Stress and Function

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Rolfers see stress in the body as a reflection of the internal organization of the connective tissue system, and in movement as balance versus disorganized function. It is the theme in Rolfing to reduce stress of entropy, the stress of disorder, by reorganizing connective tissue around fascial movement planes so as to establish an improved relation of the body segments in gravity. By evoking a more positive relation to gravity, Rolfers view the condition of disorder as the stress they are assisting to resolve. The total fascial strain pattern and organization are reciprocal states. This is the basic experience of the Rolfer and is also supported by the studies of Val Hunt, who demonstrated in a quantifiable way that the level of myofacial stress influences neurological pattern.

We'll be looking now at a major stress which relates intimately with gravitational stress reflected in fascia, but which is clearly different and often pre-eminent. For now, let's just call it "neurological stress." Realize that whenever you dissect out one thing and give it a name, you do so knowing its connection to many other things. However, we need to isolate this feature for awhile before putting it back in the hopper.

Evolutionary Perspective of Stress

As in rolfing, it is impossible to define stress without an understanding of function. You could talk about fascial stress without understanding balanced upright function. This is essentially an evolutionary and biological perspective. What I want to do here is develop an evolutionary view of stress. Darwin showed us that we were not only monkeys out of trees but fish out of water as well. Claude Bernard, the nineteenth century physiologist, took it a step further when he pictured us as a mass of fragile cell colonies carried around in a sack of brine. We were a funny-shaped city of amoeba taking the ocean with us.

In biological situations, nervous system reactions are organized into purposeful, adaptive responses. To say this is, for all practical purposes, a tautology. As Darwin and the course of modern biology would say, "we're here because we're here." We evolved the most suited genes, the most suited sets of behaviors, *fait accompli*. What are behaviors suited for, though,—what are they organized to do? Well, obviously many, many things. And that's what keeps a lot of people employed at Universities, even starting new fields like Social Biology and so forth. But I want to go back to examining the roots of behavior to look at our earliest characteristics, our most basic patterns of function. This is essential!

To develop the flexibility necessary to maintain terrestrial life required the development of a complex nervous system. This, for two reasons, is a quantum event in evolution. The obvious reason is that a highly refined proprioceptive coordinated system of locomotion is required. Second, the internal bathing medium of the cells had to be maintained at an ionic constancy similar to the ocean. That's a hell of a task if you're bopping around on land.

The relationship of that capacity for organized movement coupled to the necessity for maintaining a constant internal milieu is the primary root of all function. That may sound like a bizarre thing to say, but I want to develop this idea and show that it's quite reasonable and central. To Berard we are out on land taking the ocean with us. A modern writer put it another way: he suggested that water invented us to transport itself from place to place. Either way, the fact is we're a sack of water walking on the earth. It is our primary neurological function to make that possible. The implications of this fact were stated simply and elegantly by the neurologist Temple Fay: "Each creature's brain embraces those capabilities that they need for survival plus those capabilities each creature lower on the evolutionary scale needed for its

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survival." In this light we can look towards the most primitive function and see how it has become elaborated in evolutionary development.

The adult human brain can be divided into three anatomically distinct parts corresponding to evolutionary age, much like the strata of the earth can be described. The innermost portion, or epoch, is the brain stem. That part of the brain is almost identical with the brain of a reptile. This part of the human and mammalian brain is often called the reptilian brain, and it is virtually unchanged after all these millions of years. Then there's the mid-brain, limbic, and paleo-cortex. Part of this portion is also called the olfactory brain because of its close association with the sense of smell in lower animals. Finally, the neocortex, the new brain, which is completely nonexistent in fish and reptiles, but becomes progressively larger and more elaborate in mammals, culminating in the primate animal. It is the neo-cortex which *we* say distinguishes us from all that came before.

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When every fetus develops in the uterus, where it is bathed in what is essentially sea water, it goes through morphological changes appearing to take it through the same forms as its ancestors. These forms include the gills and the tail of the fish, limb buds of the amphibian, and so on. After birth on land, it continues to retrace its phylogeny. When at a certain age it begins to crawl, it does so as a reptile. The crawling response is virtually independent of involvement with the paleo or neo-cortex. It is not until it begins to creep around on all fours that the child begins to display its mammalian heritage. Not until it assumes an upright position, requiring cortical involvement, does it function fully as a primate. And, as it continues this evolutionary process it further develops its field of consciousness.

A child that does not crawl as a lizard will not creep nor adequately develop its neo-cortical thinking potential as a human brain, as a human being. This is the essence of what Temple Fay discovered. A child, to grow and to become fully human, not only has to go through the embryonic forms of its ancestors, but it must exhibit certain of their neurological behaviors as well. Temple Fay's words take on an animated meaning. (The work of Doman and Delicato with brain-injured children is an attempt to implement these ideas.) We do not simply go through these evolutionary epochs and dismiss them. They are the floorplan, the matrix, upon which all subsequent behavior will be molded and directed, including even the conscious activity of the neo-cortex in the adult "reasoning" human being.

Such a view takes consciousness out of the restricted domain of the thinking neo-cortex, distributing it equally throughout the brain's entire range of evolutionary development. (When I say "brain," I don't distinguish it from its concomittent body processes, but speak of both as organized in unity from a common strata of behaviors.) It's the neocortex that *thinks of itself* as the logical supreme commander in charge; the executive and overseer of all thought and behavior. It is the general feeling, really, of physiology, of 20th century science, that the brain is a somewhat stratified affair with the cortex commonly dominating the behavior of substructures which used to be dominant in an earlier stage of our evolution, that our relation to primitive archaic life function has somehow been dispensed with in the same way as the coccyx is all that remains of our once functional tail. If this were true, why have our reptilian brains not shrunk away to oblivion over these millions of years?

It was really with delight, then, that I read a lovely book published a few years ago by Wilder Penfield. This, his only popular book, is called *Mysteries of the Mind*. Penfield is neither a mystery nor a science fiction writer, but one of the most eminent neurosurgeons of this century. His work was in the probing of brains of thousands of conscious adult patients in search of damaged epileptic loci, which he then extirpated when they recalled symptoms associated with the seizures. He amassed a tremendous amount of data. (Modern neurology is largely based on the observations of Huglings, Jackson, and Penfield.) He wrote what had become the conclusions of his life-long work:

> *There is much evidence of a level of integration within the central nervous system that is functionally higher than to be found in the cerebral cortex. Evidence of a regional localization of the neuromechanisms involved in integration exists. I suggest that this region lies not in the new brain, the cortex, but* in the old brain stem. *The indispensable sub-stratum of consciousness lies outside the cerebral cortex, probably in the diencephalon, that is the higher brain stem. The realization that the cerebral cortex, instead of being the highest level of integration, was an elaboration level, came to me like a bracing wind.*

It blew his mind! The key words here are "functional," and "elaboration level." What he's saying is that our basic patterns derive from the reptilian pattern; that is, from *the need to move from an aqueous to a terrestrial environment.* We've elaborated on that, of course, but basically we are organized around that matrix! It's not that each development has made the other one useless and it's been discarded. That's an absurd notion. If something is residual, like the tail, it atrophies. That seems so obvious I don't know how in the world it could have been missed.

It's the neocortex that thinks of itself as the logical supreme commander in charge; the executive and overseer of all thought and behavior.

Penfield and Temple Fay are both saying the same thing: that more recently acquired neurological capabilities elaborate on the accumulation of all previous functions. This fact, and that basic function is the dual capacity of the organism to regulate its interior milieu and to organize movement for survival, is the kernel of what I'm saying. Functions have evolved, elaborated, expanded, but we've never replaced them. They have not become dominated or vestigial, although when we do attempt to dominate them we have some very intersting and disasterous consequences (recall Simeon's, *Man's Presumptuous Brain.*)

What's happened, of course, is specialization: digestion, assimilation, energy storage, mechanical respiration, muscles, bones, tendons, etc. Nevertheless, the basic function, the basic matrix, is that of visceration and motility. The amoeba with its pseudopods engulfes food through its membrane (motility), assimilates and digests it (visceration), which produces more energy for further movement and assimilation. It is our automatic nervous system organized from the reptilian brain stem that interfaces between these functions. Our reptilian brain is our elaborated amoebic membrane.

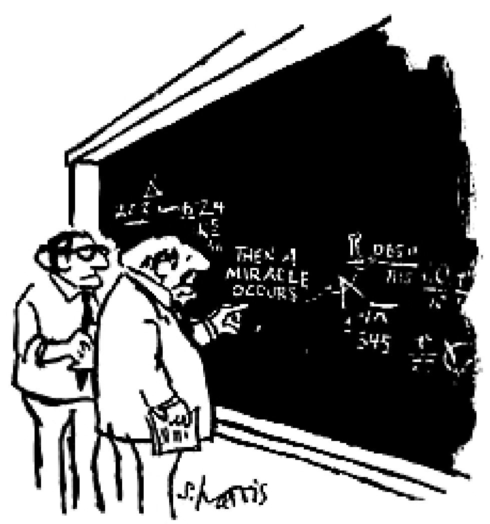
The ability to shift between maintenance functions and the emergency response is a key to both the survival and the smooth functioning of the organism.

In order to understand how stress effects an organism, we need to postulate a model of a healthy unstressed one. Recall that it was Claude Bernard who first proposed that cellular survival (and therefore the survival of the organism itself) depended on the ability to maintain a constant interior milieu. This idea was extended by Walter Cannon, a truly great physiologist, who developed the theory of homeostasis. In this vision the organism is a closed system in which a number of critical physiological processes maintain a dynamic equilibrium. This means that when a force produces a displacement from a constant set point in any of the body systems, it also triggers compensatory reactions which tend to restore the system to its original state. Cannon realized that these control mechanisms were integrated by the reptilian nervous system, especially by its autonomic branch.

The autonomic nervous system can be classified into para-symphathetic and sympathetic components. Anatomically, these two systems may be distinguished as follows: Pre-ganglionic para-sympathetic neurons have long fibers and terminate with few collaterals. Pre-ganglionic sympathetic neurons have short fibers which terminate in many collaterals at post-ganglionic cell bodies. In functional terms, the para-sympathetic neurons promote secretion of the posterior lobe of the pituitary gland, shade the eye by causing the pupillary spector to contract, accommodate the ocular lens to near objects through the ciliary muscle, and protect the cornea from drying by lacrimal secretion. Parasympathetic components further the activity of the digestive system by inducing secretions of the mouth, the pancreas, and the liver, and by increasing the peristaltic movements of the intestine. Cardiac and pulmonary functions are inhibited by the para-sympathetic vagal fibers because they decrease the rate and force of the heartbeat and produce contraction of the bronchi of the lungs. The significance of the para-sympathetic, or cranio-sacral, component of the autonomic nervous system is that it is essentially anabolic. It is directed toward the preservation, accumulation, and storage of energies in the body.

Sympathetic nerves widen the pupil through contraction of the pupillary dilator. They inhibit the peristalsis of the alimentary canal except for the contractions of the intestinal sphincters. They accelerate the rate and force of the heartbeat, elevate the blood pressure by vasoconstriction, and promote the secretion of the adrenal medulla. The bronchi of the lungs are dilated, increasing the gaseous exchange of pulmonary circulation. The general effect of sympathetic discharge is catabolic, causing the expenditure of body energies while inhibiting the intake and assimilation of nutrient matter.

The two components of the autonomic nervous system appear to be in opposition to each other. What, then, is the significance of this opposition? Cannon saw that their delicate interplay expanded and filled in some of the details of Bernard's concept of *milieu interieure.* He showed that these fine adjustments between sympathetic and parasympathetic components had as one of their main purposes the maintenance of the set-point control. In the distinction of these ongoing mechanisms in "Bernardian homeostasis," Cannon studied ones that were involved in alerting the organism to respond to extreme or threatening environmental stimuli. These responses prepared the organism to remove itself from threatening situations by fight or flight. And this takeover by the sympathetic division of the autonomic nervous system supressed, *temporarily,* the normal delicate interplay which was essential to maintaining homeostasis. These responses occurred only in extreme conditions, and only during the actual emergency. The ability to shift between maintenance functions and this emergency response is a key to both the survival and the smooth functioning of any organism. Now we are in a position to build a model of stress because we are now talking about the healthy, the "ideal," nervous system.



"I think you should be more explicit here in step two."