The Transformative Nature of Yoga

Part I of a two part series.

Siegfried Bleher, PhD

Introduction

How long does it take a yoga student to understand the real benefits of the instruction "lift the chest?" One may hear the instruction and feel the spaciousness in the chest, the improved clarity of vision, the freedom in the breath. And one may appreciate the effort required to maintain the lift and openness. But when and how does the realization come that the whole perspective may change, one's state of mind and reality, as a result of lifting the chest?

Initially, a person may practice from a place of relative unawareness, and in an unbalanced way. For example, if the back muscles are not released properly after doing back extensions ***and*** the proper changes in perspective and thinking are not made in such a way as to support the physical openness in the chest, the chest will gradually lose its lift. State of mind may be changed momentarily with a practice of ***asana***, but steady growth in outlook that is supportive of the changes brought by ***asana*** requires, as Patanjali says "long, uninterrupted and alert practice" (YS I.14).

Patanjali explains in the ***Yoga Sutras*** that discernment in the exploration of subjective, internal phenomena leads to transformations in our bodies and minds. Patanjali shows also how such internal inquiry leads to an objective understanding of the structure of our bodies, the structure of our minds, and the complex structure of nature at large. Western science, on the other hand, applies discernment to the exploration of external, objective phenomena, and has come to the conclusion that the choices made by the observer – his or her internal state of mind – have an unavoidable effect on what is observed. This means each mode of inquiry – Eastern and Western – eventually leads to an understanding of the relationship between internal and external, or between subjective and objective. Other authors have also pointed to the irreducibility of one to the other. That is, subjective experience cannot be reduced to external objective data, nor can objective information be 'explained away' as subjective experience alone (see, for example, Ken Wilber, ***Sex, Ecology, Spirituality: The Spirit of Evolution***).

In this article, I will present a Western scientific view of the transformative effects of yoga that Patanjali describes in ***Vibhuti Pada***. A simple model is introduced from modern physics for how progress occurs in the practice of ***asana***. A parallel is drawn in Part I between this model and the interplay of the ***gunas*** to show how the complex forms of nature arise. In Part II (which will appear in the Fall/Winter issue of ***Yoga Samachar***) I will discuss the relationship between ***purusha*** and ***prakriti*** in order to understand how yoga transforms both mind and body. I draw on three commentaries on the Yoga Sutras: those by BKS Iyengar (***Light on the Yoga Sutras of Patanjali***), Georg Feuerstein (***The Yoga Sutra of Patanjali***), and I.K. Taimni (***The Science of Yoga***).

Consider for a moment how dough is kneaded. A ball of dough is spread onto a flat surface with a rolling pin, folded over itself, and rolled again. Suppose that a color dye is spread over the flattened dough each time just before it is folded, and we observe the dough from the side after each folding. What would we see? Assuming the edges of the dough do not droop over the dye, then we would see the dye in between each layer of dough. Each layer of dough at later stages of kneading would become increasingly thin, and each layer of dye would come ever closer to adjacent layers. From a distance, the dye would appear to have diffused throughout the dough. As the kneading progresses, we would observe a pattern from the side of the dough that approaches what in modern mathematics is called a 'fractal' shape (see Figure 1a, page 19).

The nature of a fractal is that a pattern is repeated at all scales of resolution: no matter how finely we observe the fractal, we see the same pattern at every scale. A coastline seen from an airplane appears to be continuous and contains a pattern of curves and turns that is determined by wind conditions, tides, land conditions, etc. If we come closer to the coastline, we lose sight of the larger curves and turns, and begin to resolve smaller curves and turns. If the process that governs the pattern at larger scales is similar to the process that works at smaller scales, then we will see the same pattern forming at smaller scales. The repetition of the same pattern at all scales of observation constitutes what is called a fractal (see Figure 1b&c, page 19). In each of the examples of Figure 1 a simple process or procedure determines the change of form from one time step to the next. If continued for many time steps, the objects that result appear the same to our eyes no matter the scale. This defines the term 'fractal.' Although these examples are simple, they can each be said to represent real physical processes occurring in nature.

During the last 25 years or so, more and more phenomena in nature have been shown to have fractal-like properties, and ***nonlinear*** behavior (which is described below). Such phenomena have led to the growth of a sub-field of physics called nonlinear dynamics. What is interesting about fractals in the field of nonlinear dynamics is that a universal process underlies their generation. And that universal process is very well represented by the example of kneading. Is practice of yoga also governed by such a simple process?

Practice of ***asana***, according to BKS Iyengar, requires three steps: ***posing*** (or the active step of practice), ***reflecting*** (or the step of 'self-study'), and ***re-posing*** (posing again with insight and surrender). A little consideration yields parallels of these steps with nonlinear processes as represented by the image of kneading. But before highlighting these parallels, let me explain the phrase 'nonlinear process.'

The basic idea of ***linearity*** is that effects are directly proportional to causes. For example, a metal spring behaves linearly if the amount by which it stretches when pulled doubles if pulled twice as hard. We can see from this example that making predictions in a linear model or physical system is straightforward: any error in measurement of initial state or conditions

will lead to errors in predictions that are directly proportional to the initial errors. But if the spring, being pulled twice as hard, results in four times the extension, then we say it is a nonlinear spring: the relative change in effect is greater than the relative change in cause. This time, an initial error grows very rapidly and in little time is comparable in magnitude to the effect in question. Prediction for such a system becomes very difficult and making accurate predictions for long times is practically impossible. This is seen very well in weather prediction (see Figure 2).

One can perform an ***asana*** with or without reflection (re-posing). In the second case there is gradual progress due simply to the nature of ***prakriti*** (see Yoga Sutras, IV.2, 3). But with the involvement of intention, the process becomes nonlinear, with much deeper effects than without 're-posing.' As in the case of kneading dough, performing ***asana*** in a nonlinear way 'diffuses the dye' throughout the body. Here the dye is awareness and intelligence (***buddhi***), so it is awareness that gets diffused throughout the body. At first awareness is superficial, literally 'on the surface.' When we observe the effects of an action, we 'paste' our awareness to the place in or on the body we observe. This is like putting dye on the dough. Then we use our intention to aim the next action, which corresponds to the step of folding the dough over itself. Finally we perform the next action, which corresponds to stretching the dough, and this takes the pasted awareness deeper into the body. This description is only metaphorical, but it may be possible to measure the presence of awareness and its movement through the body during the performance of ***asana***.

Now we have a physical picture of 'kneading' plus an understanding of its role in our practice. Kneading is also the basic dynamic that underlies the play of the ***gunas*** in their creation of our multiform nature. First I will discuss the ***gunas***.

In the Yoga Sutras, the three ***gunas*** – ***rajas, tamas, sattva*** – are described as the primary constituents of nature out of which all the subtle (unseen) and gross (visible) forms of nature are composed, including elements (***bhutas***) and sensory organs (***indriyas***) (II.18, 19). ***Rajas*** means vibration and action, ***tamas*** means inertia, and ***sattva*** means radiance and illumination. Reflection while performing ***asana*** require *a kind of letting go that permits the reflection to occur.* ***Rajasic*** energy initiates the pose and has a momentum or rhythm that, left to its own nature, tends to persist. This persistence of ***rajas*** hinders our ability to reflect. Or the ***rajasic*** wave wanes and immediately a ***tamasic*** wave grows, hindering our ability to 're-pose': we tire and give up before we have a chance to discover something new about a pose. In terms of the kneading metaphor, we may therefore link ***rajas*** with stretching (posing), ***sattva*** with aiming the next action with intention, and ***tamas*** with the stability with which a pose must be held while reflection occurs. Once we see how the ***gunas*** act in correspondence with a paradigm of nonlinear dynamics, we can understand how they give rise to the proliferation of forms in nature.

Consider a scenario that starts with undifferentiated ***prakriti*** (***alinga***). This evolves to differentiated ***prakriti*** (***linga***), then to the unparticularized (***avisesa***), and finally to the particularized (***visesa***) (YS II.19). The ***gunas*** make up each of these levels of evolution, from the subtle to the gross. They are believed to compose all forms, from simple to complex, at each level, and to account for the emergence of levels of greater complexity with time. Can nonlinear dynamics do the same?

The picture of kneading describes how, given one level, all the complex forms of that level arise from simpler forms. Here are a few examples: at a physical level we have the example of a coastline that starts out as a continuous line, but ends up a fractal due to nonlinear processes of erosion (from wind, water, and varying land conditions). At the level of physiology we have the development of an embryo from a single cell. At the border between brain function and mental activity, we have complex thoughts supported by what Nobel laureate Gerald Edelman calls 're-entrance' in the brain. Re-entrance is a type of feedback loop that links different parts of the brain together in a synergistic way. This process is believed to form the physiological basis and support for complex mental processes. Edelman believes this mechanism, which is one form of 'kneading,' is in particular behind the experience of consciousness.

But does kneading as portrayed above account for the transition from one level of existence to the next, or the transition from one developmental level to the next? The claim here is that the answer is 'yes.' To explain this requires a more in depth survey of kneading than has been given so far.

Consider what happens to two points that are initially close to each other on a layer of dough. As the dough is stretched the two points grow farther and farther apart. When the dough is repeatedly folded over itself, the points may eventually end up on different sheets of dough. In the world of applied nonlinear dynamics, the large separation between points that were initially close together represents outcomes that are very different from starting conditions, and that are essentially unpredictable. In physics, this is called a 'butterfly effect': the flapping of the wings of a butterfly in South America may be sufficient perturbation in the atmosphere to trigger a hurricane in North America. Of course, the hurricane arises only if very specific conditions in the atmosphere and ocean are met, and requires a long chain of events to take place. But the idea is that all the events in the chain are connected, and their outcome can potentially be altered by changing a single link.

Once the hurricane arises, new equations are needed to describe its properties and development. It is not that the old equations and model are no longer valid, but rather that they become unwieldy to work with and not as intuitively useful. The hurricane represents a higher level of organization in the atmosphere. In general, we can say that kneading is able to describe the emergence of new levels of organization (as well as the proliferation of forms within a level). But the specific models have to change to reflect the new behaviors and the new degrees of freedom that arise at higher levels of organization. Something analogous happens in the practice of yoga.

When we practice ***asana***, explicit and implicit internal 'models' guide us. We hear instructions from teachers in class, or we rely on experience to guide our movements and actions. An explicit model might be the mental image of the ***asana***, with corresponding intentions to perform certain actions – what we consciously attend to. An example of implicit models might be the memory of openness or extension, or the

feeling of groundedness and lightness, all of which guide us. When there is more experience, ***asana*** is performed with attention to state of mind, its effects on the ***asana***, and the effects of ***asana*** on state of mind. Hence our models undergo changes or transformations (***parinama***) that reflect the changes in our bodies (YS III 9-13).

The larger meaning of the discussion above is that our assumptions and observations are inevitably embedded within our models, whether they are models that help us predict storms, or models that help us progress in our ***sadhana***. This embedding leads to the notion of ***tangled hierarchy***, which I will discuss in Part II (see *Yoga Samachar, Fall/Winter 2005-2006*). ■

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Figure 1. Examples of how fractal shapes arise. (a) Three stages in the kneading of dough are represented. The first stage is obtained by stretching the initial ball of dough into a sheet, then folding it in half. In the second stage, the doubled dough from the first stage is stretched and doubled again, yielding four (thinner) sheets, and so on. (b) An example of how a fractal tree might arise from the simple rule of growing two branches from the tip of each previous branch. (c) An example of how a fractal coastline might arise from a simple rule of adding two steps to each straight segment in the initial coastline.

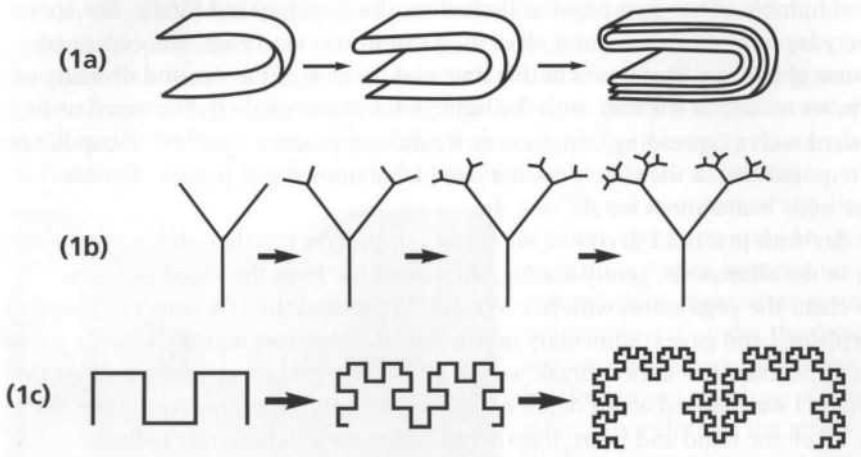
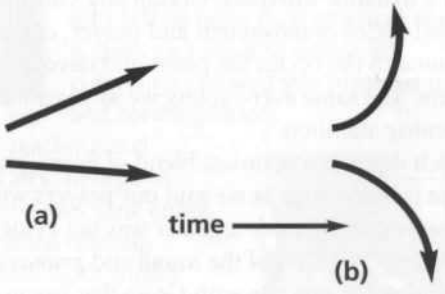


Figure 2. (a) Two straight lines separate from each other linearly in time. (b) Two curved lines separate from each other nonlinearly in time. The distance between the curved lines increases at a much greater rate than in the linear case.



Resources

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The Transformative Nature of Yoga

Part II: Tangled Hierarchy

(Part I appeared in YOGA SAMACHAR vol. 9, no. 1, Spring/Summer 2005)

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The term 'tangled hierarchy' was coined by Douglas Hofstadter in his book *Goedel, Escher, Bach* to refer to the 'tangle' that arises in organizational or linguistic hierarchies when the overall system of hierarchies is self-referential. To understand this notion, consider the following scenario for the evolution of *prakriti*, and its involvement with *purusha*. Near the time of the 'Big Bang,' we can imagine *purusha* to be involved with *prakriti* at the fundamental level of subatomic particles, the fundamental constituents of matter. Subtle and causal aspects of ordinary matter may also be present which, over time, develop into supports for subtle and causal vehicles (*koshas*). The involvement of *purusha* with *prakriti* at this stage of evolution can be imagined to be the interiority of subatomic particles, their 'subjectivity,' however rudimentary. As matter evolves and grows forms of greater and greater complexity, the complexity of interiority also grows: the nature of the subjective grows in complexity, step-by-step with the objective.

When life emerges from complex but 'life-less' molecules, there is a sudden jump in external complexity, along with all the qualities we come to associate with life, such as an increase in freedom of movement and in power to affect the environment. We may expect interiority to undergo similar jumps in complexity. The emergence of self-awareness and self-reflection represents dramatic increases in the complexity of inner life. This scenario for evolution is clearly hierarchical: whenever a level of greater complexity emerges, the previous levels remain present, but are incorporated into the 'higher' level. The entanglement takes place when self-reference occurs: not only are the lowest levels of development contained within the highest, but with self-reference (and self-reflection), the highest levels of development become involved in the lowest. Douglas Hofstadter and Amit Goswami use the example of a drawing by M. C. Escher which shows a young man looking at a picture of a ship that is anchored in the harbor of a town. The town itself has a print gallery in which a young man looks at a ship that is anchored in the harbor of a town. The world of the boy is completely contained within the little piece of his world that he observes. This is possible in Escher's drawing only if there is a discontinuity, where the upper level (where the boy lives) cannot connect smoothly with the lower level (picture). This discontinuity goes hand in hand with the entanglement, and appears in Escher's drawing as a white spot in the middle of the drawing.

Consider again the metaphor of kneading [see Part I, *Yoga Samachar* vol 9, no. 1]. Suppose an eye (sight) emerges in one of the folds of dough (Figure 3). This eye can see the other folds, but not the fold it is contained in. It can only see what is outside of itself. Furthermore, although the dough is one smooth connected sheet, due to the folding many of the layers appear to be many separate sheets. We can imagine each sheet has its own 'eye' and its own 'sense of self.' The edge connecting two sheets and the gap between the sheets represent a discontinuity. A point on a single sheet (for example an 'eye') is continuously connected to adjacent points on the same sheet, and 'feels' or intuits these points due to their nearness and sameness (*dharmi, Yoga Sutra*

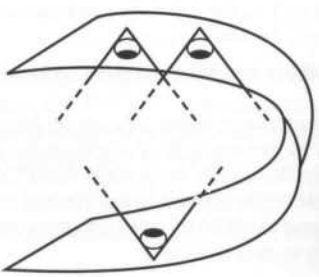

Figure 3. *Three 'eyes' emerge within the dough (the fabric of spacetime). Eyes that are adjacent to each other do not see each other in the usual way, but eyes that are on different folds of the dough can see each other.*

[YS] III.14) but does not see them. On the other hand, the points on adjacent sheets of dough can be seen. While they are seen, they are not 'felt' as are adjacent points, due to the gap between sheets. The seeing in this metaphor represents our usual way of apprehending our environment, through our five senses, plus the intellect. This way of knowing our world is founded on the apparent discontinuity that is due to the folding of the dough – to the self-reference inherent in the way the ***gunas*** interact to create our multiform universe. By its nature, this way of knowing excludes a more direct way of knowing that is able to apprehend nearby points without seeing them. The different types of ***samadhi*** described in *Yoga Sutra* I.17 may represent this 'intuitive' way of knowing. That is, we can know an object directly by knowing its nearness and sameness to ourselves, by becoming that object. That way of knowing effectively resolves the tangled hierarchy. But this resolution, as Patanjali shows in *Vibhuti Pada* (*YS* III.9-13), must occur in stages.

In *Vibhuti Pada* Patanjali provides a way of uncovering the illusion of separateness that is a natural part of the 'kneading.' The kneading gives rise to separate 'eyes' that see only separateness: this is ***prasava*** – evolution. But further kneading, once the eyes have appeared, leads to a recognition of non-separateness: this is ***pratiprasava*** – involution. Patanjali describes the process by which this involution occurs, and it is this involution that resolves the tangled hierarchy. That is, we become able not only to see the other 'separate' sheets, but also to apprehend and know their sameness to ourselves. We become able to directly know the unity within all the forms and levels of organization appearing in nature – what appears to be a tangle from the outside resolves itself into a smooth connected whole from the inside. (So ***pratiprasava*** is not a different process than ***prasava***, but rather the result of continuing the natural process of evolution with the help of self-awareness once it emerges.)

As we practice ***asana, citta*** undergoes three transformations, defined by Patanjali as ***nirodha parinama, samadhi parinama***, and ***ekagrata parinama*** (*YS* III.9 – 13, see also Table 1). The first transformation (***nirodha parinama***) is to gather our distracted mind to perform a single action in an ***asana***. This requires that those tendencies (***samskaras***) that represent the generative character of the mind, its tendency toward arising thoughts (***vyutthana samskara***) are challenged by the latent potential to calm the mind (***nirodha samskara***). In ***asana*** practice this change is felt when we naturally perform actions as soon as we enter into a posture.

Table 1. Three Transformations of Consciousness

	Patanjali	BKS Iyengar	Asana
Nirodha Parinama	Ability to restrict (distractions) arises	One-pointedness	Performance of one action without being distracted
Samadhi Parinama	One-pointedness arises (a single intent replaces a multitude of intentions)	Many-pointedness	Performance of many actions as though they are a single action, with a singular intent
Ekagrata Parinama	The same 'point' or intention arises	No-pointedness	Performance of many actions without a doer: the intent is absorbed in the doing from moment to moment

The next transformation (***samadhi parinama***) is to move from performing many separate and unlinked actions to performing a single action that engages all the individual actions. When we practice for some time, we come to a place where individual actions are familiar enough that they are performed readily (***nirodha parinama***), but they are still individual actions. They become 'second nature,' similar to the change that occurs when one learns any complex activity that requires attention, like driving a car. At some point in time there arises a unitary experience in which a single 'action' unifies all the individual and separate actions we have been performing separately. At that time the one-pointedness of performing a single action becomes a many-pointedness, which is more than just performing many actions in quick succession. But to get to that stage requires revisiting each action, re-posing, much 'kneading.' This many-pointedness corresponds to Patanjali's ***samadhi parinama***. In *Yoga Sutra* III.11 Patanjali tells us that ***samadhi parinama*** is when all-objectness (***sarva arthata***) dwindles (***ksaya***) and one-pointedness (***ekagratayoh***) arises (***udaya***). This may seem contradictory to the experience just described within an ***asana***, but it is a different view of the same thing, for the dwindling of 'all-objectness' corresponds here to shifting practice away from many separate actions, and the uprising of 'one-pointedness' corresponds to the understanding of how to engage all the actions with a single intent. Mr. Iyengar calls this many-pointedness.

The last transformation in the ***citta*** is called ***ekagrata parinama***, which means transformation to one-pointedness (*YS* III.12: when the quiescent ideas – ***santa pratyayau*** – and the uprisen ideas – ***udita pratyayau*** – in the ***citta*** are similar – ***tulya*** – then this is ***ekagrata parinama***). Mr. Iyengar calls this no-pointedness. How these two terms link can be understood as follows. Suppose one has the experience of many-pointedness in an ***asana***: a single intent is able to simultaneously perform many interconnected actions. This transformation in the ***citta*** has a very palpable effect on the body and senses which is described by Patanjali as a transformation of the elements and sense organs (***bhuta*** and ***indriya, YS*** III.13). The elements and sense organs change in response to the change in ***citta*** (perception and intelligence) in such a way that the changes in ***citta*** are now supported by the changes in the body. In other words, when we come out of a pose, our body has changed in a way that reflects our deeper awareness. And the changes in the body help stabilize deeper awareness. This implies that each time we practice we may experience a many-pointedness that involves more and more of the body and mind. At some point in time, when enough of the body and mind are involved in the performance of the ***asana***, we may experience a moment of grace when the intent that has been simultaneously triggering all the individual actions becomes itself affected by the ***asana***. The effect on that intent is effectively its dissolution, or rather its expansion to encompass more than the localized sense of self.

In a recent ***Newsweek*** article on brain function in meditators, brain imaging

methods were used to show that the part of the brain that is associated with sense of self and spatial orientation becomes quiet during meditation in meditators who have been practicing for many years (*Newsweek*, May 7, 2001, "*Religion and the Brain*": "For a mystical experience to occur, brain regions that orient you in space and mark the distinction between self and world must go quiet."). This experience corresponds to Mr. Iyengar's description of *ekagrata parinama* as 'no-pointedness.' The one-pointedness implied by '*ekagrata*' refers to the singular appearance within citta of one primary idea or thought, *YS* III.12: *tatah punah anta uditau tulya pratyayau cittasya ekagratah parinamah*: the quiescent (*santa*) and uprisen (*udita*) ideas (*pratyaya*) within *citta* (*cittasya*) are similar (*tulya*) in *ekagratah parinama*. That singular idea (one-pointedness) which arises from moment to moment is then absent of any contracted sense of self (no-pointedness).

So then, having gone through these stages of transformation in *citta*, how do we see and know the world? Patanjali tells us what happens here too (*YS* III.13-16). Along with transformation of *citta* comes about a transformation in the elements and sensory organs. Taimni observes that *bhutas* – elements – doesn't mean Argon, Oxygen, Copper, etc. Rather, since Patanjali describes a subjective science, elements represent the characteristic way in which sense organs interact with the environment. For example, earth element (*prithvi*) is the characteristic of solidity, water element (*ap*) the characteristic of fluidity, fire element (*tej*) the characteristic of heat and light, air element (*vayu*) the characteristic of gaseousness, ether element (*akasha*) the characteristic of emptiness or vacuum.

With the three-fold transformation in the elements and sense organs (*dharma, lakshana, avastha parinamas, YS* III.13), we come to know the property of matter that is the same (*dharmi*) throughout all the changes of form (*dharma*). This knowing corresponds in western psychology to a change in spatial perception – objects no longer have their distinct spatial separation. Or rather, in addition to their spatial separation, they carry a property that is outside of space. In other words, we come to know the dough itself, not only the other eyes embedded within the dough (*YS* III.13). According to Patanjali, with mastery of the threefold transformation in elements and sense organs, comes knowledge of past and future (*YS* III.16). So time sense changes as well as spatial perception. The eyes, looking out at the world in the conventional way, see objects that are separated in space. If the objects are close to each other, then they are also causally connected, and disconnected if they are widely separated. Eyes that undergo transformation (*dharma, lakshana, avastha parinama*) see connectedness in objects that are widely separated: they see 'acausal connection.'* Furthermore, they see themselves in other eyes. Time and space, according to modern physics, are intricately linked, and evidently according to Patanjali, time and space are each intricately linked with consciousness as well. The latter part of *Vibhuti Pada* explores many implications of the interdependence of consciousness with space and time. This process of transformation described by Patanjali constitutes an experiential resolution of the tangled hierarchy. Modern science also recognizes the existence of such a tangled hierarchy, and is currently attempting to resolve it using external inquiry. The principles of nonlinear dynamics described above are the beginning stage of the external approach, while a full treatment requires the use of quantum physics. A similar conclusion to Patanjali's can be drawn in that approach, that the nature of space and time are linked not only with each other, but also with consciousness.

In summary, we can say that yoga transforms our understanding of the relationship between ourselves as observers of our experience and the objects we observe. We come to discern the essential duality between *purusha* and *prakriti*: *purusha*, the capacity of seeing, is the interiority of *prakriti*, while *prakriti* is all that is seen, and they are forever separate, in the sense that pure subject can never be seen from outside. They are also forever bound together, in the sense that wherever there is *prakriti*, there is an interior, which is *purusha*. We also come to directly know a basic nonduality spoken of in Vedanta. Once the self-awareness of *citta* emerges within *prakriti* the separate self-sense also emerges. But *citta* is still within *prakriti*, so in a sense its separateness is an illusion, and our separateness from others is at some level also an illusion. Yoga leads us to an experiential realization of the duality of *purusha* and *prakriti*, and the nonduality of *citta* with the rest of *prakriti*. Further work along these lines can show how such changes in perception and understanding give rise to the practical transformations in our psyches Patanjali mentions in the *Sutras*. In particular, we come to experience freedom from actions and thoughts that lead to suffering, and we gain a greater capacity for joy, compassion, and appreciation for all of life (*YS* II.2, I.33, IV.30). Through the temporal practice of posing, reflection, and re-posing (and the other limbs of yoga), we eventually (or suddenly) come to live in the timeless present (*YS* IV.33). ■

Footnote

*An acausal connection is a connection that cannot be explained in a conventional way which requires an interval of time to occur. A connection that is 'causal' requires an interval of time – for example, when you look at your knee in *Utthita Trikonasana*, you make a correction based on what you see. This correction creates a connection between your knee and its initial movement (action), your initial intention and its modification (reflection), and the new movement (reaction). Each of these steps can be described as a transfer of energy in time, whether it is biochemical energy in muscle cells, electrical energy across synapses in neurons, or light waves from the knee to the eyes. An acausal connection is one in which the movement of the knee, the intention to move, and the awareness of the knee's position all coincide in time.

Resources

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