

**Vertical and Horizontal Scaling Strategies
to Avoid Destruction**

in the Modern Contest:

Riding Out the Perturbations of its Largest Scale

of the Seizing of High Gain/Cheap Energy

and the Expensive Refining of Low Gain Energy,

As Argued by Tim Allen and Colleagues

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I am taking these two regions of energy-capture described by Allen et al. (2008), and taking the argument one step further, to ask: **In** them, what happens to **us**?

Let us look at their diagram of these two regions in its simplest form:

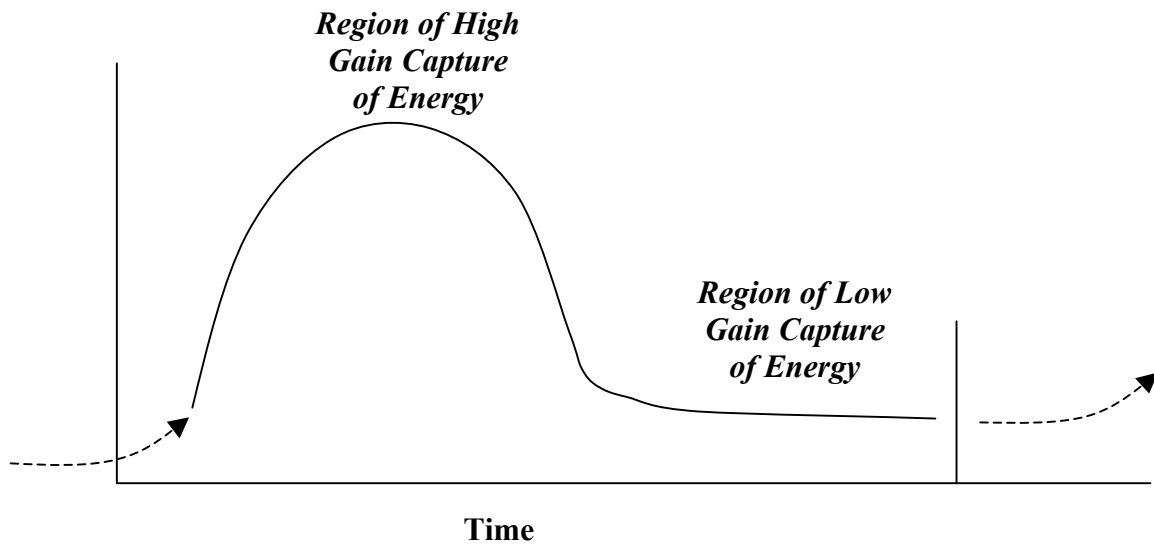


Figure 1. Argument of Allen et al. (2008) in Simplest Form

In general, I imagine it is obvious that most of us work in systems that fall on the low part of the curve. We put out a huge amount of energy to get a small return. This is true in my medical profession as it is in your profession of the basic sciences. Indeed, it is harder and harder to get ahead, despite doubling and tripling of the work hours (Warren, 2006).

What happens then? Robert Louis Stevenson foresaw what would happen over a hundred years ago when he wrote *The strange case of Dr. Jekyll and Mr. Hyde* (1985, original work published 1886). Contrary to the sensational view of this case in the public, Stevenson did not mean it to be atypical at all, but *the typical result of a regime of low gain energy capture*. Dr. Jekyll becomes exhausted. He can't keep it up.

What builds up in him is what builds up in every animal: a profound urge to start the cycle over in a region of high gain energy. Mr. Hyde, his double, begins bursting out of the back gate at midnight without restraint about seizing whatever is in his path.

This is precisely what I see all day long in our clinic (Gustafson, 1999): the depletion of Jekyll, which is signaled by depression or hopelessness, and anxiety or dread that he can't keep up and will get in a worse position, *and* a rage to force a much easier taking of resources. If you would like a comic version of it, have a look at *Clockwise* (1986, John Cleese) about a frantic school principal.

A Third Region for the Capture of Energy

Fortunately for us, there is an alternative to pushing ourselves unmercifully, or seizing other people's supplies. This third region is not to be located clockwise, but counterclockwise. By this I mean we have to go backwards in time to **locate a core rhythm which gives us more energy rather than taking away what we have got.**

This region is what I call a transitional field, and is the most important finding in my book to appear this fall, *The Great Instrument of Orientation* (Gustafson, 2008). A transitional field is equally balanced between the exterior field and the interior field. Because it is poised so beautifully between outside and inside, **it draws upon exterior and interior supplies equally.** All of the beautiful pursuits come from this region: play, music, art, love, sexuality, and so forth.

Yet many of us do not know how to find this region, and if we find it, we do not know how to defend it. It takes what Lowell Cooper and I, in *The Modern Contest* (1990) called a vertical and horizontal scaling strategy. By that we meant **an ability to locate a small enough scale which can get some independence from the general tendency to wear oneself out, and also an ability to maintain a rhythm which is not perturbed by the general tendency to be frantic** (Jullien, 2007). Vertical scaling refers to space, and horizontal scaling to time.

The Neurobiology of the Third Region of Energy Capture

Where do we find this beautiful region that will give us more energy than we put into it? An interesting experiment reported by Mathews and Strogatz in 1990 will take us to this region very quickly.

They connected arrays of limited cycle oscillators, and varied the tightness of the coupling, and varied the frequency range of the array of oscillators. Their diagram of the results looks like this:

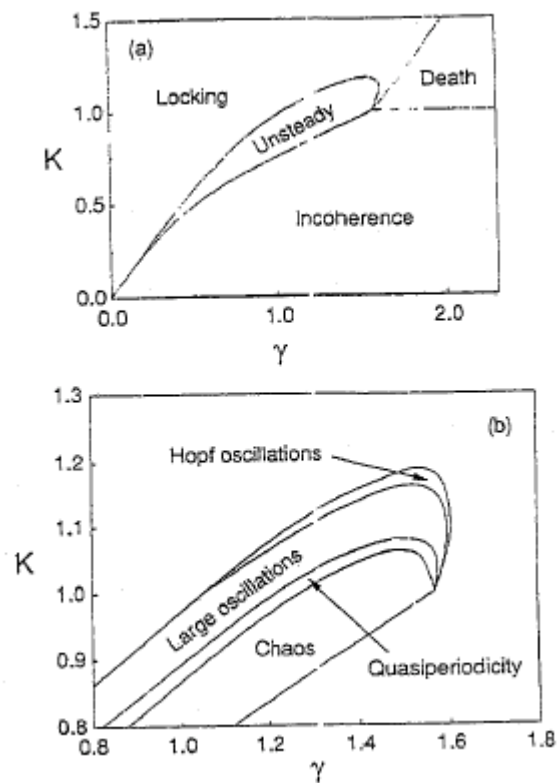


Figure 2. Results of Mathews and Strogatz (1990)

The tighter the coupling, and the smaller the frequency range, the more the system goes into synchrony. The looser the coupling and greater the frequency range, the more the system goes into low frequency incoherence. **What is beautiful is what happens in between:** when the coupling is somewhat loose, and the frequency range not too great, is the emergence of this third region, in which cascades of order, and cascades of incoherence sweep through the system.

Alexander and Globus (1996) then take this experiment as an analogy to the neurobiology of the brain. Here is their simpler diagram:

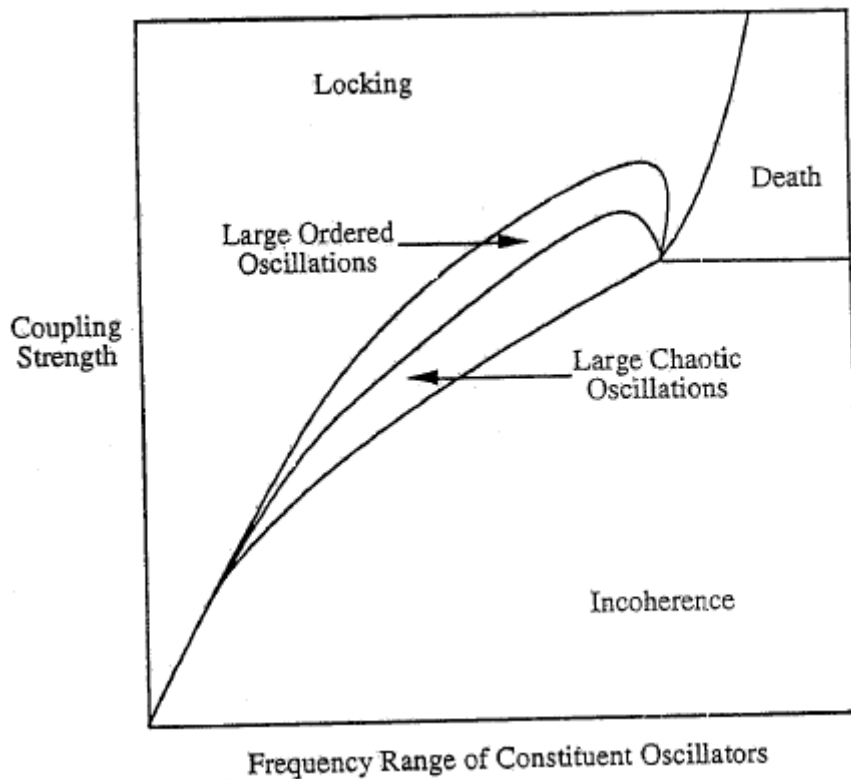


Figure 3. First Diagram of Alexander and Globus (1996)

In other words, this transitional region is tuned like a musical instrument between tight coupling and a wide frequency range. This allows it to alternate in every breath, between an incoherence which is receptive to the greatest frequency range, and a coherence which comes to a single conclusion (Freeman, 2001). In other words, a very small difference in coupling strength in this third region translates either into bottom-up incoherence, or top-down coherence, as in the following diagram, also by Alexander and Globus (1996).

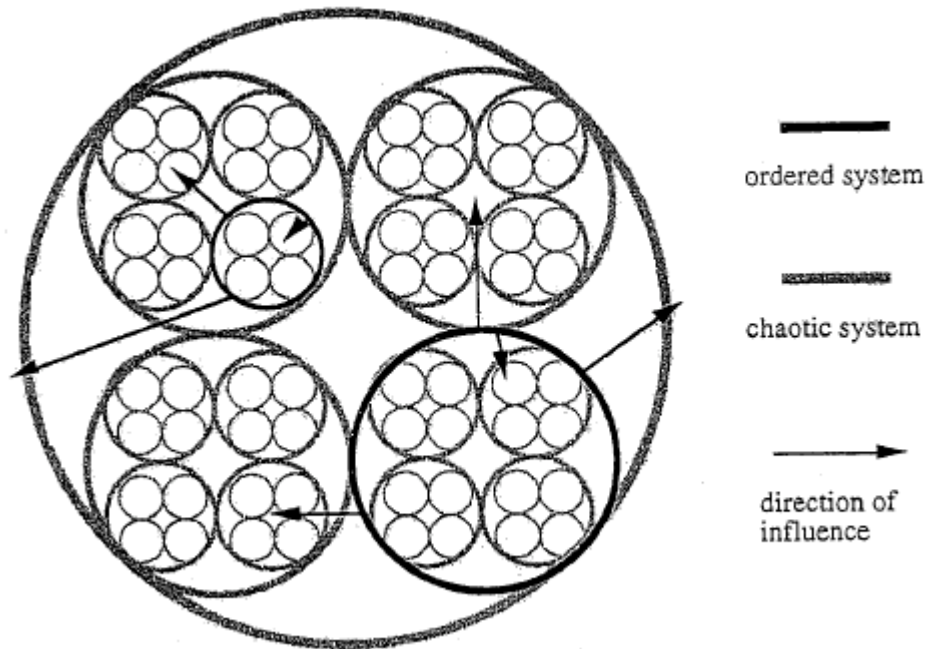


Figure 4. Second Diagram of Alexander and Globus (1996)

Disorientation to Her Exchange

The beautiful tuning of the neural network between top-down and bottom-up is also its vulnerability. Tighten up the coupling, and the system will be locked into

synchrony. The human being is a group animal, who is hugely sensitive to the energy capture of its group.

If the group is tightly driven into low gain practices for its energy supply, the individual gets caught up in it. In children, this appears as a rigid identification with an admired or feared adult, which Reich (1931, 1949) called *the constant attitude*. If mother was in a constant attitude of worry about everything, a kind of vigilance for slight deviations in any source of supply, the daughter is very likely to identify with this constant attitude and be its captive herself.

If she has had some independence from constant worry up until age ten, hiding out in the third region of play, then she begins between ten and fifteen to become increasingly worried about where she stands with the hierarchy of her pack of girlfriends. Every year from ten to fifteen (Gilligan, 1990), she becomes more tightly coupled to the point of view of the pack, and less able to have a point of view of her own.

Now put her into a professional track, and the top-down synchrony becomes completely overwhelming. Already from her mother, she began to practice worry about supplies. Then, from the teen pack she began to practice worry about her standing with them. Finally, she gets a set of lists to follow in her professional track. **By now, she is so totally coupled to family, pack and profession that she is going to have little capacity to read what she herself is getting out of it.** She now has what I call the core illness of disorientation (Gustafson, 2008). You can imagine for yourself the male version of this illness. I presented it earlier as Dr. Jekyll and Mr. Hyde.

Refinding the Third Region of Energy Capture.

The Dream Reading of the Whole Phase Space.

Because the neural network is disconnected by night from its fellow creatures, it has a chance to come to a fresh reading of its exchanges. It disconnects from synchrony, and drops into the night sea of incoherence (Ghiselin, 1985). As Poincare (1985, original work published 1908) demonstrated, the beautiful third region appears between the synchrony and incoherence as what Poincare called **a sieve**, which selects from numberless possibilities what it needs for its demonstration of the non-linear geometry it is embedded in. I will give you two such proofs from my own night-sea, to show you what I mean. The first occurred June 22, two nights after Tim Allen asked me to give this paper, extending their paper on the horizontal scaling of energy capture in hierarchies over time.

I dreamt I was in training to be a drug company representative. I was in my department conference room, which now had two long tables in parallel instead of the one I know of. On the first table, the pack of trainees was to write out as fast as possible on little cards the names of 5 or 6 references for themselves. They rushed to it, before I had time to think, and so I was left out of it.

The second table, in parallel with the first, was not utilized. The second scene was that I was standing on a little hillock watching this pack of trainees, with one of our faculty slightly ahead of them following the drug company trainer up and down a slope of descending hills like in San Francisco, which was at the same time West Washington Avenue in Madison, culminating at the Capitol. The geometry looked like this:



Figure 5. Gustafson's First Dream of the Relevant Non Linear Geometry

Interesting lines of force. It looks an awful lot like a variant of the first figure of this lecture: the descent from high gain regions to low gain regions of energy capture, with many attempts to start over in high gain energy, but a general dwindling over time of the returns, into a basin of entropy, at the Capitol.

Also, the little hillock is interesting: evidently, I have a standpoint apart from the exterior table, in an inner table of my own. I have a sieve, to see the whole situation, both vertically, from exterior to interior, and horizontally, as a trajectory in time. My hat is also interesting. It just showed up, as all details in my dream are taken from my history. It is a hat of a French explorer in a dream I had in 1996, in which I was leading a flotilla of Indian war canoes from the west to attack a train line from Poughkeepsie, N.Y., into New York City (Gustafson, 1997, p. 262). In this dream, I am only watching the self-destructive trajectory of our trainees. I am conducting a proof, and looking down the line

of its trajectory, to the exhaustion of Dr. Jekyll. In other words, I am confirming how the proof of Allen et al. (2008) is played out in the domain of medical training.

My second dream occurred on July 5, out at our cabin on the Great Prairie, where I would compose this paper, beginning on the 5th, and into the 6th of July. I dreamt I was being led by a 16 year old boy from a house in the south of San Francisco, to a house in the north of San Francisco, always with a setting orange sun to our left out over the Pacific. We had to pass through several military bases, like the old Presidio in San Francisco, and finally we had to scramble up a bone dry hill to this suburban street of the house in the north.

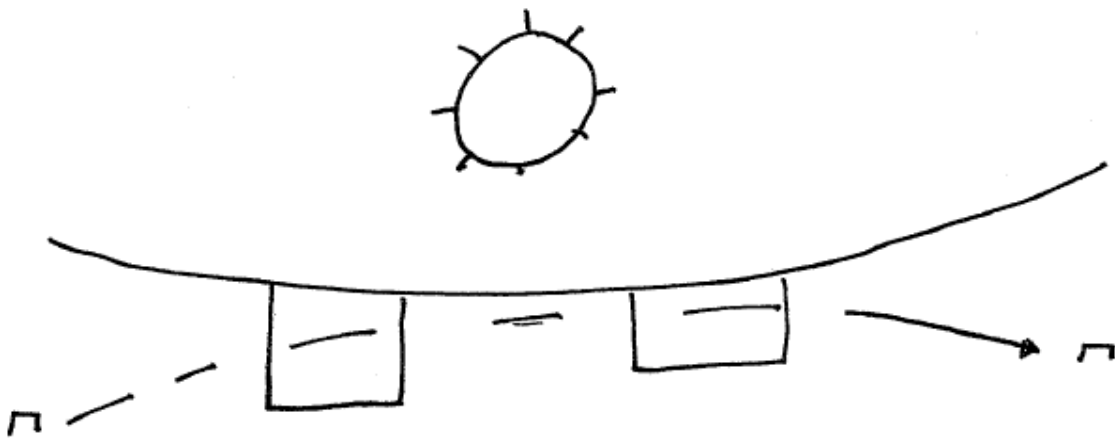


Figure 6. Gustafson's Second Dream of the Relevant Non-Linear Geometry

This dream returns to the landscape of my residency forty years ago in San Francisco. It brings me back to findings that bewildered me forty years ago, as a young resident. At that time, I was struck over and over again by the shallowness of everything I met.

Everything was a technique: from the Esalen Center of counterculture to the south of

the city, to the military base in the city pointing west to war in Vietnam, to my residency program which taught psychoanalysis as a form of control and mastery, a kind of dry northern house.

It is interesting I am guided in this proof by a sixteen year old boy, from fifty years ago, who knew instinctively that there was something deadly wrong about his father's low gain capture of energy in a Ford Dealership. Now the boy is conducting a proof for me that it has been this way all along! **These techniques promise high gain capture, and end up in low gain capture and exhaustion.**

Re-orientation to the Third Region in the English Sentence

There is a long and noble tradition in the west that is as old as the irruption of the Indo-European assault in the Middle East, and then in India, and then Europe, about five thousand years ago, between 3000 and 1000 B.C. This was the time of the original seizure of high gain energy, which has continued in endless waves, and which we are party to now in the Middle East once again.

This tradition, passed down from Homer to Dante to Shakespeare and to Tolstoy, the greatest examples, has always found its most dramatic tragedies in the phases of high gain capture of energy, Homer on the Greek conquest of Troy, Dante on the breakout of the Renaissance conquests, Shakespeare on the English force that colonized the world, and Tolstoy on the Enlightenment force that was taken over by Napoleon.

Vincent Scully (1929) gives us a paragraph in this noble tradition, ostensibly about Greek sacred architecture, **which is pointed straight at us.** He wrote:

Mycenae is, above all else, a seat of pride and power. It is the holiest in appearance of all the formations where citadels were placed. As the holiest place it must have been both the strongest in a magical sense and, in the same sense, the most dread: the ultimate weapon which only the reckless dare to use. From the pass into the plain of Argos from the north the two peaks of Mounts Marta and Zara, themselves peaks of Mount Euboea, rise mightily into view; below them stands the citadel of the fortress. The lords of Mycenae thus had a clear view of the major pass and controlled it, as they also sat upon a secondary pass to the east. From farther south in the valley the full splendor and menace of the site become apparent. A long, gentle hill rises out of the plain, and behind it, on a farther hill, the citadel can just be seen. **Its own armored, conical shape, projecting as it does just barely over the nearer hill, inescapably suggests to modern eyes the turret of a tank, hull down in defilade.** To the left and right the flanking peaks form one huge pair of horns, so that the site as a whole rises as a mighty bull's head above the valley. Yet the horns also suggest here the raised arms of the Mycenaean goddess as she is shown in the many terracotta figurines here at Mycenae and elsewhere. The arms themselves, in such figurines, make a horn shape of the head of the goddess between them, much as the citadel rises between the peaks here. Consequently, the formation as a whole can be seen as rising out of the earth like the goddess herself appearing in majesty: the mounded hill, the now terrible horns or

arms above it, and in the place of the goddess' head the fortress of the lords. But again there are multiple images here, and the one which probably dominates it is of a tremendous lap. The horns, for example, can also be seen as widely spread legs with the two rocky ledges in the hollow between them gaping, distended. **Upon this most devouring of thrones, the king dares to put himself, and the built-up cone of his citadel occupies its center. (pp. 37-38).**

I drew a crude sketch of this as follows:

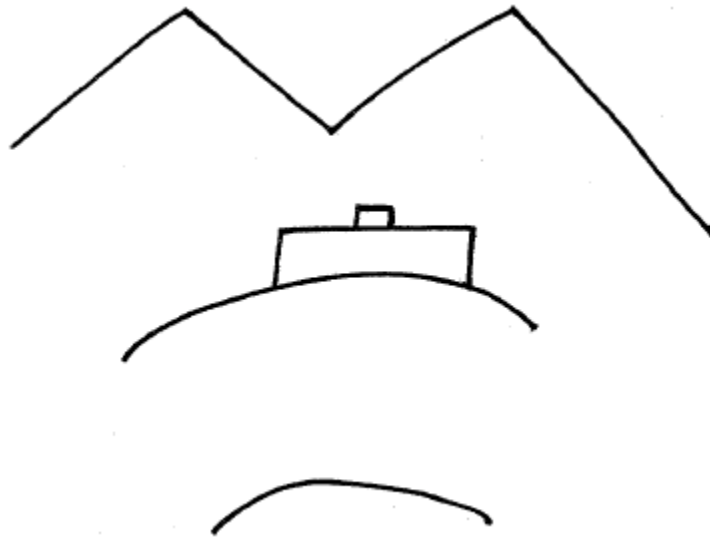


Figure 7. Mycenae

I am dwelling upon the scene for one purpose only. Greek culture hung here in the balance through its most fruitful period. So long as the male powers of the seizure of high gain energy bowed to the female powers of the whole site, the great energy was sustained

in a third region of energy capture, **which came as much from below as from above, in the beautiful transitional field.**

But this beautiful balance could not be sustained, finally, and the region of high gain energy degenerates into a low gain energy of expensive techniques.

This is where we are in this country at this time on the global scale. But it remains for us to continue the beautiful balance on smaller scales that we can defend, whether it is a little clinic or a tennis court or a cabin in the Great Prairie. That is the vertical scaling, with respect to space. The horizontal scaling, with respect to time, is well stated by my neighbor, Aldo Leopold, in his July essay in *A Sand County Almanac* (2001, original work published in 1949, and written in 1943):

One hundred and twenty acres, according to the County Clerk, is the extent of my worldly domain. But the County Clerk is a sleepy fellow, who never looks at his record books before nine o'clock. What they would show at daybreak is the question at issue. Books or no books, it is a fact, patent to my dog and myself, that at daybreak I am the sole owner of all the acres I can walk over. (p. 77)

This is the defence of the third region of the capture of energy.

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