NOTES ON INDISPENSABLE AGENTS

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According to the hypothesis under consideration here, I am suggesting that cognitive human agents who are well-integrated within a digital ecosystem, and who are indispensable to the overall adaptability and remodelling of such environment, will be retained for longer within that environment. These humans may be able to survive longer because their functional usefulness to the network is more important and less thermodynamically costly than their elimination. Here I need to clarify the notion of ‘indispensability’ or ‘usefulness’ of agents within any system. The term ‘usefulness’ is meant in the wider sense and refers to the value of an agent in facilitating the adaptation and evolution of the entire network. It has no ethical or moral connotations. A ‘useful’ agent improves the quality of function of the system, and helps it regulate its control tasks. It makes the system more effective at coping quickly with several challenges. It improves performance and productivity of the system, and helps it accomplish work which would not have been possible without that agent.

Drawing inspiration from the digital realm, we see that any computer nodes (agents) that are ‘useful’, are retained for longer within the network system. This is mirrored in neurobiology, where neurons which are well-integrated and well-functioning last longer than other cells. This effect is also encountered in social networks where links which are associated with positivism (such as endorsement and trust, ‘like’, approve etc.) are characterized by an increased tendency to connect with similar ones, whereas links carrying negative connotations (such as disapproval, rejection, dislike, refuse), are characterized by a decreased propensity to connect. If this general principle is applied on humans, it could suggest that each one of us has an inherent value to the overall evolution and adaptability of our ecosystem. For a significant section of humanity, the current ecosystem is now becoming considerably different compared to previous ones. It is no longer a community of interacting species, but a combination of just two principal elements: humans and computers (artificial intelligence/internet). Digitally ‘hyperconnected’ humans (i.e. [Noemes](http://www.indispensablesoma.info/#!the-noeme/yp737)) help maintain the resilience and antifragility of this ecosystem by absorbing disturbances and inhibiting propagation of damaging stress through the entire system. The act as creative elements which facilitate self-organisation.

We are now in a position to formalise this general principle; The Law of Requisite Usefulness, which states that *the duration of retention of an agent within a complex adaptive system is proportional to the contribution of that agent to the overall adaptability of the system*. Systems tend to increase both the fitness and the life-span of their individual components if these components provide useful functional feedback to the system. For the purposes of this hypothesis, the Law of Requisite Usefulness is represented by:

*LR(t)* = *U*+*C*  x *CC-Mr*

Where *LR* (*t*) = Length of retention of an agent within a system (in humans this represents how long repair resources are being diverted to the soma for)

*U* = Usefulness value of the agent, given by: $U=\frac{b-h}{t}$, where

*b* = the probability of causing benefits to the system

*h* = the probability of causing harm to the system

*t* = time elapsed since birth

*C* = a buffering constant

*CC =* The probability that the agent will capture the benefits of their actions. Being unable to capture the consequences (in this case, benefits) of an action, an agent could still perish even though it may be useful to the system. For example, somatic cells currently invest resources in co-operation with the germline but fail to capture these benefits, thus perish and are outcompeted.

*Mr =* Maintenance resources, needed for basic repair and maintenance of the agent

So, in more detail: $LR\left(t\right)=\frac{b-h}{t}+C x Cc-Mr$

The cybernetic concept of ‘Selective Reinforcement’ provides additional theoretical support for the above submission. The concept holds that an appropriate agent (or action) is selected and retained if its content of information is of a sufficient and appropriate magnitude. For instance, research has shown that an online avatar can ‘live longer’ (through selective user retention) within a virtual society, if this avatar is integrated and well-connected within that specific society. User disengagement and short retention of users has been correlated with low quality content. The ability to earn online reputation and intrinsic motivation for participating content are also factors that affect retention. This is a universal theme also encountered in the retention (survival) of neurons in the brain. The concept can be extrapolated to humans who act as autonomous creative agents within a technological society.

These creative, cognitively-biased humans (noemes), act within a global technological society and help to invent novel solutions for continually emerging problems, integrate the network in response to unexpected environmental circumstances, and determine the system’s potential for quick adaptation and evolution. Such creative humans improve the flexibility of the system and provide many degrees of freedom, enabling the system to store more useful information and thus enhance functionality, adaptation and evolvability (i.e. longer survival).

Attempts have already been made to elaborate on some possible biological mechanisms which may potentially underpin this increased physical longevity. One such mechanism involves information-sharing processes which force a re-allocation of resources from germline cells to somatic cells. This will be discussed in detail below. In addition, it has been shown that appropriate external stimulation may cause epigenetic re-programming, where an adult cell (old) can revert to a pluripotent (young) stem cell, and even that this epigenetic information may be heritable. This provides additional support in principle to the arguments discussed here, showing that epigenetic influence (caused by continual exposure to cognitively challenging information) may result in improved somatic repair and thus survival.

Extracted from: The Indispensable Soma Hypothesis <https://figshare.com/articles/New_draft_item_The_Indispensable_Soma_Hypothesis/3079732>