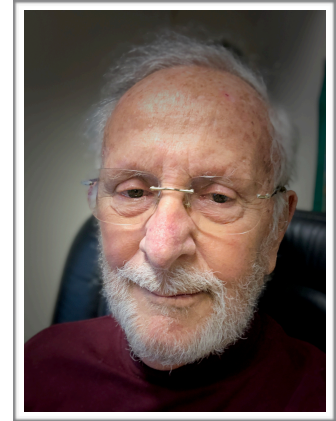Derek Hitchins, Professor (Retd.)

Systems Scientist

16 September 2021
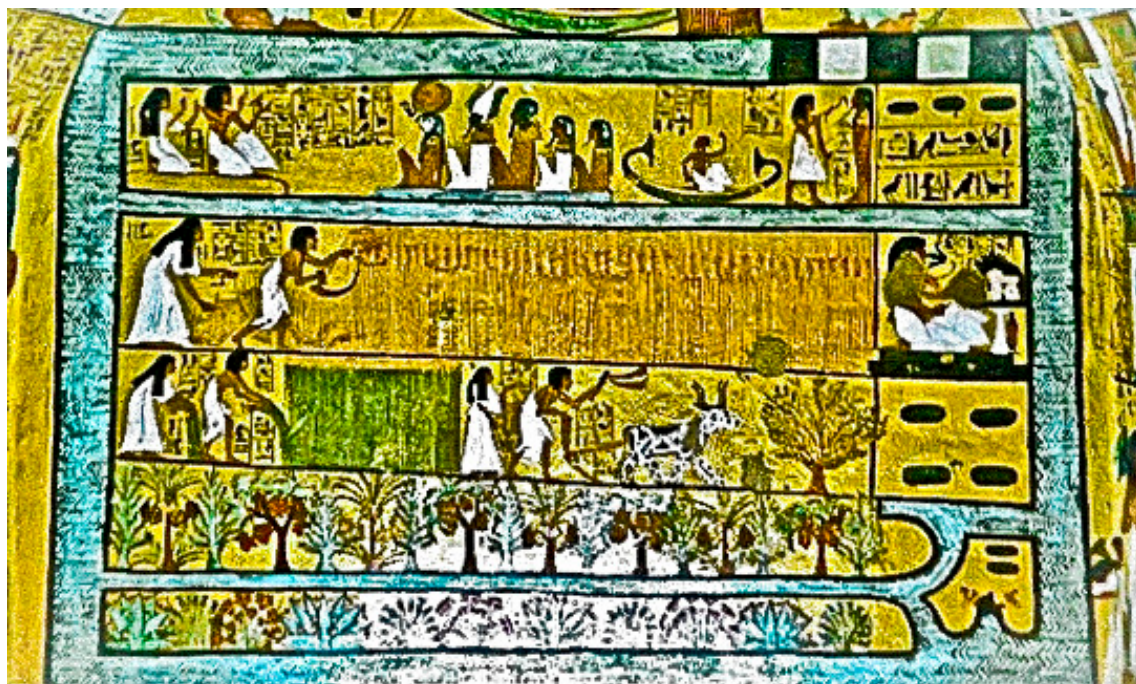
Beliefs, Behaviors, &Decisions
…rational & rationale…

I have been told that it's inappropriate to use logic and rationale to address issues and situations where human emotions are involved… Is that right? Because, if it is, we are left with few options…illogical and irrational surely won't help. So, what can we do…?

The ancient Egyptians may have got us started on Beliefs, especially "life-after-death" beliefs. You might say they were obsessed with it…what with ginormous Giza Pyramids from the Old Kingdom, designed to preserve the King's 'soul' for eternity. Moving forward to the New Kingdom, you would come across Deir el Medina, a workmen's village known-back in the day-as *set ma'at,* or 'the Place of Truth.' Only, these were very special workers. They were the artisans and artists who worked on the tombs of the pharaohs in the nearby Valley of the Kings. The workers and their families spent their lives in this barren place…which turns out to be relevant.

One of the artisans was called Sennedjem, a foreman and fine artist. In his spare time he created a tomb for him and his wife, Iy-neferti, at Deir el-Medina. And miraculously, that tomb and its contents have survived to this day, including a mural that he painted, describing the 'heaven' he believed he and Iy-neferti would share for eternity.

You can see them both in the graphic on their multi-island paradise, restored to the full youthful vigor of their earlier days, reaping the corn, ploughing with the aid of an ox, and with trees and bushes laden with fruits and dates, surrounded by water. The scene is made all the more poignant when you realize that this was the opposite of their adult life in *set ma'at, w*hich was utterly barren and without any natural water. I like to think that they made it to their idyllic heaven…[https://egypt.hitchins.net/the-three-kingdoms/the-tomb-of-sennedjem.html]

The figure below shows a causal loop model (CLM) of Belief Systems "in operation;" the upper loop refers to personal beliefs, the lower part refers to the rôle of those beliefs in society, and serves as a group attractor, i.e. groups, organizations, gangs, etc., will 'form around the belief:'

- First, the upper loop. A belief system, or paradigm, provides the believer with a straightforward World Model, or *Weltanschauung*. Individual beliefs need have no basis in truth, provided they offer the believer an explanation or interpretation of everyday events and situations. So, 'don't walk under a ladder–it's unlucky!' Or, 'fossil fuel burning causes climate change,' which encapsulates in a trite phrase the exceedingly complex and uncertain causes of climate change, and how to fix it. The simple idea that it is potentially dangerous to walk under a ladder, or that reducing fossil fuel burning will 'save our planet,' reduces the believer's psychological uncertainty and reinforces his/her belief.

### Belief System CLM: Personal & Social

- The lower part of the figure shows how belief systems, such as faiths, regimental loyalties, nationalism, etc., generate icons of the belief, together with rôle models of 'good' and 'bad' behavior (as dictated arbitrarily by the faith), along with corresponding reward and punishment concepts, combine to encourage social cohesion, giving rise to power structures that reinforce the icon. The power structures generally also seek to indoctrinate, or educate, others in the belief system, so reinforcing and expanding it directly
  - Examples of this lower half abound, with symbols, badges, and/or clothing forming icons, concepts of heaven and hell, with eternal life for the "good" and eternal damnation for the "bad."
- While these notions are often associated with religions, they also apply (e.g.) to street gangs, who tag-mark "their" territory, require would-be members to kill opposing gang members as initiation, kill deserters, etc.
- Should the narrative associated with a particular Belief System assure a young male believer that his martyrdom will result in his immediate ascent to heaven where some 77 compliant virgins await his pleasure, he may be less reluctant to blow himself up…
  - Indoctrination with ideological narratives can give rise to behaviors so intense as to appear incomprehensible to those 'not of the belief,' yet simple and apparent to the believer…

Dissonance & Rejection…

The Belief System CLM can be extended, as shown above, to outline what may happen when someone new attempts to join a group. Either of two situations may arise:

1. The 'newbie's' belief system concepts, icons, etc., resonate with those of the group, they are seen as 'fitting in,' accepted, and they join:

OR

2. There is *dissonance*: the would-be newbie's belief system, concepts, icons, etc., jar with those of the group and there is a mutual rejection–the group rejects the newbie, who similarly rejects the group, leaving the newbie isolated and uncertain, searching for somewhere else to 'fit-in.

The Substitute Group…
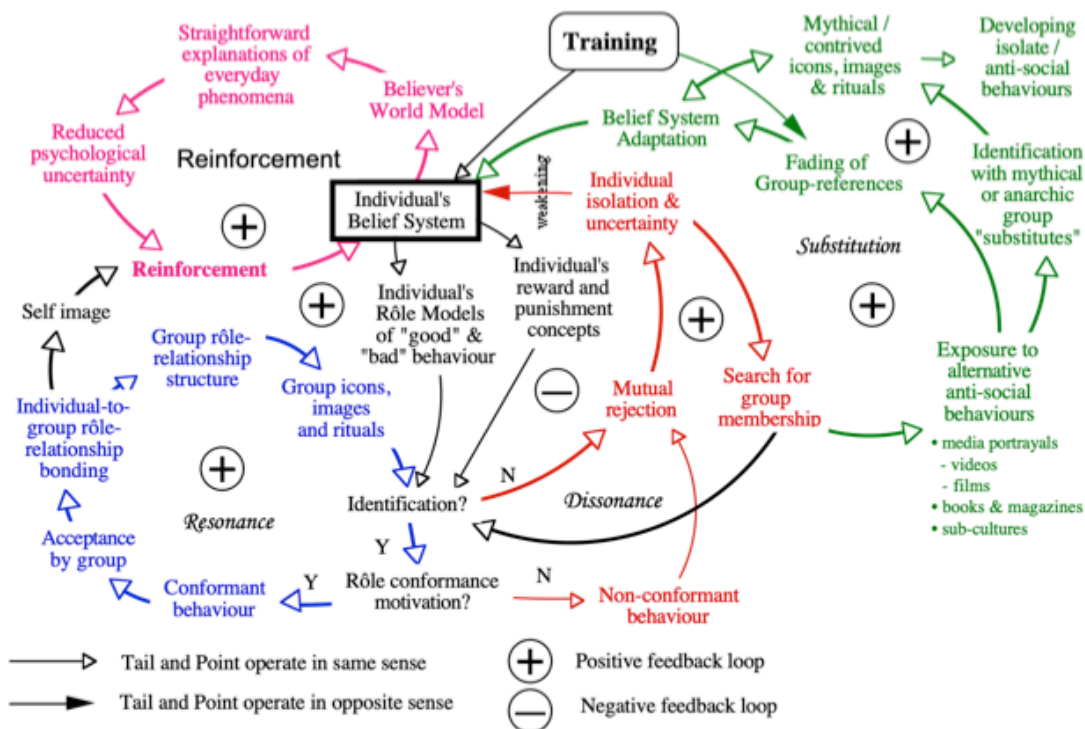
It seems that in some cases, as shown above, where an individual repeatedly fails to 'fit-in,' that he/she may feel alienated, while the 'need to belong' may remain strong, so that the individual creates a *substitute* group, perhaps a mythical group with extreme views, in which the 'loner' feels him/herself either to be the leader/messiah, or to be 'guided/commanded' by an imaginary leader. He may contemplate serious anti-social behaviors to avenge the perceived wrongs done to him as an individual, or to the substitute group, by society.

As the figure shows, this process seems to be associated with an altered belief system for the individual, so that s/he now has different notions of 'good' and 'bad' behavior, different icons, images and rituals…The individual may come the believe that s/he alone understands 'the situation,' that s/he alone 'has got things straight.' Indeed, it may be that the individual has conceived a narrative version of events, situations, plans, avenge/revenge targets, and even a final goal by which all would resolved.

N.B. The two figures above, both causal loop models, purport to show cause and effect. They do not, however, and cannot, explain what is actually happening in the mind of the individual, who may well consider him/herself to be rational. This could, of course,

present challenges to many legal system, where successful prosecution may need to show that the accused was in a state of mind, *mens rea,* to know s/he was doing wrong, to be culpable.

The study of human behavior has occupied many great minds, including those of both Sigmund Freud and Carl Gustav Jung. There are conflicting views about the relative effects of "nature versus nurture," or how much of our behavior is inherited and how much is learned from infancy. It seems likely that both inheritance and our early environment influence our subsequent behavior.

An alternative view of behavior is as a response to a stimulus, and the notion of stimulus-response pairing has formed the basis of clinical studies of behavior, including Pavlov's famous research with dogs (Pavlov, 1928). Dogs, having been previously been conditioned to associate the ringing of a bell with the arrival of food (which caused them to salivate), were subsequently observed to salivate in response to the ringing of the bell only. Could such classical conditioning apply to humans?

The figure below presents that part of Hitchins' Viable Systems Model concerned with human behavior, and it incorporates both of these viewpoints, together with other aspects of behavior, chiefly those attributable to Carl Jung:

"My thesis then, is as follows: in addition to our immediate consciousness, which is of a thoroughly personal nature and which we believe to be the only empirical psyche (even if we tack on the personal unconscious as an appendix), there exists a second psychic system of a collective, universal, and impersonal nature which is identical in all individuals. This collective unconscious does not develop individually but is inherited. It consists of pre-existent forms, the archetypes, which can only become conscious secondarily and which give definite form to certain psychic contents."

Jung, 1960

Nature is shown in the grey panel at the top-centre of the figure as having evolved, as part of our simian heritage. The arrow coming from top right also shows aspects of human nature, largely according to Jung, including his "collective unconscious," distinct from personal consciousness.

Also in the figure we can see another grey pane marked Nurture, which indicates the various sets and sources of information, real and supposed, acquired through life. Tacit knowledge is the low level knowledge we accumulate from birth, about the world about us: grass is green, things fall down, water is wet, flames are hot, mother is cuddly, sweet is nice, bitter is nasty, etc., etc. We each hold a vast amount of tacit knowledge, which we use to make sense of the everyday world. World models, *Weltanschauungen*, are individuals' views of the world and of how things work, based on our experiences, education, and culture. Should we see a helicopter hovering upside down, the vision should confound both our tacit knowledge and world models.

Hitchins' Viable Systems Model (VSM): *Behavior Management*
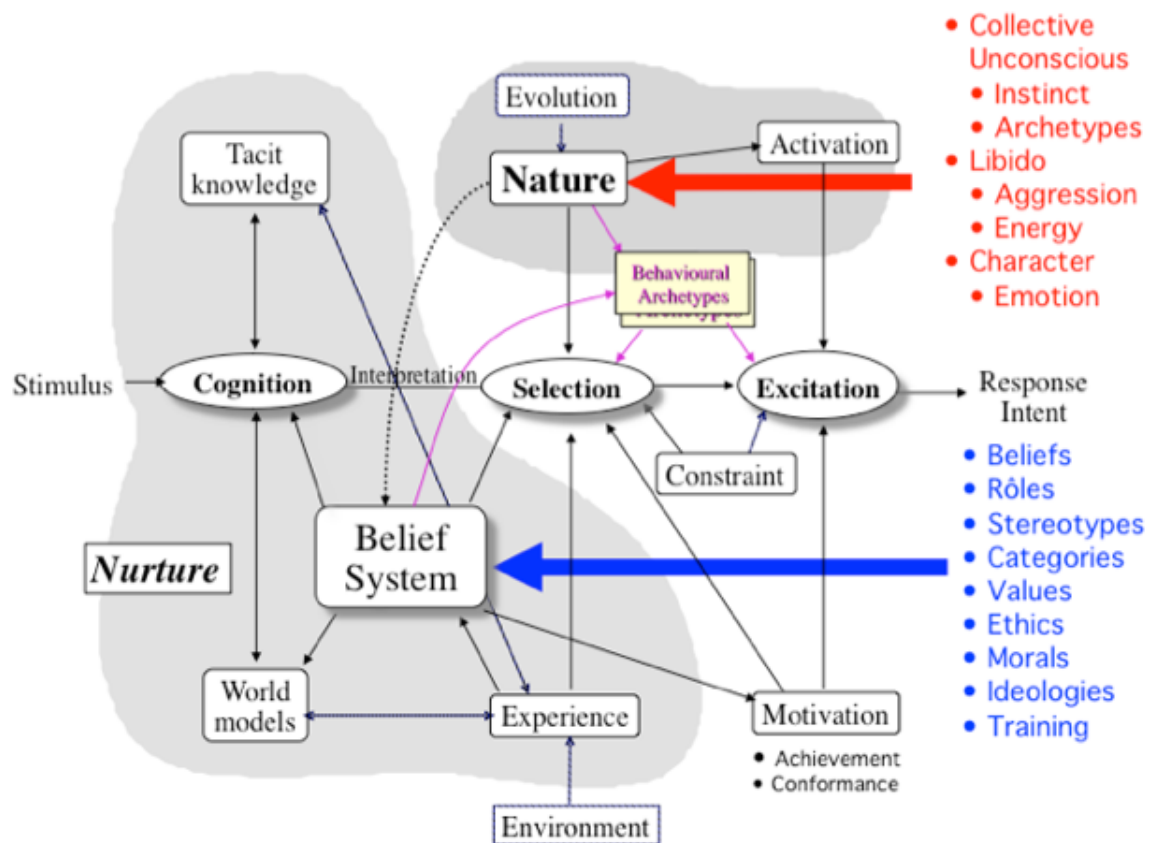
Stimulus-Response Paradigm
plus
Nature Vs. Nurture Paradigm.

A stimulus entering at the left of the Behavior Management Model will be interpreted in the light of a person's tacit knowledge, world models and Belief System, that is, what the person expects and believes. The interpretation of the stimulus will be passed to (behavior) Selection, where it may result in Nature's 'knee-jerk' reaction, which may–or may not–be immediately overridden by more considered judgement based on Experience and Belief. Nature's knee jerk, or *instinctive response,* is the fast reaction that may save us from individual catastrophe; Nurture's *considered response,* OTOH, may save us from doing something really stupid!

The Behavior Management model shows some constituent parts of Belief Systems, including beliefs, of course; things in which we believe, but for which we may have neither proof, nor evidence. Belief Systems also incorporate categories and stereotypes, allowing us to judge instantly if someone is friend or foe, safe or dangerous, good or evil, right of wrong, sensible or stupid, admirable or disreputable, one of us, or one of "them." Such instantaneous judgements have evolved to form a necessary defense; our instantaneous judgment may be wrong, but on the other hand, it may save our lives. An individual's belief system may include an ideology, perhaps with associated narratives, a system of social beliefs, or myths, that guide that individual's social movement, party, institution, etc.

Belief System also includes Training, which can seemingly override many other aspects of belief, so that – for example – the threatened soldier will resist the temptation to run away, but will instead work with his fellow soldiers to resist attacks, or to prosecute a counterattack.

We have seen a model of behavior management, part of Hitchins' VSM. The implication of the model is that the system in question may have either been a human, or perhaps had a human part: a driven vehicle, or remotely-piloted plane, for instance, could be such a system. Another, related model must address Mission Management, the continuing pursuit of some mission or goal. And the question arises: how does Behavior affect Mission Management, the purposeful pursuit of some mission. In more general terms, we might ask: is our ability as humans to formulate purpose, to establish a purposeful mission, and to achieve the goal of that purposeful mission, affected by our behavior? Further, does our behavior improve our prospects of achieving our purpose, and – if so – how? Or, can and does our behavior as humans prejudice our prospect of achieving our goal.

The answers, of course, are context dependent, and we are dealing here with abstract models that are context independent. However, since the ability to formulate some high-level purpose and to pursue that purpose to achieve some goal may be uniquely human, the questions are intriguing.

Impact of Behavior on Mission Management
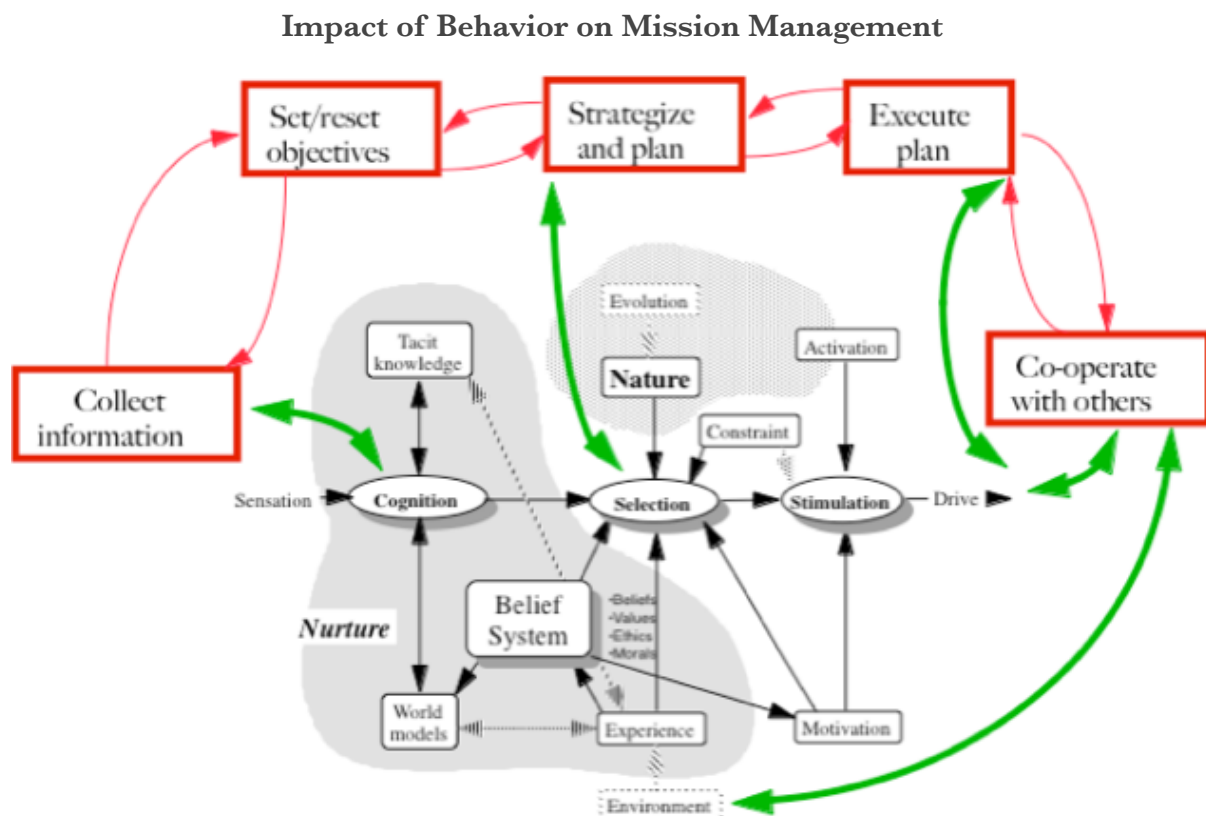
In the figure, the Behavior Management Model is shown surrounded by a minimalist model of Mission Management (see later for full model), shown in red. The viable system is presumed to be collecting information, at left, through its sensors and any intelligence sources. It uses this information to update "situation awareness," and so to set, or reset,

objectives according to progress, perceived threats, received damage, internal state, etc. It then strategizes how best to achieve the (revised) objectives and develops a (revised) plan in line with the strategy. It subsequently executes the plan, in cooperation with others, if relevant, and in so doing it interacts with, and potentially changes, the operational environment, resulting in the need to collect fresh information. So the cycle is complete and continues throughout the mission. The following WWII Bombing Raid Example, may bring some firming up to this abstract procedure.

> *Consider a WWII Lancaster bomber on a mission to bomb a dam in enemy territory, along with five companion bombers. The crew have Intel (intelligence) about best routes of ingress and egress, ground defenses, anti-aircraft fire, etc., and they can also 'see' something of the ground ahead of them using their H2S mapping radar. The crew direct their aircraft along the recommended/pre-planned path, until they see that the way ahead is effectively blocked by heavy anti-aircraft fire, and moreover there is a fighter blockade just in front of it. Time to revise objectives.*
>
> *The crew seeks a new route to their original target, but realize that they have insufficient fuel to skirt around the blockades, re-route on to the target, and get home safely. Instead, they opt to attack one of their secondary targets, and to fly at treetop level instead of at height, since this will confuse both the enemy anti-aircraft guns and the enemy fighters.*
>
> *The captain and crew work out the new plan and transmit it by coded message, using their T1154/R1155 transmitter/receiver radio, to the other aircraft and to their base of operations—knowing that the enemy will intercept their transmissions and realize that an air attack is imminent. The crew, with two other aircraft from the original six, break off to pursue their revised mission, hopefully encouraging enemy fighter defenses to divert and pursue them, leaving the way open for the remainder of their party to continue towards the original target, but now facing reduced air blockade and flying at lower altitude to make life difficult for ground defenses…*

As you read through that WWII scenario, you may have noticed that several decisions were made, all of which would have involved Behavior Management. The crew, on observing the defense-in-depth, could have called off the mission, to return another day. They decided, instead to divide their force into two parts; they believed that, by doing this, they would divide the enemy's defenses, and draw fighters away from the main target. And so on. Were you to go through the scenario carefully, you would find that the crew had to make many decisions, and that all of them involved Behavior Management. Instead of making cold, logical judgments, then, the crew were making decisions based on their experience, training, beliefs, interpretation of the information they were seeing on the radar, how they believed the enemy would respond and behave, their world models of how these missions were meant to play out, etc., and their motivation to achieve their purpose, i.e., to complete their mission.

Not all missions are quite so dangerous or demanding. A woman going to the post office to post a parcel is on a mission. She faces challenges and obstacles, and has to make many decisions: which route to take; crossing the busy road using the crossing, or jaywalking and dodging between the cars; avoiding the busybody on the corner; whether the queue in the

Post Office is too long; can she pickup her daughter from school in the time left; class of postage to pay for; how to pay, plastic or money, etc., etc. The rationale still applies…

Hitchins' VSM: *Function Management Model*
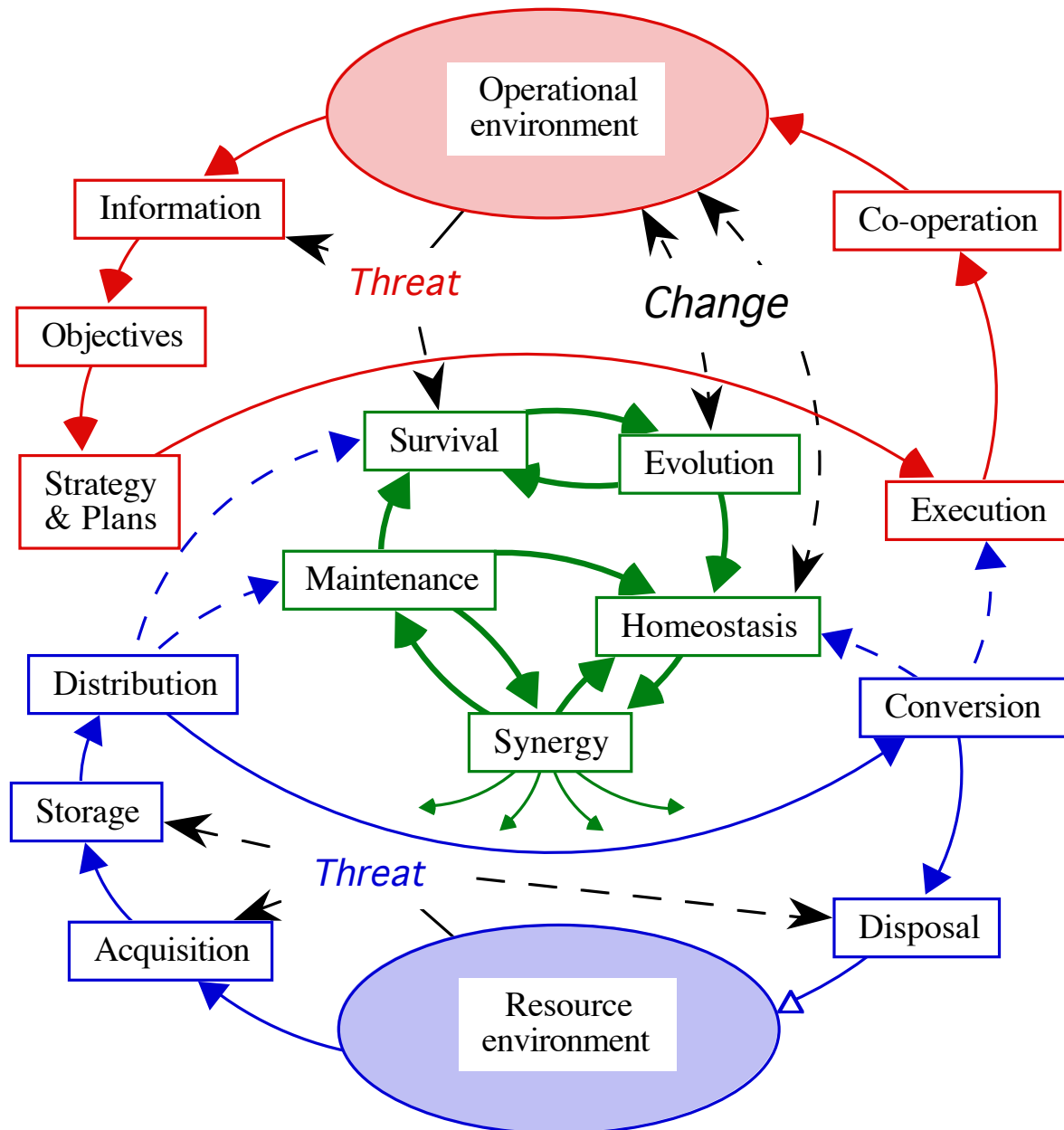
Three Management Functions are coincident: Mission Management in Red; Resource management in Blue; and Viability Management in Green.

F inally in this section, see above, which shows Hitchins' VSM: *Function Management* model of any viable system, including that of a human, but also of, say, a piloted aircraft, a driven car, an enterprise, etc. [Viability is the ability of a thing (a living organism, an artificial system, an idea, etc.) to maintain itself or recover its potentialities.] There are three interacting parts to the model: Mission Management, at the top (which we have already met in the previous figure); Resource Management at the bottom; and Viability Management in the centre:

- Mission Management collects/senses information from some operational environment, sets/resets objectives on the basis of that information, formulates strategies and plans to pursue/achieve those objectives, executes the plan in cooperation with any other parties, and so acts into the operational environment which, as a result will change, creating the need for collecting/sensing fresh information. So, Mission Management is a continuous/ continual loop process. As with the woman going to the Post Office…

- Resource Management at the bottom is similar in outline, but the interaction here is with a supposed resource environment. Essentially, all that can be done with resources is to acquire them, store them, distribute them, convert them into something 'useful,' and dispose of any waste back into the resource environment–'one man's waste is another man's resource…' Resources generally consist of two distinct kinds: resources needed to sustain the viable system/person, e.g. food, drink, heating, protection; and resources to be deployed/delivered in the pursuit of mission, e.g. money, weapons, etc.

- Viability Management is more complicated, potentially comprising some five interacting aspects, or parts:

  - Survival. Clearly, to remain viable, a system/human must survive; survival may, in turn be seen as having four aspects: *avoidance of detection; self defense; damage tolerance; and, self repair.* If the would-be viable system cannot avoid detection, then it may need to defend itself; if it cannot fully defend itself; then it may need to tolerate damage; if it cannot tolerate damage, it may need to repair itself, if possible, so restoring its viability…

  - Maintenance. To remain viable, the system/person must maintain itself such that it remains able to perform effectively. Maintenance may mean repair and the excision and possible replacement/ substitution of defective parts, but also the regular servicing/ exercising needed to keep the whole in good operational condition

  - Evolution. To remain viable, a system/person must adapt to changes in the environment, where environment can refer to the physical environment, the social environment, the economic environment, or all of these…Viability is threatened if the rate of change of environment is faster than the rate at which the system/person is able to adapt.

  - Synergy. To operate and perform effectively and efficiently, coordination and cooperation are needed between the many and various internal functions to produce some desired external effect. Synergy is inherent in the systems design, of course, but viability may be sustained and enhanced by exercise, training and practice…

- Homeostasis. The viable system/human is in a state of dynamic equilibrium: not necessarily stable in the sense used by physicists, referring to a condition of low potential energy; nor necessarily stable in the sense used by engineers and cyberneticists, induced by feedback. Instead the viable system resides at a high-energy state, with a flux of energy, substance and information passing through.
  - The human body, for instance, experiences dynamic equilibrium, homeostasis, with a nominal temperature of some 37˙C, which is reached by internal generation of heat energy through metabolizing food, fat reserves, etc., balanced against the loss of energy through radiation, convection, conduction, movement, etc.
  - Homeostasis is achieved, broadly in this manner–the balancing of one influence against another. Feedback may also be involved, as for example, in the cooling of the skin by sweat evaporation; but feedback, although important, is not generally the dominant factor. (In this respect, the viable system/human differs significantly from the manmade machine.)
  - As a result, equilibrium is dynamic, forever in a state of change. Human body temperature, for instance, varies continually, but about a nominal mean.

The Function Management Model above shows stresses that may affect the Functions; there are potential threats in both the Operational Environments and the Resource Environment. Operational environment threats may include threats to the acquisition of information, and more directly threats to survival.

The figure also shows a dichotomy between evolution and homeostasis. Evolution is concerned with adapting to changing environment so as to preserve and even optimize viability, performance, effectiveness, etc. Homeostasis, on the other hand, seeks to preserve the environment within the system/person. The difference, of course, is timescale: homeostasis acts in the 'here and now,' while evolution tends to act over the longer timescale.

Viability is concerned, largely, with the form, or physical aspects, of the system/person. External threat is countered by survival; only if the system survives will it have the opportunity to adapt and evolve, which should encourage synergy leading to coherent parts interactions—which will be sustained, or not, by maintenance. Interaction of parts potentially results in emergent properties as the viable system interacts with other systems in its environment. And, some of those interactions may give rise to threats and opportunities. So, viability can be seen as a standoff between internal viability management, on the one hand, and threats to viability, to existence, on the other.

Interacting Viable System Models
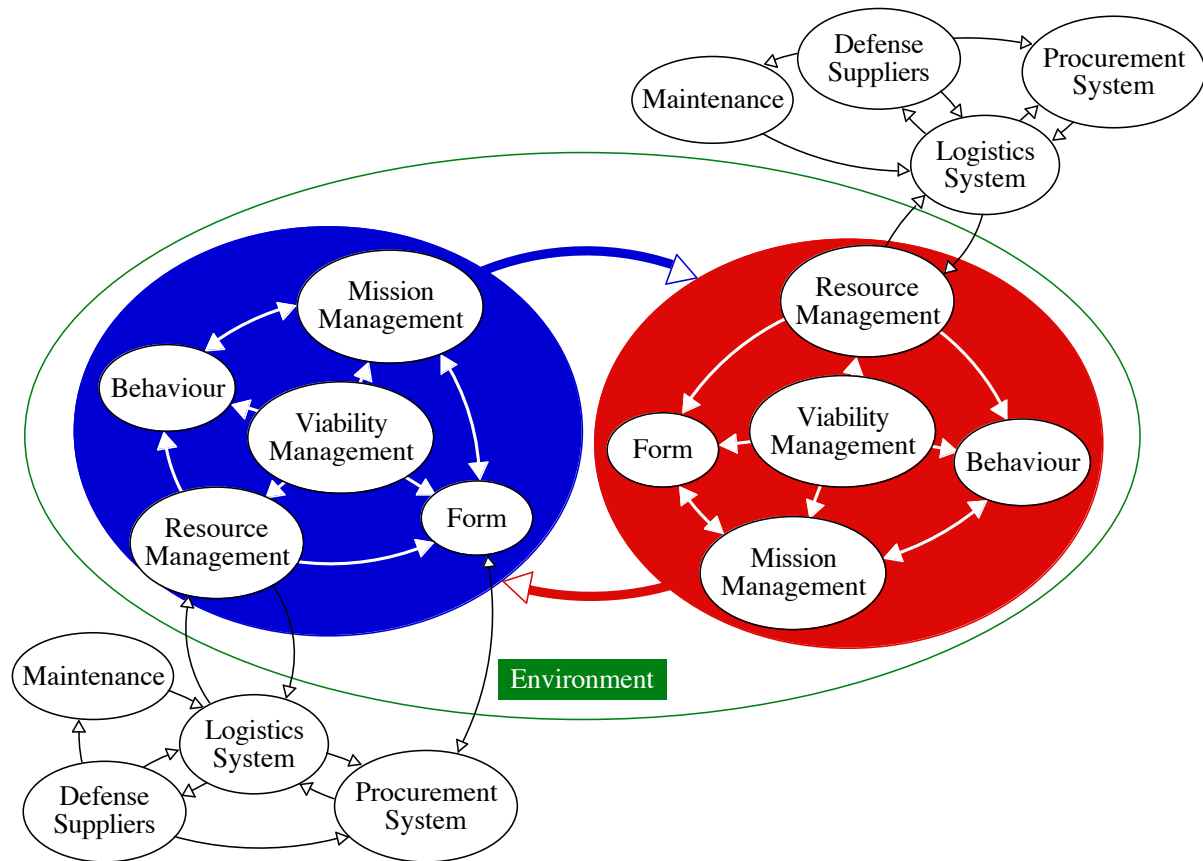
A blue viable system interacts with a red viable system in an environment. Each is supported by sources external to the environment. The figure might represent coexistence, competition or combat between Red and Blue.

In the graphic above, each VSM is shown as comprising: Form; Viability Management; Resource Management, Behavior, and Mission Management. The graphic may be modeled stochastically and dynamically using, e.g. systems dynamics tools. Each run of such a model would present different results even if the two halves, Red and Blue, were identical, owing to the stochastic variations. Over, say, twenty to 100 runs, however, the two VSMs would be expected to "average out," giving the same distribution of results, i.e. a null result.

So, what would be the point? Well, having established a null configuration, it would then be possible to maintain one VSM, say Red, as a reference, while some small change was made in Blue. Subsequent runs would reveal what difference, if any, the small change in Blue had made to the competitive or combative outcome over one hundred, or so, runs. We would have created, in effect, a test bed, to sense the outcome of small variations in "soft-ish" parameters, such as: maintenance, decision-making, doctrine, ideology, experience, training, motivation, logistic support, etc., etc., all of which are seriously difficult to assess conventionally, in terms of outcome and how they might affect it.

The outline Blue Vs Red VSM 'scenario' above may be converted to a more revealing, layered form as presented below, which shows only one of the pair, for simplicity. Mission Management, Behavior and Form are shown as the interacting central panels from top to bottom. Resource Management and Viability Management are shown as left and right hand panels, respectively.

Hitchins' VSM in Layered Form
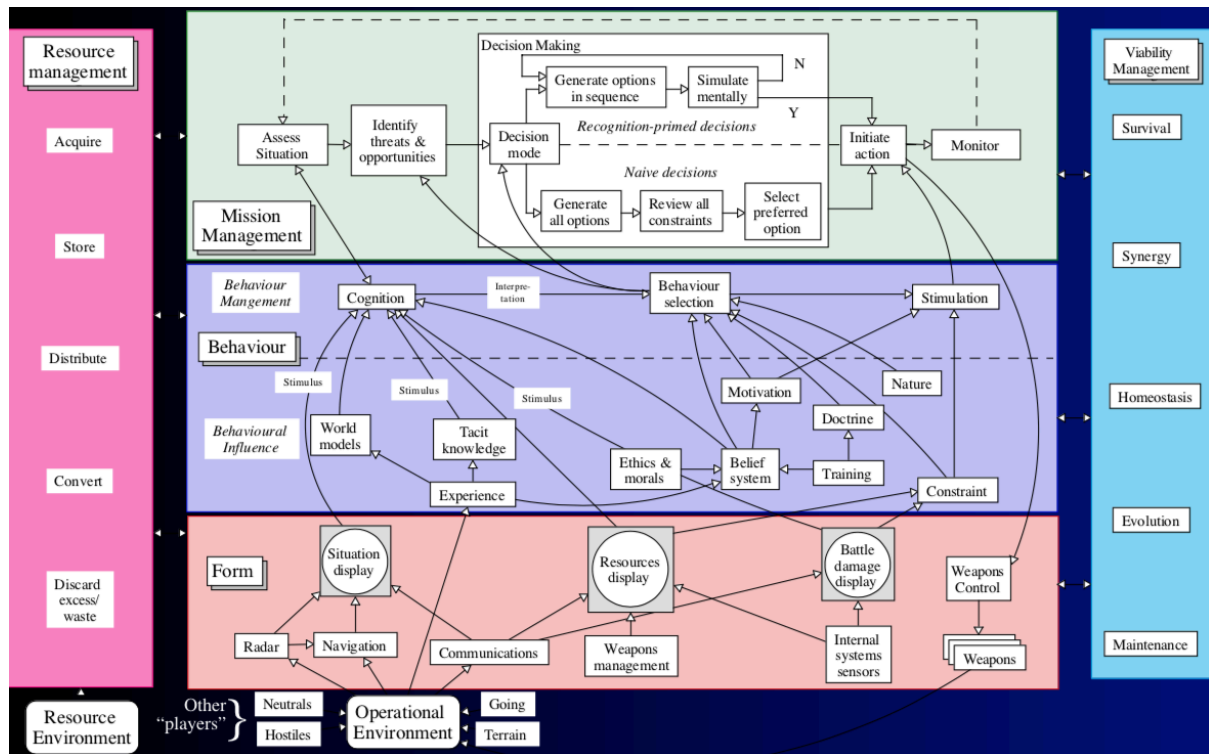
The layered model is instantiated as a naval destroyer in combat with another destroyer, not shown, but indicated as 'Hostiles' in the bottom register.

Mission Management, the top register, is shown much as before. However, the Decision Making process has been expanded to show two different approaches to Decision Making: so-called Naïve Decision Making, which is usually consultative and consequently thorough-but-slow, and Recognition-Primed Decision Making. This form of decision-making is usually attributed to a domain expert who is able, from experience, to assess and recognize a situation as like one previously encountered, make a swift decision accordingly, and generally be right —or *nearly* right! (Seel, 2000)

Two layered VSMs, one Blue, one Red, and initially identical, may be set up to interact through an operational environment model, representing in this case weather at sea, which may have an effect on radar performance, weapons range & accuracy, etc. Running the model once would, as before, produce different results for each ship, owing to the stochastic elements. Running the model, say, twenty to a hundred times, should result in identical distributions of results for identical ship VSMs, i.e. the null configuration.

Thereafter, one ship could be held unchanged as a reference, while the other might, say, incur slower decision-making, to represent a less experienced command team. Or, the second ship could run out of ammunition, or spares needed for repairs. Or the crew had not been motivated and exercised sufficiently to react rapidly to threat. Or… Would this affect the outcome over 20 runs? One hundred runs? Who knows: that (and hundreds of other such things) is what such a test bed would be used to investigate. And, of course, we could always set, say, Red destroyer up with the necessary (so not identical) parameters appropriate to, say, some 'unfriendly' ship… (Hitchins, 2003)

Using this technique, it is possible to assess the potential effects on societies/complex systems of different beliefs, emotions, behaviors, ideologies, narratives, ethics, etc., as well as of different tactics, different policies, etc.

N arratives have appeared repeatedly in the discussion of Belief and Behavior…and it is believed that suitably persuasive narratives may have been used in the on-line grooming of vulnerable young people, to persuade them to join extremist groups. Narratives can influence group cultural behavior, too. Yet they are difficult to address, as they are rarely on display, with the some narratives no doubt being intensely personal, while others may be potentially sociopathic or anarchic:

> "Narrative Psychology is a field in psychology that **investigates the value of stories and storytelling** in giving meaning to individuals' experiences— shaping their memory of past events, their understanding of the present, and their projections of future events—and in defining themselves and their lives."
>
> Sarbin (1986)

Would it be feasible, then, in a form of "National Narrative Therapy," to 'overlay' the various, diverse narratives of the disaffected, with a national narrative based on that nation's unvarnished pre-history, history, heroes, fairy-tales, myths and legends (sic), including those from any and all cultures? The overlaying process might take the form of a national curriculum, to be presented, with 'light touch,' in pre- and primary/elementary-schools, perhaps alongside conventional history. The idea would be to bring all of the people together in an understanding of what it meant to be "of that nation," to be aware of their heritage as born of that nation, and to share in the same national values and multi-cultures…

If it were feasible, would it be a good thing to do? Would it hold out the promise of cultural diversity without cultural dissonance? You know, I think it might…given enough time…

Food for thought. DKH

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