INTRODUCTION

by Alex S. Cameron (1941)

Sunlight has been used in the treatment of disease since the time of the Egyptians and Romans. Even Aristotle in 350 B.C. mentions the health giving properties of sunlight. The sun worshippers, worshipped the Sun God because they thought he would ward off pestilence and disease. Throughout time it has been proven that sunlight is essential to the well being of all living things, both in the vegetable and animal kingdoms. Especially is it vital to development in early life.

In 1666, Sir Isaac Newton discovered that a beam of light passed through a prism of glass produced a spectrum or rainbow, consisting of the following colors: red, orange, yellow, green, blue, indigo and violet. He also showed that these colors could be condensed together making a white light, so proving that sunlight was a mixture of colors.

In 1820, Sir Humphry Davy discovered the electric arc. He produce this by passing electric current through two pieces of charcoal which produced a luminous light or arc.

In 1821, Grotthus proved that *light is only active when it is absorbed and its frequencies must have the same rate as the atom or molecule upon which it acts.*

In 1880, Herschel discovered that there were invisible rays beyond the visible red end of the spectrum by the use of the black bull thermometer, and these he called infra-red (meaning before red) rays.

In 1881 Ritter, through chemical experiments, proved that there were invisible rays beyond the violet end of the spectrum and these he called ultra-violet (beyond violet) rays.

In 1887 Hertz discovered the Hertzian wave, now known as the wireless wave.

In 1892 Finsen, who later became known as one of the greatest authorities in light therapy, used carbon arc radiation in the treatment of lupus, and later built a solarium in Denmark to further carry on his work.

In 1895 the X-ray was discovered by Roentgen.

In 1903 Rollier built a solarium in Leysen, Switzerland, and there did the first scientific work in heliotherapy. He kept case histories and recorded the progress of patients.

Since then Millikan has discovered the Millikan Ray and Curie has given to the world the discovery of Radium and Gamma Rays.

This history is not complete and only mentions a few of the great authorities on light and most important discoveries made by them.

Physicists have proven that light in part consists of waves and vibrations through ether. These waves and vibrations travel through space at the rate of approximately 186,000 miles per second.

Through further research, it was found that white light may be decomposed into seven primary colors, namely, red, orange, yellow, green, blue, indigo and violet with a great number of secondary colors. It was also found that beyond the red end of the spectrum there were invisible rays, namely, infra-red, Hertzian rays and wireless or radio rays. At the violet end, there are also invisible rays, namely ultra-violet, X-rays, gamma rays and Millikan rays. This entire band is known as the physical or electromagnetic spectrum.

The spectrum is divided into divisions known as octaves. The complete electromagnetic spectrum consists of fifty-five known octaves.

Angstrom, a Swedish physicist, divided these wave lengths into units for purposes of measurement and called them Angstrom Units. An Angstrom Unit is equal to 1/10,000th of a micron or 1/ 100,000,000th (one hundred millionth) of a centimeter. The abbreviation of an Angstrom Unit is A.U.

If a dime, which is about a millimeter in thickness, was divided into ten million parts, one part would approximate the size of an Angstrom Unit.

The electromagnetic spectrum gives the complete range of wave lengths, including the visible and invisible waves extending from the gamma rays to the radio waves. The electromagnetic spectrum for therapeutic purposes has been divided into three general divisions, namely: the infra-red band, the visible band, and the ultra-violet band.

We, as syntonists, are not interested in the invisible ranges of the electro-magnetic spectrum, for in syntonics, we employ only the visible range of the spectrum, that portion which the eye has evolved to receive and utilize.

A very practical and authentic division of visible light in terms of wave lengths in Angstrom Units has been made as follows:

Visible range of the spectrum:

Red	6470-8100 A.U.
Orange	5860-6470 A.U.
Yellow	5350-5860 A.U.
Green	4920-5350 A.U.
Blue	4240-4920 A.U.
Indigo	3900-4240 A.U.
Violet	3600-3900 A.U.

In syntonics, we are not interested in *color*, but in the *power factor* or *energy content* of the frequency transmitted by the various filters. Some of the syntonic filters pass rather a broad band in the visible range of the spectrum and others a very restricted band. Each filter selected produces definite reactions.

It has long been recognized that the higher frequencies in the upper end of the visible spectrum are exciting and irritating, and that the lower frequencies on the other end of the visible spectrum have a depressing effect.

Spitler has carefully analyzed and selected definite frequencies in the visible range of the spectrum, and because the transmitted frequencies were too difficult to differentiate with common color names, he selected Greek characters to indicate definite known frequencies and also utilized the shortest route to the brain, through the visual apparatus -- the EYE.

Therefore, syntonics, using only the visible range of the spectrum through the organ of sight takes the shortest and most direct path to the brain centers, as will be described below.

Biedl and others seem to agree that whereas formerly all organic correlation was assumed to be nervous, now even nervous relation is largely considered to be induced by chemical factors.

The nervous system consists of three (3) distinct sections. These are, first, the system of afferent or sensory fibers which lead the disturbance from the sense organs to the nerve centers; second, the nerve centers themselves, lying mainly in the spinal cord and brain; third, the system of efferent or motor fibers which carry impulses from the nerve centers to the muscles and glands.

The nervous disturbance which is set up in the sense organ must travel along the path which is afforded by those three sectors of the so called response arc. What happens at the end of the arc, in the muscle or gland, is determined almost entirely by the nervous transfer of energy or influence. It is evident, then, that nervous processes belong to the general type of activities known to physicists as conductional or progational.

White states the fundamental feature of the life processes of organisms belonging to the animal kingdom is reflex action. By reflex action is meant a process involving the reception of stimuli by specialized tissue which may either directly or indirectly alter the relation of other tissue or the whole animal to the environment from which the stimulus arises.

The tissue set apart in all multicellular animals (man included) for this special function is nervous tissue, and the unit of this system is a single cell with its processes, the cyton. This cell, like all other cells, consists of protoplasm, a very complex mixture of biocolloids, and this is differentiated into cell parts: the centrally placed nucleus surrounded by cytoplasm. The cyton is variously modified according to its position in this scheme of specialized tissue. The greatest diversity of form exists in that part which is concerned with the reception of stimuli, the receptor organ. Receptor organs are so placed and varied that they are sensitive to most forms of energy. Great complexity of structure and mechanism of receptor organs has been evolved in an endeavor to discriminate the degree and intensity of the stimuli continually beating upon its cells, and so enable the organism to more perfectly react to its environment.

The evolution of the reflex, and indeed, the whole nervous system, has arisen from cells specializing in irritability; a property possessed by all living protoplasm. Irritability is essentially a property of life. The lowest form of life, a simple mass of naked protoplasm, the probable ancestor of all life forms, exhibited this property of irritability. There exist today forms of life which are just as simple. The ameba, an unicellular organism found in stagnant ponds, is a typical example. A study of such an organism informs us that the various forms of energy impinging on its whole surface directly alters the state of its protoplasm and so affects a change in the relationship of the organism to its surrounding medium or environment. Such an unspecialized cell is attracted or repelled from objects and substances comprising its environments, according to whether they be good or harmful to it.

When cells became grouped and live as a community, or, in other words, when the multicellular animal was evolved, some cells were packed away out of contact with their original environment. Unless continuity existed between those cells and this environment, the grouping of the cells would seriously handicap the activity of the organism composed of these cells. Continuity was maintained by the development of nervous tissue, which put the internal parts of the organism in proper relation to external conditions. With the grouping of cells into one composite body came differentiation and specialization of cell function; thus, certain groups of cells were set apart to perform a particular function, i.e., to bring about movement of the organism, to receive and transmit stimuli, and to secrete digestive enzymes, the whole scheme harmonizing to establish the well-being of the whole organism.

With the complexity of form there has evolved the fundamental organization of nervous tissue, *the reflex arc*, responsible for carrying out reflex action. The reflex arc is essentially composed of a receptor organ receiving stimuli, a set of mediatory nervous tissue conveying the impulse from the receptor organ to the central nervous system, and then a system from the central nervous system to the effector organ, which is situated in tissue activated by these impulses.

This complete reflex arc, however, is not an anatomical continuity. That is to say, the complete chain of nerve cells with their processes the axons, composing the arc, are not in direct contact with one another. They are, however, in close association, and impulses are able to pass over these anatomical breaks in the chain, called synapses. The association is a physiological one.

Survival of animal species has depended upon the efficiency of the reflex action. This efficiency depends upon the fact that the reflex is rapidly effected and that it is coordinated so that no hindering movements or processes may occur to prevent the objective of the action being achieved.

To understand that nerve conduction is rapid we need only observe a few familiar reflexes that occur around us every day. It will also be observed that a large number of reflexes take place to protect the individual. To illustrate both the efficiency and rapidity of reflex action, the patello-tendon reflex or the so-called knee-jerk reflex is typical. In the case of the knee-jerk reflex, the impulse passes rapidly into and out of the central nervous system in the spinal cord.

The greatest delay in the passage of the impulse occurs at the synapses, which are situated at the various cell connections in the arc. In reflex action a nice degree of coordinated movement is obtained; some muscles are inhibited, while others are excited to contraction.

Coordination is effected in the central nervous system. Each reflex arc built up into the central system produced branch connections called collaterals. These are brought into association with other arcs by physiological connections made by the ends of the collaterals with the dendrites of cells in the gray matter of the brain cord or Medulla Oblongata.

Disease or destruction of sections or areas of the central nervous system brings about the loss of coordinated action and also the destruction of a number of reflexes.

The machinery and the degree of complexity of reflex coordination is easily demonstrated by experiments performed upon a frog from which the cerebral cortex has been removed. Such a frog will jump, right itself when placed on its back, and swim when placed in water as a normal frog behaves.

The area concerned with the coordination of the activities of the organism as a whole is situated in the mid-brain, hind brain and the medulla. If these parts be destroyed the frog will no longer perform movements involving the whole of its body. Spinal reflexes, however, may still be elicited, such as the withdrawal of its foot from a harmful stimulus. The reflexes are still coordinated, but are of a much simpler nature.

These experiments also serve to illustrate another point in connection with reflex action, which is: reflexes are performed independently of will. The above experimental frog was unconscious of all the reflexes performed by it. Reflex action, however, may be inhibited by impulses arising from the seat of consciousness, the cerebral cortex. Reflex action of one kind may also be inhibited by another reflex involving a more complex action. Generally, the reflex that supervenes is the one which is capable of protecting the organism against injury. Stimuli setting up reflex action, and indeed all nervous sensations, obey two laws formulated by Muller: (1) Different kinds of stimuli acting on the same nerve produce the same effect, and (2) the same stimulus applied to different nerves or nerve endings produce different effects.

To those who make a special study of such a complex receptor mechanism as the eye with all its associated reflexes, a general understanding of reflex action is fundamental. The evolutionary point of view has here been brought forward in order that a better appreciation might be realized of the fact that a mechanism such as the eye has been evolved along lines to give the whole individual a more intimate relation with its environment, and so tend to establish a better state of equilibrium.

These days of speed and noise are very exacting on our highly specialized reflex system, and it is becoming much harder to establish the appropriate relationship with the new environment which modern invention has brought.

Having clearly in our minds reflex action, we must also understand what takes place when light of definite determined frequency is projected into the eyes.

It has been clearly determined that there are four (4) definite changes that take place when syntonics is applied, viz.:

a. Physical
b. Chemical
c. Physiological
d. Psychological.

(a) There is, of course, a physical adaptation necessary by the lens so that the light of selected frequency is properly focused on the retina. Ocular chromatism has long been known and in as much as we accept for visual purposes yellow (5350-5860 A.U.) light, when this is in focus on the retina, blue (4240-4920 A.U.) light is in focus in front of the retina while red (6470-8100 A.U.) light is tending to focus behind the retina. Therefore, it is self-evident that a physical change is necessary to focus the selected frequencies on the retina in order to see any test object clearly.

(b) It is also well known that different colored lights have different effects on the rhodopsin. The bleaching out and reestablishing of the visual purple if fairly well understood. Ladd states: "The bleaching effect of different parts of the spectrum is of very different strength, being greatest for a yellowish green. It has long appeared probable that the first effect of light on the retina must be of a chemical character, and therefore the discovery of the visual purple, and of its reaction to light, was hailed as opening the way to a more complete understanding of retinal functions. It soon appeared, however, that the visual purple was not essential to sight."

In syntonics, we ascribe tentatively a function to rhodopsin.

Suhne showed that a frog, with the purple bleached by exposure to light, still saw. It is now clear that the changes produced by light in the visual purple are not the photo-chemical processes which were looked for as the intermediary between light and nervous activity.

(c) It is recognized, of course, that all visual stimuli not only affect the photo-electric properties of the retina, but there is a reaction to these stimuli consisting of a shortening of the cones by drawing back towards the membrane limitans externa, and on the part of the pigment cell by pushing forward of their process between the rods. This process is reversed in darkness.

Adrain states: "Stimulating the nerve may be compared to firing a gun. We may pull too feebly to release the trigger but if we pull hard enough to release the trigger and fire the bullet, no amount of extra pulling will make it travel any faster." In other words, the "all or none" law of nervous response is always in effect.

The rate of travel of nerve impulse has been closely computed and the majority are in agreement that it is approximately 100 feet per second.

This reaction to the stimulus is transmitted through the reflex arc to the visual centers in the visual cortex which in turn sets off a chain of reactions, intricate and yet fairly well understood.

(d) The psychological reaction to the visual stimulus is the most poorly understood reaction. We recognize, however, that the function of the central nervous system and the internal secretions constitutes the essential mechanism. The action of the two - the vegetative nervous system and the endocrine - are so intimately related and their processes so interdependent that it is impossible to consider one without the other, for the tonicity and the irritability of the vegetative system is regulated through the endocrines.

The sympathetic nervous system comprises a chain of nerve ganglia lying on each side of the spinal column, connecting with each other and connected also with the spinal nerve.

The sympathetic system is known as the visceral or the vegetative nervous system because the organs are controlled by its function unconsciously.

The functions of the sympathetic nerves are, in brief: to cause contraction and relaxation of the muscular coats of the blood vessels, to cause contraction and relaxation of the smooth muscles of various other organs (motor and inhibitory functions), to stimulate secretions of salivary and sweat glands and to accelerate the heart beat.

The sympathetic system shows an independence of action of the central nervous system and forms one part of the autonomic system and is thus spoken of as the sympathetic autonomic system as contrasted with the vagal autonomic system (parasympathetic).

Parasympathetic

The third, seventh, ninth, tenth and eleventh cranial nerves contain visceral (organ fibers) as well as somatic (frame work) fibers. The visceral fibers in the third nerve are axons which run to the ciliary ganglion in the orbit (eye socket) from which the impulses are relayed to the ciliary muscle (the muscle of accommodation) and the sphincter pupillae (muscle of the iris). The visceral fibers in the facial (seventh) nerve are efferent, but are dendrites of cell bodies lying in several cranial ganglia (submaxillary) "spheno-palatine ganglia, etc." differing thus from the typical arrangement of the efferent neurons' conduction from the cord and brain. The fibers relaying from these ganglia terminate in the sublingual and submaxillary glands (salivary), the blood vessels of the tongue and the glands of various parts of the mucous membrane of the nose and mouth cavities.

The visceral fibers in the glossopharyngeal (ninth) nerve are axons and dendrites of cell bodies in the medulla, and run to the optic ganglion, whence the efferent fibers are relayed by postganglionic axons to the parotid gland (salivary).

The tenth nerve, with some of the fibers derived from the roots of the eleventh, together form the vagus, or pneumogastric nerve, which, like the ninth nerve, is entirely visceral, and both afferent and efferent. The afferent fibers are dendrites derived from the "jugular" ganglion, and the ganglion "trunic vagi" (vagus trunk ganglion); the efferent fibers are (like those of the seventh nerve) dendrites of cell bodies in the ganglia located in the viscera the nerve supplies. The efferent distribution of the vagus is to the smooth muscles of the gullet, stomach, small intestines and bronchial tubes; to the gastric glands of the stomach, and possibly to the pancreas; and to the heart. The effect of the vagus currents on the heart is solely inhibitory, i.e., decreasing the activity of the cardiac muscle. The distribution of the afferent fibers is not so clearly known.

The pelvic or sacral visceral connections of the central nervous system all run in the pelvic visceral nerve and are axons of spinal cell bodies. These fibers terminate in the pelvic ganglia lying in the neighborhood of the bladder, from which the further connections are with the muscles of the bladder, colon, rectum and sexual organs (and the blood vessels therein).

The effect of the parasympathetic action is to conserve bodily resources, building up a reserve of energy which may be called upon and used in time of need.

The action of the parasympathetic is opposite to that of the sympathetic and is therefore known as the "antagonistic system." Between the sympathetic and parasympathetic is a general definite physiological antagonism so that the predominance of the one or the other determines the functional activity of the vegetative organ.

The balance of action between the sympathetic and parasympathetic is of vital interest in relation to syntonics. Through the thalamus and central gray matter this balance of action is attained and maintained. It should be quite apparent from the above that when the eye is stimulated by any frequency, there is a chain of nerve impulses sent over the afferent or sensory fibers to the nerve centers, and these nerve centers in turn send out efferent impulses to the muscles and the supportive functions.

This chain of events, somewhat modified, takes place when tinted lenses are worn or a lenticular correction is prescribed for the first time to a patient.

With this background in consideration, we feel justified in proceeding to the actual application of the Cameron-Spitler AmblyoSyntonizer.