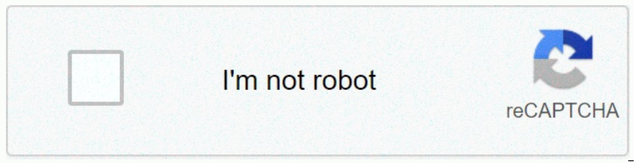

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I am available to the latest and up-to-date knowledge, actionable information that I and my fellow scientists are discovering and to change people's lives. Along the way, I've crossed into virtually another dimension, and the cutting edge of biomolecular medicine will be accessible to anyone who wants to hear about it. This mission has caught my attention very often. I work in groups at various institutions 12 times a year, so when I'm not working at Georgetown University School of Medicine, a research professor of biophysics physiology, I lock myself from coast to coast and sometimes even cross the big blue sea. It was never my plan to be a science performer, acting as a mouthpiece to educate the public as well as practitioners of alternative health exercises, so I was me for most of my career in the lab and in the mainstream world of my research. But it was a natural evolution and I am now at home in my new role. As a result of translating my scientific ideas into words, my scientific life and my personal life seem to have changed each other, expanded and enriched in unexpected and myriad ways by the discoveries I have made, the science I have made and the meaningS I will continue to reveal. Writing this book was an attempt to write down the material I've been presenting in my lectures on paper in a much more detailed and easy-to-use way. The goal of my writing was to explain the science underlying the new body mind medicine, provide sufficient practical information about the meaning of that science and the treatments and practitioners who embody it, and allow readers to make the best possible choices about their health and well-being. probably my journey,We can help others follow their path, not just spiritually. And now, take a lecture! I get the thrill from sitting in an empty room when everything is quiet and there is a state of sheer possibility that something can happen. The sound of the door swaying, the crowd muffles slowly entering the room, the squeak of water glasses, the squeak of chairs - all this creates a fun cacophony, music in my ear, overtures for what's to come. I see people moving towards their seats, finding their place, chatting with neighbors, getting comfortable and getting informed and ready to entertain, not knowing that my goal is to do more. Who is this Candace Part? Is she going to do anything good? The responses are sometimes instructing, always funny, and easy to get into the thoughts and expectations of the people I'm trying to work on. I nodded knowingly and pretended to position myself more comfortably and more carefully. I often work on a very mixed audience. Depending on the nature of my host's organization, the crowd is weighted by mainstream professionals (doctors, nurses, scientific researchers) or alternative practitioners (chiropractors, energy healers, massage therapists, and other curious participants). It frequently includes members of both camps in a blend that can best be explained so that the establishment meets a new paradigm. This kind of composition is a lot different from the more homogeneous audience that exists in the hundreds of stories I've done to my fellow scientists, colleagues and colleagues over the past 24 years. For them, I provide my more technical say in the language of the club and do not need to translate the code we understand. I still work on such groups and hold annual scientific conferences, but now I'm also expanding into foreign lands. Breathing deeply for a moment or two, I relax and close my eyes on the seat. My heart clears when I offer a simple prayer to get into a more receptive state. Calling my audience an intuitive sense of an expectation and mood, I can feel the wall coming down, the imaginary wall separating us, from scientists and layman. Experts from people I didn't know, authority, a wall I personally no longer believed in, stopped believing some time ago. As the audience room fills, I can feel the building of excitement. When I open my eyes and look around to one of these mixed crowds, I first notice it, as opposed to moreGatherings are usually attended by a large number of women. I'm still amazed to see so many of them beautifully dressed in flowing California-style, many colored robes. I'm always amazed at the many shades of purple in their dresses, more shades than I've ever known existed! and then I look beyond the surface and I try to assess the various components of my audience and the motivation they come today. My attention goes first to doctors and other medical professionals, who are almost always dominated by men, who sit in well-tailored dark suits and crisp white shirts, while their female opponents nearby look around ominously while checking their colleagues' faces into the room. Scattered more sparsely throughout the room are a new creature, a serious young man and woman, with a pack on his back, a dream in his eyes. Their attitude is hard and enthusiastic, revealing their sincerity and uncertainty about what they want and where they are heading. As the room settles down and my voice is crushed by a low-voiced dinh, I wonder: What do these people expect me to tell them? What do they want to know, what do they want? by Bill Moyers' PBS Special Healing and Mind, by Dean Ornish, John Kabato Jinn, Naomi Remen, And some are here because I saw me in a program that included segments with many other doctors, scientists and therapists trying to make the same mental and physical connections as my life. Interviews with well-informationed and receptive journalists like this have allowed me to talk about molecules of mind and emotion with passion and humor not normally associated with medical research scientists. I tried to make it easier for TV viewers to understand the exciting worlds of biomedicine, molecular theory and psychonypsymology, revealing information usually covered in cryptic words and let them know that they have a stake in understanding this body of knowledge because it can empower them to make a difference in their health state. What do doctors, nurses and medical professionals bring them out? have they touched on new situations that cannot be explained by current knowledge? many of them know me as a former chief of brain biochemistry who struggled at the National Institutes of Health for 13 years, I later demonstrated the raw chemicals that came to call the physiological correlation of emotions and developed powerful new drugs for mapping.AIDS treatment and Some may know that I am leaving the National Institutes of Health when I couldn't get interested in the government. All of them seem to recognize that science has advanced and much of what was taught in medical school 20 years ago is no longer present, but applicable. They're my job.Just as Tom Wolfe himself pronounced neuroscience, the hottest field in Forbes these days, and is now finding his way to medical schools around the world, he is a chronological reporter of contemporary culture. Then there are many massage therapists, acupuncturists, chiropractors and so-called alternative medicine practitioners who offer a non-mainstream approach to so-called patients. I know these people have been marginalized for years, and while they are rarely taken seriously by powers such as medical schools, insurance companies, the American Medical Association, and the Food and Drug Administration, it is well documented that the public spends billions of dollars a year on services. Then, in the Q&A session that follows the talks, they tell me that they believe I have conducted research that leads to the validation of their theories, their beliefs. They gave new responsibilities to individuals with new responsibilities and more control in their lives about my emotional theory, how I assumed a biochemical connection between mind and body, a new concept of human beings as a communication network that redefines health and disease. Philosophers, seekers, they are here too. Some people are very silent, not talker, but pale, serious young men and women who tell us after lectures that they lived in India or Asia. They see my work as proof of what their gurus and masters have been saying for a long time, and they want more answers, perhaps for all the meaning of it. Maybe they've heard me quoted as a scientist who said God is a neuropeptide. They know that most scientists are not afraid to use what they think of as four-letter words (souls) in my story and want their spiritual questions answered today. They come a lot just because they are curious. Perhaps they have heard of my reputation as a young graduate student who lays the groundwork for the discovery of endorphins, the body's own pain suppressants and ecstasy inducers. Or maybe she knows me as a young woman who was taken over by a prestigious prize before the Nobel Prize and challenged her leader for the recognition she felt was appropriate. They may recall that the resulting front-page controversy exposed the sexist and unjust system at its core and caused a shake-up that baffled medical dynasties. Others are here because they need to be hopeful. The sick wheelchair-bound sees it located in a passageway near the door. They know I've been on the cutting edge in my research, across fields and for breakthroughs in cancer, AIDS and mental illness. I'm always a little nervous when I see them sitting in the audience. Do they expect me to offer their miracle cure like a preacher at a resurrection meeting?I often, it still pulls uncomringly into my self-image as a scientist. I think I'm considered a healer - God forbid, faith healers! - but I can't ignore the expressions of despair and suffering visible on their faces. Information. Yes, at least I can give these people, treatment and hope that mainstream medicine does not provide any further answers, what they can use in search of alternatives. Regardless of their profession, orientation, emotional or intellectual expectations, most of the lay people who find their way to my lectures have become believable that they want to hear science deciphered, de-specialized and described in words they can understand. They want to have more control over their health and learn more about what's going on with their bodies, and are disillusioned and deeply disappointed that science has not delivered on its promise to provide a cure for a major disease. Now they want to take some power back into their own hands, and they need to know what the latest scientific findings mean to get optimal health. Perhaps those of you who are my readers should look at yourself in one or more of the groups above. If so, I always hope that for members of my audience, some of the information presented in this book will make a difference in your life. Standing on stage A sudden stillness descends on the room, undeterred me, and my head turned to see me slowly crossing the stage towards the podium in the spotlight. Below are some gorgeous details of my earnings list in general. I'm really touched by the gratitude expressed by my hosts and hostesses, but I'm always a bit embarrassed and don't deserve those compliments. Over the years, I have learned to continue to dominate my ego by saying quiet blessings during these introductory remarks. I ask you not to be troubled by or swept away by my mission. I always remember that I am a scientist, a seeker of truth, not a rock star, even though, despite the spotlight, I am about to step in! Finally I hear my name, get up from my chair and start a long walk on stage. I remember going past the front row and breathing deeply to feel all the eyes of the room focus on me. As I move in together, a few whispered words reach my ear: is she there! is it her? She doesn't look like a scientist! What did they expect? I wonder with an in-depth chuckle. I am still a woman, a wife and a mother. Don't I fit their pictures of scientists? Of course, they have their own ideas, and many of them fit the standard clichés of conservative attire, intense looks and usually male scientists. Not long ago I wore those serious little boxyDress for Success uniforms conform to a more buttoned-down image than people expect. But now my own transformation is boldly reflected in the way I present myself, an image that fit my message these days. In time for the evolution of my scientific ideas my dress has evolved to look like a woman in a flowing robe now, my clothes are looser and more colorful, more comfortable, even purple! I claim that atody has always been a feature of my character, but I have tried to maintain it from time to time to survive, but I dare to be more aty. Taking my place on the podium, I wait as the technician at my microphone and make the final adjustments to the projection screen on my side. When I look at the sea of upwards, I'm struck by someone who's still sitting quietly. I know they won't move until they joke, give them permission to have fun and explode with laughter, animate the room and fill it with energy. My audience is ready, so I also have hundreds, sometimes thousands, of people sitting in front of me waiting for my words. I take the last minute to focus in in inse on my mission: to tell the truth about the facts discovered by my colleagues and me. First of all, I am a truth-seeker. My intention is to provide metaphors that express new paradigms, that capture how the body and mind are really inextricably linked, and the role that emotions play in health and disease. I clear my throat and the house lights darken as my first slide comes up on the screen. There's something incredibly drunk about standing in front of a huge room full of all the noisy laughing people who set the tone. I've been pretty engrossed in this experience since 1977, when I gave a lecture to the National Endocrine Society and accidentally brought the house down with a joke intended to cover the mistakes I made. Now I waste no time. I sometimes get nervous and start with a cartoon that, if it's a laugh, can't pull off anything cordial. My first slide looks like this: I use this joke to point out that as a culture, we are all in denial about the importance of the causes of psychosomatic disorders of the disease. When the word psychosomatic disorder is broken down into its parts, it is soma which means the heart, the soul, the soul which means the body, and the body. The fact that they merge into one word suggests some connection between the two, but that connection is the anatomy of much of our culture. For many of us, and certainly for most of the medical facilities, bringing the mind too close to the body threatens the legitimacy of certain diseases, suggesting that they may be imaginary, unrealistic, and unscientific. If your psychological contribution to physical health or illness is seen with suspicion,It is considered completely absurd that the soul (the literal translation of the spirit) may matter. For now, we are entering a mysterious territory where scientists have been officially forbidden to tread since the 17th century. Later, Rene Descartes, a philosopher of modern medicine and founding father, was forced to trade turf with the Pope to obtain the human body needed for dissection. Descartes agreed that if he could claim the physical realm as his own, it had nothing to do with the soul, the mind, the emotions, the aspects of the human experience that were under the virtually exclusive jurisdiction of the church at the time. Sadly, this bargain set the tone and direction of Western science over the next two centuries, dividing the human experience into two separate spheres that never overlap, creating a disproportionate situation that is mainstream science as we know it today. But much of that is changing now. More and more scientists recognize that we are in the midst of a scientific revolution and a major paradigm shift that means a lot about how we deal with health and disease. As western philosophical thought since Descartes is known, Descartes's time is dominated by a methodology of reductionism that seeks to understand life by examining its smallest parts, extrapolating from its fragments to comprehensive speculations about the whole. Reductionist Cartesian thought is now in the process of adding something very new and exciting, and the whole. As I have seen as well as participating in this process, I have come to believe that virtually all diseases have a clear psychosomatic element, if not the underlying psychosomatic disorder. Recent technological innovations have allowed us to examine the molecular basis of emotions and begin to understand how emotional molecules share an intimate connection with our physiology and are actually inseparable. It's an emotion and I came to see, it links the mind and body. This more holistic approach complements the reductionist view, expands rather than replaces it, and provides a new way to think about health and disease not only for us scientists, but for one person. In my talk, I show how emotional molecules run every system in our body, how this communication system can effectively keep us healthy and disease-free without the intelligence of the body, the intelligence wise enough to seek health, and the modern high-tech medical interventions we now rely on. The book stried to give guidance on how to leverage that intelligence, but the appendix provided a list of organizations practicing different aspects of body mind medicine so that those interested could get some guidance to getMost of its intelligence allows it to do its job without interfering. The appendix also includes some basic tips for a healthy life distilled from my own experience. • Shifts occur! Ask witness Galileo! or Jesse Ross, who discovered insulin in small single-celled animals outside the human body, not just in the brain, in the 1980s, when it was first proposed and then before the Inquisition for his role in promulgate that theory for more than a century. This gave a good shake to the dominant medical paradigm, because everyone knew you needed a pancreas to make insulin! The reviewer sent them back with comments such as: This is insane, you should not wash your test tube enough. Jesse retaliated by repeating his results often enough, as other researchers who used new test tubes and were intrigued by his findings began to conduct similar experiments and report similar results. Jesse's story shows one of the paradoxes of scientific progress: truly original and boundary-breaking ideas are rarely welcome at first, no matter who proposes them. Protect the general paradigm and science moves slowly because it doesn't want to make mistakes. As a result, truly new and important ideas often come under intense, if not overt rejection and rebellion, and publishing them becomes thysifean labor. But if the idea is right, eventually they will win. It may take a good decade or much longer, as is the case with the new discipline of neurodemunology. Ultimately, however, new views become the status quo, and ideas rejected as madness are often touted and displayed in the popular press by highly critically charged people who have done much to prevent their accepting. This is what is happening today as new paradigms are born. And as far as the overall/alternative health crowd is concerned, it's not too early a moment. They have been reluctant to reigning medical models for years and have actually been actively working to overturn them. It is largely through their efforts that previously dismissed techniques such as acupuncture and hypnosis have gained the credibility they now have. But even talking to the average health-conscious consumer, people who don't have ideological animas, I'm always amazed at how deep their anger at our current health system is. It is clear that the public is catching up with the fact that they are often paying huge medical insurance payments for worthless proceduresIt could have been prevented in the first place. • • • To grasp the posulies of this revolution, you first need to understand some of the fundamentals of biomolecular medicine that I would like to discuss at the beginning of the story. How many of us can close our eyes and pictures or define receptors, proteins, or peptides? Understanding molecular cell domains is an important first step if we understand what role our emotions play in our health. I also want to provide some historical context to help people understand the impact of recent discoveries. It's one version of the lecture I'm putting here to provide a broad overview of my work, the basic science that makes it all decipherable. But I also have a more personal story than scientific, even though some of it enters some of my more informal public lectures. I believe that the story of how I was transformed by science and how the science I did was inspired and influenced by my growth as a human being, especially my experience as a woman, is as useful and equally important as the facts of my scientific adventures. For this reason, I hope to include my personal story in this book, sandwiched between sections of my lecture, to provide a perspective that reveals the human story behind the molecules of emotion. In keeping with my own evolution, as my story progresses, individuals and science eventually become intertwined, highlighting the fact that science is a very human pursuit and cannot really be appreciated if it seems as a cold, emotionless abstraction. Emotions affect the way we do science and how we maintain our health and make us sick. The first component of emotional molecules is a molecule found on the surface of cells in the body and brain called opiate receptors. It was the discovery of opiate receptors that began his career as a bench scientist in the early 1970s, and he found a way to measure them and prove their existence. Measurement! It is the basis of modern scientific methods, a means by which the material world is recognized to exist. Unless something can be measured, science refuses to deal with non-things such as emotions, minds, souls and spirits, because science does not acknowledge that it exists. But what is this previous non-object known as a receptor? The scientists who needed to believe the mostIt was a pharmacologist (a person who studies and invents drugs) because it was the only way they knew to explain the action of drugs in organisms. Pharmacologists dating back to the early 20th century believed that for a drug to act in the body, it must first attach itself to something in it. The term receptor was used to refer to this fictitious body component, which allows the drug to attach itself and thereby in some mysterious way to start a cascade of physiological changes. He said it summed up what he believed to be true. (Only he said it in Latin to emphasize the depth of the concept.) Now we know that its components, receptors, are probably the most elegant, rare and complex types of molecules: a single molecule. A molecule is still the smallest possible part of a substance that can be identified as that substance. Each molecule of any substance consists of the smallest units of material (atoms such as carbon, hydrogen, nitrogen, etc.) and is bound in a composition specific to that substance, which can be expressed as a chemical formula or more usefully drawn as a diagram. Invisible forces attract one molecule to another, allowing the molecule to match an identifiable substance. The power of these invisible attractions can be overcome when sufficient energy is added to the material. For example, thermal energy dissolves ice crystals and turns them into water, vaporizing them when molecules move with energy very fast, loosening and flying away from each other. However, the chemical formula remains the same in the state of two hydrogen atoms (in this case H2O) bound to one oxygen atom in the case of H2O, whether frozen solids, watery liquids or colorless vapors. Larger receptor molecules weigh more than 50,000 units, as opposed to small, hard water molecules with a molecular weight of only 18 units. Different from frozen water molecules, which dissolve or turn into gas when energy is added, more flexible receptor molecules respond to energy and chemical cues by vibrating. They bend and bend and change from one shape to another, often swinging, shimmying and even huming as they move back and forth between two or three preferred shapes, or three-dimensional structures. In living organisms, it is constantly attached to the oily outer edge of the cell surface, or to the cells floating on the membrane. Thought of as a lily pad floating on the surface of a pond, like lilies, receptors engulf roots in fluid membranes, meander several times and reach deep inside cells. Receptors, as I said, are molecules and consist of proteins, tiny amino acids that bind together to crumpled chains.Like a beaded necklace folded by itself. When assigned different colors to each receptor identified by scientists, the mean cell surface appears as a multi-color mosaic of at least 70 different hues (50,000 for one type of receptor, another 10,000, and 100,000 for a third). A typical neuron (nerve cell) can have millions of receptors on its surface. It means that molecular biologists separate these receptors, determine their molecular weight, and eventually crack their chemical structure to identify the exact sequence of amino acids that make up the receptor molecules. Using biomolecular techniques available today, scientists can isolate and sequence scores of new receptors, meaning they can chart their complete chemical structure. Basically, receptors function as sensing molecules — scanners. Just as our eyes, ears, nose, tongue, fingers and skin function as sensory organs, receptors also do so only at the cellular level. They hover in the membranes of your cells, dancing, vibrating and waiting to pick up messages carried by other vibrating little creatures. We like to describe these receptors as keyholes, but that's not a perfectly accurate term for something that dances in a rhythmic, vibrating way and is constantly moving. As I said, all receptors are proteins. And they gather in a cell membrane where the correct chemical keys swim up to them through extracellular fluids, attaching them to their keyholes (a process called binding) and waiting to attach them. Binding. It's sex at the molecular level! and what is this chemical key to docking to the receptor and causing it to dance and shake? It is a chemical key that binds to receptors, enters like a keyhole key, tickles molecules to sort itself, and creates a disturbance that changes its shape. If the binding tie receptor is the first component of the molecule of emotion, the rigand is the second one. The word rigando comes from The Latin Rigare, which shares and connects its origins with the word religion. Regand is a term used for natural or artificial substances that selectively bind to their own specific receptors on the surface of cells. The ridged bumps into the receptor, slips off, hits the back and slips off again. When a regand bumps, it is called a bond, in which the rigand forwards a message to the receptor through its molecular properties. The key that fits the lock is the standard image, but the more dynamic description of this process is the same note, with two voices: the regand and the receptor.Vibrations that ring the doorbell and open the doorway to the cell. It's pretty amazing what happens next. Receptors receive a message and transmit it deeply from the surface of the cell to the inside of the cell, where the message can dramatically change the state of the cell. A chain reaction of biochemical events is initiated by a small machine into action, and the message of the regand begins a number of activities, such as producing new proteins, making decisions about cell division, opening and closing ion channels, and adding or subtracting energy chemistry groups such as phosphates. In short, the life of a cell is determined by what it is and what it has ever been, which receptors are on its surface, and whether those receptors are occupied by regands. On a more global scale, these fine physiological phenomena at the cellular level can translate into major changes in behavior, physical activity, and even mood. And given that it is happening in all parts of the body and brain at the same time, how is this activity organized? The binding process is very selective and very specific! For example, opiate receptors can only receive regands that are members of opiate groups such as endorphins, morphine, and heroin. Valium receptors can only adhere to valium and valium-like peptides. This specificity of the receptor, which allows for a complex system of tissues and ensures that everything reaches where it is supposed to go. . . The first type of riganed includes classic neurotransmitters, small molecules with unwieldy names such as acetylcholine, norepinephrine, dopamine, histamine, glycine, GABA and serotonin. These are generally the smallest and simplest of molecules made in the brain to carry information across the gap between one neuron and the next, or across the synapse. Many start out as simple amino acids, building blocks of proteins, and then add a few atoms here and there. Some neurotransmitters are unqualified amino acids. The second category of riganed consists of steroids, including the sex hormone testosterone, progesterone, estrogen. All steroids begin as cholesterol, and are converted by a series of biochemical steps into certain types of hormones. For example, enzymes in the gonads (male testes, Women's ovaries) turn cholesterol into sexOther enzymes convert cholesterol into other types of steroid hormones, such as cortisol, secreted by the outer layer of the adrenal glands under stress. I saved the best for the last! As we see, these chemicals play a broad role in regulating practically all life processes and are actually the other half of the equation for what I call emotional molecules. Like receptors, peptides are made up of strings of amino acids, but I'm going to save peptide details until later in the lecture. On the other hand, one way to keep all this in mind is that if the cell is the engine that drives all life, the receptor is a button in the control panel of that engine, and a particular peptide (or other kind of regand) is the finger that presses that button to start things. Chemical Brain At this point, I want to move away from the pure molecular level and have a new knowledge of receptors and their regands to focus a little bit on how scientists are looking at the brain now and how that view differs from our previous, more limited understanding. For decades, most people considered the brain and its expansion primarily telecommunications systems. It was common knowledge that neurons consisting of cell bodies with tail-like axons and tree-like dendritics, or neurons, form something similar to a telephone system with trillions of miles of intricately intersecting wiring. This image is dominated by the public because we scientists had the tools to see and study the electric brain. Only recently have we developed a tool that can observe what is called the chemical brain. However, neuroscience, which has not yet been named, has long focused on the concept of the nervous system as an electrical network based on the connection of neuronal axon dendrite-neurotransmitters, so even with evidence, it was hard to grasp the idea that the regand receptor system represented a second nervous system. Nerves were a classic subject in neuroscience, and root science was working on the first exploration of the brain and central nervous system, so it was frustration that people were able to contemplate the idea of a second nervous system. What was particularly difficult to accept was that this chemical-based system was undeniably ancient and much more fundamental to living things. Peptides such as endorphins, for example, were made in cells long before the presence of dendrites, axons, or neurons. Until the brain peptide is in focus,In the 1970s, most of our attention was directed to neurotransmitters and jumps from one neuron to another across a small moat called a synaptic cleft. Neurotransmitters seemed to carry very basic messages, either on or off, referring to whether the receiving cell discharges electricity. Peptides, on the other hand, act like neurotransmitters and swim synaptic clefts, but are much more likely to pass through extracellular space, flow through blood and cerebrospinal fluid, travel long distances, and cause complex and fundamental changes in the cells that receptors lock. This was as much as researchers understood about receptors and their regands by 1972, before they actually discovered drug receptors, and before the breakthrough involving the immune system in 1984, using receptor theory to define information networks throughout the body and provide a biochemical basis for emotions. In the wake of their discovery in the 1980s, these receptors and their regands became seen as information molecules, the basic unit of language used by cells throughout organisms to communicate between systems such as endocrine, neurological, gastrointestinal, and even immune systems. Overall, the musical hum of receptors, which they bind to many regands, often creates a structural and functional integration that allows organisms to perform smoothly and intelligently, often in far-off parts of the organism. But I'm getting way before my story. Let's take a look at science at once and see how some of these ideas have developed historically. A brief history of receptor mechanisms The idea of receptor mechanisms comes from pharmacologists in the early 20th century, but many university physiology departments took it up because they thought it was a useful concept to explain new chemicals (neurotransmitters) found in the nervous system. Secreted across synapses, or gaps between neurons, these chemical communicators worked in a way that could be understood by receptor-rigand models, even though biochemistry has yet to develop a way to measure what is happening. The chemical formula of acetylcholine, the first neurotransmitter found, was still decades away when physiologist Otto Rowy conducted early neurotransmitter experiments following his overnight dream! Removed from the frog and still putting a heartbeat on the large beaker, the heart slowed dramatically when Loewi applied the juice extracted from the vastic nerve to it. The mysterious stray was found to be the neurotransmitter acetylcholine, made by nerves, acetylcholine causes decelerationThe heartbeat and rhythmic stimulation of the digestive muscles after meals together contribute to a sense of relaxation. For both of these processes, scientists theory that there are acetylcholine receptor sites, some in the heart muscles, others in the muscles of the digestive tract, and others in still spontaneous skeletal muscles, but they could not actually demonstrate their presence in 1972, Jean= Pierre Changez's early 20th-century theory of addressing a pharmacology conference in England became a reality. In a dramatic flourish, the biochemist pulled a small glass tube from his chest pocket and had a single narrow blue band in the middle. The tubes were taken from the body of an electric eel, separated from all other eel molecules, and contained pure acetylcholine receptors stained blue, which was the first time the receptors had been isolated in the laboratory. Changeux described how the feat was made possible by an unholy alliance between cobras and electric eels, with the former supplying poison to separate receptors from the latter. In higher animals, the poison of the cobra acts by spreading into acetylcholine receptors, including those on the diaphragmatic muscles that enter the victim's body and regulate breathing. The poison blocks access to natural acetylcholine to its receptors. Because acetylcholine is a neurotransmitter responsible for muscle contraction, paralysis of the muscle results in the diaphragm causes death from suffocation. Now, it happens that the densest concentration of acetylcholine receptors found just everywhere is in the electrical organs of electric eels. We found that snake venom contained a large polypeptide called alpha-bangelo toxin, which specifically and irreversibly bound to acetylcholine receptors in this organ that supplies eel jolts, which literally stuck like glue. By introducing radioactive atoms into toxins in snake venom, Changeux can follow the places stuck to acetylcholine receptors in the eel's electrical organs, thereby separating those receptors. That's how he got the blue stain on the test tube. The process of heating the rigand by introducing radioactive atoms was a great innovation, but it was a very tricky procedure because radioactive materials can destroy the binding capacity of the rigand and defeat the entire process. As we joked and called emerging fields, another major flow that contributed to receptorology was the study of endocrinology disciplines, ductless glands

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