# ENVIRONMENTAL IMPACTS ON HUMAN MOODS AND EMOTIONS: IMPLICATIONS FOR WORKPLACE AND WORKFLOW DESIGN

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## Abstract

The human body is designed to monitor a variety of multi-band channels delivering extremely large amounts of information from the environment. It is also designed to monitor vast amounts of information regarding its own internal states and conditions. This information flow is filtered and assessed by a large number of control loops that prepare the body for life-sustaining activity. These preparations also generate a large number of subliminal emotions that start to intrude themselves into a person's inner dialog if the control loops generating them remain unclosed or unsatisfied for a long enough period of time. The lack of congruence between natural environments and the typical workplaces inhabited by knowledge workers means that the information flow received by these control loops lacks evidence that the workplace can sustain life, and the loops remain unclosed and unsatisfied. The implication of these information deficient work environments on knowledge worker mental health and productivity is discussed, and general recommendations made for re-engineering workspaces and workflow.

## Introduction

The human organism is intimately linked to its environment through the intake of massive amounts of information from the environment. This is facilitated through a wide variety of multi-band channels into the body. The availability and openness of these channels, combined with the density of data being delivered through them, set the pedestal level for the psychological comfort of the healthy human individual.

In addition, information flow *within* the body is highly dependent on the stimulation received through the senses, and upon the chemical and hydration state of the body itself. *Information-expectant* control loops, either chemically based or based in the nervous system, monitor both the

state of the body and the state of the environment. Depending on the states detected, these control loops create motivations for the body to act in accord with the three primary drives presented in an earlier paper, and listed in a section below.[1]

## Illustrations to Expose the Phenomena

On average, the highest rates of suicide among industrialized nations occur in Scandinavian countries. Research into this statistical oddity revealed a phenomenon now called seasonal affective disorder (SAD). It has been connected to the relative lack of exposure to full spectrum sunlight during winter months brought about by the high latitudes of these countries.

Interestingly, during the past two years, news reports have occasionally appeared describing research on sun-tanning addiction. Apparently, exposing the skin to solar levels of UV radiation triggers the release of endorphins. For many people, this creates a condition similar to runner's high (which we'll talk about in a minute).

Now that we have two firmly established data points on a phenomenon, we can draw our uncontestable straight line through them and (also) draw the following conclusion: human bodies are programmed to seek out exposure to sunlight. Why? Mostly, in addition to triggering the release of endorphins, exposure to sunlight also triggers the photosynthesis of vitamin D in the skin. This is a vital element in good health.

Let's get back to runners' high to anchor another uncontestable two-point conclusion. Physical exertion in competitive sports is widely known to create positive moods in a large segment of the physically active population. Anecdotally, one often hears of people claiming to feel very good after completing heavy physical chores, especially if they have sedentary professional occupations.

To define our second point on this line, we look at the rise of cases of depression during the 20$^{th}$ Century. While some arguments could be made that a significant rise in depression is due to increased reporting of such cases to doctors, the rise of depression maps very well to the transition of large segments of the American population out of rural-based farming lifestyles into urban-based, less physically demanding lifestyles.

The level of physical activity has continued to drop off for most people through the remainder of the 20th Century to the present, and the condition of mental health in the country remains relatively poor. (See Seligman 1995[2], p. 37 for summaries of four studies in the time-development of depression in the American population.)

What do we conclude here? The human body is programmed to monitor its own level of physical activity, and apparently is also programmed to reward the owner with certain positive emotional perqs if it achieves certain levels of exertion. Why should this be? Perhaps the answer is as simple as this: active animals are better players at the game of natural selection. Successful animals have to hustle, at least once in a while. "Doing" trumps "being" in the animal kingdom. So, the emotional programming of the human body includes emotional rewards based on physical exertion, and the control loops that deliver them.

In other words, information about physical exertion is generated in the body's chemistry. The readout of that information affects the emotional state of the individual. Various levels of exertion apparently create a spectrum of positive emotional experiences, while sedentary lifestyles generate increasingly inert piles of complacency or even mild depressions. The control loops monitoring life-sustaining activities "know" when a body isn't being used properly, and "punish" accordingly with an increasingly unsatisfying emotional experience of life.

These anecdotal musings provide us with two illustrations of information management in a human body. One illustration provides us a glimpse of information collection strategies to monitor external conditions. The second one shows us that large amounts of information are also generated within the body itself, and is in fact utilized in creating or destroying various motivational mechanisms. Let's mark down two simple, more or less self-evident conclusions:

1. The emotional experiences of people are highly dependent on information collected from the environment within which they find themselves, and,
2. The emotional experiences of people are highly dependent on the information generated within their own bodies about the conditions within them.

In the rest of this article we will propose answers to the following questions:

- Where does all of this information come from?

- How does this information affect emotional states?
- Why do modern work environments affect so many people adversely?
- How can a manager re-engineer workspace and workflow to emulate the environments human bodies expect to function in?

## Methodology

There may be some who will be less than satisfied with the lack of rigorous connection to a base of scholarly or professional literature in this presentation. However, the literature in evolutionary psychology ("ev psych" for convenience), the field which provides the basis of this presentation, is aimed at a very different set of studies. To be both candid AND fair, it has established a single principle of study, that being the application of natural selection to the formation of successful animal behavior, and for humans, the formation of both successful behavior and thought. If we view thought as a form of behavior instead of as a non-material phenomenon associated exclusively with humans, we get a better handle on dealing with this admittedly difficult topic.

The problem with much literature in ev psych is that it has jumped to big problems before is has refined the way its primary principle is applied to human thought and behavior at a smaller level. It is trying to answer questions from other fields before it has adequately defined questions arising from its own initial inquiries.

To illustrate this point, let's briefly look at the history of astronomy. Ancient Greek astronomy took its foundational premise from contemporaneous philosophy, which stated that in the perfection of the heavens, all heavenly bodies travel in perfect circles. As we know from the history of astronomy, it was very difficult to reconcile eye-ball observations of planetary motions with this "accepted truth." With this is mind, let's consider an example from literature in ev psych. An early popular book in this field made a similar jump from philosophy. In *The Moral Animal* (Wright 1994[3]) the author explicitly believes that humans exhibit moral behavior, and then attempts to use ev psych to explain why this is so. However, like the premature acceptance of circles in Ptolemaic astronomy, the use of the term "moral behavior" is premature in that it establishes a category which may not necessarily simplify the scientific study of human thought and behavior, especially when the term is used to

form value judgments instead of define a quantity suitable for objective measurements.

What we instead are attempting in this presentation is "rough science" (to steal the title of a great PBS television program) on field studies of large primates in their most commonly observed setting. These are populations of humans at work. Our team at Evolving**Success** has a combined experience of over 100 years in observing and working with people in a very wide range of knowledge-based industries. We also have over 50 years of combined experience managing people in professional contexts which include the pastoral ministry, human resources management and training, large computer system integration management for Federal and Fortune 100 clients, as well as real time astronomy satellite operations and research center management.

To work through this large trove of admittedly anecdotal data, we have derived a small number of ideas from the basic principle of ev psych. In traditional academia, ev psych is used to explain various phenomena in humans based on the premise that most of these behaviors occur as services to the genes carried by animals' bodies and were optimized for conditions one to three million years ago to assure the transmission of these genes. For instance, about five years ago numerous news magazines and nightly news television shows picked up findings about human mate selection strategies based on a few ev psych studies. Men, it was determined, try to engage as many mates as possible in order to spread their genes around in the greatest numbers possible. Women, who by the nature of things can't arbitrarily throw their genes around, tend to select well-healed mates to assure that the small number of offspring they produce will live to sexual maturity, start their own reproductive activities, and therefore keep their genes moving more broadly into the ecosystem.

As astrophysicists (turned high tech business people), with a somewhat more cosmological view of things, we find this "selfish gene worldview" somewhat silly, and certainly overly anthropomorphic. Even if there is a form of geno-mechanics that facilitates a functional "selfishness" in genes, if the environment says a certain combination of genes loses the game of natural selection, then that combination loses, plain and simple. It doesn't matter how selfish genes are, they don't come near to having the final say in the course of evolution.

Our work, on the other hand, attempts to reassert the importance of environment in understanding human thought and behavior as a product of natural selection. This is an explicitly *macroscopic* view of natural

selection. Humans have changed the environmental pressures upon themselves faster than natural selection can keep up, and consequently the information systems currently installed in human animals are tuned to a different set of pressures than humans currently face in modern work places. Our model of human information processing sub-systems, produced via the method of system reverse engineering (and presented in the Fall, 2005[1] issue of this journal) suggests epochs for the appearance of each of these sub-systems scattered back through several hundred million years of natural history. Our argument is if a sub-system emerged a million years ago, it is probably tuned to conditions at *that* place and time much better than it is tuned to current, First World, knowledge-based work environments.

The aim of this interpretive work is to generate practical applications from ev psych. Our ambition is to derive repeatable human capital management techniques that will improve business performance in knowledge-based companies or the performance of any service-oriented organization. The human animal is built for best performance in environments other than the modern, knowledge industry work place. How can managers adapt themselves and their work forces to overcome and/or take advantage of this reality?

By examining our anecdotal dataset, collected over 50 years of highly successful managerial experience with the interpretive tools made available by evolutionary psychology and information system engineering, we hope eventually to answer that question. In the present paper, we offer some observations about the effects of modern work environments on human emotion as distilled from our managerial experience by this interpretive approach. The observations suggest a few high-level strategies for modifying work environments to achieve better performance from people working outside of "their naturally selected comfort zones."

## Natural Selection, Information Requirements for Large Mammals, and the Channels Currently Utilized

As noted in the previous paper in this sequence[1], the following drives serve as guiding principles for animal success in general, and as system design requirements for animal information processing in particular:

- The drive to eliminate or avoid all forms of pain or discomfort.

- The drive to have sex.
- The drive to nurture offspring to self-sufficiency in the shortest time possible.

In this macroscopic context, all living things are highly dependent on information collection and response to play the game of natural selection. However, the information requirements for animals are huge when compared to the members of other living kingdoms. This becomes ever more clear when we attempt to map out the channels carrying information into an animal body. One also begins to appreciate the tremendous power of human sensory processing capability when you take a close look at those channels. These channels look extremely wide-band from one perspective, but most of them are not. Human eyes, for example, can collect data from only about one octave out of the electromagnetic spectrum (being sensitive from roughly 350 nanometers to 700 nanometers: doubling the wavelength gives you an octave). That is a mere sliver of the entire range of energies photons can deliver. Yet, even within this narrow range of photon energies, the eye and brain divide those energies into separate channels that we experience as individual color sensations.

*The Channels and Detectors*

Contrary to subjective impression, human sensory organs are detecting stimuli on a 24x7 basis. Furthermore, all sensory organs are functioning simultaneously. "Back-office" processing of this information changes with the 24 hour diurnal cycle. It changes when various stimulation thresholds are breached. It changes more drastically when various internal conditions fall more greatly out of balance, and the body begins to seek out resources for rebalance. Pre-processing in the sensory organs, as well as back-office processing in the brain, change even more quickly when threatening conditions are detected.

Let's list and briefly work through the various channels which deliver information to the human body. The channels under consideration here are limited to those that provide information about the external environment with which the body is not in direct physical contact, as required for touch and taste. However, the channels that remain go beyond sight, sound and smell.

- Infrared radiation channel

Infrared radiation is experienced as heat or warmth. It is sensed mostly through the skin, and its detection tells us whether we need to find a warmer place or a colder place, how many clothes to put on, or how many to take off. While your skin isn't able to produce images, it can do pretty well at detecting the direction of a source of heat, like the sun or a large fire in the distance.

The detection of infrared radiation by your skin also affects your body chemistry, and a variety of physiological conditions change with the level of heat your skin detects. Extremes of heat or cold often lead to strong emotional responses such as fear.

- Visible spectrum light channel

This is the light detected by properly functioning eyes. Even though the eyes only detect approximately one octave of the entire electromagnetic spectrum, it is possible that this represents the most data-dense channel that human beings use. The imaging and resolution capabilities of human eyes provide greatly detailed information about the environment extending for several miles, and very much useful information for as far as the air is clear. The combination of two eyes also provides very good information about distances, sizes, changes, speeds, and many other quantities.

The information from the eyes is also color-coded. Color is an information enhancement artifact generated by eyes and brain; colors as perceived are arbitrary from a universal standpoint, but the colors do convey real information. They help to interpret the content of the environment. Green is a soothing color, presumably because it represents locations where food and water can be obtained. Likewise, sparkling things attract our attention, probably suggesting the presence of open water.

There is also a type of geometric coding that's important for vision. Human eyes are part of an exceptionally complex pattern recognition system, and the patterns they are tuned to recognize are fractal patterns. These are the patterns in the shapes of trees, or the shapes of clouds, or river streams, or even the textures observed in a field of grass. This is the geometry of the natural environment to which *all* human information processing systems are tuned.

When an individual is deprived of exposure to natural colors, like the greens of healthy vegetation, and deprived of exposure to settings dominated by fractal geometry, many information processing loops in the

body go unclosed. This is interpreted by the body's systems as though it is in a resource-poor environment and thus creates any of a number of anxieties.

- Ultraviolet radiation channel

Ultraviolet, or UV, radiation is also mainly detected by the skin. Its most obvious effect on the skin is tanning in the sun. You can even create simple, contact images on your skin if you're patient enough (or have a "properly vented" swimsuit). But tanning is only one of a family of chemical reactions in the skin that strongly affect mood. As noted above, there is a strong correlation between exposure to UV sunlight and emotional states.

- Audio signal channel

Audio signals received by the ears represent perhaps the second densest channel of information into your body. You don't get quite the detail that you do with vision, but information about location, distance, speed, and size can be obtained. Like color in vision, audio signals are also coded in pitch. And also like vision, your sense of hearing is equipped with pattern recognition capabilities that look for fractal geometry patterns with respect to time. Rhythmic patterns in music tend to be fractal, produced by the continued halving of the durations of notes and the interjection of percussive events splitting the time between two other simple musical events.

Sound also tells you how rich in resources your environment is. Most people enjoy the sounds of running water, like streams or waves on the beach. The sounds of birds are also pleasing to most people. Why? They are clear-cut clues that you can find food and water nearby. When your sense of hearing is deprived of these natural sounds, you begin to experience anxieties out of concern for a lack of resources to keep alive.

- Infrasonic signal channel

The deep bass of thunder, waves, and earthquakes are perceived as pressure waves on the body as a whole. These waves are perceived like touch instead of like sound. The thumping feet of large animals may also be detected in this way, providing something of a warning of approaching predators. High pressure, low frequency acoustic waves elicit a variety of emotional responses depending on the perceived source of the stimulus.

- Chemical detection channel

Perhaps the most under appreciated channel affecting mental health is the sense of smell. Compared to vision, the sense of smell doesn't offer a wealth of detail. About all you can tell when you smell something is that there's a source of the smell somewhere nearby. You can also tell whether or not the smell is likely to be good for you in greater concentrations.

But here's the key. Everything in your body, including *all* of your information processing systems, is run on biochemistry. Life operates on the basis of the chemical resources that an animal body can find. If you can't find food and water you're dead. That's why being able to detect vital chemicals in your environment is so important.

The chemical detectors of the nose are the only sensory detectors directly wired to the brain. What's fascinating is that your nose is busy detecting chemicals that you don't even sense as smell. Yet, when your nose detects key chemicals in the air, it signals the brain that the appropriate resources are close by.

Conversely, when your environment is filled with filtered air, your nose is deprived of evidence that you are living in a resource-rich environment. For lack of chemical evidence detected by your nose, you start to become anxious.

Let's collect together the channels for easier reference.

- Infrared radiation channel
- Visible spectrum light channel
- Ultraviolet radiation channel
- Audio signal channel
- Infrasonic signal channel
- Chemical detection channel

The reason we call these channels (aside from the fact that that's what they are) is to evoke a specific image. The "transmitter" of these channels, if you will, is the environment itself. These channels create a connection between the environment and the individual human attempting to succeed in it. We can then think of the human being as a mobile computing unit operating in a vast network of data sources.

What makes this a point of criticality is that the mobile computing unit (i.e., the human being) is equipped with extensive arrays of pre-initialized condition expectations. These amount to the triggers that make us feel good or feel bad under any given set of circumstances. For large

mammals in particular, the deviations from these environmental expectations (or deviations from internal "specifications" as well) are extremely closely monitored by the systems that create our emotions. As noted in the previous paper[1], emotions exist to function as condition assessments, alerts, and, when appropriate, the signals that a drive satisfaction behavior has succeeded.

Let's look at this more closely in the next section.

## Naturally Selected Sensory Targets, Emotions, and Drive Satisfaction Strategies

In the previous section we listed the various channels that your body, as a node on the environment's "wireless network," is connected to. These wireless channels provide data to your body about the state of your environment, and whether it can sustain your life easily or not.

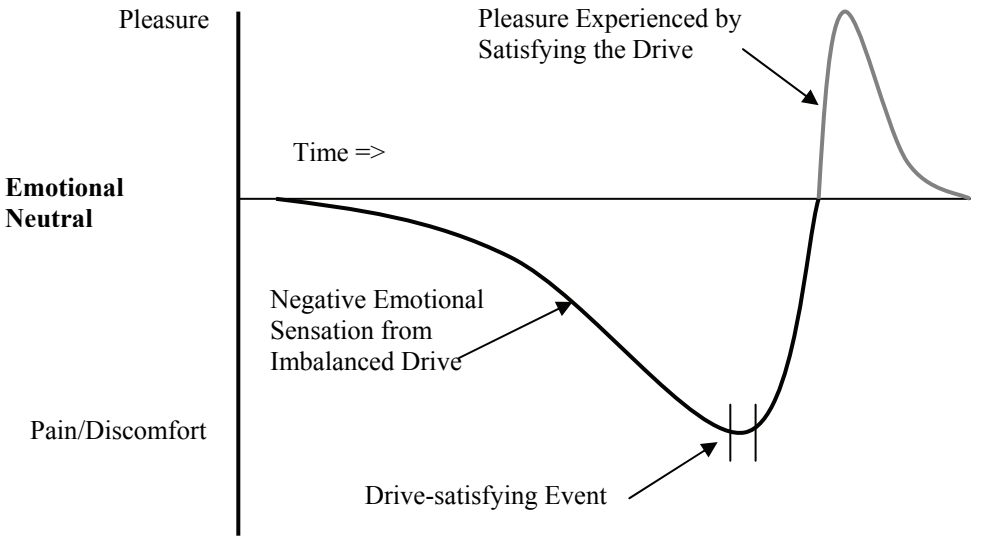
If you were to remove this node (your body) from this wireless network of environmental data resources, it would receive MUCH LESS information to use in determining how well you can live where you are. The flow of data from the natural environment would drop to nearly zero, which basically tells your body you are living in a completely barren location without food and water. Over a long enough time, this elevates a cluster of negative emotions into the awareness of your inner dialog, where you start trying to figure out what's driving you crazy. This becomes increasingly worse, because you can't figure out why you feel this way.

Working in an office in front of office machinery is one way to remove a node from the natural environment. You're working in a perfectly comfortable place, are perfectly well fed and watered, and the job is going great. Yet you still feel antsy enough to run out of your office in a panic (or, at least, a good number of people experience vaguely unsettled or unsatisfactory emotional states). This doesn't come about from "an urge to be free." It comes about because your body arouses itself to seek an environment that more obviously and assuredly will support its life. Most minor workplace anxieties would evaporate for people if they simply got some serious exposure to active natural settings everyday, a couple times a day.

In the previous paper outlining the primary Evolving**Success** model of human thought and behavior[1], we made use of the following

diagram to describe how an emotional experience evolves with time while a given drive goes unbalanced or unsatisfied.

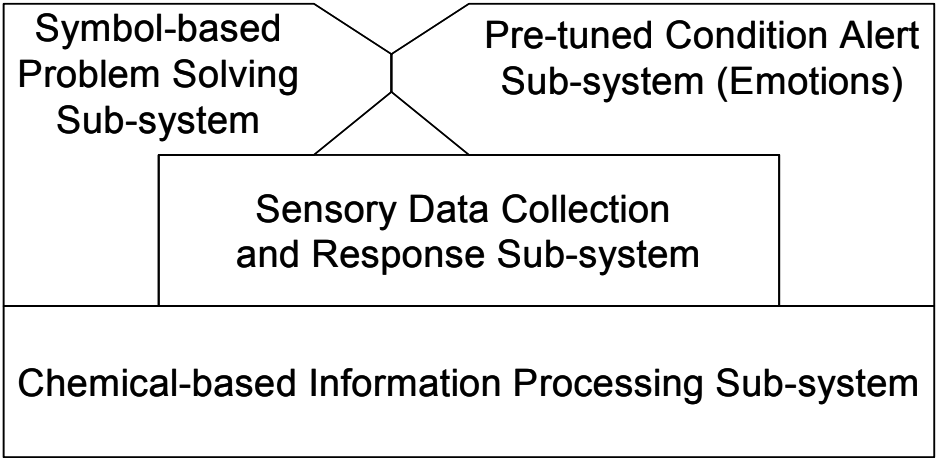
**Figure 1: Time Dependence of Subjective Emotional Experience when a Drive or Data-handling Function is out of Balance**




Every one of the data input ports in the human body is followed by, or attached to, some cluster of data evaluation systems. These evaluative functions could be hosted on a chemically-based process, a neurological process, or (most commonly) a combined assessment process. They store the needed standards by which to judge the incoming data as containing "good" information (yielding a positive emotional experience, no matter how fleeting), or "bad" information (initiating the downward sloping curve of a negative emotion that will persist until the information changes, or time reduces its significance).

The vast majority of these evaluative systems, and there are many of them, do *not* generate information that creates an inner dialog event, meaning they do *not* generate thoughts. They aren't strongly connected to information processing systems that operate through symbols that human beings typically use to understand and communicate their experiences, as illustrated in Figure 2 below. They usually, if not always, generate an *emotional* response that *only rarely* breaks through the subliminal into the inner dialog with a label (like anxiety).

**Figure 2. Schematic Representation of the Four Information Sub-systems at Work in the Human Body, with emphasis on the poor connection between the dominant sub-system of emotions and the less well developed problem solving sub-system.**




There are two things about this emotional response. Of secondary interest to this article is the fact that the experience of an emotion is actually only a bi-product of processes which are preparing the body to work on re-balancing one of the three drives. Of primary importance is that all we become aware of in our conscious experience is a feeling, and that feeling is often difficult to hook to a clear event in the environment.

What does this mean for the everyday experience of life in an ordinary work environment? It means that most of our feelings at any given time are the product of a vast number of environment assessment processes over which we have very little direct awareness and no direct control whatsoever.

There is another factor for emotional comfort implied by the curve in Figure 1: the factor of time. Each of the data evaluation systems includes a time dependence. The deadlines for behavioral responses for virtually all of them are very short when compared to the length of the average knowledge-work project. For example, the time it takes to flee from a predator, or conversely to chase down a running animal, is measured in seconds on the short side, and one or two minutes on the long

side. If a satisfactory conclusion to the event occurs, then all of the evaluation systems reset to an emotionally neutral state. If they don't, well, if you're prey you're eaten, and if you're predatory you're still on the prowl. If you don't find food for several days you continue on your quest until you succeed or you starve (a couple of weeks tops).

Knowledge work, on the other hand, often entails projects that run for months or even years. Even if the job is piece work, like data entry, the sedentary nature of the job and the confinement to a single desk or cube means that an individual is not functioning properly, from a system-design point of view.

We wrote early in this paper that physical activity affects emotional states, where, within certain bounds, great physical exertion tends to create positive emotions. Sedentary lifestyles, in general, lead to more negative moods, especially where there is also a lack of mental stimulation such as reading or problem solving. This indicates that there are also many data assessment processes that are monitoring internals states in the body. As a self-regulating system, the human body is full of data-driven control loops that motivate the animal to exert itself in the satisfaction of its drives.

When there is a lack of bodily activity, many of these control feedback loops remain out of balance in the manner illustrated in Figure 1 above. "Out-of-balance, open, or otherwise unsatisfied control loops initiate and maintain downward sloping emotional sensations. Why should this be? The figure suggests a naturally selected advantage for active animals, or human beings. In nature an animal has to exert itself physically to satisfy drives. But modern knowledge work is sedentary. Successful drive satisfaction behaviors in modern life do not "trip the switches" indicating drive satisfaction success as currently configured by natural selection. These unsatisfied control loops will start to trigger unpleasant emotions whether the worker is successful in his or her career or not.

One may ask, "What is actually experienced when these unfulfilled data evaluation functions fire off?" The answer depends, of course, on how long they go unfulfilled. The longer they go unfulfilled, the more likely a person's awareness of them will eventually make an impression on his or her inner dialog. But prior to that point, here are some anecdotal answers:

- "I feel a little off, like something might be wrong, but I just can't tell." (More commonly from women than men.)

- "Boy, I feel restless."
- "My shoulders are so stiff."
- A person might become surly or otherwise difficult to deal with for no apparent reason (more commonly men than women).

What is it about knowledge business workplaces that create these, and more serious, emotional and behavioral phenomena in human beings?

## The Modern Workplace: As Alien to the Human Body as a Flying Saucer

Most modern living and work environments are devoid of natural sights, sounds, colors, smells, solar radiation, fractal patterns, and other clues indicating that they might be able to support human life for the duration of a human lifespan. For a human body that is specifically tuned by millions of years of evolution to function in a natural environment, the lack of these stimuli triggers a large number of subliminal danger signals. The emotions these danger signals generate appear to follow the curve in Figure 1, as indicated by numerous coaching sessions we've had with employees over the years.

Add to this lack of direct sensory stimulation the extended periods of time that sedentary humans perform physically inert work and you have a recipe for numerous subliminal distractions that will impact the productivity of a knowledge workforce in increasingly negative ways. The self-regulatory mechanisms of the body assess the sedentary state as negative and act to push the human animal into action. The restlessness many people experience is completely real; their bodies are attempting to get them up, out of their chairs, and into fresh air and sunlight. Over extended periods of time these unattended subliminal distractions turn into various levels of anxiety, depression, frustration, and even aggressive behavior.

To put the sharpest of points on this, these negative responses are exactly what the human body is built to do when conditions are detrimental to personal health and safety. Before the human inner dialog came into existence, emotional programming pushed hominids to act on behalf of their own welfare. The ability to think using symbols to model and simulate other conditions and possible solutions was not needed for the human body to meet the design specifications of natural selection. The human body is designed to have a negative emotional response to

environments which make living difficult, and to enjoy environments which are rich in the basic resources required to sustain animal existence. Or, to put it more colloquially, human bodies don't "know" when their knowledge-worker owners have it so good.

None of these data evaluation routines in the body "understand" trading time for money as a drive satisfaction strategy. The smell of money doesn't really elicit a gut-level response, unless it's just been dug out of rich soil. Only a very small information system in your body understands the concept of gainful employment, and it's not big enough to change thousands of small responses your body has to an environment ill-suited to human living.

However, success in guiding troubled workers through emotional difficulties suggests that the system that understands the concept of gainful employment can also be taught how to manage those thousands of small responses to avoid negative emotional states.

## Managing Subliminal Emotional Responses by "Re-engineering" Workplaces and Workflows

The most empowering way to deal with subliminal emotional responses is to systematically retrain a worker's inner dialog to deal with them. That, however, is well beyond the scope of this article. On the other hand, we have employed techniques in the workplace that can "fool" the data evaluation functions of the body into assessing the environment as "good, safe, and life-sustaining."

We are not going to detail a wide range of specifics. There are many practical reasons why workspaces and workflows can not be "completely" engineered to cater to more primitive animal responses in human beings. However, with a knowledge of the data channels emanating from the natural environment, we can perhaps experiment with various work environment conditions to remediate negative worker experiences. Likewise, with a knowledge of the time dependence of these subliminal emotional experiences, workflow can be staged differently to provide *both* points of success that satisfy them, and to allow time for exposure to natural environments through the day.

*Reconnecting Workers to the Environment's Data Outflow Channels: Workspace Design Supporting Positive Workplace Emotions*

From an architectural standpoint, many builders and designers have attempted to create workspaces which emulate certain natural conditions. These include the extensive use of windows to bring in natural light, natural colors (various greens and earth tones), and plants. Some locations make use of fountains and other forms of moving water to create a little light-play and to produce natural sounds. Let's look at these in more detail.

The use of sunlight in workplaces makes obvious sense for a lot of reasons. It provides many key forms of visual stimulation. However, glass blocks ultraviolet radiation, the most important part of the solar spectrum for creating positive moods in people. People need to get outside for proper exposure (cancer risks and all) to the sun.

The color palette for workplaces is probably important, but the key is the patterns with which they are applied. Common experience indicates that large areas of unchanging visual stimulation are uninteresting. Vast sheets of light green or neutral beige are not as soothing as natural colors applied in some form of natural looking fractal pattern. There are other visual stimuli that can be built into a workspace that evoke specific kinds of natural settings, which can include everything from large format photographs and murals to large portions of the building built with glass that actually face an attractive natural setting, like nearby woods, farmland, or parks.

Our model suggests that plants are most likely a positive addition to workplace decor. In larger spaces larger plants and small trees strongly evoke a more life-friendly sense of the environment. They can also add important biochemical molecules to the air to improve subliminal emotional states. The olfactory sensory system provides a direct, biochemically driven informational link between the human and external conditions (Amen 1998[4]).

Decorative water displays obviously have to be proportionate to the area within which they operate. However, small table-top "meditation" fountains have become popular in workplaces, and perhaps these sounds can be integrated into larger, more complicated spaces.

Other acoustic effects could be built into a workplace using various mechanical or electronic technologies. Wind sounds could be produced, rustling leaves, or even the noises small animals make under the brush.

Our model also suggests that the least attended-to set of stimuli are the airborne ones. Office air is typically highly filtered and de-humidified. Worse, the latent scents from various cleaners and the outgassing of many synthetic products fill the air with what the brain perceives as dangerous smelling chemicals. Remember, the body is built to seek out an environment containing optimal biochemical resources **without needing to think about it**. Office air is full of strong, unsubtle clues that the office is NOT an optimal source of biochemical resources. It smells like a vat of poisons to the brain, and that creates a lot of subliminal anxiety.

Obviously, things need to be kept clean. We use advanced technology with its many, unintended by-products. That cannot be avoided. Can an office building's air be re-filtered and stocked with trace chemicals of a natural kind?

If it can't, then the solution, again, is to get the worker outside for some part of the day. If a human body can't be in fresh, naturally perfumed air all of the time, at least it can be exposed to enough good air (current pollution problems aside) to create the subliminal "belief" that good air is quickly and easily available. Of course, getting outside also exposes the human body to all of the other stimuli for which it is so well tuned to collect, assess, and appreciate. In our many years managing, we often have heard people comment on their refreshed states and improved moods after a walk outside.

In fact, the best of workplace designs probably doesn't involve interior design and architecture. Our model of the human being as a node in the environment's network of information resources suggests that the best of workplace designs may be to build extensive garden parks around the campus of a major business district, and fill them with as many naturally stimulating features as they can contain.

### *Synchronizing with Workers' Internal Clocks: Workflow Design Supporting Positive Workplace Emotions*

Apart from migrations and other long travels in search for food and water, few behaviors in the entire animal kingdom last more than a few minutes. Virtually all of the self-regulating controls of the human body are built on these same behavioral time scales.

Workplace reality, however, is that nothing takes a few minutes. In the very least, most people are expected to sit dutifully at their desks for every minute they expect to get paid. People don't sit there like that for many of the reasons we've been discussing, but the person signing the paychecks would prefer things that way.

For many knowledge workers, though, work projects run for months and sometimes years with virtually no short timescale successes to satisfy a worker's subliminal control loops. Very few things occur "by human hand" in business in a matter of minutes. As it turns out, our problem solving capabilities give us enough logic to keep us plugging away day after day, but that merely locks the animal part of human experience in a cage that is more than merely psychological.

Things, of course, have to get done, and they have to get done in the workplace. They have to be done in environments and on timescales that strongly conflict with the naturally selected characteristics of the typical human being. How does a manager use this knowledge to avoid loss of productivity in his or her shop?

For major projects, built on tasks, goals, objectives, and so forth, the current trend is to design the workflow against cost barriers and time deadlines. That's probably not changeable for practical business performance reasons. However, the granularity of the workflow design CAN be optimized for human mental health and best performance levels. How might a different granularity of task be used to re-design work?

In nature, animal behavior is dominated by three types of activity with fairly immediate rewards if they succeed:

1. An animal searches for food and water, and if it succeeds it obtains enjoyment.
2. An animal engages in a mating activity.
3. An animal flees a predator, and if it succeeds it enjoys a sense of relief.

For most of human history, success has been immediately followed by reward. By business standards, each of these three activities is a small scale effort. Obviously a business can't drop a cupcake on everyone each time they successfully complete 15 minutes of work, nor can you bring in the dancing girls or Chip'n'Dales. And merely getting the boss (the predator) off your back for a short period of time isn't adequate compensation either.

The point is that there is a granularity of effort and a system of rewards that can be found to optimize human performance and maintain good mental health in the workforce. It takes a committed and engaged management team to experiment and find it. The Evolving**Success** team has been very successful in identifying the appropriate granularity of task to get the most productivity out of project participants while keeping them happy on the job. Interestingly, the more difficult and esoteric the project, the more successful our productivity techniques tend to be.

On the basis of our ev psych model of human thought and behavior, we have composed an idealized daily workflow schedule designed to keep tasks short, get a modicum of exercise, as well as get exposure to natural settings should they be close to the work place. Again, this is highly idealized. Our work teams have only approximated it in practice. However, our experience in staging work with a time-granularity that aims at this ideal has been very effective.

**Table 1: Daily Schedule to Optimize Knowledge Worker Performance and Maintain Good Mental Health**

1. Take the low-stress route to work, regardless of how long it takes.
2. Once you get to work, take care of 2 to 4 tasks taking an average 30 minutes each.
3. Get outside and get 30 to 60 minutes of exercise at the highest level of exertion you can reasonably work up.
4. Get something to eat, but just enough to settle the hunger.
5. Take care of another 2 to 4 tasks averaging 30 minutes each.
6. Get outside for a 30 minute walk.
7. Have a healthy, reasonably sized lunch.
8. Take care of another 2 to 4 tasks averaging 30 minutes each.
9. Get outside and get 30 to 60 minutes of exercise at the highest level of exertion you can reasonably work up.
10. Get another light snack.
11. Take care of another 2 to 4 tasks averaging 30 minutes each.
12. Take the low-stress route back home, and don't be in a hurry.
13. Get in another 30 minute walk before supper.

This schedule is designed to fool the body's various environment assessment systems and self-regulating controls into assessing the situation as good. The order of events in this schedule presumes the "short

effort, immediate gratification" model of animal behavior in natural settings. By business standards this is an extravagant use of time during work hours. In our experience, where this ideal has been attempted but not met, this schedule avoids burnout, maintains mental freshness, and engenders productivity levels that pay for themselves.

## Conclusions

The human body is clearly pre-tuned to receive specific data inputs from the environment. When those inputs are not received, the body generates motivations to get out of the resource-poor or dangerous environment, and move into a life-friendly environment. The longer it takes the individual to succeed in moving to a better environment, the more deeply negative are the emotions that that individual experiences.

The body is also extremely well tuned to the state of its internal conditions. Many people often experience urges to get a little food, water, or other relief without a conscious thought to do so. If the body is experiencing conditions outside of its "safe operating specifications," negative emotions crop up to motivate the individual to take care of the need. The longer it takes to satisfy the need, the more extreme the emotional sensation becomes.

Modern living and working conditions place barriers between the human being and the data sources his or her body expects to detect. Long-term disconnection from these sources appears to be creating chronic mental health problems in the American workforce. This, of course, has various impacts on business productivity.

We have suggested principles by which to guide a manager in the re-engineering of workspaces, including the landscape architecture surrounding work locations. We have also supplied a rationale to guide in the restructuring of long term work efforts. Lastly, we provided an idealized work schedule aimed at structuring time utilization on the day-to-day level. This schedule maps to the basic psychology built into human beings by natural selection to optimize their mental health and business productivity.

## Notes

[1] Thomas Meylan, "Using Evolutionary Psychology and Information Systems Engineering to Understand Workplace Patterns of Thought and

Behavior: An Empirical Model of Human Information Processing," Autumn, 2005, Journal of the Washington Academy of Sciences.

[2] Martin E.P. Seligman, Ph.D., The Optimistic Child, Harper Perennial, pp. 37-42, 1995.

[3] Robert Wright, The Moral Animal, Pantheon, 1994.

[4] Daniel G. Amen, M.D., Change Your Brain, Change Your Life, Three Rivers Press, pp. 37-43, 1998.