



ROSS BLECKNER

MOLECULES & CHOICE

Bio-Molecular  Perspective

C A N D A C E P E R T

“A far-flung network of information carried by neuropeptides . . . [provides] the molecular underpinnings of what we experience as feelings, sensations, thoughts, drives, perhaps even spirit or soul.”

—CANDACE PERT

Candace Pert’s research suggests that our molecules of emotion play a strong role, guiding what we experience as conscious choice. According to Pert, “our emotions decide what is worth paying attention to. . . . The decision about what becomes a thought rising to consciousness and what remains an undigested thought pattern buried at a deeper level in the body is mediated by the receptors [of our body-wide, biochemical, information network.]”

But, these receptors can change in both sensitivity and arrangement with other proteins in the cell membrane. In the depthworld of our biochemistry lies what Pert calls “our potential for change and growth.” Various types of intention training (visualization, for example) can help bring pertinent information to a level of self-aware consciousness. But the wisdom of the body works in even more mysterious ways: “The unconscious mind of the body seems all-knowing and all-powerful, and in some therapies can be harnessed for healing or change without the conscious mind ever figuring out what happened.” Yogic breathing and some energy-based therapies are a few examples of the latter.

It seems that our biochemistry confirms our capacity to choose. This means we have work to do to reverse the choices of the past that no longer serve us. The good news is that in the body’s biochemical flow there is an ocean of new patterns and possibilities waiting to be confirmed to support our next choices.—Editor

Two decades ago I had a sudden breakthrough insight that resolved a centuries-old debate on the relationship between emotions and bodily healing. Research incorporating this insight has been gaining momentum ever since.

In 1984, I gave a lecture at the Second International Meeting of the Society for the Study of Emotion at Harvard University. There, I met Eugene Taylor, a scientific historian in the psychology department. He was excited about the lecture I had just delivered in which I presented the theory of peptides and other ligands (groups of small molecules) as the biochemicals of emotion. Eugene wanted to know where I stood on the famous James-Cannon debate, which, he reminded me, was about the ultimate source of emotions. Do they originate in the body and then get perceived in the head, where we invent a story to explain them, as William James said? Or do they originate in the head and trickle down to the body, as Walter Cannon posited . . . ?

While Eugene Taylor waited expectantly for my late-twentieth-century spin on the somewhat arcane James-Cannon debate, I suddenly had a big aha! “Why it’s both! It’s not either/or; in fact, it’s both and neither! It’s simultaneous—a two-way street,” I blurted out. I had just realized that the resolution of a debate whose origins went back more than a century held the key to understanding a very modern conundrum: How can emotions transform the body, either creating disease or healing it, maintaining health or undermining it?

This also helped me understand some of my then recent reading on biofeedback, the technique of using monitoring devices to measure various bodily functions (for example, heart rate or blood flow) as a step toward gaining control of those functions. Biofeedback can enable ordinary folks (and not just advanced yogis) to attain a state of deep relaxation in which it is possible for them to take

NEUROPEPTIDES

Neuropeptides are chemical substances made and released by brain cells and certain other cells. They carry information, and bind to “receptor cells” throughout the body.

Research suggests that this system may provide the key to understanding the body’s chemistry of emotion, serving as a form of communication within the entire body.

Pert was among the first researchers to show that opiate drugs such as morphine and heroin, introduced from outside the body, bind to internal receptor sites in the brain. This finding, along with the discovery that the body produces its own, internal, opiate-like chemicals that bind to the same receptor sites, opened a new approach to investigating the roles of brain chemistry and human emotions.

The relationship between neuropeptides and their specific receptor sites has been likened to that of “key and lock.” Neuropeptides float through virtually all the body fluids and are attracted onto specific receptors because, in effect, they fit specific locks. This establishes an information system in which neuropeptides “speak” and receptors “listen.” Pert believes that this communication system is fundamental to the biochemistry of emotion.

—*Editor*

conscious control of physiological processes previously thought to be autonomic and not susceptible to voluntary interventions.

Elmer Green, the Mayo Clinic physician who had pioneered biofeedback for treatment of disease, has said, “Every change in the physiological state is accompanied by an appropriate change in the mental emotional state, conscious or unconscious, and conversely, every change in the mental emotional state, conscious or unconscious, is accompanied by an appropriate change in the physiological state.” Taylor’s question had led me to another insight into the meaning of the discoveries we’d been making about the location of peptides and their receptors, and about the theories we’d been formulating about these molecules of emotion.

If we accept the idea that peptides and other informational substances are the biochemicals of emotion, their distribution in the body’s nerves has all kinds of significance, which Sigmund Freud, were he alive today, would gleefully point out as the molecular confirmation of his theories. The body is the host of the unconscious mind! Repressed traumas caused by overwhelming emotion can be stored in a body part, thereafter affecting our ability to feel that part or even move it. The new work suggests there are almost infinite pathways for the conscious mind to access—and modify—the unconscious mind and the body. It also provides an explanation for a number of phenomena that the emotional theorists have been considering.

FILTERING, STORING, LEARNING, REMEMBERING, REPRESSING

Emotions and bodily sensations are intricately intertwined in a bidirectional network in which each can alter the other. Usually this process takes place at an unconscious level, but it can also surface into consciousness under certain conditions, or be brought into consciousness by intention.

All sensory information undergoes a filtering process as it travels across one or more synapses, eventually (but not always) reaching the areas of higher processes, like the frontal lobes. There the sensory input enters our conscious awareness. The efficiency of the filtering processes, which chooses what stimuli we pay attention to at any given

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moment, is determined by the quantity and quality of the receptors at these nodal points. The relative quantity and qualities of these receptors are determined by many things, among them your experiences yesterday and as a child, or even by what you ate for lunch today.

Think of the brain as a machine for not merely filtering and storing this sensory input, but for associating it with other events or stimuli occurring simultaneously at any synapse or receptor along the way—this is learning. Let's look at how this occurs in the process of vision, which is very advanced and complex in humans. After a visual signal hits the retina, the light-sensitive part of the eye, it must make its way across five more synapses as it moves from the back of the brain to the frontal cortex.

At each synapse, the neurophysiological patterns evoked by the visual image become progressively more complex—the simple lines and edges signaled at the first synapse accruing ever richer detail and associations as the visual images moves closer to the front of the brain. Do you ever think you recognize someone you miss in a place where they cannot be? When I'm traveling, for mere milliseconds I often think that a blond teenager I glimpse in the airport is my son Brandon, before I realize that's impossible.

Using neuropeptides as the cue, our body-mind retrieves or represses emotions and behaviors. Dr Eric Kandell and his associates at Columbia University College of Physicians and Surgeons have proved that biochemical change wrought at the receptor level is the molecular basis of memory. When a receptor is flooded with a ligand, it changes the cell membrane in such a way that the probability of an electrical impulse traveling across the membrane where the receptor resides is facilitated or inhibited. Thereafter, the

receptor affects the choice of neuronal circuitry that will be used. These discoveries are important for appreciating how memories are stored not only in the brain, but in a psychosomatic network extending into the body . . . all the way out along pathways to internal organs and the very surface of our skin. The decision about what becomes a thought rising to consciousness and what remains an undigested thought pattern buried at a deeper level in the body is mediated by the receptors. I'd say the fact that memory is encoded or stored at the receptor level means that memory processes are emotion-driven and unconscious (but, like other receptor-mediated processes, can sometimes be made conscious).

CREATING OUR OWN REALITY

There is no objective reality! In order for the brain not to be overwhelmed by the constant deluge of sensory input, some sort of filtering system must enable us to pay attention to what our body-mind deems the most important pieces of information, and to ignore the others. Our emotions decide what is worth paying attention to. Aldous Huxley was on to this in *The Doors of Perception* when he referred to the brain as a "reducing valve." He was also on the right track when he assumed that what got through to command headquarters was just a tiny trickle of what could be absorbed at any given moment.

Since our sensing of the outer world is filtered along peptide-receptor-rich sensory way stations, each with a dif-

ferent emotional tone, how can we objectively define what's real and what's not real? If what we perceive as real is filtered along a gradient of past emotions and learning then the answer is: We cannot. Fortunately, however, receptors are not stagnant, and can change in both sensitivity and in the arrangement they have with other proteins in the cell membrane. This means that even if we are "stuck" emotionally, fixated on a version of reality that does not serve us well, there is always a biochemical potential for change and growth.

Most of our body-mind attentional shifts are subconscious. While neuropeptides are actually directing our attention by their activities, we are not consciously involved in deciding what gets processed, remembered, and learned. But we do have the possibility of bringing some of these decisions into consciousness, particularly with the help of various types of intentional training that have been developed with precisely this goal in mind—to increase our level of consciousness. Through visualization, for example, we can increase the blood flow into a body part and thereby increase the availability of oxygen and nutrients to carry away toxins and nourish the cells. Also, neuropeptides can alter blood flow from one part of the body to another—the rate of blood flow is an important aspect of prioritizing and distributing the finite resources available to our body.

Norman Cousins once told me that he healed a broken elbow, which he had suffered while playing tennis, and got back on the court in record time simply by focusing for twenty minutes each day on increasing the blood flow through the injured joint, after his physician explained that poor blood supply to the elbow was why injuries to this joint healed slowly.

But I don't want to leave you with the impression that I am advocating that the unconscious must always be brought to consciousness in all successful therapies. In fact, the unconscious mind of the body seems all-knowing and all-powerful and in some therapies can be harnessed for healing or change without the conscious mind ever figuring out what happened. Hypnosis, yogic breathing, and many of the manipulative and subtle energy-based therapies (ranging from bioenergetics and other psychotherapies centered on body work to chiropractic, massage, and therapeutic touch) are all examples of techniques that can be used to effect change at a level beneath consciousness. (Based on the drama and rapidity of some therapeutic transformations, I believe that

repressed emotions are stored in the body—the unconscious mind—via the release of neuropeptide ligands, and that memories are held in their receptors.) Sometimes transformations occur through the emotional catharsis common to the many body-mind therapies that focus on freeing up emotions that have become lodged in the psychosomatic network, but not always.

For example, famed psychiatrist and hypnotherapist Milton Erickson addressed the subconscious minds of several young women who, although having been subjected to all kinds of hormone injections, remained completely flat-chested. He suggested to them while they were in a deep trance that their breasts would become warm and tingly and would start to grow. Although none of them could remember anything that happened in his office, all grew breasts within two months, presumably because Erickson's suggestions caused the blood supply to their breasts to increase!

Emotions are constantly regulating what we experience as "reality." The decision about what sensory information travels to your brain, and what gets filtered out, depends on what signals the receptors are receiving from the peptides. There is a plethora of elegant neurophysiological data suggesting that the nervous system is not capable of taking in everything, but can only scan the outer world for material that it is prepared to find by virtue of its wiring hookups, its own internal patterns, and its past experience.

As research continues, it is becoming increasingly apparent that the role of peptides is not limited to eliciting simple and singular actions from individual cell and organ systems. Rather, peptides serve to weave the body's organs and systems into a single web that reacts to both internal and external environmental changes with complex, subtly orchestrated responses. Peptides are the sheet music containing the notes, phrases, and rhythms that allow the orchestra—your body—to play as an integrated entity. And the music that results is the tone or feeling that you experience subjectively as your emotions.



CANDACE PERT, PhD, is a research professor in the Department of Physiology and Biophysics at Georgetown University Medical Center in Washington, DC. Dr Pert is best known for her discovery of opiate receptors in the brain. This article is adapted from her bestselling book, *Molecules of Emotion* (Scribner, 1997) by permission of the author. For more information, visit www.candacepert.com.