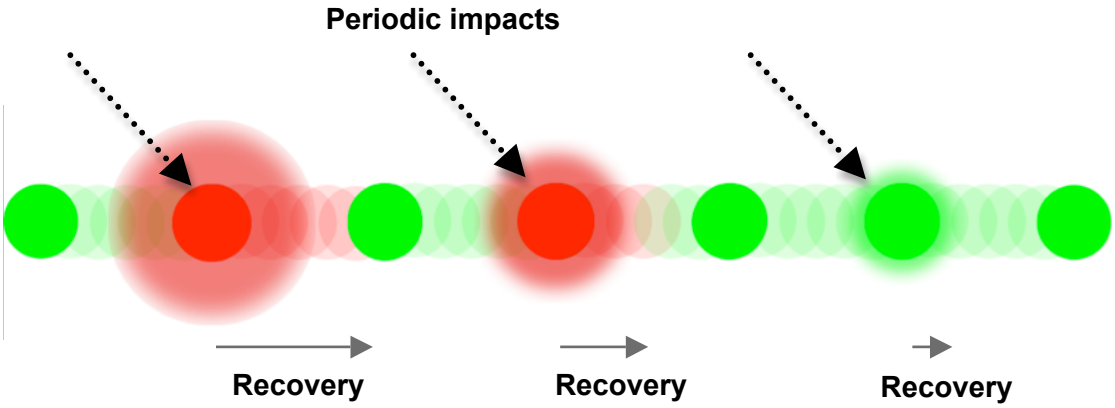

Fig 1 Periodic impacts, element time to recover

Circles show state of the element over time, where green indicates a an element in a good, or acceptable steady state and red indicates an element under recovery. The diagram indicates an element that adapts to the periodic external stimulus, can decrease the time for its recovery.

The monotonous repetition of a stainless steel ball bouncing on the stainless steel surface in vacuum presents that a recovery from impact is possible using internal structural molecular redundancy, and … this ball cannot be called alive.

Where the element may be considered alive, such as in the case of the amoeba, using redundancy for recovery can reduce the time in takes to react to the same event, provided the event is periodic. Thus life might be defined as the following:

An element is called alive, if in repeatable conditions it is able to recover progressively, using internal active redundancy.

The adaptability of the element has its limits. An element will approach the limit of its performance in adaptability as indicated in see Fig 2.

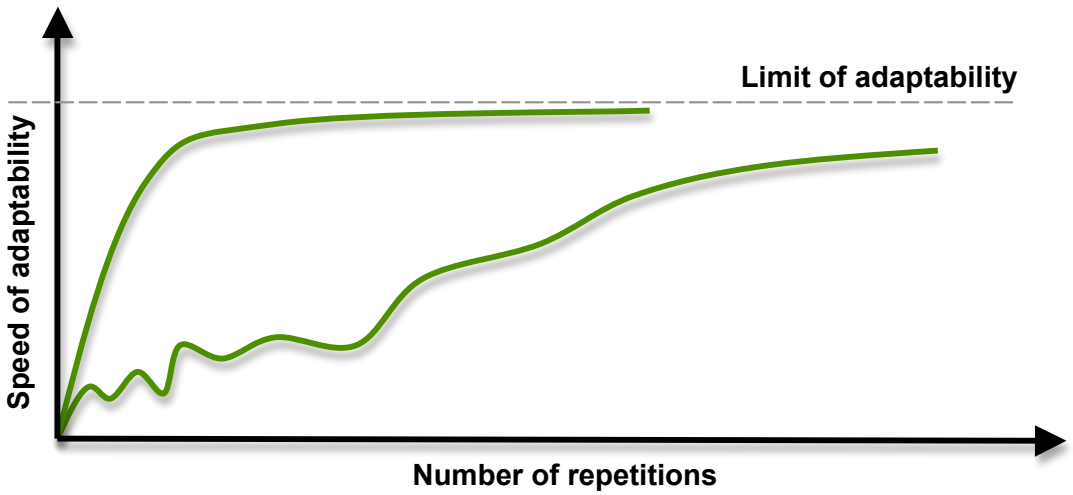

Fig 2: The adaptability of a live element to a repeated external stimulus has its own limits

What is interesting is that this simple diagram shows the role of the ability to recover. While wildlife evolution is similar to the curve presented for the selected type of species, “smart” species evolution should be smoother and faster in reaching the same or higher limit (short curve).

Thus education role and efficiency is possible to measure in comparison with wildlife.

What is the point to write this? One of the answers is simple but painful.

Without external repeatability of events life evolution is hardly possible because even having internal redundancy is not enough: evolution depends on the repetition of the same external events – no repetition, no evolution.

It means, for example, that a NASA probe searching for life on asteroids ($8bn?) is not really good idea. Asteroid does not have repeatability of events during its flight. Even if life forms were there initially their redundancy was spent for nothing – external sporadic impacts of particles.