Paper 1 of 5

A second evolutionary process moderates the evolution of emotions and behaviour

Danny Vendramini

KEYWORDS

Adaptation, Darwinism, Emotions, Environment, Evolution, Innate behaviour, Natural selection, Instinct, Teemosis, Teems, Transduction.

ABSTRACT

Evolutionary biology recognises only one evolutionary process: natural selection. However, here the existence of a second evolutionary process is posited, (called 'Teemosis'), that emerged at the Precambrian-Cambrian boundary from selective pressures for complex, environment specific, heritable behaviour. It is argued the teemosis process promulgates environmentally acquired instincts, innate behaviour, including 'human nature,' and emotions in all phyla above sponges, *(phylum Porifera.)* Although an 'instructionist' process, teemosis is nonLamarckian, thus avoids the deleterious consequences of acquired characteristics. It is hypothesised the DNA molecule contains two separate systems of inheritance; the 'Mendelian Inheritance System' utilising coding Exon genes, and the 'Teemic Inheritance System,' that conserves environmentally acquired quantums of innate behaviour, called 'teems,' in non-protein-coding DNA nucleotide sequences. Finally, the paper argues that the biodiversity and complexity that is everywhere evident in nature is not the consequence of natural selection alone, but of natural selection and teemosis working in symbiotic concert.

By integrating the evoluton of emotions, instinct, motivation and personality with organic evolution and genetics, teem theory unifies the biological sciences into a new holistic paradigm.

INTRODUCTION

The need for a new evolutionary paradigm of innate behaviour

While natural selection (NS) explains the gradualistic and incremental evolution of physical characteristics, it appears less adept at explicating the origins of complex new innate behaviour, and in particular, instincts involving current environmental conditions and circumstances: eg. migration routes, current predators and prey, mating rituals, territoriality, foraging, food preference and avoidance, conspecific and interspecific reciprocal behaviour, etc. NeoDarwinian theory has long argued that because selection occurs within the organism’s current and specific environment, the environment asserts a proactive role in evolution. However, NS is a two step process, and the second step - what Mayr (1988) calls 'natural selection proper,’[1] only selects an adaptive behaviour once the behaviour is in a heritable genetic form. Thus, the behaviour must be genetic before the environment can select or reject it, and significantly, the only way it can become genetic is via the medium of germ-line mutations,[2],[3],[4] which are known to be random.[5],[6],[7] Thus the rigidity of NS’s two step process demands new behaviour is promulgated exclusively from post-mutational selection of random behavioural alleles.

Darwin himself was the first to concede that many instincts “are so wonderful that their development will probably appear to the reader a difficulty sufficient to overthrow my whole theory.”[8] New born turkey chicks, fresh from their shells are able to identify hawks and other predators flying overhead, and run for cover, but will not do so in response to pigeons, gulls, ducks or herons.[9] NeoDarwinian theory is currently unable to demonstrate how random mutations configure the genome of clutchlings with the precise shape and flight characteristics of its principal predator, arguably equivalent to a human mutation that recognises a Volkswagen and explains how to drive it. Moreover, no mutational behavioural gene for complex, environment specific, innate behaviour or coevolutionary behaviour, (whether antagonistic or mutualistic,) has yet been identified.[10]

Notwithstanding this, somewhere in the genome of every mongoose resides the innate ability to identify and kill snakes. Somewhere in the genome of every beaver is the design of a dam and how to built it, and somewhere in the genome of every human is a preference for park-like landscapes.[11],[12],[13],[14] These innate behaviours and instincts so palpably incorporate elements in the organism's current environment, to which the mutational process is blind, as to intimate the existence of an additional, as yet, undiscovered 'instructionist' connectivity operational between environment and genome.

The inability of NS to explain perceived examples of environment-genome instruction prompted Darwin and others to examine alternative paradigms. Because the Lamarckian theory of 'inheritance of acquired characteristics' acknowledges the influence of the environment, it was considered a possible adjunct or even alternative to NS. However, while it may theoretically be adaptive for a giraffe to inherit its ancestor's longer neck, acquired from stretching to reach the highest leaves, it is maladaptive to acquire its ancestor's rheumatism, glaucoma or the scars from predatory encounters. That is to say, the deleterious consequences of environmentally acquired traits has now been comprehensively demonstrated, negating the Lamarckian paradigm with regards to organic evolution. As Richard Dawkins succinctly put it: "Life in the universe is either Darwinian or something else not yet thought of."[15]

In view of NeoDarwinism's inability to explicate the complexification and ecological 'instruction' evident in new complex innate behaviour, here 'something else not yet thought of' is proposed - there exists on this planet, not one, but two separate evolutionary processes operating in symbiotic concert. In addition to NS, aspects of a second evolutionary process have been identified, called 'Teemosis', that originally emerged to facilitate the inheritance not of physical traits, but of experiential information – the basis of all innate behaviour. Although radical, this hypothesis is based on two plausible premises: firstly, that just as other features of life evolve, so too does the process of evolution; and secondly, that the biological imperatives regulating the evolution of innate behaviour and instincts are so qualitatively different from those regulating the evolution of physical characteristics as to necessitate two distinct evolutionary mechanisms of acquisition, modification and inheritance.

Teem theory; an overview

To emerge as a viable instructionist evolutionary process regulating the inheritance of acquired behavioural traits, it was imperative that teemosis circumvent the deleterious consequences of Lamarckian inheritance. This antiLamarckian imperative has modulated every characteristic of the teemosis process. Significantly, teemosis avoids maladaptive Lamarckian protocols by the same two means it utilises to create innate behaviours. Firstly, teemosis does not exploit random germ-line mutations nor ameliorate corporeal traits, thereby precipitating no phenotypic or genotypic modification. Instead, it is suggested teemosis uses high salience emotions, the consequence of a sublethal emotionally traumatic experience, to fracture homeostasis and forcibly imprint a record of a specific traumatic emotional experience directly into chromosomal material – what is here called a ‘teem.’

A teem occurs when an emotional trauma reaches what may be termed the ‘teemic threshold,’ acquiring the emotional potency and amplitude to permanently modify specific nucleotide sequences of an organism's nuclear DNA. Simply stated, periodic traumatic events such as accidents, predator attacks and natural disasters generate sudden and abnormally intense emotional responses that activate stress hormones that disrupt homeostasis and sporadically precipitate a modification in germ-line DNA. By this means, it is suggested, traumatic emotional experiences may permanently alter the genome and be heritable to the next generation.

These trauma encoded emotions contribute to inclusive fitness because they contain retrievable, linguistically meaningful information. In a process here called ‘emotional transduction,’ environmental information is ‘transduced’ by sensory modalities into an emotion based genetic code. While the linguistic capacity of this emotional code is limited, because emotion demonstrates no genotypic physicality, it is the only informational and linguistic medium capable of permeating ‘the Weismann barrier.’[16]

The evolutionary viability of the teemosis process is based primarily on its use of emotion to cross the Weismann barrier unimpeded, facilitating the transmission of epigenetically acquired environmental information, encoded as linguistically meaningful patterns of emotion, to the next generation. Indeed, the capacity of emotion to transport adaptive information across the Weismann barrier, (to permeate the barrier,) appears to be a fundamental law of nature - as unfailing, ubiquitous and uniform as the laws of gravity.

This ‘emotional permeability hypothesis’ confidently predicts that every instinct and innate behaviour in all species above sponges, (*phylum Porifera*), is fabricated from linguistically meaningful quantums of inherited emotion, called teems. Significantly, it also predicts that if ecological information cannot be configured into teems, it is unable to be inherited by the teemosis process, and therefore cannot be factorial in innate behaviour. Thus, emotion is the elemental component of the teemosis evolutionary process. This hypothesis is consistent with the ubiquitous prevalence of emotion in nature.

The second means by which Lamarckian inheritance is circumvented, and the second core tenet of teem theory, is that emotions generated by sublethal traumas are not archived in inviolate protein-coding Exon genes. Instead, it is suggested they are encrypted in non-protein-coding nucleotide sequences of DNA which are transcribed into mRNA, but not translated into protein products.

Non-protein-coding genetic material (junk DNA) has been widely held to be an evolutionary anomaly with no significant evolutionary function. However, the hypothesis - that non-protein-coding genetic material is the indispensable corporeal archive of the teemosis evolutionary process explains both its hitherto unknown evolutionary function and its pervasive presence in eukaryote DNA - in humans typically comprising 98.5% of the genome.[17]

Once transcribed into non-protein-coding DNA, (ncDNA) the emotion generated by environmental traumas is inherited by progeny without recourse to cultural protocols. Like physical traits though, teemic nucleotide sequences are varied by DNA recombination during meiosis, mutations, genetic drift, replication slippage and environmental mutagens.

Teems remain dormant until activated by either an environmental or endogenous ‘teemic trigger’ – any sensory precept, that when transduced, is reminiscent of the original encoding emotional trauma. When activated, the emotions of the teem are expressed in somatic cells throughout the central nervous system, but primarily in the limbic system. That is to say, teems are genetically archived emotional memories, and like normal cerebral memories, they are ‘jogged’ into recall by association. It is these genetically archived emotional memories that form the basis of all innate behaviour. Because teems contain the hard won experiential adaptations of ancestral survivors, and provide the means by which taxa achieve fitness in their current ecological circumstances, teems and the teemosis process have been conserved and radiated by NS.

A teem then, is a quantum of emotional data genetically encrypted into ncDNA by stress hormones precipitated by a single high salience emotional incident. Because this unit of emotional data is an accurate emotional record of a specific real-time event (the ‘teemic trauma’,) and may be recalled if ‘jogged’ in descendents of the progenitor teemic encoder, it is more accurately described as an ‘intergenerational memory,’ albeit of a specifically emotional experience. And it is because this environmentally acquired emotional memory is primarily a consequence of a emotional trauma, (either positive or negative,) that the term ‘teem’ was derived; - (**T**rauma **E**ncoded **E**motional **M**emory.)

Importantly, because a teem contains a linguistically accurate representation of its ancestor’s emotional experience of one traumatic event, a teem can theoretically provide information pertaining to the ancestral environment and also to its ancestor’s emotional response to a specific traumatic situation. This represents the first rudimentary steps towards a singularly adaptive instructionist evolutionary process.

The teemosis process – six sequential steps

Here the teemosis evolutionary process is briefly described. Unlike NS, which is a two step evolutionary process; (production of variables, followed by selection,) teemosis requires six biologically distinct, sequential steps to produce a heritable adaptive instinct or emotion.

One: The Teemic Trauma

As an instructionist process, the first step – 'the teemic trauma,' acknowledges the environment as the progenitor of all teemic instincts and emotions. Periodically, a natural disaster, predatory assault, misadventure, copulatory activity or other sublethal environmental stressor occurs which is transduced by an organism's sensory receptors and conveyed via neural networks to the central nervous system, (CNS) precipitating a high salience emotional response in an individual. Although the emotional trauma may involve either positive or negative emotions, in lower teemic taxa, the emotions are predominantly negative.

Typically, the intensity of the arousal stimuli disrupts CNS homeostasis and stimulates the hypothalamic-pituitary-adrenal axis to affect a variety of physiological and affective responses, modulating protein synthesis and culminating in organismal stress and the subjective experience of hyper-emotionality. In a proportion of cases, physical injury or progressive shock to the CNS is irreversible and death ensures. However, in a percentage of cases, the organism survives the emotional trauma and encodes a new teem.

Two: Emotional Transduction

The emotional permeability hypothesis - that only information in an emotional form may permeate the Weismann barrier and be inherited without maladaptive Lamarckian consequences predicts that all environmental information, acquired via the senses of an organism and utilised in the formation of sensory precepts, instincts and emotions, must first be translated, or more accurately, 'transduced,' into a coded representation prior to being genomically archived by the teemosis process into ncDNA.

This prediction has two significant corollaries. Firstly, in order to be inherited as a teem, sensory information, including but not limited to visual, tactile, auditory and olfactory stimuli; gender and development cues; identifying attributes of conspecifics, predators, prey and epigamic behaviours, etc, must first be transduced into emotional ‘words’ and ‘sentences.’ Secondly, this transduced sensory stimuli will only contribute to fitness if it contains linguistically meaningful and retrievable adaptive information. This predicts that sensory stimuli is first encrypted into an emotion based code or biolanguage. Accordingly, it is posited that all teemic species maintain the capacity to transduce sensory stimuli into a teemosis compatible emotional language. I call this theoretical language, ‘Emlan,’ (**EM**otional **LAN**guage,) and it is, I suggest, ubiquitous in teemic phyla.

Because information must be coded into Emlanic form to be processed and archived by the teemosis process, only aspects of the teemic trauma that can be transduced into Emlan can form part of an inheritable teem. As all new innate behaviours are based on transduced sensory information, NS ensures that each species acquires an Emlanic lexicon sufficient to transduce the essential information required to encode the teems essential to the continuance of the species. This includes the transduction of conspecifics, predators, prey, food, sexual cues, habitats, colours, shape, size and time of day into Emlanic code. In short, every mating ritual, dance, song, web, burrow, hunting tactic, defensive strategy, colour coded warning sign, plus all the myriad elements that collectively comprise innate behaviour must be transduceable from sensory stimuli to a phrase or sentence in Emlan.

This hypothesis expands the traditional concept of emotions such as pity, joy and sadness to include nouns such as sun, grass, water, apple, prey, thunder, cave, bird etc. According to this model, the emotions of twilight, pond and tree are no less valid emotions than fear, love or interest. The transduction hypothesis and the teemic theory of emotional perception is discussed in greater detail in **Paper 2**.

Three: Genomic Archival

In the third step, it is argued that in a proportion of cases where the individual survives the physical consequences of the trauma, and the circumstances of the trauma are successfully transduced into Emlanic representations, then elevated levels of hormones and peptides, including catecholamine and corticosteroid stress hormones overwhelms the normally inviolate genetic homeostasis of germ-line ncDNA, disrupts chromosomal integrity and precipitates the linguistic reorganisation of ncDNA nucleotides to encrypt the emotions into the organism's genome. **Paper 5** demonstrates how germ-line ncDNA is transposed, duplicated, deleted and reconfigured in response to environmental stress. To date, these mobile noncoding 'transposable elements' have been considered an evolutionary anomaly – just more 'junk DNA.'

Four: Teemic Activation

When inherited by offspring, the teem is simply a genomic repository of inherited experiential information archived within ncDNA nucleotides. To contribute to fitness, this archived information must be accessed in an adaptive context. Thus, I posit, teems remains unexpressed until *activated* by a 'teemic trigger,' which may be any transduceable circumstance, object or situation that resembles the original encoding trauma. When a meerkat sees a wolf, the visual, aural, olfactory characteristics of the wolf are transduced into an Emlanic representation which matches the emotions of one of the meerkat's anti-predator teems and activates it, releasing the archived emotions of apprehension, caution, dread and so on, which inevitably manifest in heightened vigilance or an escape strategy.

Five: Teemic Monitoring

Although teemic activation is a direct consequence of transduction and memory association, in higher species, activation is additionally correlated to the evolution of specialised cerebral modules that facilitate vigilance for teemic triggers. I call this module the Teemic Monitory System, or simply the 'monitory system.'[i]

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[i] From the Latin: *monitõrius*- 'warning.

Like a smoke alarm, the monitory system is a sentinel tuned to specific transduced emotional stimuli and is fundamental to the efficient activation of adaptive teems. The monitory system utilises both hardware and software elements to maintain emotional vigilance for transduced stimuli resembling the original encoding event. While software is provided primarily by teems, monitory system hardware includes the amygladaloid complex, sensory modalities and brain waves.

Although neuropharmacological, neuropsychological and brain imaging techniques demonstrate the amygdala regulates emotions, processes emotionally salient stimuli,[18],[19],[20] and recognizes fear in particular,[21],[22],[23] these responses are indicative of the amygdala's primary evolutionary function - as the trigger mechanism of the teemic monitory system.

The amygdala's capacity for detecting threat,[24],[25],[26],[27],[28],[29] is in accordance with the view that monitoring anti-predator teems is an imperative of monitory function. Significantly however, while brain imaging and lesion studies have focused on the amygdala's role in processing threatening and aversive stimuli, a number of recent studies with human subjects have demonstrated amygdala response to arousing, positive stimuli, including, sexually explicit movies and pictures, and happy facial expressions,[30],[31],[32],[33],[34],[35] a finding consistent with the hypothesis that the amygdala is instrumental in the activation of all teems.

Monitory system vigilance is both stressful to the organism and depleting of biological recourses. In response to the stress of monitoring, the CNS of teemic species utilise EEG brain waves to regulate monitory system levels of arousal and attention vis-à-vis sensory interconnectivity to the external environment. This hypothesis predicts that in all teemic species, EEG brain waves will be positively correlated to states of arousal, from mental alertness to deep sleep, a conjecture supported by research evidence.[36] As teemic monitoring is mediated by emotional rather than cerebral processes, and functions independently of consciousness, the hypothesis further predicts that monitory function occurs subliminally; a prediction supported by a substantial body of research[37],[38],[39],[40],[41],[42],[43], [44],[45],[46],[47],[48],[49]

Six: Natural Selection and natural selection proper

Because the process of encoding new teems does not utilise mutations, exon genes or DNA translation, it is therefore blind to the mutational process. Thus the first step of Darwin's evolutionary process (production of variations,) does not apply to teemosis.

Once genomically archived into ncDNA however, each teem is subject to step two of the Darwinian process - natural selection proper, which tests the new teem within the context of the organism's current ecological circumstances. If the new teem precipitates an adaptive emotion, behaviour or personally trait, it is likely to be conserved, while maladaptive teems are eradicated from the gene pool.

The teem theory of sensations and emotions

The teemosis evolutionary process exclusively moderates all sensations and emotions in teemic phyla. Teemic transduction translates sensory perceptions (what an organism sees, hears, smells, touches, tastes etc.) into a continuous subliminal stream of transduced emotional activity. While this stream is adaptively used to encode new teems and monitor existing teems, an exapative by-product of this transduction process is a constant flow of transduced, low amplitude emotion, mostly below the level of conscious awareness of the organism. Even sentient species like humans are not generally conscious of this background stream of transduced emotion. Consequently, this activity is more accurately described as *sensations*.

Typically, the only time humans become aware of transduction activity is when the transduced precept activates a teem or generates an abnormally strong transductive pulse, which is recognised by cerebral modules and interpreted as an emotional response. For example, when we pick up a spoon, although this mundane object is transduced into a specific 'spoon representation,' comprised of 'spoon emotions,' they generally lack the salience to achieve consciousness, whereas, when we look at a particularly beautiful work of art, an erupting volcano, a spider or an ulcerous wound, the potency of the transduction pulse will be recognised by a sentient organism as an emotion.

Teemosis generates new emotions by encrypting an individual's emotional response to a traumatic circumstance into its DNA. Although each teem is a genetic memory of a specific environmental episode experienced by an ancestral individual, the activated teem contains no semantic or declarative memory of the episode, nor any physical consequence of the circumstance. Only the emotional response is archived in the teem and recalled. Without the contextualising semantic memory, cognitive awareness, or physical effects of the trauma, all that remains are the emotions generated by the episode. According to this paradigm, an emotion is the genetically encoded traumatic emotional memory of one specific event or experience in the life of an ancestor – devoid of semantic memory, conscious awareness or physical consequence.

The hypothesis asserts that when a teemic organism experiences an emotion - jealousy for example, the emotion is actually the recalled emotional memory of an ancestor's emotional response to a specific real time event. When we are moved to pity, it may be the pity first encoded into a teem by an *Australopithecus Ramidus* ancestor at the sight of a wounded infant. When touched by the beauty of a sunset, the emotions we recall may well be derived from the emotional memory of one Palaeolithic evening seen by a bedazzled anthropoid ancestor. And when we laze in the sun on a winter's day, it may be the evocation of an ancient teem first encoded by a poikilothermic reptilian ancestor on a sunny morning in a Jurassic rainforest.

How teems create personality

Once an adaptive teem is encrypted into ncDNA, it is genomically stable and conserved over great phylogenetic distances. However, over time all teems are incrementally modified by single nucleotide polymorphisms (SNPs) precipitated by sexual reproduction, genetic drift, replication slippage, environmental mutagens and in higher teemic species, additionally by learning and culture. The resultant teemic polymorphisms of ncDNA are highly variable and unique to each teemic individual. Although these polymorphisms generally do not disrupt teemic function, they subtly alter the emotions encoded in the teem and thereby moderate the expression of the teem. This manifests in individual differences in emotionality, or 'personality' in teemic organisms. Thus, although personality has traditionally been perceived as a uniquely human attribute, teem theory asserts that personality is simply a naturally occurring genetic by-product of the teemosis evolutionary process, and as such is common to all teemic phyla.

The teem theory of instincts and innate behaviour

Teems appear to create innate behaviour and instincts in two interconnected ways. Firstly, teems encrypted into ncDNA sequences regulate the expression of coding genes that control various neuropeptides, hormones, neuromodulators, enzymes, transcription activators and neurotransmitters that precipitate specific behavioural responses. This hypothesis is explicated and tested in **Paper 5**, in this issue.

Secondly, while innumerable teems express simple emotions such as joy, sadness, interest and pity, other teems contain more complex transduced emotional information relating to behavioural responses, development and gender cues, location, time, colours, texture and motivation. When activated, these complex emotional instructions predispose a organism towards a specific behaviour in a explicit environmental context. That is to say, each innate behaviour is precipitated by the expression of a specific array of recalled teemic emotions. Territorial behaviour is precipitated by territorial emotions, agonistic behaviour by agonistic emotions, maternal behaviour by maternal emotions, and so on.

This hypothesis explains why song sparrows raised in isolation are able to produce normal song-sparrow songs.[50] Teem theory argues that they do not have every note of the song encoded in their genes. Rather, each conspecific inherits a ‘song teem’ that proscribes the song as an emotional vignette. When triggered, the bird vocalizes, guided by the song emotions. When the song ‘feels right,’ by perfectly expressing the genetically encoded emotions of the song teem, the bird simply memorizes this version. With each recital, the guiding teemic emotions ensure the fidelity of the performance.

Similarly, emotions expressed by teems may even guide the design and construction of complex, three-dimensional structures such as habitats. Having inherited a teem that precisely defines what a transduced spider’s web *feels* like, a spider will begin construction, guided solely by its unique web aesthetic and motivation emotions, adding spirals and spokes until the emotions are aesthetically expressed. Like human artists, the spider works by trial and error: each wayward thread sensed as a discordant emotion and every well-placed strand evoking a satisfying emotion. The variable expression of these two emotional polarities creates a simple form of guidance. "Yes! That feels right! Move to the next step. No. That doesn't feel right. Go back and try again."

The mole cricket (*Gryllotalpa Vinae*), digs a complex underground double-mouthed horned shaped burrow, which males use to sing in.[51] The horned shape of the chamber, its smooth walls and resonating end bulb act to concentrate and focus the sound above the burrow.[52] Again, the cricket utilises a 'burrow teem', which, when activated, recalls an array of 'cricket song emotions.' The cricket then digs, shapes and smoothes the burrow, occasionally singing a short aria to test the progress, until the chamber accurately resonates the frequencies of the burrow emotions. In effect, the cricket uses the emotions generated by its teemically encoded song bouncing off the walls of the cavity to construct the perfect sounding habitat. When the sound is right, the shape is right.

From an evolutionary perspective, one of the advantages of teemic instincts is that they provide a margin of flexibility that gene based Darwinian instincts do not. This is particularly important in heterogeneous and variable environments. For example, if one favoured nest building material is in short supply, the bird may make an emotional choice in selecting a substitute that transduces similar feelings.

Additionally, teemic behaviours can be modified by experience. A honey badger for example, may expand its food selection if it finds a new food that transduces similar taste emotions to a traditional, teemically proscribed food.

Teems play an important role in interspecific and intraspecific communication, allowing organisms to communicate from birth. The following theoretical example illustrates the process of encoding a simple communications teem and demonstrates how teems confer an adaptive advantage to progeny.

A chaffinch is attacked by an falcon and although its survives the skirmish, the trauma is imprinted as various terror and startle emotions, along with the perceptual cues that identify and associate the falcon with the fear emotions. Theoretically though, when this first chaffinch was assailed, its terror emotion was verbally expressed as a loud high pitched, repeated vocalization at approximately 7 kHz frequency. This distress call was caused specifically by, and correlates precisely to, the trauma of being predated by a raptor. In effect, the distress call is an expression of the ‘falcon emotion.’ The two are inseparable.

All descendants of this ‘teemic encoder’ chaffinch will inherit a teem that recalls the same ‘falcon emotions’ whenever a falcon is transduced in a predatory context. When expressed, these precisely replicated emotions invariably precipitate the same loud, 7 kHz vocalisation. In this simple way, a new 7 kHz ‘word’ is added to the chaffinch innate language. Today, all chaffinch (*Fringilla coelebs*) use the same 7 kHz distress call.

Traumatic circumstances of the magnitude able to encode teems, (predation for example,) often result in the demise of the individual, so individuals that survive frequently do so because their behavioural response in that particular instance proved adaptive. If this life-saving ‘action response’ is transduceable into Emlan, the associated trauma may encode it as a teem, providing progeny with a new adaptive instinct. For example, the common European grass snake *(Tropidonotus, natrix*) when trapped by a fox will frequently lapse into a comatose state and the fox will not generally eat the ‘dead’ snake. This is because the fox’s ‘predation teem’ cluster includes rapid movement of the prey, and therefore needs rapid movement to be triggered. Because the snake’s death feigning behaviour proved adaptive, this new thanatosis or ‘death feigning teem’ will be conserved and disseminated to its progeny, forming part of the grass snake’s species-specific teemic repertoire. In this manner, an adaptive action response, (thanatosis,) becomes innate.

In practical terms, innate behaviour in teemic phyla is thus comprised of a species-specific symbiotic fusion of both emotionally encrypted (teemic) predispositions, and physiological behavioural dispositions precipitated by hormones, neuropeptides, neurotransmitters etc. regulated by teemic ncDNA nucleotide sequences.

Teem theory of motivation

For innate behaviour to be adaptive, it must be implemented with appropriate dispatch. Even an adaptive action response would fail without the apposite motivation. For example, precisely how fast and how high a man jumps when he steps on a snake may well affect his survival; how determined a crocodile is to conceal its eggs will impact on how many hatchlings survive predation, and how determined an organism is to procure a mate directly affects procreation.

From the perspective of teem theory, motivation is simply a measure of the salience of a transduced emotion. That is to say, motivation defines the strength of an emotion, so axiomatically, motivation is an integral component of each and every teem. Because each teem records the organism's precise motivation throughout the teemic threshold, when the archived teem is triggered, the motivation emotions are accurately recalled. This ensures that each action response includes the motivation to ensure the behaviour is adaptively implemented. Thus, motivation is another by-product of the teemosis evolutionary process.

Another reason why teemosis proved so adaptive, particularly within the Cambrian environment where it first emerged, is because teems are modulated by emotions and sensory organs, so are not dependent on cerebral (brain based) organs or modules, which had not yet emerged. In effect, while teemic organisms require a central nervous system, they do not require functional cerebral networks or brains.

Similarly, teemosis is not development-dependent, so teems may be functional in neonates, providing a degree of protection against predation and misadventure which would otherwise take a greater toll on infants. For example, the 'visual cliff' experiments by Gibson and Walk (1960)[53] demonstrate that human infants reveal a perceptual awareness of the perils of an elevated 'cliff' and will not venture over the edge. This 'cliff teem' we may imagine, was encoded by a Phanerozoic infant who survived a fall from a precipitous height, and encoded a teem that included a transduced representation of abnormal height, fear and other clustered emotions. Inherited by progeny, the teem provides a degree of prognostic protection for infants in similar perilous situations.

Conclusions and implications for physical evolution

After 3.2 billion years of punctuated gradualistic, incremental evolution, it is argued NS invented an evolutionary partner, ostensibly to generate systematic and adaptive inheritable behaviours. However, a case may be made that not only did teemosis create adaptive instincts and emotions, it indirectly exerted a substantial indirect impact on the evolution of physical forms as well. Elsewhere in this issue, (**Paper 4**), I argue that the biodiversity and complexity that is everywhere evident in nature is not the consequence of natural selection alone, but of natural selection and teemosis working in symbiotic concert. This paradigm requires a radical revision of Darwinian theory.

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