CHAPTER - I

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Today healthy life is not restricted to physical health only. Holistic health approach is the recent trend. Holistic health means the whole being inclusive of physical, emotional, mental and spiritual self. Present study is based on the same philosophical faith.

The process of body appears to be complicated with multiple nervous systems and hormonal interactions. Mental processes, which are functions of the physical brain are of equal importance and not far from complications. There are constant and often unconscious interaction of sensations, thought and will, with emotions, impulses and desires, and through it all weaves the imagination. Continuous interaction between body and mind by conscious and unconscious processes makes the whole thing more complicated. Hence, it has become a subject matter for in-depth study.

1.1. BODY MIND RELATIONSHIP

The relation of mind and brain has occupied a central position in philosophy for several thousand years. Sherington (1950) noted that Aristotle 2000 years ago, was asking how the mind attached to the body and we are asking that question still. If by mind we mean "subjective awareness" the "experience of sensations", "consciousness" and similar phrases, it seems clear that the brain has something to do with mind. The most commonly accepted explanation is that each individual is composed of two parts i.e. mind and body. According to this account, the mind has no material substance, which explains why we can not see it, but it is actually an essential and responsible part of our existence. The body through the services of the brain is capable of carrying out certain basic functions on it's own but the overall guidance often comes from the mind.

The logical place to begin unrevealing the mystery of mind is with the question of what the mind is? If the mind is truly a nonphysical entity, as has long been believed, then human beings are essentially immaterial creatures, and explanations of their thoughts and

feelings must be based on an understanding of the nonphysical realm in which minds exist. On the other hand ultimately men are material beings, if the mind is accepted as a physical process, and the inner experiences are to be understood in terms of the natural forces that prevail in the rest of the physical universe. Thus, the nature of mind is the very heart of the human search for self-understanding.

Currently there are two major approaches to understand the nature of mind. These are dualistic approach and physicalism. Dualistic approach agrees with the traditional assumption that the mind is nonphysical by nature. Physicalism is based on the idea that mental processes are actually physical activities, which take place in the human brain. Modern philosophers have largely abandoned the dualistic approach and concentrated their efforts on developing a satisfactory version of physicalism. If the mind can be understood in terms of the activity of the physical brain, however, the brain is all that stands in need of explanation. Before discussing the brain in detail (under the heading of nervous system) a brief discussion of body is essential.

1.1.1 THE BODY

Shri Devendra Vora in his book on Accupressure Therapy (Reflexology) very nicely describes the bodily systems, by comparing it with a modern mobile air conditioned factory. This mobile building gets its movement from the pillars (the legs) of cement-concrete structure. It's first floor, which is up to diaphragm, accommodates the nutrition producing plant, filtration plant and even sewage plant to throw out wastage - (urine and stools). Surprisingly it has a unique reproduction plant. On the second floor of this human building; there is a non stop pump (heart) and air controllers (lungs). The upper top floor is dome shaped and accommodates atomic reactor, super-computer and telephone exchange, which has miles long, fastest communication system. Surprisingly all the plants work automatically and in perfect coordination with each other.

1.1.1.1 ORGAN SYSTEMS OF THE BODY

i. **Skeletal System**:- This is an infrastructure of 'bones' which support the body.

ii. **Muscular System**:- It includes all body muscles attached to skeleton. Helps in skilled and gross body movement.

iii. **Nervous System**:- It includes brain, spinal cord, all peripheral nerves, organs of sensation and it helps in appreciation of environment, coordination and direction of activities of body organs. (This is one of the prime systems and will be discussed further in detail in the next section.)

iv. **Integumentary System**:- This system includes skin and appendages (hair, nails, glands) works as a protector against invasion from outside, dehydration, injury, temperature regulation.

v. **Digestive System**:- It includes, mouth, mouth cavity, pharynx, oesophagus, stomach, intestines, anus, liver, pancreas, and salivary glands and it helps in ingestion, digestion, absorption of nutrients and ejection of residues.

vi. **Respiratory System**:- It includes nose, nasal cavities, larynx, trachea, lungs (bronchi and bronchioles) works for acquisition of oxygen; elimination of carbon dioxide and acid-base regulation.

vii. **Circulatory System**:- This system includes heart, arteries, veins, capillaries, blood and blood vessels. It transports nutrients and all other products to the whole body and also helps in elimination of wastes.

viii. **Immune System**:- Consists of white blood cells, certain cells of bone marrow, lymph nodes and spleen etc. It provides defense against foreign cells, micro-organisms parasites and viruses.

ix. **Excretory System**:- Includes kidneys, ureters, urinary bladder, urethra. It helps in regulation of blood composition by eliminating the waste products.

x. **Reproductive System**:- Comprises of ovaries, fallopian tubes, uterus, vagina, mammary glands in females and testes, seminal vesicles, prostate, external genitalia in males.

xi. **Lymphatic System**:- This system includes lymph nodes, nodules, and vessels thymus and spleen. It helps in return of fluid to circulation, clearing of dead cells from body. It is a part of immune system.

1.1.1.2 THE NERVOUS SYSTEM

The nervous system with its various components and interactions is much more complicated than any other system of the body. It can be divided into central and peripheral nervous system. The central nervous system (CNS) consists of brain, brain stem, and spinal cord, with the enclosed nerve cell body aggregates, fibers and interconnections, called neuron. A nerve consists of many processes of neurons and may extend in to both the central and peripheral nervous systems. The peripheral nervous system (PNS) consists of the sensory nerves, which lead into spinal cord and brain stem from sensory receptors and brings sensory messages. The motor neurons, which issue from the spinal cord innervate the voluntary muscles in the extremities, trunk and head. The autonomic nervous system (ANS) which will be discussed in detail later, has components in both CNS and PNS.

The Central Nervous System (CNS)

CNS comprises of brain and the brain stem. Within the brain and the brain stem there are several areas or systems, which deserve mention. The **cerebral cortex** is the much convoluted outer layer of the brain. Its different regions are concerned with muscular functions and sensory impressions and are further instrumental in perceiving, thinking, learning and associative functions. It also affects the interaction of functions of the sympathetic and parasympathetic parts of ANS, and interactions between the ANS and sensory and motor somatic functions. At this highest level of the CNS are also located regulating mechanisms for cardiovascular, gastrointestinal, sexual, and other supposedly "involuntary" functions.

The **thalamus** is mainly a distribution center that relays all sensory impulses, except possibly olfaction, to the cerebral cortex and from one part of the brain to the other. The **limbic system** includes parts of the cerebral cortex as well as some lower brain structures, and it integrates emotions with motor and ANS activities. The **hypothalamus** regulates such body functions as temperature, hunger, thirst and blood pressure. It is also the central locus of such emotions as fear and anger, interacts with the reticular formation in the brain stem to keep the brain awake and alert, and controls the

pituitary gland. The **brain stem** influences motor functions, including posture and movement, reflexes, excitatory and inhibitory mechanisms and activation of extensor muscles. It may alert and activate the cerebral cortex, facilitating impulses or may block some sensory impulses. Consciousness and attentiveness are influenced by it. It also influences the ANS functions of salivation, cardiac activity, blood pressure, respiration and elementary movements. The **cerebellum** receives nerve impulses from skin, muscles, joints, tendons, eyes, ears, semicircular canals of the inner ear, and cerebral cortex. It regulates posture, balance, and coordinated movements and influences respiration, blood pressure, and other autonomic functions. The **spinal cord** conducts and coordinates nerve impulses. It is an important location of neural interaction, including summation, inhibition, and reflex action.

The Autonomic Nervous System (ANS)

Other names for this system are the involuntary, vegetative or visceral nervous system. The integrating action of the ANS is of vital importance for the constant well being of the organism. The ANS exerts regulatory influences over the smooth muscles and glands of internal organs, skin, mucous membranes, and blood vessels, which serve such usually involuntary functions as regulation of heart rate, blood flow and pressure metabolism, digestion, temperature maintenance, breathing and sexual functions are also partly under voluntary control. However, ANS acts not only as an internal homeostatic mechanism, but also as a primary reactor to environmental physical and mental stimuli.

The ANS has both CNS and PNS components. Within the CNS somatic and autonomic centers overlap, and there are probably no centers of purely autonomic integration. Integration of autonomic functions occurs at all levels of the CNS, but the hypothalamus with its regulatory functions of sleep, temperature and food intake is the most important single location for this integration. Autonomic reflexes regulating blood pressure, blood vessel size tonus, sweating and emptying of the urinary bladder, rectum, and seminal vessels can occur, in the CNS, at as low a level as the spinal cord without involving the brain.

The peripheral ANS components are now called respectively the sympathetic nervous system (SNS) and the parasympathetic nervous system (PSNS). They are also referred to as thoracicolumbar, since the SNS nerve processes issue from the thoracic and lumber sections of the spine, and cranio-sacral. The PSNS process issue from cranial and sacral sections of the spine. The SNS and PSNS are inextricably connected, and their interactions are intricate. Both systems innervate practically every organ in the body, but their actions as well as their modes of action differ.

The SNS, by means of it's two chains of nerve cell aggregates along the sides of the spinal column and other nerve cell aggregates and networks, usually acts in a general way. The origin of the PSNS in the peripheral nervous system as well as its actions are more discrete. It is organized for localized discharge to specific structures and systems, and not for generalized responses. In general, the SNS is concerned with the expenditure of energy, while the PSNS consumes and restores energy. The SNS is active during the waking state, making adjustments to a constantly changing environment, the degree of activity varying from moment to moment and from organ to organ. It also helps to prepare the individual for competitive aggressive or evasive, fight or flight behaviour. Further, sudden stresses, tension, anxiety states, and mental and physical work excite certain brain centers, which in turn influence the SNS to initiate general excitation and activate mechanisms, which contribute physiologically to the production of muscular work. During rage and fright sympathetically innervated structures through out the body are activated simultaneously. The SNS accelerates the heart rate, increases blood pressure, breathing rate and blood sugar; affects general metabolism; induces the spleen to pour red blood cells in to the circulation. It diverts the blood from the skin and internal organs to skeletal muscles. It dilates the pupils. It induces the secretion of adrenaline and noradrenaline and other hormones by the adrenal gland. The SNS also stimulates other glands among them certain sweat glands and consequently decreases electrical skin resistance and activates the smooth muscles at the hair roots to make the hair rise.

The PSNS promotes those bodily processes, which conserve and build up energy and body tissues mainly digestion, the building up of reserves and relaxation. Other functions of the PSNS are the dilation of blood vessels, including the erection of penis or

clitoris and increasing salivation, nosopharyngeal secretions, mobility in the gastrointestinal track, and lacrimation. It initiates decreases in the heart rate, tonus of the blood vessels, blood pressure, oxygen consumption, blood lactate, respiration and general metabolism. It stimulates gastrointestinal movements and secretions, evokes lapping and similar eating movements, contracts the pupil, aids in the absorption of nutrients, induces vomiting and emptying of the urinary bladder and rectum, and increases electrical skin resistance. No useful purpose would be served if the parasympathetic nerve cells all discharged at once. In fact such general action could be harmful. In modern world and excitement oriented society, the fight-or-flight responses is frequently inappropriately initiated but then not completed. This produces unnecessary stress and as a result the SNS is much over worked. In addition man has in his sheltered, civilized life being strongly conditioned to rely on external protection rather than on the innate instinctive responses of his body. The instinctive fight-or-flight reactions have not changed, but they have now become technologically and socially inappropriate. One must learn to recondition the ANS. Just as the SNS responses are elicited by situations which call for hard thinking, muscular work, flight-or-fight reaction, so are the PSNS responses elicited by a quite stream of thought, a decreased level of consciousness and muscle tone, a quiet environment, monotony and a passive attitude.

No wonder modern western man has turned his attention to ancient eastern method. Without any knowledge of anatomy and physiology of the systems involved, ancient eastern methods were developed to control voluntarily the actions of the ANS, and especially to induce PSNS reactions. It was long believed in western society that autonomic functions cannot be voluntarily controlled, although they are in fact easily influenced by thinking as well as by emotions. Thus brain is the main coordinator of the entire human body.

1.1.2 THE MIND

Mind has been defined in the dictionary of psychology as - "The organized totality of psychological process that enables the individual to interact with his environment". Mind's properties are various levels of consciousness such as conscious, subconscious,

unconscious and as per transpersonal approach superconsciousness. The basic functional components are perception, memory, thinking, emotions and will. Each of these components undergoes constant interaction at all levels of consciousness. As per the dualists view mind does not have any material component, it is something that comes from outside and resides temporarily within or along side the body's "shell." There are others with a scientific approach, who claim that the mind or the consciousness has some physical explanation. Its source must be located some where in the body, though exactly where has varied considerably through time and given rise to all sorts of models.

In order to find out the evidence that brain is the sight for mind's activity, scientists started exploring (and are still in the process) the degree of correspondence between the activities of the mind and those of the brain. Studies on electroencephalogram gives some of the basic evidence on the issue. When the neurons of the brain interact with one another, they generate a weak electrical field, in the vicinity of the brain. By placing electrical contacts on the scalp and amplifying the signals that are picked up, researchers can obtain a crude image of the brain's activity, the EEG. The electrical field of the brain goes through rhythmic cycles of greater and lesser intensity, and are called brain waves. It has been found that they bear a very regular correspondence with what is going on in the mind. When the mind is at rest, as it is during day dreaming or meditation the brain waves are quite regular, occur at a rate of about ten cycles per second. This pattern that has been designated as the "alpha" range (EEG and detail regarding alpha state will be discussed later). Most EEG research with humans has been an empirical observation of the nature of EEG pattern under specific conditions. For example, characteristic patterns of EEG have been associated with different stages of sleep, various levels of arousal, meditation, epileptic seizures, drug states, solving a problem or learning new information, the brain waves become less regular and increase in frequency to more than 14 cycles per second. If the person goes to sleep, on the other hand the brain waves become very regular and drop to as low as 3-4 cycles per second. Even dreams are reflected in the EEG.

In addition to general correspondence between brain waves and mental states, there are very precise relationships between specific mental processes and the EEGs that

are obtained during the process. For example, the brain exhibits a regular sequence of changes in its electrical field whenever a person is shown a familiar object and the sequence is different for different objects. There are also regular patterns of activity associated with other mental processes, such as comparing two objects to see whether they are the same or deciding which answer to give in response to a question. It is even possible to tell from the EEG whether a person is surprised by what is seen or heard in these experiments. On the whole, the results of studies using the EEG have revealed a consistent and reliable correspondence between the activities of the mind and the brain. There have not been any findings that would suggest a divergence between the two. Attribution of great many mental processes to various sights of the brain adds further evidence to the concept that mind is the functional part of the brain. The brain began as a specialized region of the spinal cord. Various structures of the brain gradually emerged and expanded as the adaptive value of normal processing influenced the evolution of the human species.

The internal organization of the brain, as viewed from the front of the head is shown in the figure (Fig. 1.1) here. The most primitive part of the brain is found at its base where it joins the spinal cord. This region is responsible for the maintenance of such bodily functions as circulation, breathing, sleeping, reflexes and the coordination of movement. These functions are essential to immediate survival of the body, and they evolved in conjunction with the development of the corresponding bodily organs. Activities in this region do not

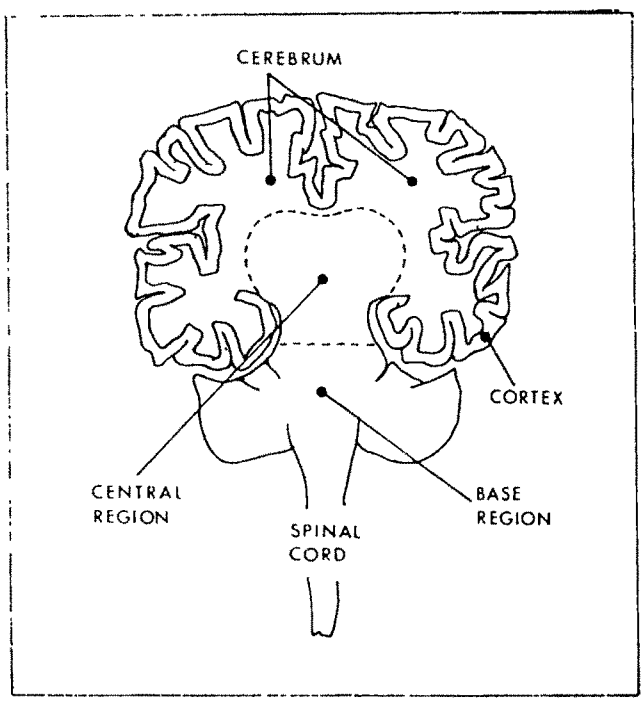


Fig 1.1 Internal Organization of the Brain

contribute to conscious experience, and they have little to do with the kind of processes that are usually attributed to the mind.

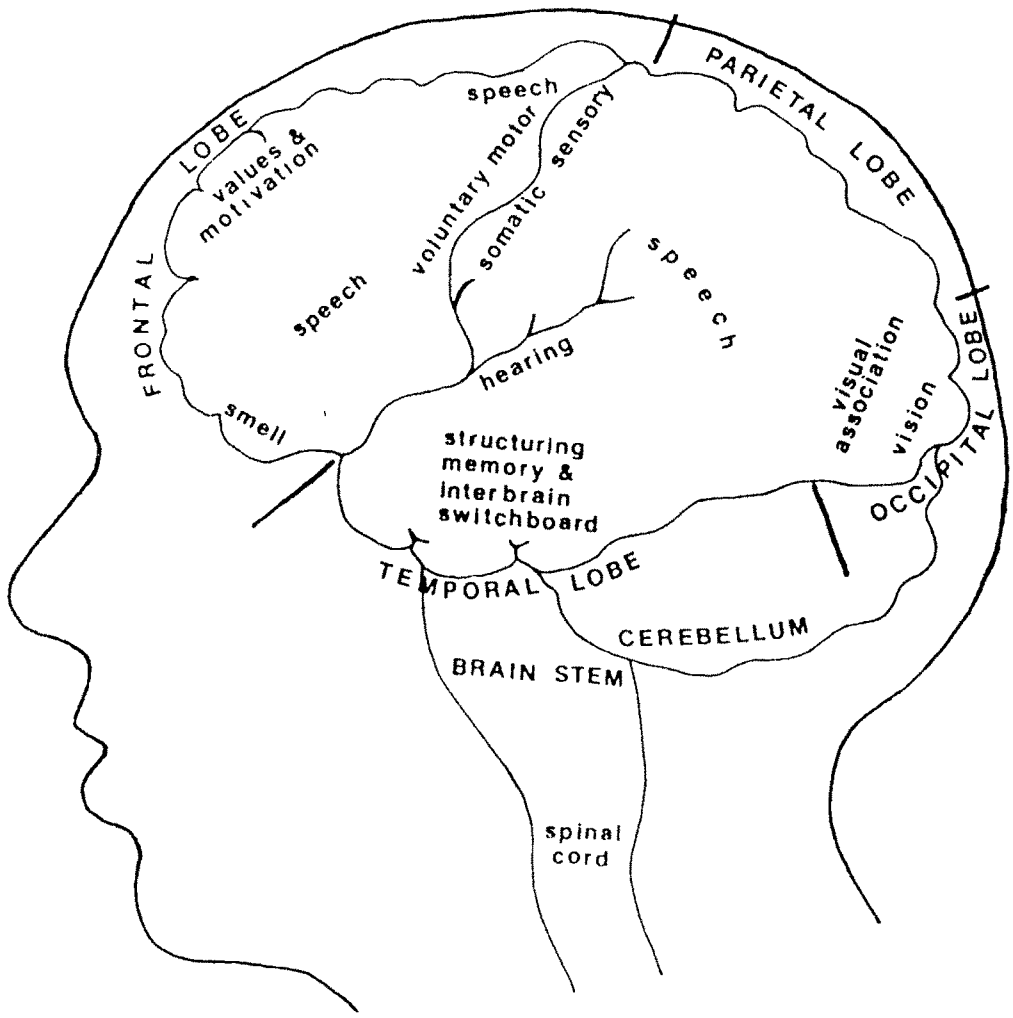


Figure 1.2 Major anatomical regions of the brain and their associated functions

In the central region of the brain are structures that are responsible for motivational states such as hunger and thirst. The experiences of pleasure, pain, and emotion are also associated with activity in this area. This region of the brain is a more recent evolutionary development than the base region, and at least some of its activities are subject to conscious observation. These activities are not, however, the ones that are most closely associated with the concept of mind. The most recent extension of the human brain is the cerebrum, a structure that has become so large over the course of evolution that it now accounts for 85 percent of the total mass of human brain. The actual

working part of the cerebrum is its outer surface, called the cortex and the major thrust of human evolution over the past million years has been the gradual expansion of this cortex. The newly evolved cerebrum is the part of the brain most closely associated with the activities of the mind, and it is these activities, which contribute most heavily to conscious experience. The cerebrum is known to be involved in perception, thought, memory, language and many other functions of the human intellect. Some of these functions have been localized to specific regions of the cerebrum as shown in the figure 1.2. Other functions, such as thinking and remembering, do not seem to take place in any one part of the cerebrum but depend up on activities through out this structure.

In addition there is a general division of labour between the left and right halves or hemispheres, of the cerebrum. Generally speaking the left side of our brain functions in a different manner than the right side. Each of our two brains perceives the world in a different way. Moreover, there is a division of intellectual functions between the two hemispheres. The left side of our brain perceives the world in a linear manner. It tends to organize sensory input into the form of points on a line, with some points coming before others. The left hemisphere is more involved with the analytic mental functions, such as rational thinking, mental arithmetic and the use of language. The right hemisphere, by contrast is more involved in holistic kinds of processes such as the perception of form, the appreciation of music, and insightful problem solving. Physiologically the left hemisphere controls the right side of the body and the right hemisphere controls the left side of the body. In view of this, it is no coincidence that both literature and mythology associate the right hand (left hemisphere) with rational male and assertive characteristics. They associate the left hand (right hemisphere) with mystical female and receptive characteristics. The Chinese wrote about the same phenomena thousands of years ago (Yin & Yang) although they were not aware of the split brain concept.

There is yet another kind of evidence to support the concept of brain being the sight for minds activity. If the mind is the functional part of brain, then any thing that alters the functioning of the brain ought to produce a corresponding change in the way the mind works. There are in fact a variety of ways in which this can occur. For example, damage to the brain caused by injury or disease typically leads to mental impairment and

the particular type of impairment that results, depends on the area of the brain that is affected. Another example is the use of psychoactive drugs such as valium, marijuana and alcohol all of which produce their effects on the mind by altering the functioning of the brain. As a further illustration, direct stimulation of the brain with electric current during surgery produces distinct mental experiences including sensations, memories, and intuitive impressions.

Looking into the varied evidences we hardly have any reason to question the fact that mind is the activity of the brain, so the mind is geared to the sense organs, and they in turn to mechanical world around us. The energy of light makes vision possible, mechanical vibration is the basis of hearing, and so on. The human mind is ultimately dependent upon the complex chain of mechanical principles. Hearing for example begins with a series of sound waves, which the various links of mechanical principles in the ear transform to nerve impulses. The nerves transmit those impulses to the brain. Depending upon the amount and intensity of neural excitement, brain interprets it as low or loud sound. It is a lawful and qualitative relation. Growing evidence of incidental and experimental findings on extra sensory perception, clairvoyance and other similar phenomenon has compelled us, if not to believe them at least to consider the possibility of mind having a channel beyond senses to interact with the cosmic reality. Hence a mere working definition of body and mind can not be satisfactory enough till the interaction between body and mind is well understood.

1.1.3 BODY MIND INTERACTION

Which ever may be the sight of mind, there is a constant interaction between mind and body. The nature of interaction is like egg chicken paradox. The question being whether mind controls body or body controls mind? For sometime, even today some theorists describe mind body relationship in terms of computers. They describe mind as software and body/brain as hardware. Computers are able to do many sophisticated things that a human brain could do. Yet one can not call them conscious beings, as they don't have spontaneity and creativity, they lack imagination, they don't laugh at jokes, enjoy music or suffer pain or do any of the other things of that sort that we normally associate

with the conscious life of human mind. A danger was recognized that if we continue to perceive ourselves as machines we may reduce the whole wealth of our conscious life to the far more narrow spectrum of thought and behaviour that can be written into programmes. A need for different way of thinking about mind/brain link was realized which would give a more human way of perceiving ourselves. To serve this purpose, a better understanding of both physiology of the brain and physical basis of consciousness is required.

The human brain is a complex matrix of super imposed and interwoven system corresponding to the various stages of evolution and the self which arises from it is something like a city built across the ages. Each of us carries within his own nervous system the whole history of biological life on the planet at least that belonging to the animal kingdom. Right from amoebae or paramecium to homo sapiens. It has also been seen that despite the increasing centralization and complexity as the nervous system evolves, the more primitive nerve nets remain, both within the expanding brain and through out the body. The more recent phases of our evolution have supplanted earlier phases but not entirely replaced them. The experience of the amoebae and the jelly fish, of the earth worm and the ant, are all embedded within our own nervous tissue, and with each one of these creatures we share the capacity for consciousness. This tempts the author to quote the following quotation from 'Times of India' (dated 24-2-99):

> "We are like dwarfs seated on the shoulders of giants. We see more things than the Ancients, and things farther away, but this is not due to the sharpness of our vision or height of our build. It is because they carry us and raise us from their gigantic height."
>
> Bernard de Chartres

Consciousness can not be restricted to the higher brain functions permitted by neuron connections in the brain. Some animals, although conscious, have no cortex at all; others have only a very primitive one. Humans lose specific capacities, such as speech or sight or movement, or even memory when vast areas of cerebral cortex are damaged or surgically removed, still they are conscious. Consciousness as a general capacity for

awareness and purposive response must issue from some physical mechanism, which is far more primitive than the developed human brain. Thus mere consciousness does not serve our purpose. Which matters most to us is the unity of conscious experience. While perceiving any object, the brain does not see the object itself, but its colour, shape, size etc. Information about each characteristic is filed in a different place on a 'separate features map' and then subsequently on a 'master map of locations'. Once the master map has been composed, focused attention takes over, looks at the map and perceives the object. In other words all the cognitive functions contribute to the act of perception. The synergy, created by coordination between each part of brain and various components of mind is greater in strength than the added strength of each individual part of brain and component of mind.

The major reason to reject the computer model of the brain is its inability to explain the unity of consciousness because it rests on the separateness of things, about constituent parts and how they influence each other across their separateness, as the separate neurons in the brain act on one another across the synapses. Descartes in his struggle to explain consciousness in physical terms said, "There is a great difference between mind and body, in - as much as the body is by its very nature always divisible, while the mind is utterly indivisible". The apparently irreconcilable division was one of the arguments that led Descartes to his dualism. The inadequacies of computer model motivated the scientists to lean up on another metaphor known as the holographic model, or the holographic paradigm to explain mind's interconnectedness. A hologram itself is just a special sort of photographic slide, which records an interference pattern of light coming from two sources after an initial beam has been split. Because the technique for creating holograms is lenseless and relies on recording light phase as well as intensity, the resulting slide has a unique way of storing information about any object photographed. The information gathered from any one part of the object is spread all over the slide, so that if some part of it gets destroyed, an image of the whole object can still be projected. The greater the area of the slide that gets destroyed the fuzzier will be the projected image. In other words, each individual part of the picture contains the whole picture in condensed form. The part is in the whole and the whole is in each part - a type of unity in

diversity and diversity-in-unity. The key point is simply that the part has access to the whole.

As it has been discussed earlier, mental life has got two sides. The first is the 'component parts' of our conscious life, which consists of the relational and analytical ability, gives us the rules to form thoughts and make decisions. It is this part of the mental life, which has given us the computer model of brain. The other side of our mental life or human knowing is called the intuitive side, the side that draws on wisdom, imagination, creativity etc. In modern neurophysiological terms, these two sides of our mental life have been termed as right/left hemispheres. Apart from Chinese Yin-Yang concept an equally good metaphor for these two sides of our mental life can be borrowed from quantum physics which could be spoken of as a particle/wave split.

Our entire society reflects a left hemispheric bias (it is rational, masculine and assertive) or in terms of quantum physics there is greater emphasis on particle aspect (individuality) of mind. Computer model is an outcome of such a bias. It gives very little emphasis to those characteristics that are representative of the right hemisphere (intuitive, feminine and receptive). In other words it gives very little emphasis to the wave (relationship) aspect of experience. The advent of "science" marks the beginning of the ascent of left hemispheric thinking in to the dominant mode of western cognition and the descent of right hemispheric thinking into underground (under psyche) status. The right hemisphere did not emerge (with scientific recognition) until Freud's discovery of the 'Unconscious', which of course, he labelled as dark, mysterious and irrational (because that is how the left hemisphere views the right hemisphere).

The 'holists' want to emphasize the wave aspect of experience, the extent which every element of consciousness - indeed every element of reality itself - is related to every thing else. The whole is some thing greater than the sum of its parts, or as David Bhom, one of the chief proponents of the holographic model, puts it, reality is an 'undivided wholeness'. Everything and everyone are so integrally related that all talk of individuals and separation is a distortion of truth, an illusion. As a metaphor accessible to the modern mind, the hologram plays a useful role in stressing the aspects of

consciousness and reality that stem from relationship and process. It serves to remind us that we are all parts of some larger whole but then the computer model goes towards the extreme of particle aspect and the holographic model goes towards the extreme of wave like side. Reality as known to us consists of both waves (relationship) and particles (individually) just as the experience we recognize as human mental life consists of both immediate consciousness (unity and integration) and computation (thought and structure). A really adequate model of the nature of consciousness and its relationship to the brain must be able to account for both.

As an attempt to put the unity of consciousness on a sound scientific footing, the holographic model fails on at least two counts. In the first place it fails to account for the unity of conscious perception. If the brain is a hologram perceiving and participating in the holographic universe, who is looking at the hologram? The hologram itself is nothing but an unusual sort of photograph, which can not on its own be doing any perceiving. Furthermore, the holograms are constructed by recording the interference patterns of light waves, and such influence patterns are an entirely classical effect described by standard electromagnetic theory, holograms themselves are classical systems. That is despite their ability to store information about a whole object in each part of the photographic plate, they are ultimately divisible into parts. They are so many separate marks on a plate which when enough of them are seen together, represent a whole, but one can always reduce the number of marks perceived to a point where they convey nothing of the whole. This is not the kind of holism required to explain the unity of consciousness, and in that crucial respect the hologram is no better than any other classical model for explaining the physical basis of consciousness. In fact there is very little to distinguish it from the computer model of perception discussed earlier. That models master map of locations might well be a hologram constructed through the parallel processing of visual data. Just as "the spot light of focused attention" was a crucial missing link in the visual process, so it is in the holographic model of more general brain function.

The desire for some sort of holism is in the air. As increasing numbers of people feel a pressing need to find some way beyond the lonely isolation and general alienation imposed by the strong mechanistic strain in our culture. The more holistic paradigm is

foundational to eastern wisdom where balance is considered essential to life and health. As Chinese trained physician Dr. David Eisenberg puts his observation:

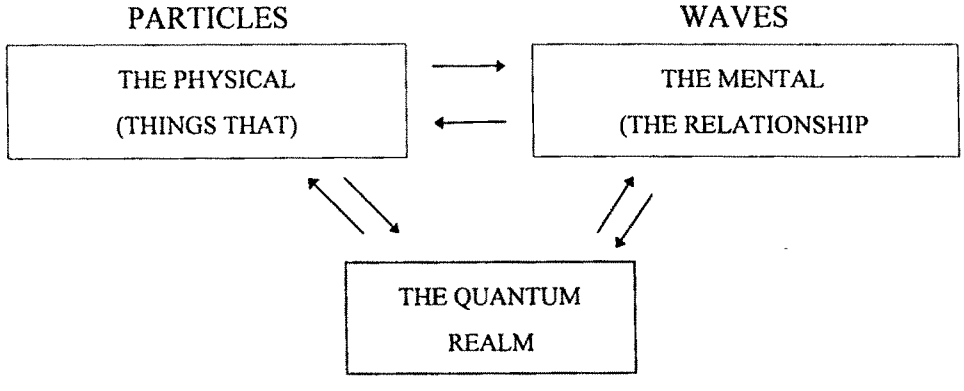
> "We (in the western world) invented the notion that "biology" and "physics" and "psychology" and "psychiatry" are separate. If we want to deal with health, and we are looking only at the chemistry or emotional state, we have an imperfect glimpse. The patient sitting before me brings with him or her not only chemistry but also family, relationship, emotions and character. The distinctions we bring to a hospital in terms of mind and body are abstractions that we make. The patient is still a whole person, and to help him or her get better, ideally we would deal with all of these aspects - the balance of a persons life."

The essence of this more holistic paradigm of balance is captured in the words of the ancient Sufi teaching. "You think, because you understood *one* you must understand *two* because one and one makes two but you must also understand *and*". On personal basis when the paradigm is applied it is seen that balance in our lives is not a running between compartments, it is a dynamic equilibrium. It's all parts working synergistically in a highly interrelated whole, balance isn't 'either/or', it is 'and'. The same phenomenon has been explained in physics in the form of 'Bose-Einstein Condensate" whose crucial distinguishing feature is that the many parts which go to make up an ordered system not only behave as a whole but they become whole - their identities merge or overlap in such a way that they lose their individuality entirely.

If holism is to have any meaning it must be grounded in the actual physics of consciousness and relate it both to brain structure and to the common feature of our everyday awareness. To achieve that one must turn to quantum mechanics. The word denotes a discrete jump from one level of functioning to a high level - the quantum leap. Quantum is also a technical term once known only to physicists but now growing in popular usage. Formally, a quantum is "the indivisible unit in which waves may be emitted or absorbed." The definition given by the eminent British physicist Hawking in layman's terms the quantum is a building block.

A quantum mechanical model of consciousness, then gives rise to a picture of our overall mental life which is neither entirely like a computer nor entirely like a quantum system. The model is indeed not entirely 'mental' what we recognize as our full-blown conscious life. Use of 'conscious' in its common vernacular sense is actually a complex, multi-layered dialogue between the quantum aspect (the ground state) and a whole symphony of interactions that cause patterns to develop in the ground state interactions with our computing facilities in the cerebral cortex, with our instinctual and emotional capacities in the primitive fore brain, with our appetites and our twitches (or, pains), with a whole host of activities going on in the body, and to some extent with the conscious lines of other people and creatures. It is the quality of play by various members of this symphony that ultimately determines the overall quality and content of the music played - our conscious life. Quantum mechanical model is a physical model that assumes that the phenomenon of consciousness (awareness, perception, thought, memory etc.), along with those of physics, chemistry, biology, belong to the order of nature and can be experimentally investigated. This way of looking at consciousness implies that consciousness and matter are so integrally bound up with each other that either consciousness is a property of matter, or else, consciousness and matter arise together from the same common source - which can be termed as the world of quantum phenomena. The kind of quantum relationship, which creates some thing new by drawing together things that were initially separate and individual, is very important, and in itself opens new vistas in the philosophy of physics. It's importance goes far beyond physics. Such relationship is both the origin and the meaning of the mental side of life.

Fig. 1.3 THE QUANTUM MECHANICAL MODEL



WAVE /PARTICLE DUALITY

Consciousness or the mental is at the most primary level of existence, a pattern of active relationship the wave side of the wave/particle duality. Just as the physical side of life originates in the particle side of duality (Fig. 1.3). This essential definition of consciousness as relationship can be applied and found to hold good for all levels and degrees of consciousness. At the level of consciousness that we understand, originates in our own brain, quantum 'relational holism' could arise from the correlation of waves in the powerful electromagnetic field created by the jiggling of charged protein or fat molecules in the neuron cell walls. Their relationship would form something like a Bose-Einstein condensate, the most highly ordered form of relationship possible in this world. This state of affairs is then what gives rise to the unity of consciousness, the "black board" on which all our thoughts, feelings and perceptions are written. Thus by understanding the quantum mechanical nature of human consciousness - seeing consciousness as a quantum wave phenomenon - we are able to trace the origin of our mental life right back to its roots in particle physics, just as has always been possible when seeking the origin of our physical being. The mind/body (mind/brain) duality in man is a reflection of the wave/particle duality which underlies all that is, in this way, human being is a tiny microcosm of cosmic being. We are, in our essential being, made of the same stuff and held together by the same dynamics as those which account for every thing else in the universe. Equally it brings out the enormity of this realization, that the universe is made of the same stuff and held together by the same dynamics as those which account for us. By interpreting consciousness in this way, as a particular kind of creative relationship made possible by quantum wave mechanics, several things fall into place which offer a better understanding of both consciousness itself and its relationship to matter, such as that in our brains.

Most importantly, if we want to combat materialism and its whole reductionist ethos, this insight allows us to argue that the mind is not some mere off shoot of brain function. Just as the relationship between two electrons whose wave functions are overlapping can not be reduced to the individual characteristics of the two electrons, so the relationship between the waves which make up the Bose-Einstein condensate of consciousness can not be reduced to the activities of individual vibrating molecules. We

are not our brains. The condensate is a thing in itself, a new thing with qualities and properties not possessed by its constituent parts. As Plato said in the *Timaeus*:

> "Two things alone can not be satisfactorily united without a third, for there must be some bond between them together. And of all bonds the best is that which makes itself and the terms it connects a unity in the fullest sense."

Quantum theory thus reveals a basic oneness of the universe. It shows that we can not decompose the world into independently existing smallest units. As we penetrate into matter, nature does not show us any isolated basic building blocks, but rather appears as a complicated web of relations between the various parts of a unified whole. This overlapping interrelation between body and mind, through its proper synchronization between various parts and components creates a general well being in individual. When this synchronization is disrupted, individual suffers from sickness or disease. Health as defined by World Health Organization (WHO) in the preamble of its charter is "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Disharmony in any part of the whole can effect any other part or the entire organism. When physical health is hampered due to disharmony in mental faculties, such a condition is termed as psychosomatic problem. The term will be further explained in the next section.

1.2 PSYCHOSOMATIC PROBLEM

In psychosomatic dysfunction the psychological disorders or difficulties are expressed through some physiological pathology. With the study of the effect of emotion on the various body organs the coined term psychosomatic was introduced by Johann Christian Heinroth in 1818, in regard to insomnia. The word was later popularized by Maximilian Jacobi, a German Psychiatrist. Exactly where and how do the psyche and soma interact? Representatives from both psychiatry and medicine have agreed for more than 100 years that, in some disorders emotional and somatic activities overlap. Psychosomatic medicine emphasizes the unity of mind and body and the interaction

between them. In general the conviction is that psychological factors are important in the development of all diseases, whether that role is in the initiation, the progression. the aggravation, or the exacerbation of a disease or in the predisposition or the reaction to the disease is open to debate and varies from disorder to disorder. The term psychosomatic was defined in 1978 by National Academy of Science as "the interdisciplinary field concerned with the development and integration of behavioural and biomedical science knowledge and techniques relevant to health and illness and the application of this knowledge and these techniques to prevention, diagnosis and rehabilitation." In the revised third edition of Diagnostic and Statistical Manual of Mental Disorder (DSM IIIR) the term "psychosomatic" has been replaced with the diagnostic category of psychological factors affecting physical conditions. In the fourth edition (DSM-IV) it is called psychological factors affecting medical conditions. However the use of the term psychosomatic will never diminish.

1.2.1 CLASSIFICATION

The DSM-IV Diagnostic criteria for psychological factors affecting medical condition (that is, psychosomatic disorders) specify that psychological factors adversely affect the patients medical condition in one of the variety of ways. The key is that "the factors have influenced the course of the general medical condition as shown by a close temporal association between psychological factors and the development or exacerbation of, or delayed recovery from, the general condition." Among the psychological factors are mental disorders (For example Axis I disorders, such as major depressive disorder), psychological symptoms (for example depressions symptoms and anxiety), personality traits or coping style (for example, denial of the need for surgery) and maladaptive health behaviours (for example, over eating). The patient has a general medical condition that is coded on Axis III. The important change in DSM-IV from DSM-IIIR is that DSM-IV allows clinicians to specify the psychological factors that affect the patients medical condition. In DSM-IIIR psychologically meaningful environmental stimuli were temporally related to physical disorder. The key phase in DSM IIIR was "environmental stimuli." The DSM IV emphasis on psychological factors permits a wide range of psychological stimuli to be noted (for example personality trait, maladaptive behaviours).

The DSM-IV Diagnostic criteria for psychological factors affecting medical condition are presented in the following table:

A.	A General Medical Condition (coded on Axis III) is present
B	Psychological factors adversely affect the general medical condition in one of the following ways: 1. The factors have influenced the course of the general medical condition as shown by a close temporal association between the psychological factors and the development or exacerbation of, or delayed recovery from the general medical condition. 2. The factors interfere with the treatment of the general medical conditions. 3. The factors constitute additional health risks for the individual. 4. Stress-related physiological responses precipitate on exacerbate symptoms of a general medical condition. Choose name based on the nature of the psychological factors (if more than one factor is present, indicate the most prominent). **Mental disorder affecting medical condition** (e.g. an Axis I disorder such as major depressive disorder delaying recovery from a myocardial infraction). **Psychological Symptoms affecting medical condition:** (e.g. depressive symptoms delaying recovery from surgery; anxiety exacerbating asthma.) **Personality traits or coping style affecting medical condition:** (e.g. pathological denial of the need for surgery in a patient with cancer; hostile, pressured behaviour contributing to cardiovascular disease.) **Maladaptive health behaviour affecting medical condition:** (e.g. lack of exercise, unsafe sex, over eating.) **Stress - related physiological response affecting general medical condition:** (e.g. Stress-related exacerbations of ulcer, hypertension, arrhythmia, or tension headache.) **Other unspecified psychological factors affecting medical condition:** (e.g. interpersonal, cultural or religious factors.)

The following are the conditions excluded from the criteria of "psychological factors affecting medical condition" (psychosomatic disorders):

i. Classic mental disorder that present with physical symptoms as part of the disorder (for example, conversion disorder, in which a physical symptom is produced by psychological conflict);
ii. Somatization disorder, in which the physical symptoms are not based on organic pathology;
iii. Hypocondriasis, in which patients have an exaggerated concern with their health;
iv. Physical complaints that are frequently associated with mental disorders (for example dysthemic disorder, which usually has such somatic accompaniments as muscle weakness, asthenia, fatigue, and exhaustion).
v. Physical complain associated with substance-related disorder (for example, coughing associated with nicotine dependence).

1.2.2 ETIOLOGY

Investigators have questioned the validity of the concept of psychophysiological medicine. Some have suggested that it is too vague a term; others say that it is too narrow. But most agree that chronic, severe, and perceived stress plays some causative role in the development of many somatic diseases. The question regarding organ specificity - that is, why, under stress, one individual develops bronchial spasms, another hypertension, and still another migraine headache. In this connection the interacting roles of biological, sociocultural and psychological variables in making an individual prone to psychosomatic disorders and maintaining them have been sensed.

As reported by Coleman (1981) the development of psychosomatic disorders by and large appears to involve the following sequence of events:

i. Arousal of negative emotions in response to stress situations - the degree of arousal depending not only on the nature of the stress situation, but also up on the persons perception of the situation and his stress tolerance.

ii. The failure of these emotions to be dealt with adequately, either through appropriate expression or through a changed frame of reference or improved competence with the result that the emotional arousal continues on a chronic basis.

iii. Response stereotype - when the damaging effects of chronic arousal become concentrated on a specific organ.

1.2.3 BIOLOGICAL FACTORS

The biological variables influencing psychosomatic disorders include genetic factors, differences in autonomic reactivity, somatic weakness and alterations in corticovisceral control mechanism.

1.2.3.1 Genetic Factor

Asthma, ulcers, migraine and hypertension in greater frequencies have been reported in the close relatives of the patients. Studies by Sines (1959) and Harvald and Hauge (1959) on animals indicate to some degree a specific genetic factor in ulcer susceptibility and bronchial asthma respectively. Criticisms of the genetic explanation of psychosomatic disorder argue that recent studies on automatic nervous system show that psychophysiologic disorder in a given family may result from common experience and imitative learning. However, in spite of these criticisms it will not be wise to wipe out the genetic factor from the etiology of psychosomatic disorder.

1.2.3.2 Differences in Autonomic Reactivity

Psychophysiological disorders may be the outcome of individuals primary reaction tendencies to stress. There is significant variation in the primary reaction tendencies in every infant. Different children react to same stress differently by developing specific types of psychological disorders, like fever, indigestion, sleep disturbances, etc. These individual differences in primary reaction tendencies during childhood continue in adult life and most probably accounts for the differences in susceptibility to psychophysiological disorders and also for the type of disorder one is

likely to develop. Wolf (1950) has in this connection suggested that on this ground people can classified into stomach reactors, pulse reactors, nose reactors depending on what kinds of physical changes that stress characteristically triggers in them. A person for example, who reacts to an emotional stress with high blood pressure will be susceptible to hypertension. On the other hand, one who reacts with excessive secretion of stomach acids will be more likely to develop peptic ulcers.

1.2.3.3 Somatic Weakness

From the experimental findings of Rees and White (1964) it is concluded that psychosomatic disorders occur specially in the weak or inferior organ of the body which is produced usually due to heredity illness or trauma. For example, one who has a weak stomach may develop peptic ulcer and other gastrointestinal troubles to emotional stress like worry and anxiety. Similarly one who has respiratory infections may develop asthma to stress situations.

1.2.3.4 Inadequate Corticovisceral Control Mechanism

According to Halberstam (1972) Lebedev (1967) when the corticovisceral control mechanisms fail in their homeostatic functions, the individual shows exaggerated emotional responses and he does not regain the physiological equilibrium. This leads to psychophysiologic disorder. So far as the role of biological factors in psychosomatic disorder is concerned, the maximum emphasis is given on the characteristic autonomic activity of the given individuals, the susceptibility of the effected organs and possible alterations in cortical control mechanisms that usually control autonomic functioning.

1.2.4 PSYCHOSOCIAL FACTORS

Psychosocial explanation of psychosomatic disorder includes personality pattern, kinds of stress, interpersonal relationships and learning in the autonomic nervous system.

1.2.4.1 Personality Factor

According to Dunbar (1945) as such rigid highly sensitive to threat, short tempered persons are more susceptible to hypertension. It is also reported that different types of personality make up leads to different kinds of psychosomatic disorders. Kindson (1973) noted hypertensive persons are significantly more insecure, anxious, sensitive and angry than a non hypertensive control group. In spite of the importance of personality factor in the development of psychosomatic disorder, it is yet undecided why some individuals with more or less similar personality traits do not develop psychosomatic disorders. The following study of Jenkins supports this view. Jenkins (1974) administered a questionnaire to 270 men who had no heart attacks. Among them those who strive diligently to achieve, are very punctual, time conscious, tense, unable to relax and active, were named as type A. The men who scored high on type A behaviour had twice as many heart attacks during the 4 years follow up period as against those who scored low. Majority of these people died of heart attacks. The contradictory finding was that some of them who did not belong to this type also had heart attacks.

Some studies have been conducted on the Indian patients with bronchial asthma by Rama Chandran and Thiruvengadam (1974) by the help of Eysencks personality inventory. They found that most of them were ambiverts leading towards extroversion and neuroticism. In another study using M.P.I. (Maudsley Personality Inventory) of Eysenck, Sridhar (1975) studied different groups with peptic ulcers, hypertension, irritable bowel syndrome and bronchial asthma and compared these groups with patients suffering from neuroses and physical illness. His findings indicated that peptic ulcer, IBS and Bronchial asthma patients were introverted and neurotic, patients suffering from hypertension to be high only in neuroticism.

In a study 3 groups of patients suffering from bronchial asthma, peptic ulcers and ischemic heart disease were compared with the control group by Shanmugam (1981). He found that all the three groups were extroverted than the matched group free from disease. He further found that cardiac group was more extroverted than the bronchial asthma and peptic ulcer groups and all the psychophysiologic groups were more neurotic than the

control group. Finally within the three psychosomatic groups, the asthmatic group was more neurotic than the other two groups.

Deep studies and widespread surveys have shown that persons with a particular type of personality or behaviour pattern suffer from high blood pressure or cardiovascular problems more often. Scientists have named such behaviour: "Type A behaviour pattern" Type A behaviour has clear cut characteristics. A person with type A behaviour pattern -

i. Talks aggressively and hurriedly; he unnecessarily stresses or accentuates certain words while speaking and hurries the end of the sentences.
ii. Always moves walks and eats rapidly.
iii. Become impatient if events taking place in front of his eyes are slow; he strives to rapidly complete the sentences of others, thinking they speak two slowly or not to the point.
iv. Gets irritated and enraged if the vehicle in front is moving slowly.
v. Gets impatient or irritated if he has to stand in a queue.
vi. Tries to accomplish more than one work at one times; he reads the newspaper while having his lunch or eats his breakfast while shaving.
vii. Prefers to go through the summary of a book instead of reading it fully.
viii. Always dwells in his own thoughts; while with others, he tries to bring the theme of the conversation to those subjects which especially interest and intrigue him and if unable to accomplish this maneuver pretends to listen but remains preoccupied with his own thoughts.
ix. Feels vaguely guilty if he has nothing to do even for a while: he just can not enjoy a weekend or a vacation.
x. Attempts to schedule more and more in less and less time, leaving little room for unseen contingencies; in short, he suffers from a chronic sense of time urgency.
xi. Feels challenged or jealous when in company of another type A person.
xii. Unconsciously clenches his fists or jaws and grinds his teeth, while occupied in some work.
xiii. Thinks that his success depends solely up on the pace of his work.
xiv. Tries to accomplish most tasks in the same way, hesitates to employ a new idea or a new system and lacks imagination and creativity.

xv. Can not remember the colour or furniture of even a most recently visited place: knows little about his neighbours, nearby shops or other places.

xvi. Considers it to be a waste of time if he has to play with his children on returning home from work.

xvii. Remains so busy in his activity that he is unaware of things occurring around him.

xviii. Has an extreme fascination for numbers; if a businessman, he is more interested in the figure of his income than in how he will use that money.

Even with a fleeting glance at the above list, it is clear that a type A person considers life a battle, races against the clock and invites mental tension. Mental tension or 'type A' personality stimulates the secretion of certain undesirable juices inside the body, which increase the arteriolar resistance and causes high blood pressure. The type A behaviour pattern does not equate with personality and emotional factors assessed by standard psychometric inventories but is instead an interplay of certain behaviours and emotional responses with the environment. Moreover, the relationship of TABP to CHD has cross-cultural validity, specificity, and a biological gradient of pathogenecity. In addition to the personality factors, the relationship between the individual's attitude towards stressful situations and the coping pattern he developed has been emphasized by Graham (1962) in the development of psychosomatic disorder. He found the following attitude and coping pattern to be typical:

Ulcers: The patient feels deprived of what is due to him and wants to get what is owed or promised and to get even.

Eczema: The person feels that he is being frustrated, but he is helpless to do any thing about it except take it out on himself.

Migraine: He feels something has to be achieved. Drives self to reach a goal and then feels let down.

Asthma: The patient feels unloved, rejected, left out in cold.

Hypertension: The person feels endangered, threatened with harm, has to be ready for anything, to be on guard.

Similar work has also been done by Dr. Louise L. Hay (1982) an internationally - renowned counselor, teacher and lecturer and she has come out with a long list of faulty mental attitudes and healing affirmations for a vast number of physical problems which are presented in her book "Heal your body."

Day-to-day observation also shows that many persons suffering from psychosomatic disorder seem to be restrained in their emotional reactions, rather appear to be unable to express their emotions adequately through verbal means. They have also not learnt to use appropriate ego defenses to channelise their emotions. Repression is the only defense mechanism that they use, but the physiological components of emotion lead to psychosomatic disorder. Though personality factors and attitude can not account for the total cause of psychosomatic disorder it can account partly.

1.2.4.2 Interpersonal Relationship

Marital unhappiness, separation, death of near ones, divorce and other stressful interpersonal relationship may influence physiological functioning. In a study of widowers, Parkes, Benjamin and Fitzgerald (1969) found that during the 6 months period following the death of their wives the subjects showed a death rate of 40 percent above the expected rate. Moreover, the incidence of cardiac deaths among these widowers was so high that investigator called these findings as the "broken heart syndrome." Some studies on asthmatic patients by Lipton et. al. (1966) Olds (1970) indicate the relationship between pathogenic family pattern to psychosomatic illness. Mothers of such patients were found to be ambivalent and over protective towards their children and tended to reject them as well as unduly restrict their activities. People coming from such families are likely to be over dependent and insecure. As a result they are likely to react to normal problems with emotional stress. But at any rate, it is yet a question unanswered, a riddle, why some of these individuals develop psychosomatic disorders, while others can adjust to stressful situations adequately?

1.2.4.3 Learning in the Autonomic Nervous System

Pavlov and several other investigators have shown that the autonomic responses can be conditioned and in particular, operant conditioning can also be used in this regard. Turnbull (1962) has effectively shown that by reinforcing certain breathing behaviour the 'E' can induce respiratory patterns that are progressively chosen to asthmatic breathing. Thus, it has been hypothesized that psychosomatic disorders may occur through accidental conditioning and reinforcement. For example, by simply crying the child may not be able to draw his mother's attention. But when he shows grasping or wheezing reactions, he may immediately draw the attention of his mother, with the repetition of this pattern of behaviour, the infant might learn through conditioning an asthma like response as a technique of getting parental attention and alleviating distress. Psychosomatic disorders therefore as it appears, bring certain secondary gains, like attention and care, security and sympathy from the desired persons.

1.2.5 SOCIOCULTURAL FACTORS

Although psychosomatic disorders vary in incidence from culture to culture and society to society, in the same culture they do not appear to be affected by them. Though psychosomatic disorders are rarely found in primitive people, primitive societies facing rapid changes were found to develop this disorder. For example, in Japan, since the second World War (Ikemi, et. al. 1974), the incidence of bronchial asthma and irritable colon have significantly increased among the young while hypertension and heart attacks have increased markedly in adults. Similarly in U.S.A. arthritis was most frequently found in the lower S.E.S. people whereas ulcers and heart problems were most commonly found among executives but the recent findings do not support these views. The review by Senay and Redtick (1968) indicated that psychosomatic disorders were not related to social class or other major sociocultural variables. Secondly, stress and emotional tension have become common occurrences in every home and in different strata of society irrespective of culture or creed. So the role of S.E.S. in the causation of psychosomatic disorders may not be very much emphasized.

Whichever may be the predominant factor, stress is the trigger, which leads towards establishment of any psychosomatic disorder. Hence stress and coping mechanisms are of vital importance as far as psychosomatic disorders are concerned. So are to be discussed separately.

1.3 STRESS

The word stress is derived from the Latin word 'Stringer' that means to bind tightly. It first entered the vocabulary of the engineers, where it means "to subject to the action of a force or forces". What it means or how it feels "to be under stress" is known to all. Yet it is complicated to define and describe the psychophysiological concept of stress. Stress has been defined as:

> "The State manifested by the specific syndrome which consists of all the nonspecifically induced changes within a biologic system." (Selye 1950);
>
> "A Systematic response induced by the wave of cellular alterations identical to those which initiate inflammation" (Eyring and Dougherty, 1955);
>
> "A process that occurs when a system is forced to react at a rate to which it is not 'geared' at the moment" (Jencks, 1962);
>
> "Any condition that makes the body mobilize its resources and burn more energy than it normally does" (Morgan, 1965);
>
> "The physical or mental effect of disturbance of, or interference with any of the body's automatic biological processes" (Stephan, 1971);
>
> "Environmental conditions that require behavioural adjustment" (Selye, 1974).

In simplest terms, stress is a heightened state of bodily functioning triggered by the release of certain hormones, especially adrenaline and noradrenaline. It allows us to cope with or adapt to changing circumstances, which is why Hans Selye referred to stress as adaptation energy. Experience of stress is extended to every one irrespective of ones social, cultural or economic status. Human stress is neither good nor bad. The bodily process is the same whether it leaves us feeling great or lousy. Stress can be an effective motivator that adds spice to our life. Olympic athletes do not normally break records during training, nor do actors give their best performance during rehearsals. Like every one of us, they are at their best when invigorated by the stress of performing before the eager gaze of watchful audience. Some of the best things in life are extremely 'stressful', that is they produce lot of stress energy - joy, love, sex, excitement, inspiration and creation, to name a few. They are accompanied by exactly the same internal bodily process as some of the worst things in life such as, physical threat, psychological trauma, real sickness, Selye used the word *distress* to describe the feeling of unpleasantness or unwellness that is the negative result of stress. He called the positive state eustress when most of us use the word stress, we are talking about the negative effects of stress poorly invested and inefficiently spent - what Selye called distress.

1.3.1 BODY'S REACTION TO STRESS

In essence, stress is a very primitive bodily reaction that provides us with the energy to either fight or flee. We can also think of it as the body's built in mechanism for adapting to unexpected changes in the world around us. Dr. Selye identified three basic stages the body goes through each time it experiences a stress reaction. He named this stage as the General Adaptation Syndrome (GAS), and it remains the basis of all modern discussions of biological stress. The three stages are: the alarm reaction; the stage of resistance (or adaptation); and the stage of exhaustion. The GAS is a very primitive response mechanism, the body attempts to deal with a threat and then get back as quickly as possible to normal operational equilibrium, or homeostasis, what Selye characterized as normal or healthy level of resistance. During the resistance phase, it is as if one's body temporarily turns up it's stress thermostat. As soon as possible, it turns it back to normal.

As the two diagrams Fig. 1.4a and 1.4b show, the GAS has two distinct patterns.

HANS SELYE'S GENERAL ADAPTATION SYNDROME

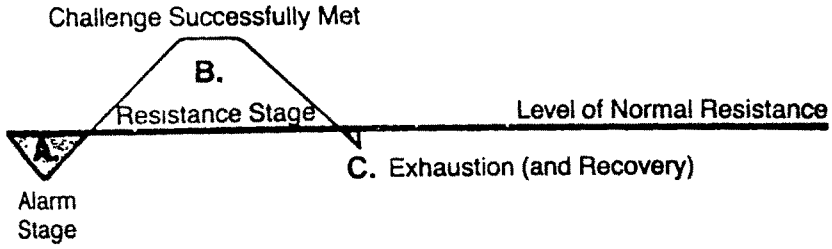


Fig. 1.4a An Acute, or Short-Term Stress Reaction

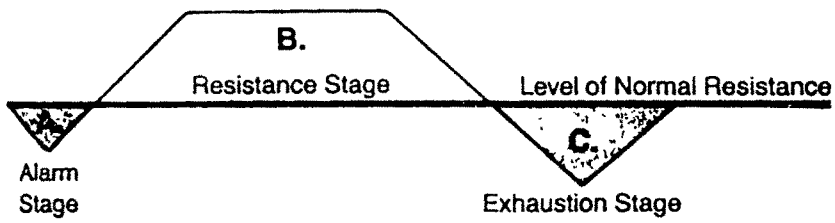


Fig. 1.4b A prolonged Stress Reaction

The **first diagram** shows an acute, or short-term, stress reaction, with short resistance phase, that quickly returns the body to normal. A good example of this is when one runs to catch a train, which is about to leave. One puts all his efforts to speed up and reaches the train before it finally leaves, finds a seat and is relaxed. The person's resistance phase - the actual dash for the train - lasts for a short time and comes down to a clear defined end. The **second diagram** depicts a prolonged stress reaction. Here the stage of heightened resistance is stretched out ones a period of minutes, hours, days or weeks - or it may even be the way one picture of many of us over the course of a normal working day. Dr. Selye was fond of saying that the major cause of distress in modern man was frustration, the cumulative effect of the many difficulties and annoyances of daily life. Because of them, most of us spend most of our time in a prolonged resistance stage, on top of which we experience intense stress reactions of shorter duration. Such as running for the bus, or getting in to an argument with the boss. Every stress reaction at what ever level of intensity and what ever its duration, goes through all three phases.

1.3.2 THE PHYSIOLOGY OF THE STRESS REACTION

Through the work of Selye and others, the physiology of the stress reaction is now well understood. The following capsule summary describes the sequence of chemical and physical events the body goes through during the three stages of the GAS. This sequence makes, the pivotal role stress play as a link between mind and body more clear.

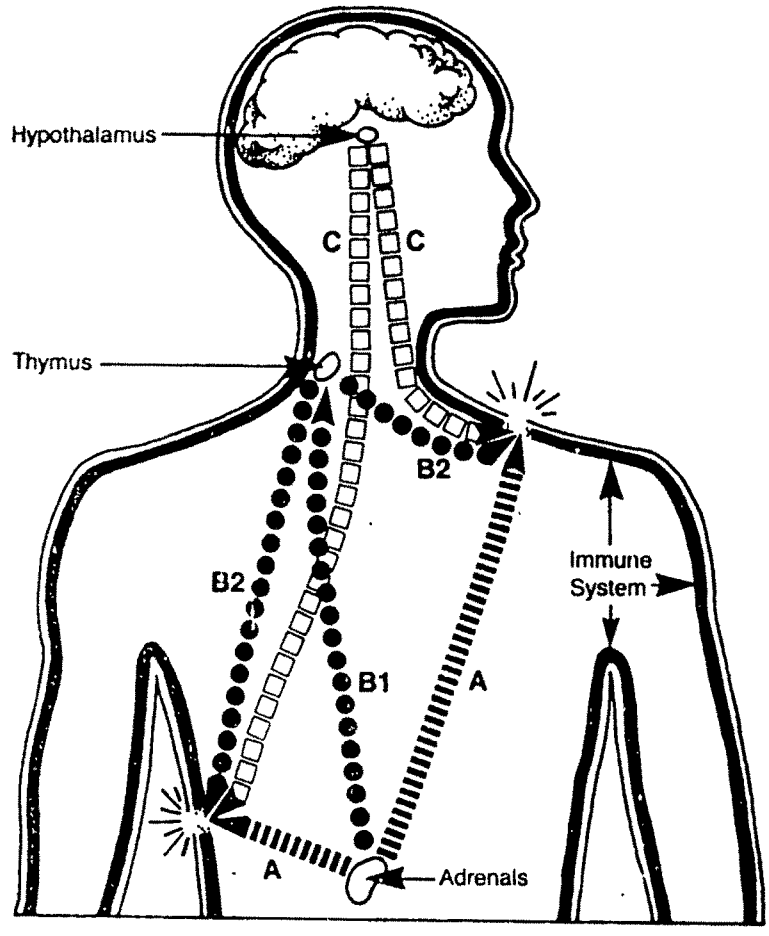
The Alarm Stage

i. Body perceives a stressor - something new or unusual that seems to represent a challenge or a threat. A stressor may be psychological (some ones angry expression, approaching deadline, etc.), physical (an accidental fall, excessive cold/heat, etc.) or biological (a disease or virus; poor nutrition; the injection of toxin). Regardless of the kind of stressors individuals reaction to stress is essentially the same.

ii. The hypothalamus triggers a series of chemical and electrical changes in the body. Hypothalamus is the primitive base of the brain, its job is to maintain homeostasis. The response of the hypothalamus to a stressor is to attempt to return one's body to a normal balanced state. It's one of the ways of doing this is through the autonomic nervous system, which has two branches: The sympathetic nervous system and the parasympathetic nervous system. Another way is through the endocrine system, comprised of the various organs that secrete hormones, ranging from adrenaline to testosterone, into the blood stream. The hypothalamus is also closely linked to the functioning of immune system.

As soon as a stressor is perceived, the hypothalamus causes three things to happen. First, stress hormones are released into the body (especially adrenaline and noradrenaline). These temporarily suppress the level of killer T cells of the body's first line of defense against infection. Second, the sympathetic branch of autonomic nervous system begins to stimulate a number of bodily systems, including the blood vessels, the smooth muscles of the internal organs, various glands, and the digestive system. The pupils automatic adjustment to changes in light is the work of autonomic nervous system. Finally, the hypothalamus triggers the release of the beta endorphins,

Fig 1.5 STRESS AND THE BODY'S IMMUNE SYSTEM



As body's stress level rises, the immune system becomes less effective. The diagram shows the three basic immuno-suppressing pathways:

A. Direct suppression of immune cell activity by stress hormones released from the adrenals

B1, B2. Stress hormones cause the thymus to shrink, killing immune cells or leading to their release at a premature (weaker) stage of development

C. Beta endorphins activated by the hypothalamus suppresses immune cell activity as well as acting as the body's natural painkillers.

The thick line that follows the outline of the body represents the immune system. In the diagram, it has been shown that the immune system is being weakened in two specific spots by the combined effect of these three pathways. In reality, the whole immune system becomes less effective as a result of these types of immuno-suppression.

the body's natural painkillers that are opiates identical to morphine. The beta endorphins raise one's pain threshold, allowing the body to withstand a prolonged physical discomfort (for example, muscle tension). This is why one does not feel a cut or braise incurred during intense physical exertion until much later. As a by-product of the release of these natural painkillers, the immune cells become less effective.

iii. The package of stress hormones combined with the stimulation of the sympathetic nervous system triggers a multitude of other bodily reactions. Body's metabolism, the rate at which you burn fuel, speeds up. Heart beats faster, blood pressure rises, perspiration starts, lungs take in more air, eyes dilate, mouth goes dry, the hairs on the skin stand on end. All of these symptoms, including the "butterflies" in the stomach, are familiar to the athlete, the actor, and the speechmaker just prior to a performance. To some degree all of us experience them every time we feel 'stressed'.

iv. Blood begins to flow away from peripheral areas and nonessential organs in order to maximize the effectiveness of the more essential organs, such as heart and lungs. As a result skin begins to pale, and digestive system starts to shut down. That is why often stomach becomes queasy and there is ache, if one tries to eat when under stress. Voluntary, or skeletal muscles become tense, ready to fight off an attacker.

v. Finally, the stress hormones effect glandular activities; for example, one sweats more. In combination with decreased blood supply, this causes skin to become cold and clammy. Blood also flows away from areas of the brain responsible for problem solving and information processing, impairing these faculties. And because of the increased adrenaline flow there is difficulty in concentrating and staying still.

The Resistance Stage

vi. The stress reaction continues as long as one stays in the resistance phase - that is as long as threat is perceived and body is able to maintain itself in this heightened state. The individual may not be aware of the state of heightened resistance. It can become a familiar, rather feature less plateau. If the resistance phase is prolonged, a key part of the immune system is affected. Within forty-eight hours of the onset of an acute stressor such as disease, injury, or psychological shock, the thymus shrinks to half its normal size, effectively neutralizing millions of B cells and T cells (B cells form antibodies when they meet a virus or bacterium. T cells are the white blood cells which acts as a primary defense against infection).

The Exhaustion Stage

vii. The exhaustion phase is triggered by a rapid increase in the release of cortisol, a steroid hormone produced by the adrenal gland. This action has a damping down effect, reversing the stress reaction and returning the body to normal. The stimulating effect of the sympathetic nervous system is now supplanted by the calming effect of the parasympathetic branch of the autonomic nervous system. Among other things, it causes the blood to flow back to the skin surfaces, the digestive track, and the brain. As a side effect of cortisol, the immune system is again suppressed. Also known as hydrocortisone, cortisol is often used as an anti-inflammatory drug for the treatment of auto-immune diseases such as skin rashes act rheumatoid arthritis.

viii. Ideally after the exhaustion phase, body returns to a healthy level of resistance. However, it may damp down only to a lower set point - a lower but less than ideal setting of the stress thermostat. This means that the individual remains at a higher degree of alertness than is necessary or efficient, given the situation. People who have trouble relaxing, or "calming down," after a high stress experience on having trouble turning down the stress thermostat. They end up expanding a lot of unnecessary stress energy and have less available when a real change comes along.

Normal body mechanisms that restore balance following a short term challenge become a problem when prolonged at elevated levels. The longer or more intense a stress reaction is, the more wear and tear it will inflict on your body. Chronic (long-term) stress in effect turns the body against itself. The pathogenicity of many systemic and local irritants depends largely upon proper functioning of the hypothalamo-pituitary-adrenalaxis. The later may either enhance or inhibit the body's defense reactions against stressors and disruptions of this adaptive mechanisms are the principal factors in the production of certain maladies. Therefore they are considered by Selye as essentially diseases of adaptation. Imperfections of the G.A.S. are not so much the direct results of external agents such as infections or intoxication, but rather consequences of the body's inability to meet these agents by adequate adaptive reactions, that is, by a perfect G.A.S.

Among the disruptions of the G.A.S. which may cause disease, the following are particularly important:

(a) An absolute excess or deficiency in the amount of corticoids and STH (somatotrophic hormone or "growth hormone" of the pituitary) produced during stress.

(b) A disproportion in the relative secretion, of ACTH (Adrenocorticotrophic hormone) and glucocorticoids on the one hand, and of STH and mineralocorticoids on the other.

(c) Production of metabolic disarrangement by stress, which abnormally alter the target organ's response to STH, ACTH, or Corticoids (through conditioning).

(d) Finally, we must not forget that although the hypothalamo-pituitary - adrenal mechanism plays a prominent role in the G.A.S. other organs which participate in the latter (e.g. liver, kidney) may also respond abnormally and become the cause of disease during adaptation to stress.

Undoubtedly, many psychosomatic disarrangement are due to stress and particularly to disruptions of the G.A.S. Most of these depend not so much upon the apparent pathogen but upon the way we react to it. This was clearly expressed by the much-quoted sentence formulated by Parry in the eighteenth century when he wrote: "It is much more important to know what sort of a patient has a disease, than what sort of a disease a patient has". The point is well documented by more modern studies showing that 'O'clusters of illness' often occur during periods that are significantly stressful for people striving to adapt to conflicting and often threatening demands.

Many of the psychosomatic disarrangement can be predicted by questionnaires, such as 'Schedule of Recent Experiences' of Holmes and Rahe (1967). Among the most common somatic diseases, frequently traced to psychogenic stress situations, are allergies, asthma, skin disorders, gastrointestinal maladies and disarrangement of the cardiovascular system (particularly hypertension and coronary heart disease). Even immune reactions can be influenced by psychogenic stress and, in latent diabetics. Keto-acidosis is occasionally precipitated by emotional stimuli (Selye, 1976a).

1.4 HYPERTENSION AS A PSYCHOSOMATIC DISORDER

The term arterial hypertension describes the persistence elevation of (arterial) blood pressure. Most popular term for it is high blood pressure. So before knowing high blood pressure, one must understand what blood pressure means? Blood pressure is merely the pressure that the blood exerts on the blood vessels, while circulating.

Blood pressure is essential for:

i. The return of the blood to the heart, after making its way through more than 60,000 miles long blood vessels of our body
ii. The exchange of nutrients and waste products between the various cells of the body and the blood capillaries
iii. The filtering (and therefore purification) of blood in the kidneys and lungs

1.4.1 HOW IS BLOOD PRESSURE MAINTAINED?

Heart is a wonderful natural pump, made up of special muscles. It incessantly and rhythmically beats, thereby maintaining the blood-circulation. Usually it beats 72 times a minute. This number is termed, the "heart rate." At every contraction, the heart pumps about 70 ml (half a cup) of blood into the arteries. This quantity is termed the 'stroke volume.' Thus it pumps about 5 liters of blood every minute. This quantity is termed 'cardiac output.' This can be expressed in the equation form thus:

Cardiac Output = Stroke Volume x Heart Rate

The main artery, the aorta, arising from the heart divides into branches. These branches, in turn, give rise to smaller and smaller arteries. Such branching finally gives rise to extremely small arteries called 'arterioles.' The walls of the arterioles possess muscle fibers. The arterioles can therefore, contract or expand as per the bodily needs. Usually the arterioles possess a tone i.e. they remain in a partially contracted state, thus slowing down the flow of blood. Such resistance to the flow of blood by the arterioles is called 'peripheral resistance.' Blood pressure is the result of interaction between the

cardiac output and the peripheral resistance. This can be expressed in the equation form thus:

Blood Pressure = Cardiac Output x Peripheral Resistance

It can be easily understood that cardiac output and peripheral resistance are inversely proportional, i.e., if one increases, the other correspondingly decreases to maintain the blood pressure at normal values. If one of these two factors increases and the other does not decrease proportionately (or if both increase), the blood pressure goes up. If such a condition persists for a long time, the person is said to suffer from high blood pressure or hypertension.

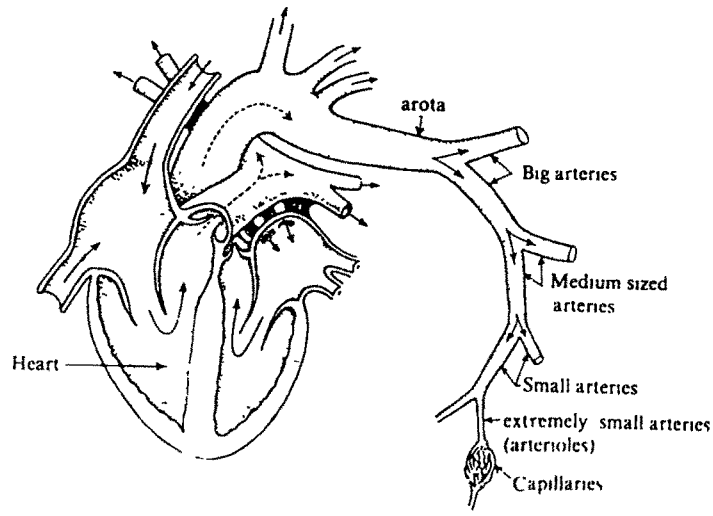


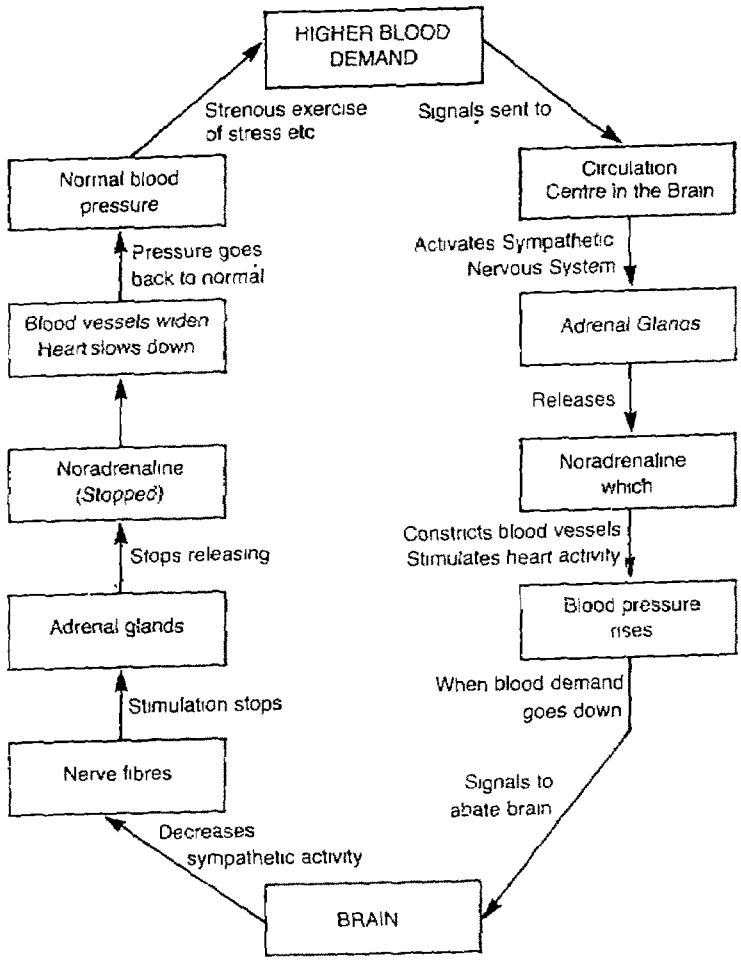
Fig 1.6 The heart and the arteries

1.4.2 REGULATION OF BLOOD PRESSURE BY THE BODY

In any normal individual the blood pressure varies at different times e.g., if a person is asleep or just relaxing, the blood pressure is at its lowest. If this person sits up, more blood is required by certain muscles in the body and the supply of blood has to be increased. The heart pumps more blood and the blood pressure goes up. During, walking, running, climbing, cycling etc. the blood pressure goes even higher. Similarly certain emotions also cause a rise in blood pressure e.g., stress, tension, anger, worry, fear or nervousness. Now, in a normal person, when the particular condition which brought about the increase in blood pressure disappears or subsides, the blood pressure returns to its normal level. And in a healthy individual this temporary rise in blood pressure does not do any harm. It is only in individuals whose blood pressure remains higher than

normal (continuously) that a sudden, further rise in blood pressure can be serious and sometimes even fatal. Now it is known that our body is constantly adjusting the pressure and distribution of blood in the arteries to meet the changing situation from moment to moment. This is done by a feedback mechanism, which is shown in Fig 1.7.

Fig. 1.7 REGULATION OF BLOOD PRESSURE BY THE BODY



The walls of the large arteries, particularly the aorta and the kidney arteries are lined with pressure sensitive cells. These "pressure receptors" are connected by nerve channels with the circulation center of the brain, to which they transmit information about the pressure relationships in the different sectors of the arterial system. The circulation center collates these signals with other metabolic information from the blood and brain impulses. The circulation center is linked to the muscular arteries and heart by the "sympathetic" channels of the autonomous nervous system. If an increase in blood pressure is necessary, the center sends appropriate signals to the bubble like terminals of the sympathetic nerve fibers which act like specialized laboratories with enormous production and storage capacity, and immediately release required quantities of noradrenaline. Noradrenaline is a hormone that constricts the peripheral arteries and stimulates heart activity. The hormone thus augments arterial resistance to the flow of blood and thereby volume of blood per minutes through heart. The result is a rise in blood pressure. The brain center analyses further data and if this data analysis indicates the reported blood pressure exceeds the demands, the signals abate. In other words the stimulation of the sympathetic channels diminishes and with it the noradrenaline production. This closes the cycle. If the system is activated by a sudden decrease in blood pressure, the cycle is reversed. The functional unit of the sympathetic nerve fibers and their noradrenaline producing terminals in the heart and arterial walls are called the sympathetic adrenergic system.

1.4.3 SYSTOLIC AND DIASTOLIC PRESSURE

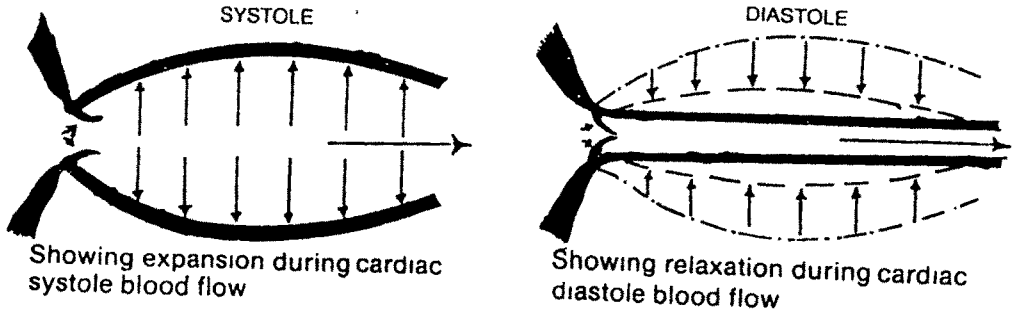


Fig 1.8 Elasticity of Walls of the Aorta

Each time the blood pressure is checked, two figures are recorded -- the upper, or systolic pressure and the lower or diastolic reading (Fig 1.8). When the rhythmically beating heart contracts, it forcefully drives the blood into the arteries. The pressure at such a time is high and is termed 'systolic blood pressure'. When the heart relaxes, the pressure is comparatively low and is termed 'diastolic blood pressure'. The instrument used to measure blood pressure is known as 'sphygmomanometer'. Blood pressure like barometric pressure, is expressed in millimeters of mercury (mm Hg), a measurement of 130/86 mm Hg means a systolic pressure of 130 and diastolic pressure of 86.

1.4.4 NORMAL AND ELEVATED BLOOD PRESSURE

For a variety of reasons medical science has had difficulties in establishing a standard norm. There is no natural dividing line between normal blood pressure and hypertension. In any population, blood pressure values have a continuous, bell shaped distribution skewed to the upper end. Because of this it is not possible to distinguish clearly "pathological" from "normal" values. First of all there is the natural daily fluctuation mentioned earlier. The blood pressure of a normal person at rest can range from 95/90 mmHg at night to 135/80 in the morning to 150/90 in the evening. Moreover, the blood pressure of many, though by no means all, people goes up with age but they do not suffer from hypertension. Also, blood levels like other biological norms can be established only after taking the measurements many times in healthy individuals. But since the pressure levels of such persons vary enormously it is difficult to establish a rigid dividing line between normal (normotension) and high blood pressure (hypertension). On the other hand, it is vital to establish firm upper normal limits, for without them we can not detect high blood pressure nor evaluate the effectiveness of treatment. After much debate a rule of thumb to determine a valid norm of blood pressure reading has been arrived at:

- To determine the acceptable upper norm of systolic pressure
- Age + 100 (maximum 160 mm Hg). To determine the upper norm of diastolic pressure.
- 90 mm Hg., regardless of age.

Thus if a person is 40 years old, his/her blood pressure should not exceed 140/90. If it is between 140/90 and 160/90 the person should get blood pressure checked every 3 to 6 months to make sure that there is no upward trend. A reading of 160/95 would certainly seem to indicate that the person has high blood pressure. Moderate divergences from the systolic standard values - from 20 to 30 mmHg lower, and if sixty years and older, of 10 to 20 mmHg higher are not unusual and compatible with good health.

1.4.5 HOW HIGH BLOOD PRESSURE ORIGINATES

The clinical picture of chronic hypertension - its symptoms, course, and complications - is quite clear but its causal factors and precipitating mechanisms covers a broad range. Causal factors indicate organic diseases, precipitating mechanisms refer to personal habits and external influences, that accelerates the development of high blood pressure. It is essential to bring out the difference between these two sets of circumstances. Causal agents are as a rule hereditary and appear spontaneously, whereas the precipitating mechanisms can be controlled and eliminated.

1.4.5.1 CAUSAL FACTORS:

Based upon the causes hypertension is divided into two broad categories:

i. **Secondary Hypertension**: Organically caused types of high blood pressure are referred to as "secondary hypertension," and they account for only about 16-18 % of all known cases of high blood pressure. The most common are inflammatory diseases of the kidneys, the various types of nephritis. Nothing is known about how and why they are linked to hypertension. Little more is known about the relationship between high blood pressure and various conditions that narrow the arteries of the kidneys (renal atrophy, hypoplasic, renal artery stenosis), thereby diminishing the blood supply to the kidneys and raising blood pressure. It is possible that an increased production of a hormone like substance, called rennin by the defective kidneys provokes the onset of hypertension. The type of hypertension induced by kidney disease accounts for about 15% of all cases of chronic high blood pressure.

Among the rare causal factors are tumors of the adrenal glands -- generally benign, small organs about 2 inches in length lying above kidneys. They consist of two layers that produce hormones essential to the circulatory and metabolic functions of the body; the inner part (medulla) produces noradrenaline and adrenaline, which raise the blood pressure, and the outer part (cortex secretes hydrocortisone and aldosterone which indirectly participate in the control of blood pressure. Tumors can stimulate the adrenals to excessive hormonal activity, which in turn can elevate the blood pressure to abnormally high levels. The incidence of this type of hypertension is low, about 1-2% of all cases. Another and highly infrequent type of hypertension is caused by a constriction of the aorta, the major artery leading from the heart (aortic coarctention)

ii. **Primary Or Essential Hypertension**: Essential hypertension is a puzzling disease whose causes and nature are still largely unexplored. In its simplest form it is a functional disorder of the nervous circuit controlling blood pressure. But despite intensive research the site of the disorder is not yet discovered -- whether the pressure sensitive receptors send out wrong information, whether the circulation center itself is defective and over stimulates the sympathicoaderenergic system, or whether the artery walls are unduly sensitized and react abnormally. All these questions remain unanswered.

A variety of factors, many unknown, apparently play a part in this puzzling malfunction of blood pressure. Heredity plays an important role, as evidenced by the high incidence of essential hypertension running in families.

1.4.5.2 PRECIPITATING MECHANISMS

There are a number of environmental influences that can set off and accelerate both primary and secondary hypertension. They are obesity, a high sodium diet, sedentary life style, smoking, alcohol consumption and prolonged psychological stress or inadequate coping skills. Like any other psychosomatic illness stress is one of the major contributing factors in onset and acceleration of hypertension. Job worries, social status,

noise, aggression, agitation, anxiety, all these negative influences and emotions are thought to precipitate hypertension. But there is no definite proof that they do. What is known is that they can raise the blood pressure temporarily and exacerbate existing hypertension. In some instances they can even turn "benign" hypertension into malignant hypertension. Even though conclusive evidence is still lacking we can safely assume that given a tendency toward hypertension and only then - can frequent and prolonged stress facilitate and accelerate hypertension. Individual's coping style has been found to be playing a crucial role in development of hypertension. Hence needs to be discussed under separate heading.

1.4.5.3 COPING BEHAVIOUR

Natara and Oxford (1992) described coping as a "complex cognitive, intellectual and individual concept" that is useful to study the handling of stressful situation either for solving problems, preventing future difficulties or alleviating anxiety.

> As per Fleishman (1984) coping is "overt and covert behaviour that are taken to eliminate psychological distress or stressful condition."

> Moos (1982) described coping as a stabilizing factor that may help individual maintain psychological adaptation during stressful periods."

> Coping is defined by Yager (1989) as "physiological, emotional, cognitive and behavioural efforts used to manage the constantly changing internal and external demands that tax, overwhelm the ordinary resources of a person."

> Litman (1979) described coping as a highly individualized intrapsychic defense against threat.

> Gelfand (1980) conceptualized coping as "conscious and unconscious ways of dealing with stress without changing ones goals."

Coping refers to strategies for dealing with threat. According to Lois Murphy coping is a much broader concept, including efforts at mastery of any new situation or problem. Murphy uses the term 'mastery' apparently to refer to the aim of coping, that is, the successful meeting of difficulties. Mastery connotes some standards against which the coping process can be evaluated. Thus, mastery is a concept whose essential character is an achievement, while coping refers to a process, that is efforts to meet threat. The distinction is implied when Murphy states, "coping devices involve choices in the ways of using these resources and also new structures and integration developed by the individual organism to master its individual problems with the environment".

Observable threat and stress reactions are reflections or consequences of coping processes aimed at reducing the threat. These coping processes depend upon cognitive activity similar in kind to primary appraisal. Appraisal involved in coping is referred as 'secondary appraisal'. Secondary appraisal is distinguished from primary appraisal by the sources of information which feed it. In effect, while primary appraisal is concerned with the impending harm, secondary appraisal is concerned with the consequences of any coping action. Of the various ways of classifying coping responses, most accepted approach is to distinguish between strategies that are active in nature and oriented towards confronting the problem. In the present study such a strategy is frequently going to be refereed as 'Task Oriented Pattern' of coping. The other way of coping is through strategies that entail an effort to reduce the tension by avoiding dealing with the problem. In the present study its refereed as 'defense oriented pattern' of coping.

1.5 COPING AND ADAPTATION

It has been increasingly acknowledged that health outcomes are products of effective coping rather than simply a consequence of the presence or absence of stress (cf. Antonovsky, 1979; Henry & Stephens, 1977; Roskier & Lazarus, 1980). Within psychology this change in perspective is reflected in renewed interest in psychological determinants of health (cf. Cohen, 1979, Sexton, 1979; Ursin, 1980, Weiner, 1982) and in the emergence of health psychology and behavioural medicine as sub-disciplines (cf. Davidson & Davidson, 1980; Mc Namara, 1979; Millon, Green & Meagher, 1982; Stone,

Cohen & Adler, 1979); these trends have stimulated research on the role of coping in predisposing and initiating disease processes (Glass, 1977; Weiss, 1977) and in influencing the course of illness initiated by other factors (Cohen & Lazarus, 1979; Moos, 1982; Shontz, 1982). Disciplines that are concerned primarily with environmental sources of stress, such as epidemiology and sociology have experienced a parallel growth in interest in the environmental resources believed to moderate the health consequences of stress by facilitating effective coping (Cassels, 1976; Henry and Stephens, 1977; Jenkins, 1979; Kaplan, Cassel & Gore, 1977; Rahe & Ranson, 1978).

In order to formulate hypothesis about the health consequences of different coping processes or to improve health outcomes through the enhancement of coping skills, it is not sufficient merely to acknowledge the importance of coping; we must move beyond this acknowledgement to an analysis of the mechanisms through which coping effects health. As our initial step in this direction four general pathways are outlined:

i. Coping affects health outcomes by influencing the frequency, intensity, and patterning of neuroendocrine stress responses. This may occur in three ways. By preventing stressful event from occurring or by enabling the individual to avoid or resolve difficulties that do occur, problem-focused coping may eliminate environmental demands that otherwise could lead the individual to mobilize for action; however if it is inapt, problem focused coping may aggravate stressful circumstances so that the individual is continually mobilized for struggle. Emotion focused coping also can either moderate stress emotions and associated physiological mobilization or intensify and prolong the stress emotions that occur in response to even minor difficulties. Further more particular coping styles or types of coping activity may affect health outcomes because they are associated with patterns of physiological mobilization that predispose to certain disorder but not to others.

   The potential damaging effects of repeated or prolonged elicitation of neuroendocrine stress responses were recognized half a century ago (Cannon, 1932), and the concept that these responses play an important etiological role in a wide variety of disorders has been explored scientifically and popularized by Selye (1976). We now know that

neuroendocrine stress responses can influence virtually every cellular and metabolic process in the body (Mason, 1968, 1975a). However, the somatic consequences of the mobilization are not always as straight forward as might be expected. For example, stress related fluctuations in neuroendocrine activity may alter kidney function, thereby baising hemodynamic control systems in the early stages of essential hypertension (Kaplan, 1979), or they may reduce the effectiveness of the immune response, increasing the individuals vulnerability to whole classes of disorder (Bowers, & Kelly, 1979; Morillo and Gardner, 1979; Rodgers, Dubey & Reich, 1979). However in other circumstances stress hormones may enhance the effectiveness of the immune response, acting protectively against disease processes (Amkrant & Solomon, 1974). Therefore, straight forward notions about the damaging consequences of mobilization (Stoyva, 1976) probably are, if not incorrect, at least incomplete and overstated.

Behavioural scientists have begun to examine biobehavioural responses to stress in a more integrated fashion. For e.g. Glass (1977; Glass, Krakoff, Contrade, Hilton, Kehoe, Manucci, Collins, Snow & Elting, 1980) argued that fluctuations in catecholamines sufficiently dramatic to influence the pathogenesis of coronary heart disease are elicited by a coping style that alternates between intense efforts to control stressful transactions and helplessness when coping efforts fail. Similarly Obrist (1981, Obrist, Light, Langer, Grignolo & McCubbin, 1978) contrasted cardiovascular responses, associated with active and passive coping and presented evidence that only active coping is accompanied by sympathetic stimulation of the heart and is therefore likely to generate the hemodynamic changes pathogenic for essential hypertension.

ii. A second pathway through which coping can influence health outcomes comes into being when illness behaviour (i.e. reporting symptoms and/or seeking treatment) or actual physiological symptoms serve coping functions. Illness behaviour may serve stabilizing functions in conflicted families (Minuchin, Rosman & Baker, 1978) or be maintained by secondary gains or reinforcement (Whitehead, Fedoravicious, Blackwell & Wooley, 1979). Some physiological symptoms may probably also be acquired and maintained in a similar manner.

However Miller (1980; Miller & Dworkin, 1977) speculated that essential hypertension may develop when elevations in blood pressure serve as coping responses. Drawing on research indicating that baroreceptor stimulation inhibits reticular formation activity and thereby produces sedative like effects, Miller suggested that individuals who are unable to manage stress psychologically may learn to cope physiologically; that is, by elevating blood pressure so as to produce the sedative like effects that accompany baroreceptor would then continue to occur in stressful situations because they are reinforced by immediate reductions in stress emotions. However, over the long run they could be expected to contribute to the hemodynamic disregulation (Schwartz, 1977) that occurs in early stages of essential hypertension.

iii. Thirdly coping may contribute to disease because it involves changes in health behaviours that expose the individual to injurious agents such as alcohol, tobacco smoke, or allergens. When symptoms co-vary in a systematic manner with the occurrence of stressful events, the possibility that symptoms are triggered by changes in health behaviours and not by the mobilization of physiological stress response is apt to receive insignificant attention. For e.g. disease process may be initiated or aggravated when men at risk for coronary heart disease increase their smoking in response to stress (Horowitz, Hulley, Alvaruz, Reynolds Benfari, Blair, Borhani, & Simon, 1979), or when peptic duodenal ulcer sufferers increase their consumption of alcohol in response to work stress (Weisman, 1956).

iv. Finally, the way an individual copes with the threat of acute illness (Moos, 1982) or with the demands of chronic illness (Cohen & Lazarus, 1979; Shoutz, 1982) can be an important determinant of the course of the illness and of the medical care received. Some patients are over medicated due to their over anxious reaction to threat. Whereas others aggravate symptoms due to their habit of ignoring symptoms at early stage and self medication. For e.g. asthmatics who respond with high levels of fear frequently return to the hospital because they have over medicated themselves, probably because they perceive few options other than the immediate use of medication, whereas asthmatics who cope with threat by persisting in their daily

activities and ignoring the early warning signs of attack return to the hospital because they fail to medicate themselves until it is too late to control an attack (Kinsman, Dirks & Dahlem, 1979).

1.6 TREATMENT

There is no specific treatment for essential hypertension, because medical science has found no specific cause for this disorder. The aim of therapy is to lower the blood pressure using rest, diet, avoidance of stress and drugs. Medical treatment usually takes the form of:

i. **General Advice**: Counseling on how to live a healthy life. This includes dietary manipulation to reduce the intake of fats and salts in order to lower the pressure and reduce the chance of hardening of arteries. Obesity is reduced by dietary measures. Smoking is to be stopped. Exercise within the range of tolerance is recommended.
ii. **Antihypertensive Drugs**: There is a wide variety of drugs available for the physician to choose from. In most cases drugs can lower blood pressure without undue side-effects. However one is obliged to continue medication even when the symptoms are ameliorated and it appears, at the surface level, that the hypertension is cured. Drugs do not cure hypertension, but only suppress it.

Thus medical therapy rests on drugs and general advice. At the same time the aware and concerned physician acquaints himself with his patients personal and family problems in order to relieve them and to reduce tension, which may be aggravating the patients internal state. Good communication between doctor and patient, and trust and faith on both sides ensure better management and a greater chance of successful cure.

1.7 NON-DRUG MANAGEMENT OF HYPERTENSION

Both psychosomatic medicine and behavioural medicine are concerned with the interaction of the psyche and the soma. Traditionally psychoanalysis and psychotherapy have been used to treat psychosomatic disorders. Within the past two decades a great deal of interest has developed in the use of behaviour modification (learning theory)

techniques emphasized in behaviour modification are muscular relaxation therapy, biofeedback, hypnosis, controlled breathing, yoga, and massage. The goal of both behavioural techniques and the usual psychotherapeutic modalities is to improve the psychosomatic equation.

By identification and acceptance of body mind relationship and minds influence over bodily functions, role of psychotherapist has been expanded to all areas of human existence. Training of effective coping skills through cognitive behavioural therapeutic intervention has been proved to be beneficial in case of functional disorders. Most brands of psychotherapy rely for their credibility on focusing one or the other aspect of human functioning and making it central to their system. However, all psychotherapies are severely limited in the degree to which they are capable of modifying man's behaviour or expanding the client's awareness. According to the transpersonal approach of psychotherapy, therapeutic outcome can be more reliable when it is associated to a firm spiritual dimension. As it aims to restore the lost harmony between microcosm (individual) and macrocosm (universe). In their meeting points psychospiritual discipline and psychotherapy could be considered as schools of self-knowledge; by removing ignorance the seeker is able to discover and reunify himself in order to become his real self. Self knowledge is seen as the key to the discovery of the seeker's integrity. As the present study is based on the two therapeutic techniques namely Alpha Biofeedback and *Yoga Nidra*, a detailed discussion on both the techniques is essential.

1.7.1 BIOFEEDBACK

Biofeedback is essentially a nonspecific therapy, a technique for the mastery of psychogenic stress by bringing into awareness certain stress indices such as changes in heart rate, a rise in blood pressure, muscular tension, or any combination of these. Thus, one can learn how to control stress itself, to a considerable extent, by becoming aware of its intensity and avoiding the danger of exceeding our natural stress level.

The modification of physiological activities has been the subject of practice and investigation by mystics and scientists for a considerable period of time. The goal of

control of physiological functions has been pursued for at least three reasons. These included:

i. To achieve spiritual enlightenment. Yogis and other mystics of the eastern tradition have shown that through certain physical exercises or by sheer act of will they are capable of producing tremendous physiochemical changes in their bodies resulting in perceived pleasant state of consciousness (Bagchi, 1969; Bagchi & Wenger, 1957).
ii. To test theories of learning. Later, we will review some of the early research in this area.
iii. As a clinical treatment procedure for modifying psychological and medical disorder.

Paralleling the public interest in mind and consciousness and relief from stress, biomedical and psychological scientists have been exploring the mind-body control systems. Gradually materially oriented intellect of western science is being satisfied that mind generated of brain is indeed a powerful controller of the health and illness of man. This new perspective is contained in the new word biofeedback, and in the realization that the mind-brain complex possesses a remedy for the distress of stress that is unique in the history of therapeutics.

1.7.1.1 THE BIOFEEDBACK TECHNIQUES

The biofeedback technique is based on the fundamental learning principle that we learn to perform a particular response when we receive feedback or information about the consequences of that response and then make the appropriate compensatory behavioural adjustments. A tentative definition is that "biofeedback is the process or technique for learning voluntary control over automatically, reflexly regulated body functions." (Barbara B. Brown, 1977).

Pavlov's experiments on classical conditioning and Skinners work on instrumental (operant) conditioning made psychologists to assume that internal visceral responses could only be modified by classical, involuntary conditioning. CNS innervated responses have always been thought modifiable via instrumental (operant) conditioning. In other words involuntary responses mediated by ANS could only be modified by

classical conditioning, and that operant conditioning is only possible for voluntary responses mediated by the CNS.

Since 1960s, a number of studies began to appear in the scientific literature which discredited the belief with the demonstration that visceral responses can be instrumentally conditioned. These demonstrations were accomplished by providing human subjects with biofeedback allowed subject to learn how to exert control over these "involuntary" responses. Also, research employing laboratory animals by Neal E. Miller and his colleagues provided convincing evidence that the ANS can be brought under voluntary control through instrumental conditioning (Miller, 1969).

The technique is one in which a selected physiologic activity is monitored by an instrument which senses, by electrodes or transducers, signals of physiological information about such body function as heart rate, blood pressure, muscle tension or brain waves. The sensed information is amplified, then used in the instrument to activate a display or signals that monitor, i.e. reflect changes in the physiological activity. The process is a bit like feeling the pulse, or taking the blood pressure or temperature, where the physiological information is "sensed" and is translated into numbers, as beats per minute, or millimeters of mercury of blood pressure, or degrees Fahrenheit. Although special instruments are not always necessary, the instruments developed especially for biofeedback are preferred because of their convenience and accuracy. Most of them have been designed so that the individual undergoing biofeedback training can see or hear (or both) the monitor of his selected biological activity more or less continuously. The light or tone monitors change with the normal fluctuations of physiological processes.

Biofeedback is an unexampled process for treating human illness because it evokes complex mental processes to regulate and normalize even the most complicated functions of the human body. It is called biofeedback because its effects rest up on making information about biological activities, including those of the brain, available to the mind. And when mind receives information about itself and its body, information about how it reacts to stress and how it can return to well-being, mental faculties of awareness and understanding and control are aroused to action. By some obscure

capacity, cognitive faculties are set in motion to restore the mind and body to a state of balance and relieve the effects of stress.

Biofeedback is an unprecedented therapy. It is both psychological and medical. Its uses cover nearly the entire range of human emotional and physical disorder, and its uniqueness lies in the fact that the therapeutic process takes place in the mind-brain of the patient. It is the patient whose mind-brain does the work; the patient, with some latent capacity of his mental processes, processes the magical therapeutic power to rid the body of the excesses of inappropriate reactions or misdirected physiology. The therapists and machines give him the right information and guide and assist, him, but the process itself is a remarkable reversal of the patient-therapist roles. The implications of this role reversal are striking: The patient is no longer the object of the treatment, he is the treatment.

1.7.1.2 BIOFEEDBACK METHODS

There are different modalities of treatment through biofeedback for various therapeutic purposes. Let us have a look at a few standard modalities that are commonly used in treatment of stress-related disorders.

i. Galvanic Skin Resistance (GSR) Biofeedback

Under severe stress the sweat glands in our body are activated leading to increased secretion. When a tiny amount of current is passed through the skin, the increased sweat gland activity registers increased flow of current, which are picked up by the electrodes placed on the skin. This increased or decreased electrical skin conductance picked up by the system gives the required feedback. This is also the method usually used in most of the lie-detectors to measure emotional arousal of inner conflicts, when a person is supposedly lying. GSR training helps in gaining control over one's ANS by monitoring the activity of sweat glands. It has been successfully used in treatment of anxiety and phobic states.

ii. Pulse Rate Biofeedback

The Heart Rate parameter measures beats-per-minute and gives feedback on how relaxation efforts influence it. A lowered heart rate is an indication of the relaxation response.

iii. Respiration Biofeedback

The respiration parameter measures breaths-per-minute and gives feedback of deep progressive relaxation and increased parasympathetic responsiveness by the breathing rhythm.

iv. Electromyographic (EMG) Biofeedback

By providing information regarding muscle tension the EMG biofeedback increases the awareness of the mechanism of muscle flexure and also helps to develop voluntary control over dysfunctional, semi-voluntary muscle activity.

v. Electroencephalographic (EEG) Biofeedback

It gives feedback regarding electrochemical activity of the brain and helps in rectification of faulty mental posture. Applications of various biofeedback techniques is almost limitless. Going in to the depth of it for all other modalities is beyond the scope of this study. We will discuss EEG biofeedback more in detail as it has been one of the major therapeutic technique in the present study.

Electroencephalograph

In the late 1920s, Hans Berger used surface electrodes on the scalps of humans to record changing electrical activity. Since that time, the electroencephalograph (EEG) has fascinated professionals and layman alike. The EEG has been used to study physiological and psychological functions as well as states of consciousness. As its signal is seen to reflect the activity of the brain.

The cortex (outer layer) of the brain is composed of millions of nerve cells (neurons), which are interconnected in a complex manner. The changing electrical potentials of these nerve cells is the basis of EEG signal. The signal represents the average change in the potentials of many cells, not the firing of any specific cell.

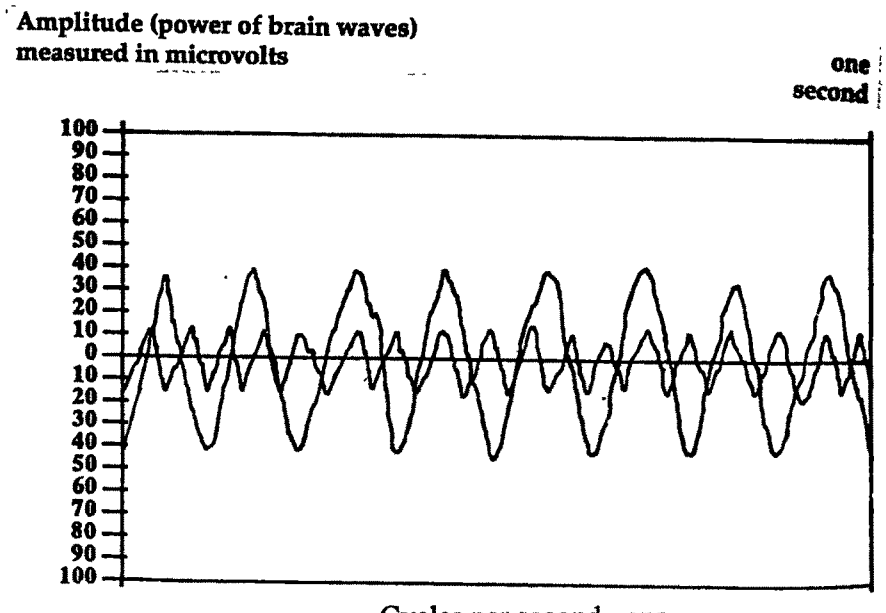
Most EEG research with humans has been of an empirical nature-observation of the EEG pattern under specific conditions. For example, characteristic patterns of EEG have been associated with different stages of sleep, various levels of arousal, meditation, epileptic seizures, and drug states, such as those induced by amphetamines. The EEG pattern is defined in terms of its frequency expressed in Hertz (Hz) or cycles per second (c.p.s.). The patterns most often discussed and the common psychophysiological states associated with the patterns are shown below in Fig 1.9.

Although these patterns have been characterized, actual EEG recordings may be much more complex. They may be composed of many patterns with varying amplitudes. In addition, the patterns recorded will vary with the position of the electrodes (for example, alpha EEG activity is more likely to be recorded from the back of the head than from other areas).

The EEG pattern can be seen to be an almost never ending variety of patterns. No two moments seem to be the same. It is almost impossible to find exactly duplicate patterns of even a few seconds' duration, no matter how long the recording is continued.

Brain wave patterns reflect the dynamic racing of mind activities because they, the brain electrical activities, are the energies given off, as the brain neurons process sensory and memory information. As the brain processes its enormous resources of information - perceptual, sensory, memory, experiential, judgmental - the sum of these activities, as determined by the numbers of active neurons, brain sites, densities of brain structures, levels of brain excitation, etc., all determine what brain electrical activity is available at the scalp to be recorded as the EEG pattern. The EEG pattern is thus a constantly changing pattern and at best a faint mirror of brain events occurring at some distance from the recording.

Fig. 1.9 MEASUREMENT OF BRAIN WAVES



Cycles per second - cps
Number of cycles (brainwaves) in one second

The shorter line indicates an amplitude of 15 microvolts, an output that is common in a normal waking state. It also registers that there are 18 cps, which is low Beta

The taller line indicates an amplitude of 40 microvolts, which is considerably high output for most meditators.

The EEG Rhythms

The various patterns of EEG are basically rhythmic waves that have been labeled. The first to be identified is the ALPHA wave, variously defined as rhythmic EEG activity having a frequency of somewhere between 9 and 12 Hz, (Barbra, B. Brown, 1977) although many researchers include 8 and 13 Hz waves in their definition. Alpha frequency varies from person to person It also varies in the same individual depending upon a number of factors, such as level of attention, state of consciousness, mood etc. That is why it is defined in terms of frequency range rather than as a specific frequency. The exact characteristics of alpha activity can also differ depending upon the location of the scalp recording electrodes. Frequently alpha in the frontal and pre-

central areas can differ remarkably from that found in the mid-scalp or occipital regions.

The most precise expression of the behavioural state, most closely identified with alpha activity is relaxed wakefulness. It implies that the brain state is a receptive one, and that it is not actively engaged in any specific mental or emotional activity. Alpha activity can be present, however, when a concentration of attention is not required for a mental task, or when a particular mental activity is habitual, or when attention is focused inwardly, or paradoxically in some cases where emotional adjustments block responsiveness and result in continued alpha in the EEG pattern. The second rhythmic EEG activity to be identified is *theta activity*. On the average, theta waves are about one-half the frequency of alpha waves, and are generally defined as having a frequency range of from about 3.5 to 6.5 Hz, although some researchers extend the range up to the lower end of the alpha frequency range, i.e., to about 8 Hz. Theta waves are sparse in the normal waking EEG pattern, and pose problem for biofeedback because theta usually appears as single or pairs of waves and trains of theta waves are usually poorly defined in recordings and secure only rarely. They rarely exceed more than 5 percent of the total pattern under any circumstances and are found most frequently during drowsiness and during dreaming. Even in these states, theta is not abundant Theta activity also occurs during alert behaviour, generally sporadically, but it frequently appears at moments of sudden insight or recognition of events in memory. Research evidence suggests that these quite different behavioural states and activities may relate quite directly to specific frequencies of theta, particularly within the same individual.

There is a good deal of evidence to indicate that the rhythmic EEG wave with a frequency of 6 to 9 Hz (between the theta and alpha range) has mental and emotional correlates distinctive from either alpha or theta, however research has not yet treated this frequency range as a separate EEG component.

There are few other easily identifiable rhythmic EEG components DELTA WAVES, having a frequency range of about 0.5 to 3 Hz, occur almost exclusively during the

deeper stages of sleep, and usually appear as single waves and rarely as trains of four or more waves. Another rhythmic activity that occurs in short bursts has a frequency range of about 12 to 14 Hz, and occurs predominantly during the intermediate sleep stages, although it is occasionally found in awake states and is treated by some investigators as a higher frequency variant of alpha. The same frequency can be elicited by biofeedback techniques, although it does not normally occur during waking behaviour, and is being used in treatment of epilepsy.

Except for infrequently occurring large voltage waves, nearly all other EEG activity is lumped together under the name "BETA" The term is poorly defined but is generally use to indicate all EEG activity of (assumed) frequencies higher than that of alpha. As the term is used by different investigators, it can refer to rhythmic or non-rhythmic EEG and to different frequency ranges. Recently researchers have been characterizing beta according to specific frequency ranges such as 13 to 28 or 28 to 40 Hz, but often it is not specified whether the beta is rhythmic or not. In general, beta activity is quite low voltage, and because of this and its close relationship to the characteristics of electrical noise in frequency and voltage, it is difficult to quantify precisely. Beta activity is also loosely related to behaviour. It is generally accepted that beta activity accompanies alert behaviour and concentrated mental activity, such as in solving problems in mathematics. Beta activity is also the dominant pattern in anxiety and apprehension.

One of the higher beta frequencies that has been investigated adequately is the 40 Hz rhythm. Work with the 40 Hz rhythm depends upon sophisticated and high fidelity instrumentation because it is a very low voltage brain wave, close to the "noise" level of most instruments. It must be "extracted" from the electrical noise, as well as from neighbouring EEG frequencies and from extraneous scalp muscle electrical interference This high frequency activity has been found to occur in states described as "circumscribed cortical excitability or focused arousal" and the inference is that it is related to conditions favourable to short-term memory consolidation and problem solving. Most of the research has been done by Sheer, who reports that its use in biofeedback training is an effective tool for increasing problem-solving capacity in

some individuals; he cautions, however, against generalizing on his preliminary results.

There remains an enormous amount of basic research to be done simply to characterize the normal EEG adequately. Each brain wave component can differ in its particular characteristics or aspects, i.e., each can vary irregularly in its aspects of (1) abundance (2) specific frequency (3) amplitude (4) variability (5) location (topographical distribution) (6) propagation or conduction time to the different recording sites, and (7) circumstances of appearance.

1.7.1.3 USE OF EEG BIOFEEDBACK

Compared to any other scientific approach, EEG biofeedback's contribution is more significant toward understanding the relationship between brain electrical activity and the products of brain activity labeled mental and emotional. It can be used to produce a relatively steady state of brain electrical activity, sustaining particular EEG patterns long enough to be studied and analyzed and reliably reproduced so that confirmations of conclusions can be made.

The fact that, in general, the presence of alpha activity in the EEG and the absence of beta activity indicates a mental-emotional state of relaxed wakefulness is almost reason enough to suggest its use in individuals who complain anxiety and whose EEG shows an abnormally low content of alpha. The appropriateness of EEG biofeedback for a particular patient is, of course, established first by conducting medical and psychological examinations to ensure that the complain does not have a specific or serious medical or psychiatric origin.

A second indication for the use of EEG biofeedback is when a brain wave index of normal activity is lacking, such as possibly the 40 Hz rhythm, or the 12 to 14 Hz activity used in the experimental treatment of epilepsy. Conversely, it can be clinically meaningful to use EEG biofeedback techniques as a means of suppressing EEG components related to disturbed behaviour.

A major use for EEG biofeedback is in the area of psychological selfexploration, or with the therapist as an adjunct in psychotherapy. A consequence of learning how to sustain different brain states is the subjective effect. Even though EEG's are recorded at a distance from important brain structures and are a mish-mash of many different kinds of brain electrical influences, there are a number of defined and potentially definable relationships between brain electrical activity and subjective feeling and thought activity. When any of these EEG components (or more probably a specific mixture) is sustained over any appreciable period of time, as with biofeedback, then it would seem likely that the presence of the feeling or thought states in consciousness, even liminal consciousness, could easily elicit or attract associated subjective material, be integrated with the ongoing subjective activity, and result in new "insights" or change in perspective.

1.7.2 *YOGA NIDRA*

Yoga Nidra is a systematic method of inducing complete physical, mental and emotional relaxation which is derived from the *tantras*. It is a powerful technique in which one learns to relax consciously. The term *Yoga Nidra* is derived from two Sanskrit words, '*yoga*' meaning union or one-pointed awareness, and the meaning of *Nidra* is sleep. During the practice of *Yoga Nidra*, one appears to be asleep, but the consciousness is functioning at a deeper level of awareness. For this reason, *Yoga Nidra* is often referred to as psychic sleep or deep relaxation with inner awareness. In this threshold state between sleep and wakefulness, contact with the subconscious and unconscious dimensions occurs spontaneously.

In the yogic system, *Yoga Nidra* is considered as a form of *raja yoga*. The classic sutras, a collection of 196 sutras or aphorisms, written by the sage Patanjali several centuries before the birth of Christ. Patanjali divided the path of *raja yoga* in to eight stages, starting with the basic rules of attitude and behaviour that are conducive to mental peace and ending with *samadhi*, or self-realization, in which the contents and activity of the mind are completely transcended. These stages are:

PREPARATORY OR EXTERNAL STAGES (*BAHIRANG SADHANA*)

i. *Yama* (Social Code)

ii. *Niyama* (Personal Code)

iii. *Asana* (Postures - state of being)

iv. *Pranayama* (Control of *prana*, life-force, cosmic energy).

HIGHER OR INTERNAL STAGES (*ANTARANG SADHANA*)

i. *Pratyahara* (withdrawal of the senses)

ii. *Dharana* (Concentration)

iii. *Dhyana* (meditation)

iv. *Samadhi* (transcendental consciousness).

The first four outer stages are concerned with specific practices. These are performed essentially by the conscious mind, the rational, analytical part of consciousness that is active in the normal waking state The last four stages are states of consciousness as well as the practices needed to achieve them. These involve the subconscious mind, which is the storehouse of all experiences and the ego, which regulates the flow of information into the conscious mind.

Yoga Nidra belongs to the higher stages of Patanjali's *raja yoga*, since it is essentially a method of *Prayahara*. Awareness is progressively withdrawn from the external world, the body, the process of breathing, the conscious mind, and finally, the unconscious mind In advanced stages, when relaxation is complete *Yoga Nidra* involves *dharana* and *samadhi*.

1.7.2.1 PURPOSE OF *YOGA NIDRA*

The initial purpose of *Yoga Nidra* is to relax the body and the mind, and when one comes to the last stage of the practice one tries to dissociate oneself from the body and the mind In *vedanta* and *yoga* philosophy human personality consists of three dimensions, namely gross, subtle, and causal dimensions These three dimensions are further divided into five sheathes or *koshas* which is described as "spirituo-physical, structure" by Swami Chinmayanand (Fig. 1.10). The *Atman* or the self is omnipotent and omniscient. This

spark of life has come to be, in a sense, enveloped by matter, and the various envelopments are called in vedanta as 'sheathes' or *koshas*. The term 'sheath' indicates that just as the sword and its sheath have no contact so too, between the Eternal Divine spark-of-life and the matter there is no contact: it only indicates that in the presence of the spirit alone the matter coverings gain a similitude of life. The five sheaths/koshas are defined in the yogic texts as follows:

i. *Annamaya Kosha* (Food Sheath): The physical body which every one of us is fully aware of during our waking state of consciousness is termed as the food-sheath. It is called so because it has come up from the food taken by the individual, it exists because of the food taken in; and ultimately, after death, it must go back to become food. This is the grossest level of human manifestation. The organs of knowledge and organs of action exist in this sheath.

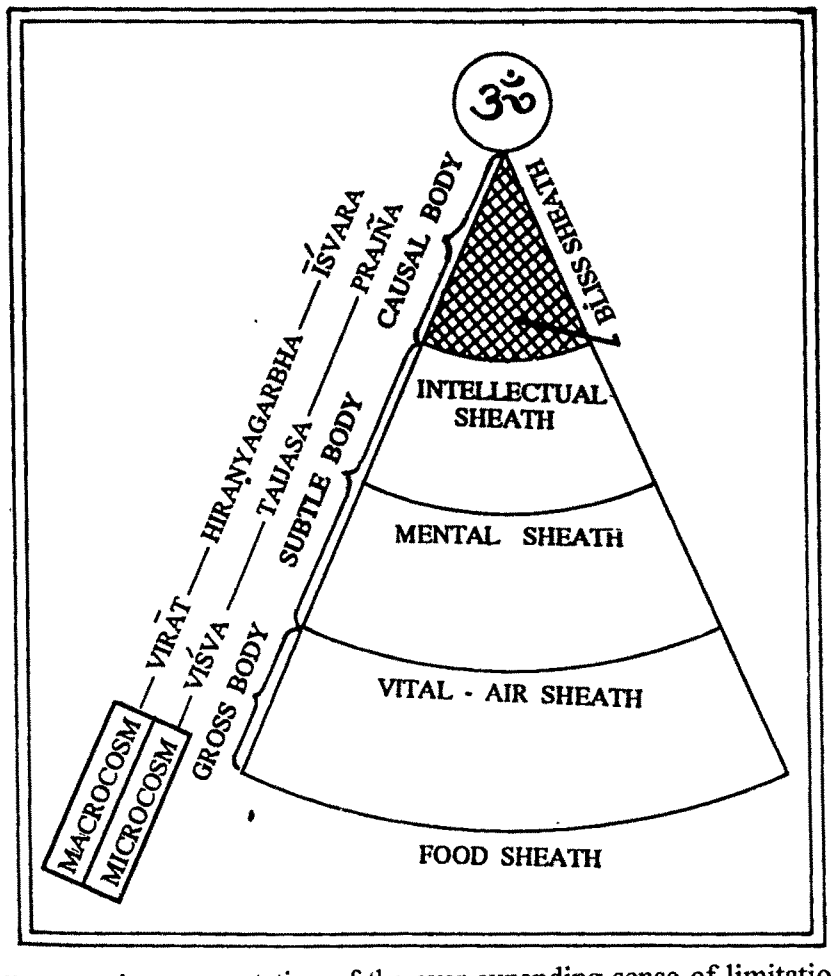
ii. *Pranamaya Kosha* (vital-air-sheath): This is the underlying energy network of the human structure, which consists of currents of prana or bioplasmic energy.

iii. *Manomaya Kosha* (the mental sheath): This is the layer of conscious operation within the sphere of the mind.

iv. *Vigyanamaya Kosha* (psychic sheath): This is the dimension of personality which is operating on the astral plane. This is the body and various types of psychic phenomena one experiences.

v. *Anandamaya Kosha* (The Bliss Sheath): This is the transcendental dimension of the human personality existing in total absence of pleasure or pain. This is very important but difficult to explain. *Ananda* has been misinterpreted as 'felicity', 'joy' or 'bliss.' It is actually a particular state where there is awareness of neither pain nor pleasure. At that time a total homogeneity is experienced, and this state of homogeneous awareness is known as *anandamaya*. Normally experience of pain or pleasure produces mental fluctuations It means pain is an experience, and so is pleasure. But in *anandamaya kosha*, the most subtle body of all, there is no experience The instrument of experience has been totally transcended.

Fig. 1.10 SPIRITUO-PHYSICAL STRUCTURE



(The diagramatic representation of the ever expanding sense of limitation arising out of our ignorance and the consequent falls identification with matter envelopements *'Koshas'*)

Ultimately, the practice of *Yoga Nidra* will lead the practitioner right to this point, where only the fundamental vibration of the unconscious remains, without fluctuation or modification. This is the deepest experience of *Yoga Nidra*, the dimension of total unconsciousness *anandamaya* or bliss body.

This homogeneous experience has been defined clearly by Adi Shankaracharya in the ancient text Yoga Taravali:

> "When mind has transcended *maya* (delusion), when ego has become static, when senses are no more functioning, And when all communication

between the mind and the senses has been cut, when 'I' and 'you' no longer exist, for a period of time..."

This is the ultimate achievement in *Yoga Nidra*. Apart from the ultimate achievement, when *Yoga Nidra* is practiced regularly with sincerity. Several other benefits are bestowed up on the practitioners as side effects of the divine practice. They are:

- Ability to relax body and mind perfectly.
- Deepening of the prayer mood.
- Better ability to concentrate.
- Helps in deep contemplation.
- Strengthening of will power and memory.
- Learning becomes effortless.
- Stimulates creativity.
- Body and mind get re-energized.
- Restores physical health through self-integration.

1.7.2.2 HOW *YOGA NIDRA* RESTORES HEALTH

There is a close connection between the discoveries of today's brain researchers and those of the enlightened *yogic* seers and *rishis* who long ago evolved the practice of *Yoga Nidra*. Of course the *yogic* scientists of former ages did not devise this powerful technique merely as a means of alleviating diseases, but primarily as a way of attaining higher consciousness by expanding and liberating individual awareness from its fixation within the physical body and its sensory modalities, towards the more subtle *pranic*, psychic and spiritual dimensions underlying gross material existence.

However, in the context of modern man suffering from a host of stress-related diseases and complaints, it is sufficient to recognize that these originate out of excessive identification of the psyche with the soma or material body, through the medium of the sensory channels, leading to nervous depletion, exhaustion and even breakdown. In *Yoga*

Nidra, this destructive psychosomatic tendency is effectively alleviated by the opposite somatopsychic route. Psychosomatic imbalance is restored spontaneously due to liberation of *prana* or nervous energy, which is withdrawn from the sensory channels and modalities as the *pratyahara* state is attained. This energy is redirected for healing and rejuvination of over taxed tissues, glands and organs.

The most important part of *Yoga Nidra* is the visualization. The symbols visualized during *Yoga Nidra* can act by direct association with the *samskaras*, or by an abstract association. Images used in *Yoga Nidra* are most powerful during this process of abstract association, as a whole host of repressed memories and *samskaras* can be recalled and witnessed if the symbols are carefully chosen by the instructor. Different symbols reach different depths of the mind. This is how the science of *kundalini chakras* evolved, as the symbols related to *kundalini chakras* probe the deepest level of consciousness. The *chakras* do not exist in the physical body. They exist in the psychic body, which can not be experienced by the senses. This requires an altered state to be perceived through the mind. In *Yoga Nidra* this state of perception is induced by gradually withdrawing the senses during the rotation of consciousness throughout the body and by breath awareness. This induces both *pratyahara* and deep relaxation. Once this state has been induced, the guided image visualization proceeds under instructors instructions. So, it is apparent that the use of guided imagery in *Yoga Nidra* is a very powerful method of resolving suppressed conflicts, desires memories, and *sanskaras*. At the same time it is the key to the awakening of a new creative individual with unlimited resources of knowledge readily accessible. More about technique of *Yoga Nidra* will be discussed under chapter III.