NEO MORPHEUS

The map of the CMBR of the universe from the creation of matter

of prof. Nelson for IMUNE

A review of the science of the universe and its development of a true biology and truly modern medicine with Quantum Electrodynamics

INTERNATIONAL MEDICAL UNIVERSITY OF NATURAL EDUCATION
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**INTRODUCTION**

In 1962 I wrote my first published story. At the tender age of 11 my class watched the flight of John Young be the first American in orbit. As we watched I wrote a log of his journey, cataloging each aspect of the flight. He orbited three times and I chronologized his flight. The Girard, Ohio newspaper published my story on the front page. My story was the lead story.

As time went by I found that I could write science and true stories. I was president of my senior class of 1969 in Girard High school. My ability to write has lead me to a career in science and publication. After graduation with honors, I was chosen out of many applicants graduating high school, to work as an electrical engineer for AC Electronics, a division of GM. And I was to work on the Apollo moon project navigation system.

When AC lost the bid on the shuttle space craft, many persons at our Milwaukee office were laid off or fired. They transferred me to work on bombs. But since I was learning more about spirituality, I could not work on weapons. I worked odd jobs and landed in a seminary to become a pastor. But God talked to me and said he called me rewrite Molecular Biology. I found a Dr. James Pershing Isaacs who taught me the basics of Quantum Biology.

In 1982 I did God's work from his calling and I published my first large book the PROMORPHEUS, a basic treatise on the Quantum Biology. Since that time I have published over 80 books, over 100 medical journals, over 50 movies, and a host of other multimedia work.

Now with 2012 advancing fast I am publishing this large collection or anthology if you will of the science works written, edited or approved by me.

This volume will have a basic lay person simple and short review. Each section will then lead to a medium set of texts on the key topics, and then an advanced set of texts to further validate each key concept. So this collection will have multimedia movies, music, and scientific articles and books. It will take an entire 4 Giga byte DVD to bring this to you. To buy each of these articles would cost over a thousand dollars. But the electronic medium allows for a much reduced price. This set of ideas is a hallmark of today's science and proves several hot topics debated in science today. So with this DVD collection we see the collective work of Prof. Nelson or also referred to as Desiré Dubonnet. I welcome you to read, think, and open a debate if you will, but before you open a debate do step two, THINK. There are small petty picayune minds that will be challenged by this book. And small mediocre minds hate to have their false beliefs challenged. They will back stab, slander, lie and do anything to not face their false beliefs. Most often they start by trying to shoot the messenger.

This has been the bane of my existence as that a host of small minded petty people have tried to illegally defame and wrongfully discredit me. I welcome you to read, think, and debate, not to lie and twist behind my back.

This book is designed to expose false beliefs of science and to open the door to a new science and a new medicine. To find out more of my life and my work as an angel to bring the world to a thousand years of peace and harmony, see the Angel Book from www.desifm.net. For info on the persecution of the angel see the Persecution DVD movies to understand more. For more science see the International Journal of the Medical Science of Homeopathy from IMUNE, at www.imune.net.
In 1982 I published my first book, in fact the first book on Quantum Biology, the PROMORPHEUS. PRO is from the Greek for First; MORPHEUS is from the Greek for shape. NEO is for new. The PROMORPHEUS was over 1350 pages long many have said that this was a life work. But this is just a drop in the bucket for my life. Now over 28 years later, I am being threatened violently. Narrow minded people are attacking me and I choose to publish a follow-up book on the science of the Quantum biology. This I will call the NEOMORPHEUS, for new shape.

This book will be written on the several topics that validate a new medicine and invalidate the old style of SINthetic drug medicine allopathy. I will write very simply for people to understand and then put the very technical support articles in the appendix that further validate the apparent logic of the chapters. But for the first chapter we must define the reason for the attacks on me. These are best described as coming from small minds. Einstein writes that "Great Spirits get incredible resistance from mediocre minds". This is very true. In eastern religions it is said that the cause of evil is greed, anger and delusion. Delusion comes from people who have overly invested in a false belief. Small minds become more attached to false beliefs than others. Small minds fear humiliation and exposure of the smallness of their minds so they must violently attack those who threaten to expose their beliefs as false. Max Plank said after he developed Quantum theory "There is only one way for a new theory to gain attention, all of the people who have the old theory must die."

Quantum theory and Quantum Electro-Dynamics are now firmly established as the new theory. They are undisputedly anchored in science. This allows for us to make the electronics, TVs, telephones etc that make up our new culture. Quantum is unshakably the foundation science everywhere but in medicine. Even though I proved that the body is Quantum in operation in the PROMORPHEUS, medicine still resists. The Feb. Discover magazine has an article that shows that now scientists are starting to realize that Quantum theory explains what happens in biology. This is now a massive trend in science of medicine, but there is massive resistance. The reason is that when we use Quantum Electro-Dynamic theory, which is the only theory that can be used to understand the molecular nature of biological action this quickly and very efficiently disproves and invalidates SINthetic chemistry. In other words the multi trillion dollar SINthetic pharmaceutical industry is invalid. This proof was in the PROMORPHEUS in 1982, and now will be updated in the NEOMORPHEUS.

Upton Sinclair writes "it is difficult to get a man to understand something when his salary depends on him not understanding it". It is difficult for any to accept a new idea when it threatens your old antiquated education. The medical
system is so extremely flawed and has failed so miserably it is ripe for an intellectual overhaul. I have done this for years, and I have done this so thoroughly that there have been violent attacks on me. The Ultra Rich who own the medical system feel it is easier to attack the messenger than to debate the message. This book will outline the science and the intellectual soundness of all of these theories. Both in simplicity and in science. The Ultra Rich use their army of petty small minded bureaucrats to attack those who oppose them. In my case the attack has been most coercive. The Ultra Rich have suppressed my movies, books, music, and every ounce of my personality for they fear the truth. The truth that when anyone sees the logic and freedom of choice that my work has done, they will easily see the illogic of the profit designed past and see the value of people over profit. My message is sound. But the Ultra Rich do not want any to hear the message.

They do not want you to read this book. The small minded army has placed lies and slanderous falsehoods into the media, and used the small minds of the tabloid rag press to publish lies and rumors. They have revoked my American passport, and have tried to put me in jail without a trial or chance for explanation. Their fear of my message and desire to put me away is everyday accelerating. So I believe I must write this book to give the message. The Ultra Rich and the drug companies tried to kill me in the nineties. (See my movies) I decided to become Desiré and honor and let my female side out. The Ultra Rich stopped trying to kill me; they by mistake thought that no one would take Desiré seriously. They were wrong, and now they realize their mistake and are escalating their attack on me.

The small minds fear exposure of their false beliefs. Many of these small minds are very conservative and try to stop or slow down change. Many are secretly homophobic and often are hiding their own latent homosexuality. So my free lifestyle makes them uncomfortable. This is what happened with the author of the Seattle Times article. His fear of exposure of his hidden homosexuality aggravated his attack on me. His article discusses more the height of my high heel and my make-up than intellectual science. These small minds in the media inappropriately use controversy as if it was evidence. Very free spirits get violent resistance from mediocre minds. And my lifestyle of freedom gives them plenty of ammunition.

But most powerful at the depth of the small mind motivation lies the profit motive, or Greed. Mahatma Gandhi once said “the Earth provides for all of Man’s needs, but not for Man’s Greed”. Bureaucrats are most often small minded people who seek to rationalize their existence by achieving some power over others. Their compensation driven lifestyle often leads to a government job where they can exert influence on others. A greedy man or a small minded self righteous bureaucrat can twist, rationalize, justify, or distort, they can excuse, disfigure, explain or contort any memory, action, idea, or thought. They can twist any position, any belief can be bought. The petty mind can rewrite any contract, confidence, agreement or trust. They can reposition any idea they feel they must. And oh by the way they can change any deed, in a flash when dictated by Greed.

In a time of such financial crisis and challenges to our environment there is a firm need for change. This book will show any and all the way to not only save massive amounts of money but to help millions to defeat disease and find health and wellness. I know that the small minds reading this book will be even more antagonized by its truth. Their anger will grow with the threats of change and exposure of their small mindedness, but our society needs the change to survive. With this in mind perhaps the reader will want to read the Angel book you can get it by contacting andrea@imune.net.

So for those of you who care about health care and to piss off the small minded bureaucrats, I now offer you the NEOMORPHEUS.
**Style**

This book will be massive in its total size. To get the whole book you will need a small truck or a DVD. First there will be a simple easy to read lay person’s book that is the basic shell. The chapters and topics will each have a layperson’s simple outline, followed by a middle class more scientific chapter, a very scientific set of explicit science studies to make the points very eloquently, and a complete reference set of studies to validate the advanced science contained in this book.

The basic style is also designed to expose a series of false beliefs that have held back science and society from progressing. It is said that there is no right or wrong but thinking makes it so. So we are not trying to play self righteous with our exposure of these false beliefs, but rather it is designed to open up discussion and free up the mind to consider alternate ideas. It is the stagnation and the effects of greed and fear of humiliation that have most hindered science in the past. It is difficult to get a person to believe something when his paycheck depends on him not believing it.

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**Chapter 2 - Basic Science of Life**

In 5th grade we are all taught a basic scientific fact, we are made of atoms. All things are made of atoms. Atoms are made of electrons, protons, neutrons, and other much less numerous subatomic particles. The electrons and protons make up by far most of things and thus most of our bodies. The electrons and protons are electrically charged. The electrons are so highly charged that they never touch but instead repel when they approach another. The electrons, protons, and neutrons are very small and they are held apart from each other by fields. If we condense the solid matter of the electrons, protons and neutrons together the human body would be so small it would take a microscope to see it. If the proton is the size of a golf ball, the electron is smaller than the size of the point of a pin and it is over a mile away. Between the electron and proton thus are electro-magnetic-static fields, held by Quantic forces. So our bodies are more than 99.999999999999999999999999999 fields empty of matter. These Quantic electro-magnetic-static fields are what we are. This is 5th grade science, maybe not the science taught in Seattle.

No one has yet to see the true nature of our existence. No one can see the electrons, protons, or the fields they make. So we are only able to see a macro form of it. Our brains are trapped inside our skull and thus we cannot directly perceive anything. We are thus stuck with an indirect perception; a perception that comes through the brain and is affected by our brain state. We project our own feelings, memories, psychic mental states onto our perceptions. It is difficult not to. So as humans developed we have made many assumptions of how the universe works, what is the nature of our bodies and lives, and our belief in a power greater than our own. And with a sense of history and knowing that we must project, and twist ideas, we should always be humble and recognize that we can never know. We are stuck making good guesses, better and better guesses, but always guesses. This book is about making a better guess.

For more information, please see “The Illusion of the Science of Human Perception”, IMUNE Press 2008.

In 9th grade we are taught about light. Light is made of photons. Photons are electromagnetic radiation, particles in wave formations that can transfer energy. Quantum Electro-Dynamics QED tells us of how when an electron absorbs a photon the electron goes to a higher quantum energy state. When the electron releases a photon it goes to a lower state. QED tells us of virtual photons and just how all electron, proton, neutron movement is connected to the photon.

Voltammetry is the science of understanding how a substance’s electro-magnetic field reacts with its environment. A hormone has electrons and protons and how they are placed in a 3 dimensional space will determine how it exchanges electro-magnetic action and this is measured by measuring the 3 dimensional
effect of its voltammetric field. The amount of charged particles is the amperage, the pressure or potential of the charged particles is the volts. Basic 7th grade physics, every compound having its own individual and distinct voltammetric signature field.

For more information about the science of Voltammetry, please see the International Journal of the Medical Science of Homeopathy, Vol. XXIII. 3. Special Issue on Voltammetry.

There are other forces such as the large atom forces that when the extreme energy in a sun forces protons to overcome their need to repel and forces them together. Thus all atoms past hydrogen are made in the stars. Gravity is the force that when matter is made all matter is drawn together. This is a weak force, as Newton once said "it takes a group of matter the size of the earth to make a liter of water weigh a kill".

There is another weak force that is undeniable, the power of the mind. We know from Quantum theory that twin photons can be separated to any distance and when we tell one photon something the other twin knows it instantly. At the birth of the universe there was a big bang where all of the matter of the universe came through a singularity in ten to the minus 43 of a sec. Thus at one point in our past history all things were conjoined and as such there is an ability of a Quantic system to influence another; the observer effect of physics, the need for a double blind in medicine, and other evidence in our past history all things were conjoined and as such there is an ability of a Quantic system to influence another.

For more information about the Proof movie, please go to www.i-am-fils.com

A living thing must be able to metabolize and reproduce in some fashion to be considered alive. Metabolism is taking in nutrients, taking the energy from them, and excreting the remainder as excretions of waste products. Reproduction is assembling new tissue for repair and also to propagate the species. The energy is Quantic electromagentic-static in nature as is everything; the basic energy of the electromagnetic radiation that is visible light or infrared heat. Plants take in low energy ionic bound minerals and use the energy of visible light to make high energy covalent bound plant compounds which are then food for the animals. This is the process of photosynthesis as shown in the Calvin Cycle.

Animals take in the high energy compounds with electrons in high energy states. This energy is then gleaned in the cells via the Krebs Cycle to make ATP (Adenosine Tri-Phosphate) for energy. ATP is the key energy of most life. The single cell systems such as bacteria set up a boundary layer such as a cell membrane to separate the thermodynamic world from the Quantic interior. Entropy and thermodynamics dictate process in the non-living exterior versus the Quantic organized non random entropy interior.

Metabolism and reproduction guided by an organized accounting of energy intake and outgo, geared for metabolism and reproduction. Quantic Electromagnetic fields in cyclic organized fashion that is mostly dependent on the Quantic actions of DNA. DNA can only be described in the Quantic electromagnetic actions of the fields of it voltammetric structure.

Single celled organisms develop or evolve if you will allow us to say into multi celled organisms. This needs more complex DNA structures and the number of chromosomes needed grows. DNA acts as the chief accountant as it sends off RNA and messenger RNA to accomplish the goals of life. Life develops with tremendous diversification over 100,000,000 organisms have evolved with various and diverse functions. But all are Quantic electromagnetic exchange devices taking in energy, excreting waste products, and trying to reproduce. Everything having its own set of field intricacies, and a single reactive ever changing overall field signature. The Quantic Electromagnetic-static field of an organism is reacting towards nutrition and
away from toxins, to maximize metabolism. It reacts to mating signals and reproductive gesticulations to maximize reproduction.

Everything is a wash of field interactions and electromagnetic radiation photons. The cells of biology use this electromagnetic radiation for communication. Information for reproduction or Mitogenic radiation is in the visible; metabolism radiation is in the Infrared. Biology does not just send heat out as a waste product it is a communication network for cellular info exchange.

The multi-celled organisms diversify and all have an innate non-verbal Quantic electro-magnetic drive for survival. Biology operates through field interactions. The height of DNA diversification is presently the development of a word are of the brain, and are where we think in words. This allows for explicit communication and exchange of thoughts, feelings, desire, fears, etc.

There are over one hundred trillion cells in the human body and all are sending signals to the brain via enervation and photon exchange, making some ten to the 16 bits of data a sec; or less. 1,000,000,000,000,000,000. The word area of the brain has developed as a small part of the human brain. About the size of a golf ball this Broca area is for words. Words coming in and words going out. The rest of the Brain is for life, metabolism and reproduction. Life is an unconscious process. Life is non-verbal. We do not have to think words to live.

Words are for helping us function in social ways. We have a reticular formation in the base of our brains that act as a filter to screen out unneeded data from our word area. The word area has the ability to assay about one million 1,000,000 bits of data at a time. Below one thousand sensory bits and the system goes into sensory deprivation mode. It invents sensory data. This means that ten to the sixteenth bits of data minus the ten to the 6 bits of data for the word area and the word are of the brain gets one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of the data sent to the brain. The unconscious non-verbal body electric gets all of this data and much more.

The spiritual cultures of the world know this and all exercises in spiritual development revolve around diminishing the words in the brain and coming aware more of the unconscious process. Mantras, meditation, stillness, yoga, kundalini, and many others all say we must control and diminish to effects of the verbal word mind to get in touch with our body energetic. The true self. Much of the mistake of modern science and modern societies is to over value the words and the verbal process. Our society is presently over valuing the paper pushers and letting their need for words be more important than people. We need paper pushers and we need to have quality systems but there should be a requirement to try to minimize the over wordy and clarify the process of our society for everyone to understand not just the small minded paper pushers. This is especially true for biology and medicine.

The very process of life is an innate unconscious non-verbal Quantic electromagnet field interaction. Words have little to do with it. But so-called modern medicine has overvalued the words. They wait for the patient to verbally notice something is wrong, go to the doctor office and announce what is wrong, answer the doctors’ verbal questions, and receive verbal instruction. And yet this verbal exercise of medicine is only aware of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of the data. The body electric knows much more.

Patients’ words are influenced by their mood state. Patients all lie; at least that is what Dr. House tells us on TV. Patients sometimes say things they think the doctor wants to hear, they cover up things they don’t want the doctor to know and very often they are completely out of touch with their own feelings and symptoms. Once I asked a patient if they had regular bowel movements. She said of course once a week like clockwork. Words are often the only intervention given to a doctor.

In ancient China the doctor was sometimes unable to see the patient if he was royal. So the Chinese doctors had to develop new skills. Words have been a hallmark of medicine but it is also one of the greatest limitations. You can be really sick and have no symptoms or any verbal awareness of your sickness. Many people have tended to not only over value words, but some assume falsely there are only words.
Chapter 3 - The Body Electric

Now as we learned in 5th grade everything is made mostly of electrons and protons. Photons are involved in all exchange of energy states. Now in some materials the electrons are tightly bound and are unwilling to allow electron exchange. In concrete the atoms are bound tightly and the electrons are not very conductive. In a metal like copper the electrons are quite willing to allow electron energy exchange and transport of electrons. So copper is a good conductor.

The organization of atoms and electrons determines the nature of the substance. Atoms seek to have a balanced outer level of electrons as per quantum law. This is the nature of atoms and it is calculated in the Mendeleev table of elements. Atoms seek to find the balance of the noble elements. This is the lesson from 10th grade chemistry. It is a simple lesson that tells us just how all atoms combine to make molecules. This lesson is based in Quantum theory. Those to say that quantum theory is not relevant to biology are expressing a rather concerning ignorance.

Molecules can be very, very complex. But all of them are made of electrons, protons, neutrons etc held by Quantic forces. These molecules all have a structure of their outer electrons that can be assayed by the voltammetric signature. Voltammetry is the science of electrodes checking the individual style of electron and proton interaction. This is how every substance reacts to another, the outer electrons never touch but the field interaction as determined by voltammetry is a definition of how they work.

Every atom or molecule can be balanced, positive charge, negative charge, or combination of both. This depends on the amount of protons and electrons. This is Basic grade school science. The charged particles that travel make a current flow. The amount of charged particles in the amperage, the pressure or potential of the flow is the voltage; the resistance to the flow is the resistance. All organisms use this electrical flow of charged particles for each and every biological process.

The electron is the smallest charged particle to move, and most of electricity is of the traveling electron. But protons and ions range from the small to very large. The outer electrons of a plant are taken to higher energy states through the QED phenomena known as photosynthesis. These electrons are most often stored in carbohydrates and natural sugars. The body uses them for energy, making ATP from the electrons. Energy transfer in the body takes place in many voltammetric ways. Water has free protons and free electrons and thus it is essential for life. Water does not conduct electricity, unless there are some mineral salts or electrolytes in the water. But as in the salt water the body has lots of water and electrolytes. Thus the body electric can thrive.
The two body problem is easily solvable. This has been used by science for hundreds of years. But when there are three bodies (ball, earth, moon) it gets very difficult, but still solvable, and when there are more bodies there is an unsolvable result. Science has struggled to reduce everything to the two body problem; this is called reductionism. So to test a drug they reduce the human to just one variable like blood pressure, give a drug and measure the change in blood pressure. Advanced science has learned that complex systems such as the human body are fractal in nature and reductionism fails, so they have developed CHAOS theory. When more and more variables are measured there is complex results. Things never repeat, and some small stimuli can have large effects. This is called the butterfly effect. The EPFX device uses fractal chaos theory and was called the butterfly device in a Japanese medical journal in 1990. Reductionism is an useless exercise of the small mind. All of science has no developed more non-linear analytical systems, all except medicine, which depends on reductionism to sell patent synthetic drugs.

There are over one hundred trillion cells in the human body. Each cell is doing fantastic incomprehensible mathematical procedures. There is an innate intelligence beyond our comprehension to which we must be humble. So ten to the sixteenth bits of data are being transported to the brain, and the reticular formation filters them so that less than a million can go to the verbal brain. So the verbal brain is only aware of one percent of the happenings in the body. The non-verbal body is electric of the total. And there is a non-verbal unconscious that directs us. It is electrically reactive and it is the heart of our lives. It takes us places and our verbal minds make up reasons to explain why we are there. Many people are completely unaware of their unconscious and they struggle with every action. Others are more in tune and understand most of their actions. Only a small few are really in tune and live harmonious lives.

There is Adaptation response to the EPR and there is a variety of fractal reasons why the Xrroid results are not 99% accurate. The best results are 85%, and this is not enough to establish a confident status. So the Xrroid scores are disclaimed as not being diagnostic, but they are interesting. So the EPFX device is only sold to professionals, with the training to know that the Xrroid results are interesting and need to be more traditionally explored.

The verbal mind must learn humility & respect and learn to restrain its arrogance.

For more information, please see my book, "The Structure and Properties of Water", published by IMUNE Press.

Fish like the shark swim and thus live in an electrolyte conductive medium. They develop electrical sensing systems, and can detect foods by their voltammetric signatures. In other land creatures like humans this electro sense is transferred to the skin and nose. But still voltammetric sensing of items are the basis for life.

For more information on this topic, please see my article "Olfaction Sense is our Electro-sense", published by IMUNE Press.

We have the sense of sight for photon sensing, hearing for sound vibration detection, feeling for movement, pressure, heat, cold, balance, and the alkaline acid balance of chemicals. Smell and taste are voltammetric shape receptors sensors (Ref. 2004 Nobel prize in medicine for the study of olfaction). The largest gene family of our DNA is dedicated to the smell, over 3% in humans, 7% in some animals. All of our senses are electrical in action and transfer mechanism. Some of our sensory system is directed to our verbal or conscious mind and most to our non-verbal unconscious.

In the human body there is massive transfer of electrical signals. The flow of food entering the colon during digestion is based on static electrical attraction. Water facilitates the entire body electric. The body heat is photonic and also contributes to information transfer. If we look at the body human with today’s modern science of QED and electronic physics, a whole new science develops a world different than the synthetic drug and surgery medicine we have today. Today’s so called modern medicine is based on a 200 year old reductionism 17th century Newtonian antiquated physics.

A true new modern medicine of the body electric opens the door to a more affordable, sophisticated, safer, and more efficient modern medicine.

For more information, please see "The Integral Details of the Body Electric Simplified for Scio Therapist", IMUNE Press 2008.

There is resistance to the flow of electricity. Louis Ampere discovered amperage, Volta discovered Volts, and Dr. Ohm put a law together to describe the relationship in terms of resistance. Resistance is in Ohms and Ohms law states that voltage equals amperage times resistance. This is the first week of electronics class usually taught in 9th grade physics. The right hand rule describes the fields around a flowing current. And it says that as a current flows like your outstretched right thumb, a magnetic field is made at 90 degrees like you’re out stretched for finger, and a static field is made at 90 degrees like your outstretched
middle finger. Thus the fields of electricity are described. This is the second week of electronics class usually taught in 10th grade physics.

For more information, please see my book, "Energetic Medicine - The Path of Science over the Resistance of Convention", published by IMUNE Press.

So all electrical action or flow of electricity generates a three dimensional field, at least. So we called the process of measuring this field the trivector. This is a type of 3-dimensional voltammetry.

Voltammetry is the science of understanding how a substance's electro-magnetic field reacts with its environment. A hormone has electrons and protons and how they are placed in a 3 dimensional space will determine how it exchanges electro-magnetic action and this is measured by measuring the 3 dimensional effect of it voltammetric field. The amount of charged particles is the amperage, the pressure or potential of the charged particles is the volts. Basic 7th grade physics, every compound having its own individual and distinct voltammetric signature field.

For more information on Voltammetry, please see International Journal of the Medical Science of Homeopathy, Vol. XXIII. 3. Special Issue on Voltammetry.

Volts times amps is a power index or what is known as Watts. Once we measure simple variables we can easily calculate a great variety of electrical forces. We can thus calculate volts, amps, ohms, reactance, susceptance, watts, capacitance, inductance, impedance, and other virtual mathematical calculations.

Knowing that reductionism has filed as a way to analyze the human body we can make more global measures of these energies of a human, compare them to norms, and then using safe microcurrent stimulation change them. We can detect and affect the body electric is safe and effective ways. The SCIO system is designed and registered to do just this.

To detect and affect, EEG, ECG, EMG, GSR, electro osmosis, trauma tissue, wounds, pain, charge stability, acid alkaline balance, voltammetric reactivity of substances, oxygenation, hydration, redox potentials, electro-acupuncture, bio-resonance, super learning, and other bio-electric functions. All from simple basic science taught in our schools today. A Clinical Evaluation was performed to prove the science behind the device. Only with the 40 years of experience to sharpen and perfect the precision of the art.

The first studies of Dr. Nelson on the body electric were done in Youngstown, Ohio. This ever dedicated scientist has artfully perfected this art of energetic medicine. All designed as a truly modern medicine to safely assay and treat the people. The human body is a complicated intricate electrical assembly. It has a reactive set of fields that are driven towards life giving things like oxygen food etc. It is electrically repelled from toxins. This electrical field is processing the qualities of life such as metabolism and reproduction. Thus a vast ever changing system of electrical fields that is intricately interactive with the environment. The human system is not a linear predictable or reduction type of system. Its vast complicate and elaborate functioning makes it a fractal complexity. As such it responds better to ever changing fractal stimulation not linear reductionistic simple stimulation.

So developing an electrical treatment needed some advances in technology. First a cybernetic loop of measuring, calculation, stimulation, measuring, calculation, stimulation, measuring, calculation, and so on. All at biological speeds. Then a reactive system that reacts to fractal stimulation and an auto-focusing self adjusting stimulation. The body electric treats itself beneath the human awareness of the limited word area of the brain. And thirdly a way to measure the trivector field of items and then to measure the reactance of a person. All technological achievements of Dr. Nelson and Dr. Nelson alone.

The body has a reactive trivector set of fields. An item not living has a stable unchanging field. So to measure the substances fields, and then the person's reaction to these fields, a truly modern medicine is achieved, based on what we know of the body electric and basic high school physics.
Every step of our existence is of Quantic Electro-Magnetic-Static fields. Fields obey the inverse square law. The strength of the field diminishes as per the inverse square of the distance from the field. A single electron has an intense field at a small distance. It diminishes as we move away from the source, but it still exists till the ends of the universe. Perhaps it is ten to the negative thousand or more, but the field fills the universe mathematically. The total universe is a collection of these fields.

Since our part of the universe started in a singularity, there is a quantum connection that remains. Everything is made of fields and the fields fill the universe. So at one level there still is a singularity mathematically. A universal connection remains. A connection we call subspace. With the entire universe sharing a quantum connection and a common field, a God's presence becomes a certainty; a presence knowing all, even knowing each electron, each photon. And then there is no such thing as noise, but only information we do not understand.

A left over from the Big Bang has been found to be a Cosmic Background Microwave Radiation (CBMR). This radiation has been echoing around the universe since its inception, some 14 billion years ago. It is of the microwave frequency. This CBMR is of the wavelength that TVs cold receive. This wavelength has action of protons. A MRI or magnetic radiation imagery uses this wavelength. A person is placed into a MRI device and an intense magnetic pulse is made surrounding the person. All of the free protons have a Quantic magnetic action and they come to attention in the magnetic field. When the magnetic field is turned off the protons return to their original spot due to Quantic magnetic memory. As they return, as we have said, a photon is released due to the laws of Quantum Electro-Dynamics. This photon is of the microwave type and has a wavelength near one meter. This is why the antennae for the photon is near a meter and the need for the large antennae around the MRI.

The CBMR is of the same wavelength and thus it affects free protons such as in water. Water has so many peculiarities and it is in touch with the voice of the universe. As has been shown twin photons once joined share an instant knowledge. When we tell something to one twin photon the other instantly knows it at the any distance, even the ends of the universe. All of the CBMR photons were twins at the Big Bang, thus all of the universe CBMR photons know what a single photon knows when it contacts the free protons in you. This proves a universal God consciousness. And tells us why there is similarities throughout the universe.

But the CBMR photons do not penetrate deep. They are blocked by about fifty feet of rock. And perhaps this is why our legends of the devil and his hell deep in the earth became. The God consciousness cannot penetrate so deep. So there are areas that are not exposed to the CBMR, but the subspace unity penetrates everywhere. The subspace is a mathematical unity of the dimensions.

We live and think in four dimensions of length, width, depth and time. But we now know that there are more dimensions ranging up to 11 and the final twelfth dimension is a return to subspace. In the chapter on string theory we see the final mathematical proof of these theories. The subspace book and the work on the CBMR have a much more in-depth analysis of this set of theories. Since no one has seen the true reality, everything and every philosophy is but an illusion. Much of science that develops is based on assumptions. Who is to say that ghosts don't exist when we are technologically unable to view our reality? Chakra, psychic energy, telekinis, and many more are all theoretical possible. Just because these events are not extremely predictable does not mean they should be dismissed. It only takes one white crow to prove that a white crow exists. People do not create their own reality, but people do indeed interpret or explain their reality.

In India lately a Buddha boy sat under a tree without food or water for over 100 days. Western medical scientists and doctors said it was impossible. The Eastern Buddhist scientists and doctors said it was not only possible but it happens all of the time. Two interpretations. Ultimately neither can know the true extent of our reality. So the more open minded interpretation is most often closer to the truth.
There have been hundreds of good medical studies that have proved the power of prayer. Many struggle to dismiss this as they cling to a very narrow interpretation of the world. These people will always prove their interpretation with self-fulfilled prophecy. They will hear what they want to hear, believe only what they want to believe, they will narrow-mindedly construct their interpretation of reality, and most damning they will seek to impose their limited view on others. Their insecurity will drive them to impose their interpretation on all others.

The powers of the mind have been ridiculed for so long that most scientists are unwilling to look at the data and the new science. Since science has become a pursuit for funding not a pursuit for truth, to protect their income scientists fear ridicule more than anything. But none of them have even seen the truth we are all taught in 5th grade. Every couple of years, scientists look back and laugh at the folly of their past beliefs. This should be an indication for a more open-minded philosophy. But the exaggerated ego of insecure scientists is a large barrier to overcome.

**What we are**

As we have shown with our 5th grade science, we are made of atoms, which are made of electrons and protons with photons compelling interaction. The subspace unity of a common singularity birth and a 12th dimensional commonality of all things, contribute to the unity of all things. We are made of electrons, protons, photons, neutrons, etc., which are all intense vibrating collections of energy. These make Quantic electro-magnetic-static fields. These fields make up what we truly are. And these fields grow weaker at distance but still fill up the universe.

The Cosmic Background Microwave Radiation from the big bang tickles our protons and on doing so communicate across the vast distances of the universe all of the activity of the universe. The common twin nature of the CBMR photons share Quantic information. Thus at one level of existence we are link to the all. This is basic science. Most people do not feel this link often. Some a very small amount of people go through life and never feel this unity consciously. Everybody feels it unconsciously, but some over focus on the verbal and ignore these feelings.

Most people feel the Universal power deep in their soul. They recognize Churches, Religions, Spiritual groups. Some indulge in this deeply. Everyone can feel this. But the vastness of this feeling brings with it a peace and nonjudgmental sense of intuition. When in true contact with the all little is of consequence. Suffering, pain, joy, all emotions become just grist for the mill. This deep feeling is an intense nonjudgmental awareness with no contact of words. People who bring back words from this state are usually bringing verbal self-projections of their individuality not the total cosmos. If you feel that God talked to you and told you to
kill, it wasn’t God. Believe me God does not ever tell you to kill. The universal force of the cosmos brings
you to a state of non-judgmental awareness of the triviality of emotions and desire. Suffering happens,
and it is just a process. The fires of the Sun and Stars make the elements that make our world and our
bodies. All just process.

From this feeling of non-judgmental oneness from the essence of our Quantic electromagnetic being, we
are now an organism; a collection of electrical forces that need energy to metabolize and reproduce. We
need oxygen to breathe, food for metabolism, nutrients to assist the process, reproduction to preserve the
species. These are the basis of biological existence, and make up the bottom of Maslow’s chart of needs.
Next we need shelter, clothing, and warmth. These needs are locked into our deep biology.

Next is the base old lizard brain. This area of our developed brain lies deep in the bottom of the brain. It
is responsible for territorial feelings of possession and emotions to defend possessions. Thus greed, anger,
delusions of false belief, conceit, arrogance and other evil base emotions come from here. Some people
over focus on this area of existence. It cannot be ignored but most people over focus on belongings as
temporary as they are.

Next is the Limbic System with its emotional states. We need other people, intellectual stimulation, love,
respect, and a host of other emotional needs. Most of these are basic nutrients essential for a healthy
life. Now sex can be over focused. Intellect can be over focused. And the personality and needs of the
individual person come to surface. A host of hormonal systems are designed to make this area one of the
most important areas of existence. Love is so important, but over time the possession greed lizard brain
often wins out. Look at divorce court to see how long the vows and sex hormones last.

At the top of the brain is our word area. It gets very little direct information and it is designed for
communication. Communication also brings understanding and comprehension. Speech areas can also be
over focused and thus leads to over intellectualization and a host of problems. This area is often mistaken
for territorial feelings of possession and emotions to defend possessions. Thus greed, anger,
delusions of false belief, conceit, arrogance and other evil base emotions come from here. Some people
over focus on this area of existence. It cannot be ignored but most people over focus on belongings as
temporary as they are.

Most people caught in the limitations of the verbal and macro world become small minded petty and thus
are perfect bureaucrats. Their insecurity makes them seek power and control over others. They sense the
true nature as do we all, but fear it because they do not understand it with their word area of the brain.
And these small minded petty mediocre minds give extreme resistance to large souls, open minds, and
great spirits. They fear the spiritual so violently they even forget their 5th grade teachings. The word area
gets so little of the information that it must assume and suppose things to understand. Most often thus
employs reductionism, where the mind must reduce complex things to try to understand. Reductionism
has worked well in science making cars, buildings etc. But it fails in understanding complex things like the
human body. Reductionism has given way to fractal and nonlinear theories.

So with Maslow’s hierarchy of self we go from base survival needs, job needs, social needs, intellectual
needs, and up to self actualization of potential. But there is more. Maslow paints a pyramid. As we go past
the top or vertex, we can go further. This is called transcendence. We can transcend the limitations and
bring all of our levels to maximization. But feeling the all, non-judgmental awareness, self awareness of
base needs, social emotional needs, intellectual needs, a communion of self, others, society, love, sacrifice,
share and care we can transcend the limitations of the evil self centered feelings and become our highest
self. This transcendence is possible for all, but fulfilled by few. But as time develops there will be more
and more awakening the truth and fulfilling their life. If these truths can be found and shared, our society
could find a thousand years of peace and harmony.

For more information on the Angel book, please contact andreea@imune.net.

So we can see that there is a many tier set of perceptions making up our lives. A set of perceptions ranging from the universal
connection to all, a survival instinct, a territorial instinct for greed, a love and a social rightness instinct, a word area for
communication and science, and a transcendence possibility. People gravitate to the area that brings them the most satisfaction.
With this knowledge we can better understand our self and others.

So people can experience the non-judgmental deep connection of the universe, the base needs for survival, the lizard territorial
possessive brain, the love emotion based limbic system, the word verbal judgmental brain or transcend them all together. People
develop through their lives in stages and develop through these centers of thinking. It is a shame that the first stage is
sometimes felt only on the deathbed if ever. And that few people ever develop the ability to transcend. But the greatest shame is
how certain people with over-valued words areas terrorize and humiliate those with the basic ability to sense our true nature.
Chapter 5 - Stress Reduction as a New Medicine

The best way for us to review the EPFX/SCIO policy on stress reduction is to introduce the philosophical father of the device Canadian doctor Hans Selye. A current updated literature review follows as well as our own sponsored independent research.

Hans Hugo Bruno Selye, CC

(Hungarian: Selye János; January 26, 1907 - October 16, 1982)

...was a Canadian endocrinologist of Austro-Hungarian origin and Hungarian ethnicity. Selye did much important factual work on the hypothetical non-specific response of the organism to stressors. While he did not recognize all of the many aspects of glucocorticoids, Selye was aware of this response on their role. Some commentators considered him the first to demonstrate the existence of biological stress.

Hans Selye was born in Vienna in 1907, of Hungarian descent, but did most of his work in Canada. As early as his second year of medical school (1926), he began developing his now-famous theory of the influence of stress on people’s ability to cope with and adapt to the pressures of injury and disease. He discovered that patients with a variety of ailments manifested many similar symptoms, which he ultimately attributed to their bodies’ efforts to respond to the stresses of being ill. He called this collection of symptoms—the separate stress disease—stress syndrome, or the general adaptation syndrome (GAS).

He spent a lifetime in continuing research on GAS and wrote some 30 books and more than 1,500 articles on stress and related problems, including Stress without Distress (1974) and The Stress of Life (1956). So impressive have his findings and theories been that some authorities refer to him as "the Einstein of medicine". His medical genius has gone unrewarded for his work did not depend on any synthetic drug solution in an overly reductionistic style of modern medicine. He has shown that at first the symptoms of disease are alarm reactions to stressors. If the stressor continues the person’s body adapts to the alarm reaction and the symptom goes away. Thus as Selye has said “being symptom free is not an indicator of health, and a medicine based on symptoms is irregular”.

A physician and endocrinologist with many honorary degrees for his pioneering contributions to science,
Selye also served as a professor and director of the Institute of Experimental Medicine and Surgery at the University of Montreal. More than anyone else, Selye has demonstrated the role of emotional and biological stressor responses in causing or combating much of the wear and tear experienced by human beings throughout their lives. He died in 1982 in Montreal, where he had spent 50 years studying the causes and consequences of non-specific stress as a universal causative agent in disease. His theory of how accumulated stressors could weaken the body and then the weak genetic link of the human health chain would be the first to snap. Thus any disease is complicated by stressors, and reducing stressors can help to improve any disease. Stressors being of emotional, toxic, deficiency, physical traumatic, infectious, allergic, job, family or other stress. All being accumulative in weakening the disease resisting force of the body.

The Nature of Stress - by Hans Selye
International Institute of Stress
University of Montreal, Montreal, Quebec, Canada

The Nature of Stress was submitted to Dr. Nelson and his other colleagues shortly before Selye’s death. Dr. Nelson knew him well having been worked with Selye and having shared his lecture platform on several occasions. This treatise is presented as prepared by Hans Selye as if he is still living, which indeed he is through his monumental works, for Dr. Stress, or the Einstein of modern medicine as he was occasionally entitled, will live forever since so many believe that Hans Selye is the foremost medical researcher of the 20th century.

About the Author

Dr. Hans Selye is without question one of the great pioneers of medicine. His famous and revolutionary concept of stress opened countless avenues of treatment through the discovery that hormones participate in the development of many degenerative diseases, including coronary thrombosis, brain hemorrhage, hardening of the arteries, high blood pressure and kidney failure, arthritis, peptic ulcers and even cancer. At present, most of his research is concerned with formulating a code of behavior based on the laws governing the body’s stress resistance in dealing with personal, interpersonal, toxic, nutritional, traumatic and group problems.

Dr. Selye has served since 1945 as professor and Director of the Institute of Experimental Medicine and Surgery at the University of Montreal. Now he is President of the International Institute of Stress, founded by him in 1976 at the University of Montreal.

Born in Vienna in 1907, he studied in Prague, Paris, and Rome. He received his medical degree and his Ph.D. (chemistry) from the German University in Prague, and his D.Sc. at McGill University in Montreal. He is the author of 38 volumes and more than 1600 technical articles. In addition to his doctorates he holds 20 honorary degrees from universities around the world. He is a Fellow of the Royal Society of Canada and an Honorary Fellow of 68 other scientific societies. A recipient of numerous honorary citizenship, he counts among his medals the Starr Medal (highest distinction of the Canadian Medical Association); the Prix de l’Oeuvre Scientifique (highest award of the Canadian Association of French speaking Physicians); the Killam Scholarship (highest award of the Canada Council); the International Kittay Award (top prize in psychiatry); the American Academy of Achievement’s Golden Plate Award, and the 1977 Canadian Authors Association Literary Award for nonfiction. He has, in addition, been made a Companion of the
Order of Canada (the highest decoration awarded by his country).

When I wrote the first paper on the stress syndrome in 1936, I tried to demonstrate that stress is not a vague concept, somehow related to the decline in the influence of traditional codes of behavior, dissatisfaction with the world, or the rising cost of living, but rather that it is clearly a definable biological and medical phenomenon whose mechanisms can be objectively identified and with which we can cope much better once we know how to handle it.

Since then, a great deal of progress has been made in identifying the mechanisms of stress-induced bodily responses. And during recent years, considerable knowledge has been acquired about comprehending and controlling stress through scientific techniques. The results are of immense practical value for further improving the understanding of stress mechanisms by scientists, and for the treatment of certain stress-induced derangements by competent physicians.

Yet today, though everyone talks about stress, only a few people know exactly what it is. It is hard to read a newspaper or watch a television program without hearing about stress, and literally hundreds of people now lecture and write about it. They are ever ready to give advice, usually based on the teachings of an Eastern guru or Western "stressologist" - advice that works well provided that one has absolute faith in the master's divine infallibility.

Far be it from me to suggest that these people have nothing to offer, but in the absence of a clear concept of exactly what stress is, one is not likely to find it easy to maintain faith should difficulties crop up. Besides, in the modern world there are so many prophets around trying to convince us that a desire to adopt their faith is enough.

When confusions and arguments about stress - indeed about any concept - start to prove a barrier to communication and progress, it is always best to revert to the undisputed facts, the original observations that gave rise to the field. Accordingly, let us proceed to a discussion of the nature of stress.

**What stress is not**

The word stress has been used so loosely, and so many confusing definitions of it have been formulated, that I think it will be best to start by clearly stating what it is not. Contrary to current popular or medical opinion:

1. Stress is not nervous tension. Stress reactions do occur in lower animals and even in plants, which have no nervous system. The general manifestations of an alarm reaction can be induced by mechanically damaging a denervated limb. Indeed, stress can be produced under deep anesthesia in patients who are unconscious, and even in cell cultures grown outside the body.

2. Stress is not an emergency discharge of hormones from the adrenal medulla. An adrenaline discharge is frequently seen in acute stress affecting the whole body, but it plays no conspicuous role in generalized inflammatory diseases (arthritis, tuberculosis) although they can also produce considerable stress. Nor does an adrenaline discharge play any role in "local stress" reactions, limited to directly injured regions of the body.

3. Stress is not that which causes a secretion by the adrenal cortex of its hormones (the corticoids). ACTH, the adrenal-stimulating pituitary hormone, can discharge these hormones without producing any evidence of stress.

4. Stress is not the nonspecific result of damage only. Normal and even pleasant activities - a game of tennis or a passionate kiss - can produce considerable stress without causing conspicuous damage.

5. Stress is not the deviation from homeostasis, the steady state of the body. Any specific biologic function, e.g., the perception of sound or light, the contraction of a muscle, eventually causes marked deviations from the normal resting state in the active organs. This is undoubtedly associated with some local demand for increased vital activity, but it can cause only "local stress" and even this does not necessarily parallel the intensity of the specific activity.

6. Stress is not that which causes an alarm reaction. The stressor does that, not stress itself.

7. Stress is not identical with the alarm reaction or with the G.A.S. as a whole. These are characterized by certain measurable organ changes which are caused by stress.

8. Stress itself is not a nonspecific reaction. The pattern of the stress reaction is very specific; it affects certain organs (e.g., the adrenal, the thymus, the gastrointestinal tract) in a highly selective manner.

9. Stress is not a reaction to a specific thing. The stress response can be produced by virtually any agent.
10. Stress is not necessarily undesirable. It all depends on how you take it. The stress of failure, humiliation, or infection is detrimental; but that of exhilarating, creative, successful work is beneficial. The stress reaction, like energy consumption, may have good or bad effects.

11. Stress cannot and should not be avoided. Everybody is always under some degree of stress. Even while quietly asleep our heart must continue to beat, our lungs to breathe, and even our brain works in the form of dreams. Stress can be avoided only by dying. The statement „He is under stress” is just as meaningless as „He is running a temperature.” What we actually refer to by means of such phrases is an excess of stress or of body temperature.

If we consider these points, we may easily be led to conclude that stress cannot be defined, and that perhaps the concept itself is just not sufficiently clear to serve as the object of scientific study.

Nevertheless, stress has a very clear, tangible form. Countless people have actually suffered or benefited from it. Stress is very real and concrete indeed, and is manifested in precisely measurable changes within the body. So before we proceed to a formal definition of the nature of stress, we will describe these manifestations.

What stress is

Mechanism. The workings of stress are extremely complex (see Figure). Apart from specific stimuli, which need not be discussed here, the first effect of any agent or demand made upon the body is running up a flight of stairs, dealing with a viral infection, or performing a dance - is to produce a nonspecific stimulus (the agent’s “stressor effect”). This may be a nervous impulse, a chemical substance or lack of an indispensable metabolic factor; it is referred to simply as the “first mediator,” because we know nothing about its nature. We are not even certain that it has to be an excess or deficiency of any particular substance; it is possible that various derangements of homeostasis can activate the stress mechanism.

Although we have still to identify the first mediator(s), we do know that eventually stress acts upon the hypothalamus and particularly upon the median eminence (ME). This action appears largely to be mediated through or modified by nervous stimuli coming from the cerebral cortex, the reticular formation and the limbic system (especially the hippocampus and amygdala). The incoming nervous stimuli reach certain neuroendocrine cells, most of which are located in the ME. These act as „transducers”, transforming nervous signals into a humoral messenger, the corticotrophic hormone releasing factor (CRF), which can be demonstrated histochemically in the ME region and can also be extracted from it. Oddly enough, the posterior pituitary contains the highest concentration of CRF, and it has been isolated from this source in pure form, thus permitting the determination of its chemical formula as a polypeptide which subsequently was synthesized. Yet we have no conclusive proof that the CRF-active material extracted from the hypothalamus is identical with that obtained from the posterior lobe since only the structure of the latter has been definitely ascertained. Although vasopressin (antidiuritic hormone) possesses considerable CRF activity it is not identical with CRF; this has been shown by the well-documented differences in their chemical structure and physiologic activity.

CRF reaches the anterior lobe through the hypothalmo-hypophyseal portal system that originates in the ME region within a network of capillaries into which CRF is discharged by the local neuroendocrine cells. It is then carried down through the larger veins of the pituitary to a second capillary plexus in the pituitary. The hypothalamus does not stimulate the adrenocorticotrophic hormone (ACTH) secretion of the anterior lobe through nervous pathways descending in the pituitary stalk but rather through blood-borne substances carried by way of the portal veins. That is why transection of the stalk inhibits the ACTH secretion only before vascular connections between the hypothalamus and the gland are reestablished; if regeneration of these vessels is prevented by interposing a plate between the cut ends of the stalk, this pathway is permanently blocked. Both in vivo and in vitro experiments have proven that CRF elicits a discharge of ACTH from the adenohypophysis into the general circulation. Upon reaching the adrenal cortex, it causes secretion of corticoids, mainly glucocorticoids such as cortisol or corticosterone. These induce glycogenolysis, thereby supplying a readily-available source of energy for the adaptive reactions necessary to meet the demands faced by the body. In addition, they facilitate various other enzymatically regulated adaptive metabolic responses and suppress immune reactions as well as inflammation, assisting the body to coexist with potential pathogens (syntoxic reactions).

Furthermore, the glucocorticoids are responsible for the thymic lymphatic involution, eosinopenia and lymphopenia characteristic of acute stress. Curiously, glucocorticoids are needed for the acquisition of adaptation primarily during the alarm reaction, but not so much to maintain the adjustment during the stage of resistance. ACTH plays a comparatively minor role in the secretion of mineralocorticoids, such as aldosterone, which is regulated mainly by the renin-hypertension system and the blood electrolytes, whose homeostasis is in turn influenced by them.

This chain of events is cybernetically controlled by several biofeedback mechanisms. Whether an excess of CRF can inhibit its own endogenous secretion is still doubtful because its lifespan in the circulating blood is very short. On the other hand, there is definite proof of an ACTH feedback (short-loop feedback) by a surplus of the hormone, which returns to the hypothalamo-pituitary system and inhibits further ACTH
production. We have even more evidence to substantiate the existence of a corticoid feedback mechanism (long-loop feedback) in that a high blood corticoid level similarly inhibits ACTH secretion. It is still not quite clear to what extent these feedbacks act upon the neuroendocrine cells of the hypothalamus, the adenohypophysis or both. (Hence, in the Figure the corresponding arrowheads merely point towards the hypothalamo-hypophyseal region in general, without specifying exactly where their target areas are situated.)

Another major pathway involved in the stress mechanism is carried through the catecholamines liberated under the influence of an acetylcholine discharge, at autonomic nerve endings and in the adrenal medulla. The chromaffin cells of the latter secrete mainly epinephrine, which is of considerable value in that it stimulates mechanisms of general utility to meet various demands for adaptation. Thus it provides readily available sources of energy by forming glucose from glycogen depots and free fatty acids from the triglyceride stores of adipose tissue; it also quickens the pulse, raises the blood pressure to improve circulation into the musculature, and stimulates the CNS. In addition, epinephrine accelerates blood coagulation and thereby protects against excessive hemorrhage should wounds be sustained in conflicts.

All of this is helpful in meeting the demands, whether they call for fight or flight.

At this point it will be helpful to discuss two apparent objections to accepting the concept of a single stereotyped response to stress:

1. Qualitatively different agents of equal toxicity or stressor potency do not necessarily elicit exactly the same reactions in different people.

2. Even the same degree of stress, induced by the same agent, may produce different effects and even lesions in different individuals.

3. The effects specific to any given agent usually modify the effects and manifestations of the general stress syndrome. (Thus, it took many years to recognize and prove the existence of the latter.)

4. The fact that the state of stress, even if due to the same agent, can cause different effects in different individuals, has been traced to “conditioning factors” that can selectively enhance or inhibit one or the other stress effect. This conditioning may be endogenous (genetic predisposition, age or sex) or exogenous (treatment with certain hormones, drugs, or dietary factors). Under the influence of such conditioning factors, a normally well-tolerated degree of stress can even become pathogenic, selectively affecting those parts of the body that are particularly sensitized both by those conditioning factors and by the specific effects of the eliciting agent, just as physical tensions of equal strength in different chains will break the particular link that is the weakest as a result of internal or external factors.
The foregoing processes are the principal ones involved in the stress reaction, but by no means the only ones. As well, the level of STH, the growth hormone, may rise, and changes in the output of thyroid hormones of the ovary or testis may take place.

**Stressors**

The agents or demands that evoke this coordinated response which I have designated 11 stress” are referred to, quite naturally, as stressors; and of course something is a stressor to the same degree that it calls forth the syndrome.

When the stressor in question is some organism or substance foreign to the body, the curative process resulting from the stress reaction can take either of two forms, according to whether the pathogen causes trouble directly or indirectly. Direct pathogens cause disease irrespective of our body’s reaction, whereas indirect pathogens produce damage only through the exaggerated and purposeless defensive responses they provoke. If a patient accidentally exposes his hand to a strong acid, alkali, or boiling water, damage will occur irrespective of his reactions.

Because all these are direct pathogens; they would cause damage even to the body of a dead man who obviously could not put up any vital defense reactions. On the other hand, most common inflammatory irritants, including allergens, are essentially indirect pathogens, which do not themselves cause disease, but are damaging only by stimulating an inopportune and harmful fight against what is innocuous.

During evolution, immunologic reactions which lead to destruction of microbes, grafts, and other foreign tissues undoubtedly developed as useful defensive mechanisms against potentially dangerous foreign materials. However, when - as in the case of many allergens, heart transplants, etc. - the attack against the “foreign” agent is unnecessary or even harmful, man can improve upon the wisdom of Nature by suppressing this hostility. Nevertheless, when the aggressor is dangerous, the defensive reaction should not be suppressed but, if possible, increased above the normal level, which can be done, for example, by catatonic substances that carry the chemical message to the tissues to destroy the invaders even more actively than would normally be the case.

However, stressors are not exclusively physical in nature. Emotions, e.g., love, hate, joy, anger, challenge and fear, also call forth the changes characteristic of the stress syndrome.
Stress and disease

In general, the hormonal responses outlined above aid adaptation to environmental change or stimuli; but they are sometimes the cause of disease, especially if the state of stress is prolonged or intense. In this latter case, the body goes through the three stages of what I call the “general adaptation syndrome” (G.A.S.). The first is the alarm reaction, characterized by the changes above described. Of course, if the stressor (stress-producing agent) is so severe that continued exposure is incompatible with life, the organism will die within a few hours during this stage; otherwise, a stage of adaptation of resistance will ensue, since no organism can be maintained continuously in a state of alarm. The adaptive stage is characterized by the vanishing or diminishing of the initial symptoms, since the body has achieved optimal adaptation. After still more prolonged exposure to the stressor, however, this acquired adaptation is lost and a third stage of exhaustion is entered into, which, unless the organism receives emergency aid from some outside source, leads to death. Apparently, the adaptability of an organism is finite.

Also of interest is the routine picture of endocrine gland disturbance that Selye (The Stress of Life, New York, McGraw-Hill, Inc., 1956) so ably depicted in the General Adaptation Syndrome brought on by any stress to the body.

Definition. Let us see now whether the following definition will fit all our facts:

Stress is the state manifested by a specific syndrome which consists of all the nonspecifically-induced changes within a biologic system. Thus, stress has its own characteristic form and composition, but no particular cause. The elements of its form are the visible changes due to stress, which are addictive indicators expressing the sum of all the different adjustments that are going on in the body at any time.

The above is essentially an “operational definition”; it tells what must be done to produce and recognize stress. A state can be recognized only by its manifestations; you have to observe a great many living beings exposed to a variety of agents before you can see the shape of stress as such. Those changes which are induced by only one or the other agent must first be rejected; if you then take what is left - that which is induced by many agents - you have uncovered stress itself.

For simplicity’s sake we have attempted to state the essence of this concept in the following, less formal terms:

Stress is the nonspecific response of the body to any demand, whether is is caused by, or results in, pleasant or unpleasant conditions. Stress as such, like temperature as such, is all-inclusive, embodying both the positive and the negative aspects of these concepts.

Within the general concept of stress, however, we must differentiate between distress (from the Latin dis = bad, as in dissonance, disagreement), and eustress (from the Greek eu = good, as in euphonia, euphoria). During both eustress and distress the body undergoes virtually the same nonspecific responses to the various positive or negative stimuli acting upon it. However, the fact that eustress causes much less damage than distress graphically demonstrates that it is “how you take it” that determines, ultimately, whether you can adapt successfully to change.

The general adaptation syndrome

Definition

While stress is reflected by the sum of the nonspecific changes as they develop throughout time during continued exposure to a stressor, the G.A.S. encompasses all nonspecific changes as they occur during continued exposure to a stressor. One is a snapshot, the other a motion picture of the response to demands.

Thus, the G.A.S. may be defined as the manifestation of stress in the whole body, as they develop in time. As we have seen, a fully-developed G.A.S. consists of three stages: the alarm reaction, the stage of resistance, and the stage of exhaustion. Yet it is not necessary for all three stages to develop before we can speak of G.A.S. Only the most severe stress leads rapidly to the stage of exhaustion and death. Most of the physical or mental exertions, infections, and other stressors, which act upon us during a limited period, produce changes corresponding only to the first and second stages: at first they may upset and alarm us, but then we adapt to them.

Normally, in the course of our lives, we go through these first two stages many, many times. Otherwise we could never become adapted to all the activities and demands which are man’s lot. Even the stage of exhaustion does not always need to be irreversible and complete, as long as it affects only parts of the body. For instance, running produces a stress situation, mainly in our muscles and cardiovascular system. To cope with this, we first have to limber up and get these organs ready for the task at hand; then for a while we will be at the height of efficiency in running, but eventually exhaustion will set in. This could be compared with an alarm reaction, a stage of resistance, and a stage of exhaustion, all limited primarily to the muscular and cardiovascular system. But such exhaustion is reversible; after a good rest we will be back to normal. Most human activities go through three stages analogous to those of the G.A.S.: we first have to get into the swing of things, then we get pretty good at them, but finally we tire and lose our acquired efficiency. This triphasic evolution of adaptation is quite characteristic also of all bodily activities, including those that only the physician can fully appraise; for instance, of inflammation. If some
virulent microbes get under the skin, they first cause what we call acute inflammation (reddening, swelling, pain); then follows chronic inflammation (ripening of a boil or abscess); and finally an exhaustion of tissue resistance takes place, which permits the inflamed, purulent fluid to be evacuated (breaking through of an abscess).

**The diseases of adaptation**

Many maladies are due not so much to what happens to us as to our inability to adapt, and they have therefore been called „diseases of adaptation. „ The most common of such diseases are peptic ulcers in the stomach and upper intestine, high blood pressure, heart accidents, and nervous disturbances. Of course, any event makes demands upon us and, hence, causes some stress, but it is only people who cannot cope, either because of innate defects or lack of knowledge, who develop stress diseases.

Yet this is a relative concept. No malady is just a disease of adaptation. Nor are there any disease producers which can be so perfectly handled by the organism that maladaptation plays no part in their effects upon the body. Such agents would not produce disease. This haziness in its delimitation does not interfere with the practical utility of our concept. We must put up with the same lack of precision whenever we have to classify any other kind of disease. There is no pure heart disease, in which all other organs remain perfectly undisturbed, nor can we ever speak of a pure kidney disease or a pure nervous disease in this sense.

**The concept of adaptation energy**

The selective exhaustion of muscles, eyes, or inflamed tissue all represent final stages in local adaptation syndromes (L.A.S.) only. Several of these may develop simultaneously in various parts of the body; in proportion to their intensity and extent, they can activate the G.A.S. mechanism. It is when the whole organism is exhausted - through senility at the end of a normal life-span, or through the accelerated aging caused by stress - that we enter into the (fatal) stage of exhaustion of the G.A.S.

Apparently, we have hidden reserves of adaptability, or adaptation energy, in ourselves throughout the body. As soon as local stress consumes the most readily accessible local reserves, local exhaustion sets in and activity in the strained part must stop. This is an important protective mechanism because, during the period of rest thus enforced, more adaptation energy can be made available, either from less readily accessible local stores or from reserves in other parts of the body. Only when all of our adaptability is used up will irreversible, general exhaustion and death follow.

**Adaptation energy and a natural code of behavior**

There seem to be close interrelations between the G.A.S and aging. We have already mentioned that several local adaptation syndromes may develop consecutively or even simultaneously in the same individual. People can get used to a number of things (cold, heavy muscular work, worries), which at first had a very alarming effect; yet, upon prolonged exposure, sooner or later all resistance breaks down and exhaustion sets in. The term „adaptation energy” has been coined for that which is consumed during continued adaptive work, to indicate that it is something different from the caloric energy we receive from food; but this is only a name, and even now we still have no precise concept of what this energy might be.

Further research along these lines would seem to hold great promise, since we appear to touch upon the fundamentals of fatigue and aging. Seemingly, each individual inherits a certain amount of adaptation energy, the magnitude of which is determined by his genetic background, his parents. He can draw upon this capital thriftily for a long but monotonously uneventful existence, or he can spend it lavishly in the course of a stressful, intense, but perhaps more colorful and exciting life. In any case, there is just so much of it, and he must budget accordingly.

How can we, as individuals, best manage our limited store of this energy? Surely scientists have found enough evidence to justify trying to develop the fundamentals of a code of behavior based only on the laws of Nature, though we may need much more scientific work to learn how to apply them in our daily life and to make them easily understandable. In the light of what my own laboratory and clinical study of somatic diseases has taught me concerning stress, I have tried to arrive at a code of ethics based not on the strictures and traditions of society, inspiration, or blind faith in the infallibility of a particular prophet, religious leader or political doctrine, but on the scientifically verifiable laws that govern the body's reactions in maintaining homeostasis and living in satisfying equilibrium with its environment. By means of such a code, we can adjust our personal reactions to enjoy fully the eustress of success and accomplishment without suffering the distress commonly generated by frustrating friction and purposeless, aggressive behavior against our surroundings.

It is a biologic fact that man - like the lower animals - must fight and work for some goal that he considers worthwhile. We must use our innate capacities to enjoy the eustress of fulfillment. Only through effort, often aggressive, egoistic effort, can we maintain our fitness and assure our homeostatic equilibrium with both the social and the inanimate world.

To achieve this state, our activities must earn lasting results; the fruits of work must be cumulative and must provide a capital gain to meet future needs. To succeed, we have to accept the scientifically established fact
that man has an inescapable natural urge to work egoistically for things that can be stored to strengthen
his homeostasis in the unpredictable situations with which life may confront him.

We should not combat or be ashamed of these instincts. We can do nothing about having been built to
work, and it is primarily for our own good. Organs that are not used (muscles, bones, even the brain)
undergo inactivity atrophy, and every living being looks out first of all for itself. Neither should we feel
guilty because we work for treasures that can be stored to ensure our future homeostasis. Hoarding is
a vitally important biologic instinct that we share with animals such as ants, bees, squirrels and beavers.
In man, the urge first manifests itself when children start to gather match boxes, shells or stickers; it
continues when adults collect stamps or coins. Such a universal drive cannot be an artificial, indoctrinated
tradition.

On the other hand, there is no example in Nature of a creature guided exclusively by altruism and the
desire to protect others. In fact, a code of universal altruism would be highly immoral, since it would
expect others to look out for us more than themselves. Of course, “Love thy neighbor as thyself” is a
command full of wisdom; but, as originally expressed, it is incompatible with biologic laws; no one needs
to develop an inferiority complex if he cannot love all his fellow men on command.

What are the ingredients of a code of ethics that accepts egoism and working to hoard personal capital
as morally correct? After four decades of clinical and laboratory research, I would summarize the most
important principles briefly as follows:

1. Find your own stress level - the speed at which you can run toward your own goal. Make sure that both
   the stress level and the goal are really your own, not imposed upon you by society, for only you
   yourself can know what you want and how fast you can accomplish it. There is no point in forcing a
turtle to run like a racehorse or in preventing a racehorse from running faster than a turtle because of
some “moral obligation.” The same is true of people.

2. Be an altruistic egoist. Do not try to suppress the natural instinct of all living beings to look after
   themselves first. Yet the wish to be of some use, to do some good to others, is also natural. We are
   social beings, and everybody wants somehow to earn respect and gratitude. You must be useful to
   others. This gives you the greatest degree of safety, because no one wishes to destroy a person who
   is useful.

3. Earn thy neighbor’s love. This is a contemporary modification of the maxim “Love thy neighbor as
   thyself.” It recognizes that not all neighbors are lovable and that it is impossible to love on command.

Perhaps two short lines can encapsulate what I have discovered from all my thought and research:

Fight for your highest attainable aim,
But do not put up resistance in vain.

So far as possible, I myself have followed this philosophy, and it has made my life a happy one. Frankly,
in looking back, I realize that I have not always succeeded to perfection, but this has been due to my own
shortcomings, not those of the philosophy. As I have often said. The builder of the best racing car is not
necessarily its best driver.

As to a driver, I turn my life’s work over to my successors like Dr. Nelson who I believe can drive this car
and revolutionize medicine.
Undoubtedly, in man, with his highly developed central nervous system (CNS), emotional arousal is one of the most frequent activators. Yet it cannot be regarded as the only factor, since typical stress reactions can occur in patients exposed to muscle fatigue, trauma, hemorrhage, etc. while under deep anesthesia. Indeed anesthetics themselves are commonly used in experimental medicine to produce stress, and 11 stress of anesthesia” is a serious problem in clinical surgery.
The Educational Books and Multi-Media
written by Professor Nelson

1. The Prometheus (the first shape) An Advanced Treatise on Quantum Vibrational Medicine
2. Essential Biofeedback and an Introduction to Unconscious Biofeedback
3. Superlearning Insights to Stimulating the Intellectual Mind
4. Registered Wellness Consultant Course
5. The Pathway of Pathology Unpublished
6. Anti-Aging Detoxification Treatment
7. Nelson’s Essential Complete Homoeopathy
8. Nelson’s Essential Cardiology
9. Nelson’s Essential CPR and Emergency Medicine for the Natural Health Therapist
10. Depressive Disease and Cancer (A new understanding of potential cure)
11. Using the Accutest Complement / Fractolite in Pregnant or non Pregnant Patients, Advances in Medicine
12. Nelson’s Essential Energetics Medicine
13. Nelson’s Hematology-The Blood and it’s Diseases, Microscopic Analysis
14. Nelson’s Essential Hematopathology
17. Nelson's Organic Pathology
18. Nelson’s Essential Neurology
19. Symptom Operationalization For Homoeopaths and SCIO Biofeedback Therapists
20. Nelson’s Essential Physiology
21. Nelson’s Essential Anatomy and Operationalization for Homoeopaths
22. Substance and Quantum Interdependence Aspects of Biology
23. The Fallacy of Synthetic Drugs
24. Proceedings of the Natural Medicine Conference at the Royal Society of Medicine in London England
25. Care of Shiny Hair: The Magic Spot of Life
26. Vermin in Homoeopathy
27. Care of the Woman and Her Diseases
28. Whose is the Arsenic
29. Nelson’s Essential Epidemiology
30. Nelson’s Human Perception
31. Lazy Gut, Detention and Repair
32. Sown on the Altar: The true story of how one man thought the FDA to register the acupuncture needles
33. Daniel’s Story: The story of my son Daniel born autistic who was cured by energetic medicine
34. Proof of the Effect of the Mind: How and why science has accurately reported and legally covered up the non-local universe proving the effects of the mind
35. Towards a New Medicine (how and why medicine has plotted to cover up the fact that synthetic drugs are not compatible with the human and how natural medicine is the true medicine)
36. Towards a New Sport Medicine
37. Subspace—the collective unconscious and mathematical connection of all
38. Results of the world wide large scale study of the SCIO
39. Bio-Quantum Matrix
40. Quantum Vibrational Medicine

41. Quantum Quality Control
42. Natural Repentance
43. The Experimental Evidence of Homeopathy
44. The Physical Diagnosis
45. The Natural Compendium
46. New Biology I
47. New Biology II
48. A Legal Outline of the Medical Practice of Electroacupuncture
49. The History of Law with emphasis on Education; A Treatise for Evolution in Law: The next step Equal Economic Education
50. Create Gender, the race of Nematology
51. Nelson’s Essential Parapsychology
52. The Nelson Method of Health Care
53. The Angel of God leads us to 3000 years of Peace and Harmony, Maitreyta
54. The History of the Blood Fever of Dacca
55. The Medical Case of AIDS
56. The History of Homeopathy
57. Nelson’s Disease Dictionary
58. The Home Medical Advisor
59. Desire, the Apollo Moon Project and the reality of the UFO
60. Mathematics, the Numbers and the Development of an Advanced Study of Numerical History
61. Suggested Home Therapies for all Human-Compromised Disease
62. The War Crimes Trial of Harry S. Truman
63. The False of the FDA
64. A Complete and Working Medical Education
65. The Angel Story in Pictures. The story of Bill in Desh in a beautiful large coffee table pictorial philosophical biography
66. A holistic, Natural and Homoeopathic Education in Curiology
67. Introduction to Pharmaceutical Science
68. Woman’s Health
69. The Illusion of the Science of Human Perception
70. The Structure and Properties of Water
71. Basic Biofeedback Physiology For All International Medical University Staff and Therapists
72. Nelson on Pathology
73. Electroacupuncture with Energetic Cybernetic Therapy
74. The BODY ELECTRIC SIMPLIFIED FOR THERAPIST
75. The Natural Repentance of Prof. Nelson: An In Depth Understanding of Nelson Homoeopathy
76. Symptom Operationalization (Reportory) For Homoeopaths, Nurses and SCIO Biofeedback Therapists
77. The Internal Details of the BODY ELECTRIC SIMPLIFIED FOR THERAPIST
78. Energetics Medicine - The Path of Science Over the Resistance of Convention
80. CED the Neo Morphous (new shape)
Electro Smog or Electro Smoke

The insidiousness about electro smog is that it is not perceived by the human sense organs. Nevertheless we are exposed to it at all times. And, depending on the intensity of and prolonged exposure to the radiation it presents a possible health risk. We can hardly escape e-smog because due to the introduction and the rapid further development of new technologies for wireless communication such as GMS, GPRS, UMTS, GPS, WLAN or Bluetooth™ there already is an almost continuous supply and thus a dramatically increasing pollution due to electromagnetic fields - and now WLAN has made its arrival in airplanes as well.

Cell phones, computers, notebooks, monitors, LCD displays, CD players, cordless DECT phones, kitchen appliances, radio alarm clocks, radio clocks, wireless product scanners in supermarkets (RAFI), WLAN Access Points, energy saver lamps, even night desk lamps produce alternating electric fields, even if they are turned off. Currently there are approximately 2 billion cell phones in use worldwide which require short-pulsed high-frequency cellular transmitters. There is practically no escape from this radiation anymore. And the introduction of UMTS will increase the current number of approximately 50,000 transmitter stations in Germany alone many times over.

Possible consequences may be:

- Sleep disorder, hot ears, headaches, nervousness, concentration loss and memory defect, impaired potency, reduced male procreative capacity, low energy, high blood pressure, reduced melatonin production, hormonal dysfunction, tinnitus.
- Even brain tumors are sometimes attributed to EM emission exposure. Eye tumors – hardly known in the past – are increasing.

How Does Electro Smog Effect Us?

Electro smog disrupts the natural life cycles by interfering with and changing the biological processes. It manifests itself as stress for body and mind.

The body then tries to counteract the arising imbalance but can't due to permanent exposure. Therefore the body is undergoing a constant adjustment process, which, due to the increased energy consumption, weakens the immune system and manifests itself in various symptoms such as headaches, nervousness, concentration loss and memory defects as well as low energy. The weakening of the immune system together with other factors then furthers various other diseases including tumour development.

The fact that most people do not notice any symptoms connected with the use of electronic devices does not allow the conclusion that there are no biological impacts. The incubation period for possible manifestations based on electromagnetic radiation is up to seven years according to the findings of Swiss radiation protection experts.

Geopathic and geological radiation pollution

Besides the technical radiation pollution caused by electro smog the natural radiation emissions - known for generations - have a similarly significant impact on the human health. The most critical culprits here are the so-called earth radiation, water veins, Hartmann grid and Curry grid. In case of prolonged exposure these have the same biological effect as technical radiation. These emissions cause a permanent weakening of the immune system which can then lead to corresponding diseases including leukaemia and other cancers in the mid and long term.

So far physical measurement techniques cannot measure geopathic and geological radiation emissions. At a Cancer Convention held by physicians and scientists in September 2002 in Dallas, Texas, USA it was unanimously noted that the exposure to natural and technical radiation is to be considered one of the most fundamental factors for the development of tumours based on many years of experience.

“Universal electrophysiological biofeedback system can safely measure over the skin (transcutaneous) skin electro-potential down to the micro-volt range. Virtual and mathematical calculations of the attained data can provide CNS (Central Nervous System) biofeedback data, so as to include (including simple EEG [electroencephalography], 3-pole ECG [simple stress electrocardiography], global transcutaneous EMG [electromyography]). The system can measure the transcutaneous skin resistance by application of a medical safe micro-current voltametric pulse, so as to measure GSR (galvanic skin response) and TVEP (transcutaneous voltametric evoked potential). The system is designed for the detection of stress and reduction of stress through CNS biofeedback data or stress lifestyle questionnaires. The stress and lifestyle questionnaires provide educational feedback through library referenced functions. And the device can be used for the treatment of muscular re-education from injury, muscle weakness, sport muscular enhancement or various dystonia. The applied voltammetric pulse can be used to detect and affect in established modalities such as pain (TENS - transcutaneous electro nerval stimulation), trauma/wound healing, charge stability imbalance, redox potential and electrophysiological reactivity. The device after 20 years of sale is determined as quality tested, clinically evaluated and scientifically validated as safe and effective in its suggested use”.

Dr. Nelson developed a way to treat the electrical stress in the human body to normalize and correct the body electric.
Stress Detection and Stress Reduction as New Adjunct to Modern Medicine - by Prof William Nelson

IMUNE - International Journal of the Medical Science of Homeopathy

Introduction

The Bible says “that as a Man thinketh, So is He”

Jesus when asked about what food to eat, said it is not what goes into the mouth that defiles some one but what comes out. In fact the Bible, Koran, and all of the religious books abound with references of how the mind effects the body. Prayer and it's ability to help people is a basic believe. This was all general knowledge many millennia ago. Our science has no proven these believes even further. But today the antiquated science of medicine and small minded doctors have a hard time accepting this fact. Physician Heal Thyself.

Mendeleev made a chart of the elements based on his observations. Then later it would be learned that this organization of the chemical elements was because of the quantum states of the outer electrons. Quantum theory alone gave us an understanding of chemistry. But quantum theory has the observer effect where the mind of the observer can effect the outcome. Medicine seems to have an unstable phobia and an over compensative distaste for the powers of the mind.

Science has developed a basic understanding of electronics several centuries ago. Electronics made a major boom in technology. It allowed us to understand so much of the world. But modern medicine has resisted an electrical analysis of the body. Yes technology allows for tech measures of the body, but there is little analysis of the body electric. Energetic medicine of Dr. Nelson defines a process to explain the body electric. But the modern medicine fixation on the financial hold of the synthetic chemical industry has prevented a progression of medicine into the modern age. Nearly a century ago, quantum research overturned the 17th century mechanistic paradigm of “world as a machine”, within which phenomena is to be understood by reducing them to their parts. Reductionism worked for making cars, buildings and was so valuable to our society. But reductionism fails in a complex situation.

Chaos theory gave us an enlightenment that reductionism does not work in complex systems like the human body. Fractal dynamics teach us that the reductionistic model fails in biology. In an overly complex closed system Fractal dynamics are unpredictable. Reductionism is completely invalid.

The Rules of a Fractal System are 1. nothing ever repeats exactly as before, 2. small changes can prompt very large and dramatic effects, 3. observer effects and the mind can have effect on a complex fractal system (prayer works). Reductionism is the process of taking a complex situation and reducing it to simple terms. We reduce the weight of a building to a simple vector to calculate the strength of a support wall. Reductionism has been responsible for allowing us to build cars, boats, machines, etc. But reductionism fails in very complex situations. The human body has over 200,000,000,000 cells. Each cell is more complex that we can presently imagine in our verbal minds. This complexity makes our bodies a fractal. Reductionism cannot work for medical analysis.

When the drug companies wanted to test a blood pressure medication they reduce the patient from the complexity of life to a simple variable, blood pressure. They test the blood pressure before, the pre test. Give an intervention, the drug. And then test the blood pressure again, the post test. They do not test the side effects. They observe them. This is important because they can only observe gross side effects and still they get by. If they would have tested the blood sugar, they would have found out that all patients...
taking certain blood pressure medications get some degree of diabetes every one of them. If they were to test all variables for side effects, it would cost too much to do testing. And there are not enough people to do the test for statistical satisfaction, there are not enough rats, there are not enough fruit flies. The statistics of total protection against side effects are tremendous. These side effects are killing not hundreds of people, not thousands, not tens of thousands, but millions of people every year. Our society has rejected synthetic foods. We tried the synthetic experiment and it failed. The synthetic foods made cancers and diseases. We will not choose them from a menu; we will not buy them from the shelf. We know from the gourmet that the finest quality is always from the natural. Thus is un-doubtable. It is just a simple step of intellect to see that it is also true about our medicines as well. In the IJMSH of 2009 there is an entire issue of the failure of the FDA to protect people from these side effects of synthetic drugs. I spell it SINthetic. It is a sin to kill so many in the name of profit and ignorance, ignoring the benefits of natural medicine is ignorance at its ultimate ignorant best. All justified by reductionism. A science not used today by anybody but medicine. The reductionistic methods of drug testing are killing millions and wounding many, many more. But big money is hard to beat, especially when there is 30 billion spent by the drug companies on political lobbying alone in America. Fractal non-linear science has stepped forward to help us understand medicine.

When it was developed in the 1920's, quantum mechanics was viewed primarily as a way of making sense of the host of anomalous observations at the level of molecules, atoms, and subatomic particles that could not be explained in terms of older mechanical models. Now, in the 21st century, most physicists are confident that quantum mechanics is a fundamental and general description of the physical world. Indeed, quantum ideas are now being applied to understand the workings of consciousness, environment, electromagnetic field interactions, low-dose healing effects, non-local phenomena, and many other observable phenomena that are unexplainable with an outdated mechanistic world view.

During the last century, traditional medical and philosophical practices, such as Traditional Chinese Medicine, acupuncture, Qi Gong, Tai Chi, meditation, homeopathy, naturopathy, and mind-body techniques considered “esoteric” by the scientific establishment, have been largely ignored while the world’s attention was focused solely on drugs, surgery, radiation, genetics, and other invasive and reductionist approaches; approaches that make money for the synthetic chemical cartel. But these synthetic therapies are failing. One by one the synthetic pharmaceuticals are being discredited. With massive public pressure to support research of safer Complementary and Alternative Medicines (CAM), and with athletic communities seeking effective drugless performance advantages, significant funds are moving in those directions. Quantum physics and non-linear mathematics are providing scientists with better models for understanding complex systems and subtle interactions, like mental, emotional, environmental,
and electro-physiological interactions in the human body. With new ways of measuring and verifying energetic and quantum events and their effects on health, disease, and performance, scientists are re-igniting interest in traditional healing techniques, and the field of subtle-energy medicine is emerging. One of the most exciting and promising fields of CAM involves bioelectromagnetics (BEM)—the study of electromagnetic fields (EMFs) and their biological effects. Based largely on biofeedback principles, BEM diagnostic and healing devices are well entrenched in mainstream medicine already, but scientists are really only beginning to realize the practically limitless potentials that this field offers. The purpose of this article is to introduce modern advanced biofeedback, one of the fastest growing areas within the field of BEM, and provide supportive evidence for its use with Olympiclevel athletes. Focus is given to the most advanced biofeedback technology, the SCIO (Scientific Consciousness Information Operating System), which combines mind-body training with a methodology of applying micro-currents at various frequencies to the body, measuring feedback, and utilizing the resultant information for stress reduction, education, behavioral modification, and self-adjusting cybernetic correction (an historic innovation exclusive to the SCIO).

"Conventional" biofeedback, the use of devices to monitor physiological processes and enhance mind-body interactions, has been one of the most researched branches of CAM for over 60 years, and it provides the basis for this study and for claims made in athletic sport performance. "Quantum" biofeedback is the term adopted to describe advanced Quantum Electro-Dynamic Biofeedback capabilities performed with the SCIO system, which combines the benefits of both conventional and advanced methods.

PSYCHO-SOMATIC and SOMA-PSYCHO disease

Medicine was shocked to see that there was indeed a set of diseases that were psychosomatic. The mind can affect the body. The largest type is the stomach ulcer or other gastric disturbance. Here stress upsets the sympathetic nervous balance versus the parasympathetic. There are also soma-psycho diseases such as when hormonal disturbances produce mental abnormalities. Medicine was shocked at the proof of this. But this threatened pharmaceutical sales. As time goes by the list of possible involvements from psycho-somatic and soma-psycho disease grows and grows. Till now there is overwhelming evidence that there is mental involvement in over 80% of disease. Stress detection and stress reduction then become an integral component in disease care and thus health care. There is an overwhelming evidence for a Psych-Neuro-Immuno-Soma link this is so well documented as to be an irrefutable fact. But still some over fastidious small minded geeks will reject this truism. In the PNIS issue of the journal we see more collective evidence.
The End of Degenerative Disease

One of my jobs as the angel of God is to bring an end to degenerative disease as a predominant killer. To do so has taken a lifetime of dedication, persecution, and violent attacks from so many places. First we must confront the failure of the FDA to protect Americans from degenerative disease. Let’s review the largest killers. What’s really killing people in the world today is number one: Tobacco. This is the number one killer. David Kessler was the head of the American FDA in the 1980’s. And when I met Kessler at an FDA meeting he was going to do his job to protect the public. I met him at a meeting in Salt Lake City, Utah and he said he wanted to go after the most major risk to health, smoking. That his job was to protect the American people, included that he should go after big tobacco and to clamp down and to make sure that the people were protected. He was denied that. He was stopped from doing that. He quit the FDA, unable to do his job, as he said. Big tobacco is killing over a million people a year.

The next leading killer is factors that are related to sugar, Big Sugar for its corporate name. As people who get bad sugars and bad oils, trans-fatty acids and cooked oils. Factors of bad nutrition in America are making people sick, producing blood sugar problems, producing obesity, cardiovascular problems, and many, many things that the FDA could also affect. Limiting trans-fatty acids, making good sugars (Left handed Fructose), rather than bad sugars (right handed Dextrose). The body needs right handed sugar (Blood Glucose) to enter the cell for energy. Right handed sugars such as sugar cane, beet sugar, grape sugar, corn sugar are right handed and they enter the cells too fast. This produces fat more easily, hyperglycemia (mild addiction) and then hypoglycemia (mild depression). This puts a burden on the pancreas, the eye and other organs.

There is also a well documented negative effect on the immune system from dextrose. If you use chemicals to strip away vitamins and minerals to make the sugar white, and it gets even worse. Fructose revolves to the left and needs to be converted to the right, a process that takes time and thus allows for a more smooth delivery of the glucose. Less fat, less stress on organs, less craving, less depression, less blood sugar fluctuations. More hormonal and enzyme production thus it is an anti-aging therapy.

Use fresh fruits as a sweetener; it will change your life. Crazy food additives that have not been fully tested add to the food and drug problems. The synthetic foods and drugs have failed. Our society has learned to avoid and mistrust synthetic foods. We will not order them on a menu or buy them of the shelf. We have learned to be chemophobic. We know that synthetic foods create cancer and disease. Our society must learn that this is true of our medicines as well.

Our body needs good fatty acids. They make up the cell membrane of all of our cells. Stress sets them free. Cooking destroys most fatty acids. Meat and potatoes contain very little. In fact the fatty acids from an animal are saturated. Fresh and raw vegetable and unheated vegetable juice are the best source. Bad food is a problem in degenerative disease. And this is also another industry the FDA is not attacking that the FDA is not doing their job to protect the human beings of America. Big Sugar and cholesterol are leading to diseases that are killing over a million people a year.

In the next category is allopathic doctor prescribed drugs. The medical doctor prescribed medicines are the third largest killer. Big pharmaceuticals are killing in the neighborhood of some 600–700 thousand people a year. By all of these statistics, big tobacco, Big Sugar, Big fast food, and Big Pharma, collectively they are in the neighborhood of directly 3 million deaths a year in America alone and possibly 10 million complicating factors creating an incredible burden on the health care system.

We need to embody a new theory of health care. The Hans Selye theory tells us that the cause of disease is a stressor. Towards a new Safe and Effective truly Modern Medicine. This is a new common sense method of modern medicine that is Health motivated not just symptom control. We respect the complexity and the whole body, and respect the Natural process of health Health is Ease of Flow, Stressors block Flow, Stress is more than just personal stress. Stress Reduction is the key to Medicine.

Major Stressors or Causes of Disease include:

- LACK OF AWARENESS OR LACK OF EDUCATION
- STRESS
- HEREDITY
- MENTAL FACTORS (Greed, anger, delusion arrogance ETC)
- ALLERGY
- BAD POSTURE
- TOXICITY
- TRAUMA INJURY
- PATHOGENS (MICRO-ORGANISMS, Bacteria, fungus, virus, prions, worms, etc.)
- PERVERSE ENERGY (Heat, cold, wind, dryness, radiation, magnetic, etc.)
- DEFICIENCY OR EXCESS OF NUTRIENTS

When the stressor or stressors weaken the defenses of the body, the weakest link of the body (from nature or nurture) is most prone to distress and thus disease.
HEALTH THEN ENTER STRESSOR (TOXIN ETC. ~enters)

1. **ALARM Stage**: symptoms are the alarm, not the enemy, symptoms at first are related to the Stressor, later the dysfunction
   - if stressor continues then

2. **ADAPTATION Stage**: symptoms go away as we adapt, the distress + disease penetrates deeper.
   You can have no symptoms and be very very sick. Being symptom free is not an indicator of Health
   - if stressor continues then

3. **EXHAUSTION Stage**: the stressors burden the weakest organs
   - if stressor continues then
     a) **FUNCTIONAL**: first the stressors affect the weakest organ function
     - if stressor continues then
     b) **ORGANIC**: then the weak organs start to swell or shrink
     - if stressor continues then

4. **DEATH**: cellular, organ, organ system, organism death

We can see the importance of stress detection and stress reduction. This form of medicine is a more true form of health care where now a days medicine is much more positioned at the end of this scale. In other words a heroic medicine, a disease care system designed to stop you from dying.

I have spent a life time trying to build an educational system and a program to make health care more available the **Nelson Method of medicine is as follows**.

1. Reduce the Causes of Disease, Change Behavior, get patients to Care, get the nail out of the tire
2. Repair the organs weakened by the Causes. Restore Health. Fix the Tire
3. Unblock the Blockages to energy, nutrition, Oxygen, waste, Para, acupuncture, nerval FLOW
4. Treat the symptoms with natural means before resorting to Synthetic. Use foods, exercise, herbals, homeopathics any and all natural means before resulting to Synthetics
5. Balance the metabolic typing or Constitutional Imbalances. Treat the patient as an Individual Whole
Since the body’s weakest link is prone to disease from the stressors, any disease will improve with reduction of the stressors. If there is good nutrition and no excess or deficiency of nutrients, the body’s repair system improves. With stress reduction the Para-Sympathetic system becomes free to boast digestion and immunity as well as cellular repair. Some stressors can have more specific target diseases, such as cigarettes target the lungs primarily. But with the lack of systemic oxygen, any other weak link in the body from genetics or from life will be involved.

Thus stress reduction is a universal therapy for all diseases. Reductionism of diseases via inaccurate and expensive current medical diagnostic means, are archaic, inaccurate, overly complex, nonproductive, expensive, unsafe, risky and most often ineffective. Add to this the risk of side effects from SINthetic drugs and we see the poor history of medicine. Nelson and Selye have plotted out a safe, inexpensive and effective new more modern medicine.

The next step is to design a system to work with the body electric. A system to use the advances in science such as electronics, fractal chaos and Quantum Electro Dynamics. A new style of much more modern medicine. A device to find disease at the earliest level and reduce it. I have been able to make such a machine in 1985, legalize it in 1989, sell it around the world in compliance fashion. It is completely tested, safe, completely tested, and effective. It works and it helps people in many different ways.

There have been over one hundred studies published on the Device the EPFX / SCIO. The frustration of lack of education and the lack of opportunity it conveys, leads many of the poor children to resorting to drugs and crime. Addiction develops and spreads. Equal Economic Education will also help the society reduce degenerative disease and the costs it incurs. As well as when there is better education there will be more intelligent selection of foods and the ability to resist drugs. I have dedicated my life to helping reduce degenerative disease.

If we can see the problems of Big Tobacco, Big Sugar, Big Pharma and just how the medical community fights any change. I have dedicated my life and intellect to make a new system of medicine and the tools to do it with a system that is safe and effective. But instead of me being applauded for the work that I have done, I am attacked. I am vilified.

As you read the EPFX / SCIO testimonials you will see incredible results. As you read these testimonials, these stories, recognize that this is the tip of the iceberg. Is that we have been hearing these stories for 20 years. The wondrous stories of how people’s lives have been changed.
So to end degenerative disease we must

• Make Big Tobacco pay for the damages they incur
• Make Big Sugar pay for the damages they incur
• Make Big Pharma pay for the damages they incur
• End Allopathic philosophy and develop a new stressor reducing based medicine
• Avoid Bad sugars white processed. Eat Good Sugars from fresh fruit. Avoid bad oils cooked or saturated. Eat good oils from fresh and raw vegetable and uncooked low temperature made oils
• Equal Economic Education- and a new medical education based on natural
• Safe forms of early intervention medicine such as energetic biofeedback

With these social changes degenerative disease could be so greatly reduced to allow for an inexpensive medicine.

Chapter 6 - The Future of Medical Devices

The Universal Electro-Physiological Feedback Xrroid, SCIO has been registered and sold in the world markets for over two decades. It is designed and marketed as a stress reduction biofeedback instrument. The claims are for stress reduction and muscular re-education. The device is designed to measure subtle electric potentials of the body such as voltage, amperage, temperature and oscillations of same. Virtual and mathematical calculations are also available on this data. It can also measure resistance and reactivity via the input of a variant voltammetric signal. The system can send into the body a micro-current signal and measure the resistance or reactivity of the signal. All data is fed back to patient and therapist for evaluation. The feedback to the patient is done through the Central Nervous System (CNS) through its parts of the Peripheral Nervous System sensory and motor (PNS), or the Autonomic Nervous System (ANS). All of this registered in our 1989 USA 510k.

The technique of using monitoring devices to obtain information about an involuntary function of the central or autonomic nervous system, such as body temperature or blood pressure, in order to gain some central nervous system CNS, control over the function. Using biofeedback, individuals can be trained to respond to abnormal measurements in involuntary function with specific therapeutic actions, such as muscle relaxation, meditation, or changing breathing patterns. Biofeedback has been used to treat medical conditions such as stress, hypertension and chronic anxiety.

The Body Electric and Energetic Medicine

In fifth grade we learned that our bodies are made of atoms. And atoms are made mostly of protons, neutrons and electrons. There are great spaces between these electrons and protons and other atoms. Here is a Hydrogen Atom.

In Hydrogen if the protons are like marbles, the electron is over a kilometer away the next atom's electron is over 2 kilometers away, the next proton is over 4 kilometers away. So there is more than 99.9999999999999999% empty space. This space is filled with energetic fields.
Atoms are 99.999999999999% empty space and the empty space between atoms is just as or emptier 99.999999999999999999999999%. Electrons repel of course so the atoms with outer electrons repel each other. Why don't things pass right through things?

Things don't fall through other things because they are levitating on an energetic electrostatic fields, I am not kidding! When you sit on a chair, you are not really touching it. You see, every atom is surrounded by a shell of electrons. This electron cloud presents a rather negative face to the world. Remember that like charges repel each other. When two atoms approach each other, their electron shells push back at each other, despite the fact that each atom's net charge is 0. This is a very useful feature of nature. It makes our lives a lot easier.

Now the question you should be asking is, if atoms push away from each other, why doesn't the entire universe just blow away from itself? The answer is gravity of course and actually most atoms' quantum electron shells are not full. When two atoms come together and have empty spaces in their electron quantum shells, they will share electrons to fill in the spaces in both of their shells. Yes, the electrons really do go back and forth between atoms and they do so pretty fast. Outer Electrons tend to be kind of mobile, which is also a very nice feature of nature, since without it your walkman would not work or you would not be alive. It is the free electrons and protons in the body that allow life. Once both atoms' outer shells are full due to this electron sharing, they go back to their usual repulsive behavior. This, by the way, is how we get molecules, hormones, enzymes etc and the secret to understanding Chemistry, Biology, Medicine, Physiology etc. It's all about the electrons and protons, charged particles and vibration! How about a medical device to measure and correct electron disorders? We call it SCIO.

The electrons and atoms of our complex Fractal body obey quantum, QED, photonic, electro-magnetic-static laws. This is a mouthful so we abbreviate and since these are all energy let's say ENERGETIC. Atoms are 99.99999999999% empty space and the empty space between atoms is just as or more empty.

What we are is Energetic Fields.
What we need is an Energetic Medicine.
But the FDA is Afraid of the word Energetic.
muscle testing was also found to be 100% under operator control in all tests and thus was not measuring
the patient’s body but measuring the therapist’s intent. Many claims were not supported with research or
with clinical evidence. There were many charlatans selling illegal even complete bogus fraudulent devices
with exorbitant claims. Certain Russian devices and others were found to be completely deceptive shams
and doctors have lost their license using them.

Recently the regulatory bodies have been intruding to make the energetic medicine people put up the
evidence to support their claims. We at SCIO have done so. We now have a CE stamp of approval for our
CE mark and this paper is about the claims we and you can make in print or elsewhere. Congratulations
everyone, energetic medicine is saved. We have made the studies correctly, found the literature evidence,
and compiled the dossier to support the claims we make. By surveying the world’s best literature on all
electrical medical data we complied. And we made the CE evaluation to make our device legal for sale
around the world.

There are about 100 trillion cells in the human body and another 50 trillion microorganisms in the gut.
All of these cells are in communication with each other and the master regulator the Brain. The cells
communicate via signals of

• Electro-Magnetic Radiation  EMR  (that is Photons and only the photons touch things), this is
mitogenic radiation and infrared body heat which also can transmit information
• electro-magnetic-static free electrons, or free protons (electricity)
• intra-cellular ionic charged particles, (sodium and potassium channel Pump of neurons)
• extra-cellular ionic charged particle, osmosis regulation, water circulation
• large molecular paramagnetic substance like enzymes and hormones
• Blood flow of Oxygen and nutrients in and Carbon Dioxide and excrement out.
• The vibrations or cycles of each of these transfers is the frequency of operation

A FEW STRESS RELATED DISEASES
1. Acid Peptic Disease
2. Alcoholism
3. Asthma
4. Fatigue
5. Tension Headache
6. Hypertension
7. Insomnia
8. Irritable Bowel Syndrome
9. Ischemic Heart Disease
10. Psychoneuroses
11. Sexual Dysfunction
12. Skin diseases like Psoriasis, Lichen planus, Urticaria, Pruritus, Neurodermatitis etc.
13. High Blood Pressure
• Ischemic Heart Disease
• Peptic Ulcer
• Irritable Bowel Syndrome
• Asthma
• Tension Headache
• Psychoneuroses
• Fatigue
• Insomnia
• Sexual Dysfunction
• Alcoholism
• Smoking
• Skin Diseases like Psoriasis, Urticaria, Neurodermatitis, Pruritus etc (List incomplete)

In Fact all disease is associated with or aggravated by stress. We now know that the electro-stress is increasing. The SCIO balances the body to better deal with Electro Smoke or Electro-Stress. See electro smoke paper. Ease of flow of information is health. Stressors deregulate the flow and produce Dis-Ease, Dys-Ease disease. Disease is problems with the flow of health. See the causes of disease in the IMUNE Literature. The Brain receives Photonic, Electrical, and Chemical information from all of the cells of the body, to regulate all of the body processes.

With the DNA of 100 trillion (100,000,000,000,000) cells sending information to all of the Brain, it is an overwhelming task of the Body Electric.

There are over 100 billion neurons in the Brain.

There are approximately 10,000 cellular Operations Happening every second.

This means there is 10 to the 18th bits of information going to the brain every second, but the Reticular Activating System (RAS Word Brain) can only handle 1 million bits of Data a second or it is overloaded.
The CNS (Central Nervous System) receives feedback from the body's organs and systems, adjusting the body's functions to maintain homeostasis. This feedback loop involves the autonomic nervous system (ANS), which controls involuntary functions such as heart rate, breathing, and digestion. The ANS is divided into the sympathetic and parasympathetic nervous systems, which work together to regulate bodily functions.

With a Cybernetic BioFeedback Loop, the SCIO (Schrödinger's Cat and the Internet) can measure and treat various physiological parameters, including skin resistance (GSR), heart rate, and muscle activity. This technology integrates modern electro-autonomic nerve (EAN) regulation with body electric healing, to restore balance and support the body's natural healing processes.

The SCIO can measure and treat conditions such as pain, trauma, and emotional states, offering a holistic approach to health and wellness. It combines electro-active techniques with software algorithms to provide personalized feedback and treatment.

This system is designed to complement existing medical practices, offering a non-invasive and non-pharmaceutical solution for managing health and well-being. It is user-friendly and accessible, allowing individuals to monitor and manage their health at home or in a professional setting.

In summary, the SCIO represents a cutting-edge technology that integrates advanced neuroscience with modern therapeutic methods, aiming to enhance the body's natural healing capabilities and improve overall health and quality of life.
So the word area is getting one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of one percent of the information of life. We need to measure the body electric to determine health.

Verbal lack of symptoms is inadequate. You can be really sick and not know it verbally. But your body electric knows all of the processes right down to the electron.

The SCIO measure the Body Electric variables of voltage, amperage, resistance, hydration, oxidation, Ph and the oscillations of each of the electrical factors in the body. These oscillations make up some of the standard biofeedback measures.

The SCIO can measure the Brain wave (EEG), heart electric (ECG), muscles (EMG), Skin Resistance (GSR) and measure global and quadrant body voltage, amperage, resistance, hydration, oxidation, and Ph. EEG, EMG, ECG all involve oscillations. GSR or skin resistance does not involve oscillation. Resistance is measured without regular patterns of oscillation. This is one of the failures of the Voll and point probe devices.

The SCIO can treat Pain (MENS), Trauma (EWH), Emotions (MCES), and Reactivity (TVEP).

Research has shown that when you apply an electrical impulses of a certain nature to tissue you can electrically treat pain, increase osmosis, speed up healing, measure reactivity, correct brain wave, treat emotional disturbances like addiction insomnia, anxiety, increase intellectual thinking and help learning disabilities. This and many more is shown in the literature and registered with the FDA as treatment devices.

When these therapies listed above are coupled with a cybernetic feedback loop where we can automatically adjust the pulses in strength, duration, speed, or wave form, we get a superior technology. The electrophysiological feedback Xrroid then results. A technology registered around the world for over two decades. Safe and effective energetic medicine now available.

With a Cybernetic BioFeedBack Loop of Measure, Treat, Re-measure, Retreat the SCIO can Repair the Body Electric

With Modern Electro-Auto-Focused Feedback the SCIO stimulates Osmosis, Healing, Thinking, and Nerve and Body Electric regulation.
measures

- Vols and Oscillations (EMG, EEG)
- Amps and Oscillations (ECG)
- Resistance (GSR)
- Hydration
- Oxidation (Redox potential)
- pH acid vs alkalinity
- Reactivity evoked potential to conductometric fields of substances (TVEP) over 228,000 measures a second of these energetic factors

treats

- Brain wave and emotions with (MCES)
- Pain with (MENS) (TENS)
- Trauma or wounds (EWH)
- Electro Weakness pH, Redox disorder (VARHOPE Correction)
- Trickle charge the body electric

All designed to detect + reduce Electro-stress and Balanace the Body Electric Automatically
Treat Attention Deficit Disorder + ADHD with SCIO for non-drug relief of insomnia, rage, clinical depression, general addiction.

The SCIO has a two decade history of safety, efficacy, and revolutionary challenges to the dominance of the drug companies, but the science of the body electric and Neuro-Electro-Physiological-Xrroid Biofeedback has come of age.
Leonardo Divinci was a cross dresser with man and woman characteristics of beauty, grace, science and art. He is an example of eccentricities in Genius. The male and female mind when combined and set free can see truth and see reality where more rigid minds are blind.

It was Genius to take Behavior Medicine, Life Style, Electro-Acupuncture, Homeopathy, Herbal Medicine, Homotoxicology, Blood Analysis, and all of Natural Medicine and combine it all in one Energetic Medicine device. Theorize it, Research it, Build it, Register it and do clinical evaluation of it for the last 30 years. True Genius, perseverance, steadfast dedication, vision, and enthusiasm.

There is more published research in peer reviewed medical journals on the SCIO than any other such device in history. There have been over 30,000 sold worldwide. Now how does a system like this get
registered researched and have a history for over 20 years without you knowing? Easy the competitors do
not want you to know about it, so they lie and make up slander and liable about the developer to deter
you. They try to distract you with stories about the genius behind the device rather than talk about the
device itself. Slander lies and innuendos about the developer are used to keep you unaware of the actions
of the SCIO.

The drug companies got angry when I proved that the SiNthetic medications are incompatible with the
human. We all know about the side effects and nobody trusts the drug companies anymore. The muscle
testers and the point probe people got angry when I proved that they were not measuring the patient, but
they controlled the result with changes in pressure on a muscle and speed of delivery of the point probe.
They all made up lies about me and got the regulators to attack me. This was then used to stop doctors
from listening to the truth. Stop you from looking into the SCIO.

There are conferences every year on alternative medicine. They plead for science and scientific studies.
We have over a hundred, but we are never asked to come to deliver a paper. One man said we cannot
ask Nelson to come because he spoils our party. He tells us what the law is, and he points out that we
do not comply with the law. He points out what real science is, and how many of our devices are very
unscientific. His devices use science and all comply with laws and regulations and if we invite him to speak
we can’t sell our outlaw devices, so he spoils our party. So we don’t invite him.

Energetic medicine has become more of a struggle to sell devices than a medical concern. Few of the
companies can comply and they make outrageous claims. Few even understand the body electric at
all. Now when companies are attacked by the authorities to prove everything the companies claim it is
important for us to understand the body electric and not just make speculative anecdotal claims. The CE
mark and full outline of what our SCIO device does, the legal claims are at the end of this discussion. We
have beaten back the regulatory wolves till the next round of whiney rumors from the sham competitors.

Now I am ready to help you get out the word on the SCIO and energetic medicine. Please let us organize
some meetings with the experts and leading doctors in the field of natural medicine to let them see the
new leading technology and the future of energetic medicine. Let us put the excuses of my eccentricities
aside and meet to talk about truth and science not about rumors or lies. I am available for you to set a
pace into the future of medicine.

Sincerely Desiré Dübouneet

These are just some of the certificates we need to make and sell a medical device in Europe.

These are just some of the certificates we need to make and sell a medical device in Europe.
Certificate

Hungarian Institute for Testing and Certification of Electrical Equipment Ltd (MEEI Kft.)

hereby certifies that

MAITREYA Hungary Ltd.
Kálvária tér 2.
1089 Budapest
Hungary

Place of the audit: H-1089, BUDAPEST Kálvária tér 2.

established and applies a quality system for the following scope:
Design/development, manufacturing, distribution and servicing of Universal Electrophysiological Biofeedback System

Compliance with the requirements of

EN ISO 9001:2008

This certification is subject to regular surveillance audits.

Registration no.: MQ 692490700001
Audit report no.: 2820466 001

Validity of certificate:
from 2019.02.23 to 2021.02.23

Budapest, 2019.02.23

Zoltán Ambrus MD

Certifier

MEEI Kft. – TÜV Rheinland Group – H-1132 Budapest, Váci út 48/a-b
Tel.: (+36) 1.288-416 Fax: (+36) 1.288-409 e-mail: meei@tuev.com http://www.tuev.com/meei/

Certificate

The Certification Body of
MEEI Kft. – Member of TÜV Rheinland Group

hereby certifies that the company

MAITREYA Hungary Ltd.
Kálvária tér 2.
1089 Budapest
Hungary

has established and applies a quality management system for medical devices for the following scope:
Design/development, manufacturing, distribution and servicing of Universal Electrophysiological Biofeedback System

Compliance with the requirements specified in


This certificate is valid until:
2015-02-22

Budapest, 2015-02-23

Zoltán Ambrus MD

Certifier

MEEI Kft. – member of TÜV Rheinland Group – H-1132 Budapest, Váci út 48/A-B
Tel.: (+36) 1.288-416 Fax: (+36) 1.288-409 e-mail: meei@tuev.com http://www.tuev.com/meei/
Niels Bohr
Albert Einstein
Desire’ Dubounet
the debate goes on...
This micro-current input pulse can have many secondary uses, such as wound or trauma repair, transcutaneous electro nerve stimulation for pain reduction, cranial electro-therapy stimulation, transcutaneous voltammetric evoked potential, charge stability of positive versus negative potential for acidity alkalinity balance, and bio-electrical impedance measurements of body liquids and electrolyte strength for hydration and oxidation indexes. Thus our system has universal electro physiological for decades.

The micro-current pulse and the device design guarantees safety. All devices have a TUF safety registration and pass all required safety tests. No reports of any significant risk have ever been reported. The results of the risk analysis show complete safety and only a slight possibility of an insignificant risk. It is our theory that the body responds best to interactions that are near to the electro-potentials of the body. So our device calibrates to the patient electro-potential during interaction. The literature has a vast arena of electrical interface equipment, many and most with micro current applications. The registered devices number in the thousands. Each with subtle individualistic variations on a theme. Each with the personality of the developer ingrained in its use. Our device is indeed substantially equivalent to these other registered units with some slight variance on the collective themes. Devices are not required to be exactly equivalent but substantially equivalent. Some of our more modern advancements are such variations on previous technology.

To provide a more complete but not exhaustive clinical evaluation we need to break down the literature into key areas of literature and clinical review. These include the following:

1. Stress reduction and Stress Questionnaire
2. EEG brain wave stress reduction, Cranial electrotherapy
3. 3 pole EKG simple heart awareness stress reduction
4. EMG simple reeducation of muscles
5. Trauma or wound healing and electro osmosis
6. Transcutaneous electro nerve stimulation for pain reduction
7. Transcutaneous voltammetric evoked potential
8. Voltammetric Charge stability of positive versus negative potential for acidity alkalinity balance, and bio-electrical impedance measurements of body liquids and electrolyte strength for hydration and oxidation indexes
9. Temperature feedback for circulatory balance etc.

1. Stress reduction and Stress Questionnaire

The work of the Canadian genius medical doctor Hans Selye, has shown the world the pervasive and comprehensive effects of stress on the body. Stress and stressors weaken the body's immune system and generally weaken the whole defense system, thus the genetic or systemic weak link of the body will give out first from continued stress. Reducing stressors helps all diseases. Our system uses a health questionnaire to assay behavior or lifestyle stressors and to educate the client to reduce the stress burden.

2. EEG

Our Scio device measures a simple EEG brain wave designed for relaxation biofeedback training. The device interacts with the CNS of the patient in a cybernetic feedback loop to reduce stress, increase body and brain awareness. There are many substantially equivalent devices on the market with this capacity. Our clinical studies and a brief literature review are in this section.

3. 3 pole ECG simple heart awareness stress reduction

Our Scio device measures a simple 3 pole ECG designed for relaxation biofeedback training. The device interacts with the CNS of the patient in a cybernetic feedback loop to reduce stress, increase body and brain awareness. There are many substantially equivalent devices on the market with this capacity. Our clinical studies and a brief literature review are in this section.

4. EMG simple reeducation or relaxation of muscles

Our Scio device measures a simple EMG wave designed for relaxation biofeedback training. The device interacts with the CNS of the patient in a cybernetic feedback loop to reduce stress, increase body and brain awareness. There are many substantially equivalent devices on the market with this capacity. Our clinical studies and a brief literature review are in this section.

5. Trauma or wound healing
The body has its own bio-electric system. This system influences wound healing by attracting the cells of repair, changing cell membrane permeability, enhancing cellular secretion through cell membranes and orientating cell structures. A current termed the “current of injury” is generated between the skin and inner tissues when there is a trauma in the tissues. The current will continue until the tissue defect is repaired. Healing of the injured tissue is arrested or will be incomplete if these currents no longer flow while the wound is open. An electrolyte rich wound environment is required for the bio-electric system to function. A rationale for applying electrical stimulation is that it mimics or intensifies the natural current of injury and will jump start or accelerate the wound healing process. Electrical stimulation is defined as the use of an electrical current to transfer energy to traumatized tissue. The type of electricity that is transferred is controlled by the electrical source the SCIO to accepted safety standards. (AHCPR 94). Capacitatively coupled electrical stimulation involves the transfer of electric current through an applied surface electrode pad that is in electrolytic contact (capacitatively coupled) with the external skin surface and/or wound bed. When capacitatively coupled electrical stimulation is used, two electrodes are required to complete the electric circuit. Electrodes are placed on the wrists ankles and forehead; they can be moved to other locations if desired, or over conductive medium, in the wound bed and on the skin a distance away from the traumatized tissues.

6. Transcutaneous electro nerveal stimulation for pain reduction

TENS is a non-invasive, safe method to reduce pain, both acute and chronic. A number of systematic reviews or meta-analyses have confirmed its effectiveness for postoperative pain, osteoarthritis, and chronic musculoskeletal pain. Recent clinical studies and meta-analysis suggest that using adequate intensity of stimulation is necessary to obtain analgesia with TENS.

Basic science studies show that high and low frequency TENS produce their effects by activation of opioid receptors in the central nervous system. Specifically, high frequency TENS activates delta-opioid receptors both in the spinal cord and supraspinally (in the medulla) while low frequency TENS activates mu-opioid receptors both in the spinal cord and supraspinally. Further high frequency TENS reduces excitation of central neurons that transmit nociceptive information, reduces release of excitatory neurotransmitters glutamate and increases the release of inhibitory neurotransmitters (GABA) in the spinal cord, and activates muscarinic receptors centrally to produce analgesia (in effect, temporarily blocking the pain gate). Low frequency TENS also releases serotonin and activates serotonin receptors in the spinal cord, releases GABA, and activates muscarinic receptors to reduce excitability of nociceptive neurons in the spinal cord The Scio develops a TENS micro-current pulse for pain control.

There is very limited results reported from the direct device use and more substantial therapies are recommended if results are not forthcoming. There are many substantially equivalent devices on the market with this capacity. Our clinical studies and a brief literature review are in this section.

7. Transcutaneous voltammetric evoked potential

Everything is made of Atoms. Atoms all have Protons and possibly Neutrons in the center with Electrons around the outer border. The Electrons never touch each other because of the large Electrical-Magnetic-Static Charge they have that repel each other. Atoms join to make Molecules by the need to fill the outer Quantic Valen Shell. If they have low energy electrons in the outer shell they make simple IONIC bonds such as in the Mineral Kingdom. The Electrons of each atom making up a Molecule never touch each other because they repel each other. Plants take in light Photons and through Photosynthesis they get electrons to higher energy states that then make Co-Valent or Sigma bonds. The Electrons of each atom making up a Molecule never touch each other because they repel each other. What holds together the atoms and the molecules are Quantic Valen Attraction forces and Electro-Magnetic-Static fields?

There is undeniably unarguably an energetic field around all Atoms and Molecules. All Molecules interact with each other through their fields. The outer Electrons never touch, they repel each other. All of biology is a study in field interaction. This is a basic scientific fact Voltammetry (Electro-Analytical-Chemistry) is the study the nature of the field of a substance and the shape of the interactive field. This is a basic universally accepted form of science. 8. Global Voltammetric Charge stability of positive versus negative potential for acidity alkalinity balance, and bio-electrical impedance measurements of body liquids and electrolyte strength for hydration and oxidation indexes. The SCIO can measure voltage, amperage, skin resistance and oscillations of same. There are norms of these values that can be assayed and normalized through CNS biofeedback interaction.

9. Temperature Biofeedback

Our Seio device measures temperature to one hundredth of degree accuracy at the wrists ankles, and forehead, designed for relaxation biofeedback training. The device interacts with the CNS of patient in a cybernetic feedback loop to reduce stress, increase body and brain awareness. There are many substantially equivalent devices on the market with this capacity. Our clinical studies and a brief literature review are in this section.
In Summary

Each cell exists because an electro-potential exists across the membrane. The collective electro-potentials of the cells of the body create other electric signals. The base electro-measures of the body are voltammetric, resistance and oscillations of same. Virtual and mathematical calculations can then be made from these data.

Signals such as EEG, ECG, EMG, and GSR are measured in global and quadrant fashion by the SCIO. These are biofeedback modalities used to interact with the patient's CNS for stress reduction. Selye has proved that stress reduction can have universal benefits for the client. Stress reduction and lifestyle education is the primary function of the SCIO. Application of a voltammetric signal is necessary for measuring skin resistance. This application of a voltammetric signal has secondary but important benefits. Benefits like osmosis stimulation, oxidation, TENS for pain, TVEP, Trauma repair, Cranial electro-therapy and others. When included in a CNS cybernetic loop the SCIO system can help to stimulate and encourage stress reduction and muscle re-education through a voltammetric interaction. A marriage of biofeedback and safe micro-current electro-therapy.

Over two decades of research, clinical use, worldwide sales of over 25,000, with over an estimated 250,000,000 patient visits and not one significant risk recorded. This proves the safety as well as our risk analysis. With over 100 articles in peer reviewed journals of the efficacy of the device in various settings and conditions, the clinical evaluation is extensive.

DISCLAIMER: (attached to all systems)

**Electro Physiological Feedback Xrroid System EPFX SCIO**

This system is to be used as a Biofeedback multimedia system. It is designed for stress detection and stress reduction. The device does not diagnose any disease other than stress. Stress can come from many sources. This system uses many multimedia treatments to treat stress through the Central Nervous System interaction. This device also measures patients’ Electrophysiological reactivity, which is another representation of stress. Reactivity scores are not to be used as diagnostic criteria, nor is the biofeedback instrument to be used solely as medically decisive criteria. Please use this device for stress reduction and refer any questionable problem to qualified medical staff.

Only a licensed diagnostic practitioner can diagnose a patient not a device. The sensitivity is set so fine as to pick up the earliest sign of stress and distress. Thus the results might be below the client recognition. The readings should be evaluated by trained staff. Use additional tests or referrals for further clarity. No claims other that Biofeedback Stress detection and treatment are made of the system or results.

**Atoms** all have Protons and possibly Neutrons in the center with Electrons around the large Electrical-Magnetic-Static Charge they have that repel each other.

Atoms join to make Molecules by the need to fill the Outer Quantic Valant Shell. If they have low energy electrons in the outer shell they make simple IONIC bonds such as the Mineral Kingdom. The Electrons of each atom making up a Molecule never touch each other because they repel each other.

What holds together the atoms and the molecules are Quantic Valant Attraction forces and Electro-Magnetic-Static fields. There is undeniable coagulability of an energetic field around all Atoms and Molecules.

All Molecules interact with each other through their fields. The outer Electrons never touch, they repel to each other.

All of biology is a study in field interaction. This is a basic scientific fact.

Voltammetry Electro-Analytical-Chemistry is the study of the nature of the field of a substance and the shape of the interactive field.

Field lines of the van der Waals force between two atoms or molecules.

The van der Waals force usually causes things to stick; the force is attractive; and it acts only across short ranges.

**Ionic Weak Bond**

NaCl

**Stronger Co-Valent**

Sigma Bond

Empty space is not empty, but is filled with the quantum vacuum, with endless virtual processes. The energy of the quantum vacuum, the zero-point energy is infinite according to our present theories. Clearly, this infinity is an artifact - it would make the electromagnetic field infinitely massive, because energy and mass are related according to Einstein's E=mc². The empty electromagnetic field would collapse under the weight of its own gravity. Some unknown mechanism beyond quantum electromagnetism must regulate the infinity of the electromagnetic vacuum energy. Nevertheless, the zero-point energy results in perfectly stable and experimentally confirmed facts, for example the Cosmic force.
Chapter 7 - The Basic Truth

So as we can see there is a profound science of energetic medicine. It is not only undeniable but it is more logical, analytical, clear, cogent, coherent, commonsensical, compelling, congruent, consequent, consistent, convincing, deducible, discerning, discriminating, intelligent, judicious, and functional medicine. It is truly a modern medicine. It is truly more intelligent than synthetic chemistry and allopathy. These two medical ways are archaic, dysfunctional, debilitated, decayed, defective, deteriorated, flawed, inhibited, maladjusted and very expensive.

The basic truth is that we do not have a health care system. We have a disease care system that does not make any body better. Nobody gets healthier or more well from a doctor visit. They just get symptom treatment of reductionistic old style medical synthetic drug and surgery opinion.

The American Medical Association has criticized its own medical philosophy. By their own admission the accuracy of a medical diagnosis is less than 35% accurate. And yet 85% of the trillions of dollars spent on medicine each year are spent on inaccurate, reductionistic, counterproductive, and archaic diagnosis. Doctors are intellectually bullied to participate in an impractical, incompetent, ineffective system. A reductionistic diagnosis with little if any appreciation for diet and lifestyle is incomplete in a fractal complex system. Every client has intricate subtle complex multiple concerns that make up his case not just a single diagnosis. The insurance companies only pay with a reductionistic diagnosis. Insurance does not pay to get people healthier. The whole system’s philosophical base is archaic, dysfunctional, debilitated, decayed, defective, deteriorated, flawed, inhibited, unintelligent and maladjusted. The current system makes money first, perpetuates false beliefs and the egos that go with them second, and makes dependencies on drugs third, rather than any type of wellness. The FDA and the AMA allows the two biggest killers to continue shop. Tobacco and synthetic pharmaceuticals kill millions. Big white dextrose sugar and trans or bad fatty acids kill as much if not more. The amount of disease made by Big Tobacco, Big Pharmaceuticals, Big white dextrose sugar and Trans or bad fatty acids, is immeasurable. Not only do they kill they injure people and burden the society with an incredible health care burden.

The FDA and the AMA turn a blind eye to the Big money killers and attack energetic medicine. Engineers, doctors, scientists, technicians of true health care who step out of line to oppose these killers are attacked by small minded petty regulators. The FDA, AMA and others are just the junk yard dog of Big money killers, who value profit over people. The FDA works to protect the Big Profits of the Big Money Killers.

We have made our Doctorate of Wellness course to help technicians and doctors learn how to increase
wellness, teaching people how to make patients better. Using simple safe legal biofeedback, nutrition, stress reduction, exercise consultation to help people to get better. The practice of medicine is diagnosing a disease and treating it. What we teach is how diagnose wellness and increase it. How to make people well.

People will comment on the need for literature. We have in the large DVD of the Neomorphues a list of references. The SCIO system has hundreds of studies. There was one large scale study just under 100,000 patients. Published in Internationally recognized peer reviewed medical journals, the studies validate the safety and effectiveness of the SCIO. These references appear in the DVD. We have reviewed the literature on stress reduction, voltammetry, energetic medicine, homeopathy, biofeedback, cranial electrical stimulation, TENS, body micro-current stimulation, failure of the FDA, and many other areas. The list of total references is very large. But we have put the top couple of thousand for you to see the immensity of this new way of seeing medicine, a new medicine, a modern medicine, a true health care.

If the FDA was truly able to regulate the Big money killers and a new health care come out. Doctors freed from the chains of the drug companies and insurance companies to help people to get healthier. Better education on Wellness, nutrition, exercise, meditation, and health all to help our society lower the costs of medicine and make people healthier. Wellness is a new word bandied about like rain these days. Wellness hotels, wellness restaurants, wellness shoes, etc are all the new rage. So a doctor in Wellness course should help people learn new way about this new art. For a partial list of articles on the topics, please go to the Collection of Viable Science folder on the Neomorphues DVD.
Chapter 8 - The Scientific Proof of Non-Locality

edited by Desiré Dubounet  Prof. Emeritus IMUNE

The Einstein-Podolsky-Rosen Paradox and Bell's Theorem

"It is an illusion we are all separate, the universe at one mathematical level is still one. It is our job as humans to expand our circle of compassion to include all things."

"One can escape from this conclusion only by either assuming that the measurement of B (telepathically) changes the real situation at G or by denying independent real situations as such to things which are spatially separated from each other. Both alternatives appear to me entirely unacceptable. Non-Locality is an ever increasingly undeniable aspect of science."

Albert Einstein

"There is no such thing as noise, but only quantic shared information we do not understand. Such is the Nature of the universe that there is a shared subspace dimension of all regular matter that generates non-locality."

"The universe at one mathematical subspace level is still one. It is our job as humans to expand our circle of compassion to include all things, and our circle of compassion must begin with ourselves. We must learn to forgive ourselves, forgive others, and forgive God before we can expand our minds through expansion of our compassion."

William Nelson

In our movie and treatise on the PROOF, we established 8 steps of proof for the non-local universe. Here they are again. Bell's theorem is but just #5.

Proof of the Powers of the Mind

The most important argument in the world of science today is the clash between the people that believe in a Non-Local Universe versus those that believe in a Local Universe.

Local people believe in the direct push pull, cause and effect action, and they do not believe in the power of the mind to effect things at a distance without a direct connection. They look for repeatability and worship statistics.

Non-Local believers see a universe where there is prayer, spirit, a collective unconscious and a connection of all things. They know that there is a power of the mind to effect things and a level of connection of all things.

The Steps of the Proof are:

Step 1. The test of time: Humans have always felt the connection of mind and spirit. Every race of people and every tribe have had those who have greater abilities to use these powers of the mind. They know that there is a subtle but undeniable force of connection.

The Bible, Koran, Bagavad Gita, the analects, and all of the religious beliefs are filled with every page referencing the power of spirit, prayer, faith, hope and God.

This belief is Ageless, Universal, and Omnipresent. The test of time is met and if we had a vote on the conflict of Non-Local versus Local there would be landslide 99.9% for a Non-Local universe.

Step 2. Quantum Theory: Physicists were shocked when they found that a very small quantic experiment could be influenced by the observer. This was called the observer effect and thus the world of science was changed forever when the Observer Effect was PROVED!!!!.

Step 3. Medicine's Paranoiac need for Double Blind: Medicine was shocked when they discovered the placebo effect. The mind of the researcher was able to affect the results of an experiment. The mind of a doctor can affect the patient. The mind of a patient can affect himself. From then on a double blind experiment was required. Proof of the powers of the mind.

Step 4. Fractal Complexity: What we do not know is so vast that it should be humbling. Fractal complexity has shown that reductionism is now no longer a valid process of examining complex situations. Non-Linear chaos mathematics is needed. When we use this type of analysis we can see that a small change might produce a large change. This is known as the ‘Butterfly Effect’ and it allows for the powers of the mind.

Step 5. Bell's Theorem: This basic theorem of Quantum Electro Dynamics has shown that twin photons can have instantaneous effects on each other even when light years apart. This has been PROVED theoretically and experimentally to the utmost level of science.

Step 6. PEAR = Princeton's Engineering Anomalies Research: After over a decade of research on the effects of the mind in a prestigious American university Princeton, there is undeniable proof of the power of the mind to effect things. The evidence is astounding for it's quality and quantity and is without doubt PROOF. See the PEAR studies.
Step 7. The disbelievers always get test results that deny the proof: The hypothesis of our theory is that the mind can affect things. This means that those who disbelieve or scoff at the theory will only be able to get test results that confirm their own disbelief. Why is it that when a researcher does a study that it usually confirms his original belief is because there is an effect of the mind.

Step 8. The resistance to accepting the powers of the mind is great; in fact it is too great. The resistance is so incredibly great that it becomes PROOF: There appears that this resistance comes from such closed minded people and often psychologically unstable people. These critics will often shake and flush and get over compassionate in their attempt to dispel the powers of the mind. Their actions and reactions are so contrived and insecure that they cause wonder that perhaps there is an ulterior motive. Is there perhaps a plan to keep the powers of the mind away from the general public?

This study will now more fully discuss Bell’s Theorem.

The basis of Bell’s theorem is this: if no local model of reality can explain the results of any particular experiment: then reality is non-local, if there is non-locality anywhere then there is some non-locality everywhere. To prove that white crows exist we only have to produce one white crow. All of the black crows are not proof that white crows do not exist. All we need is one with non-locality it is even more of the same, because if there is non-locality somewhere then there is some non-locality everywhere. Just how much is the part of the mystery of life?

Before we study what "non-locality" means, let's take a look at this particular experiment, called the EPR experiment (Einstein-Podolsky-Rosen Paradox), which is the factual basis for Bell’s fantastic result. Like so many other innovations in twentieth-century physics, the EPR experiment was conceived by Albert Einstein.

Although he helped put it together, Einstein was never satisfied with quantum theory. He didn't like its intrinsic randomness ("I cannot believe that God plays dice with the universe"), but most of all he disliked the fact that quantum theory (as interpreted by Bohr and Heisenberg) implies that reality is observer-created. "I cannot imagine," Einstein once said, but as Nelson has said "What if God is the Dice? What if God is in the indeterminacy? Could this indeterminacy be the subspace? Could God be the subspace glue that penetrates the essence of the universe? Answer to all: Yes"

"That a mouse could drastically change the universe by merely looking at it." Einstein accused Bohr and Heisenberg of attempting to restore man (and mouse) to the center of the cosmos from which Copernicus had ousted them nearly five hundred years ago. "The belief in an external world independent of the perceiving subject," Einstein maintained, "is the basis of all natural science." But men (and mouse) are the center of their own cosmos, relativity revisited, or at least the maximum twist of relativity.

Bohr responded by comparing Einstein to the critics of his own relativity theory. He pointed out that thanks to Einstein’s work, physicists have come to realize that space and time are not absolute but relative to an observer’s state of motion. In quantum theory we simply take this way of thinking one step further and recognize that reality itself (or at least its dynamic attributes) is also observer-dependent. Why did Einstein find it so difficult, Bohr wondered, to accept this natural extension of his own ideas?

"A good joke should not be repeated twice," Einstein quipped.

Niels Bohr and Albert Einstein debated the quantum reality question for as long as they lived: Einstein failed in his attempts to assault quantum theory head on, and reluctantly agreed with Bohr that
quantum theory describes correctly all presently conceivable experiments - a conclusion that remains uncontested today. Einstein resorted instead to criticizing quantum theory on the grounds that it is incomplete.

Quantum theory may be sufficient to explain experiments, Einstein confessed, but experiments are only part of what goes on in the world. Because quantum theory makes only statistical predictions, it cannot help but leave out certain "elements of reality" which a more adequate theory of the world must include.

Niels Bohr, on the other hand, claimed that although quantum theory does give only statistical predictions, it is still complete. Quantum theory's indefiniteness is a virtue, not a weakness, because it corresponds to an indefiniteness that actually exists in the world. It is foolish to seek a precise description of an imprecise world; such misplaced precision is bound to miss the mark.

Einstein put forth his best argument for quantum theory's incompleteness in the form of a thought experiment involving two correlated quons. He devised this experiment at Princeton in 1935 with the help of two American physicists: Boris Podolsky, originally from southern Russia, and Brooklyn-born Nathan Rosen. The original Einstein, Podolsky, and Rosen (EPR) experiment concerned two momentum-correlated electrons, but physicists today repeat EPR's argument using David Bohm's conceptually simpler experiment involving two polarization-correlated photons.

If we compare a light beam to a series of balls (photons) thrown by a baseball pitcher. The two-valued photon polarization attribute was compared to a batter holding his bat at a certain angle 0 and getting either a hit or a miss. In the laboratory, photon polarization is measured with a calcite crystal which splits a light beam into up and down channels depending on whether its photons are polarized along or across the calcite's optic axis.

The EPR experiment is only slightly more complicated than this two-man ball game. The EPR source emits pairs of photons (Green and Blue) which travel in opposite directions to two distant detectors (also labeled Green and Blue) where their polarization $P(\theta)$ at a particular angle 0 can be measured. To visualize this EPR arrangement we imagine a pitcher who throws two balls at a time. First he throws a Green ball to home plate; then, without breaking rhythm, he turns and fires a Blue ball to second base where a second batter is waiting.

As in the previous game, the batters at home and at second can each measure the "polarization" of the baseball by holding their bats at a particular angle. A hit shows the ball to be polarized at the bat angle; a miss means polarization at right angles to the bat.

The pitcher fires off a pair of balls, rests for a moment, then throws another pair. For each pair of balls, the Green player measures his Green ball's polarization at some Green angle, while the Blue player measures her Blue ball's polarization at some Blue angle. To understand the EPR experiment, it's not necessary actually to know what polarization really is - what polarization "really is" is a mystery to physicists too - but only the particular results of each pair of polarization measurements. Encoded in the pattern of these results is the gist of the EPR paradox as well as the core of Bell's theorem.

The EPR photon pairs are pitched in a special way; they come out of the light source in a particular phase-entangled state called the "state of parallel polarization." Because their phases are entangled with each other, each photon's phase depends on what the other photon is doing. Consequently, neither photon by itself is represented by a definite waveform; hence (according to quantum theory) neither photon possesses a definite polarization.

Observationally, not possessing a definite polarization means that no measurement of polarization will always give the same result. In fact, for this particular two-photon state the Green light and the Blue light are completely unpolarized - the maximum indefiniteness possible for a two-valued attribute. For each photon at any angle 0, a polarization measurement $P(\theta)$ gives 50 percent up/50 percent down, results which occur at random, like flipping a coin.

Although each photon by itself does not possess a definite proxy wave, the two-photon state as a whole is represented by a definite wave, which means that certain two-particle attributes (which belong to the Green and Blue photon together) have a definite value. For photons in the state of parallel polarization, one such definite attribute is the photons' paired polarization.

To measure paired polarization $PP_*$ at a particular angle 0, set both Green and Blue calcites at the same angle $\theta$ and look at their polarization values (up or down). Like polarization itself, the PP attribute can take two possible values: either both photons have the same P (match) or they have opposite P (miss).

Both quantum theory and quantum fact agree that for photons in the parallel polarization state, $PP(\theta)$ at all angles 0, always has the same value, namely match. This means that if you measure the Green polarization at angle 0 and the Blue polarization at the same angle, both polarizations are always the same. Furthermore the $P$ of $C$ will be the same as the $P$ of $B$ no matter how far apart the photons fly or which polarization happens to be measured first. For instance, you can measure the polarization of the Green photon immediately after it leaves the source and measure the Blue photon a year later (when it is one light year away from its source): the polarizations of both photons will be identical.

According to quantum theory, in the state of parallel polarization each photon by itself has no definite $P$. However, the $PP_*$ of $C$ and $B$ together is definite: it's match in every direction. The polarization attributes
of unmeasured photons in this state resemble the attributes of identical twins before conception. Each twin's attributes (sex, hair color, and so forth) are undecided but the status of their paired attributes is already known: the same for both. For this reason I call the state of parallel subspace polarization "the twin state."

In terms of the two baseball players, the results of a long series of plays against a pitcher who always throws pairs of balls in the twin state is this:

- I. At no matter what angle $\phi$ either player holds the bat, he/she always gets a 50-50 mixture of hits and misses;
- II. If both players agree beforehand to hold their bats at the same angle (I call this move "measuring the PPO attribute), whatever happens to one player’s ball (hit or miss) also happens to the other player’s ball.
- III. Shared subspace interaction allows for a non-locality, "what God hath joined together let no man set apart"

Quantum Theory as a partial or complete description of reality

"Obstacles occur only in the Mind" - Helen Keller

One difference between human twins and a pair of photons in the twin state is that before conception the human twins are nonexistent, while before measurement the photons already exist. We know that they were emitted at a certain time from their source and are traveling with a certain velocity toward their respective detectors.

For a pair of photons in the twin state, Einstein asked the question, "Is the P of photon G, after it's emitted but before it's actually measured, truly indefinite as Bohr's interpretation of quantum theory requires, or is it, like identical twins in the womb, really definite but unknown?" In other words, "Is our uncertainty concerning the unobserved polarizations a matter of quantum or classical ignorance?"

According to Bohr, the P of photon C does not even exist before we measure it. G's so-called attributes belong not to the photon itself but reside partly in "the entire experimental arrangement." Like the position of a rainbow, polarization is a relational attribute and does not come into existence until Green observer decides how he will deploy his apparatus at location G (and possibly elsewhere as well). It is nonsense to suppose that before a measurement, photon G has some definite polarization. Einstein argues that, on the contrary, not only does photon G have a definite P in some direction; it has a definite P in every direction.

To dramatize the difference between Bohr and Einstein, let's imagine that Blue player moves closer to the mound so that she gets her Blue ball before Green player gets his. Suppose she holds her bat at zero degrees (vertically) and gets a hit, which means that her photon is V-polarized. We now switch our camera to home plate where the spirits of Bohr and Einstein are discussing the reality status of the as-yet-to-be measured Green photon presently hurtling toward the Green batter at the speed of light. To allow the great men time for debate, we imagine the usual passage of time to be temporarily suspended.

BOHR: When I say that quantum theory is "complete," I mean that QT says everything that can possibly be said about the reality of that Green photon. If it's not in the theory, it's not in the photon either.

EINSTEIN: If complete, what, then, does quantum theory say about this Green photon now approaching the Green batter?

BOHR: In the first place, given that Blue's already measured a V photon, coupled with the fact that this pitcher throws nothing but twin-state photon pairs, quantum theory predicts that if Green chooses to hold his bat vertically, he will certainly get a hit; furthermore it also predicts that if he holds his bat horizontally, he will certainly get miss.

EINSTEIN: I agree with you concerning what quantum theory predicts if Green makes either a horizontal or a vertical polarization measurement. Now, what is supposed to happen if Green holds his bat at some other angle?

BOHR: For Green bat angles other than zero or ninety degrees, quantum theory gives no certain results, but only the relative probability of a hit. For instance, if Green should hold his bat at 45 degrees, the odds are 50-50 that he will get a hit.

EINSTEIN: Yes. Quantum theory indeed gives only statistical predictions for intermediate angles. We seem to agree concerning the predictions of the theory and about the facts of the matter - namely, that quantum theory has never made a single incorrect prediction. We agree, as Kant would have put it, about the appearances and about the theory. But what, my dear Bohr, are you willing to say about the reality of this particular Green photon magically suspended before us?

BOHR: Because I believe that quantum theory describes all physical situations completely, I must say that before it is actually measured, this photon really has a definite polarization only in the V and H directions, but no others. To speak of a definite polarization in any other directions would be to talk nonsense. Thus I say that, in reality, this Green photon does not possess polarization attributes except perhaps at these exceptional angles. Even at these special angles, for which quantum theory gives certain results, I am not entirely convinced that these results represent a definite attribute belonging solely to the photon. I believe
that all attributes are joint creations of photon and measuring device and do not belong to one or the other.

**EINSTEIN:** Concerning this matter of completeness... As you know, my friend, I cannot refute your opinion that quantum theory is a complete theory of phenomena; it indeed seems to describe correctly the results of every experiment my poor head has been able to imagine. But I do not share your faith that quantum theory is a complete theory of reality. I believe that certain elements of reality exist in the world that are not described by the quantum formalism. In the case of this Green photon, for example, I say that it possesses a definite polarization attribute for every possible angle, not just for the V and H directions.

**BOHR:** No, my friend, you are mistaken. Except perhaps in certain special situations where the outcome is not a matter of chance - such as the V and H directions in this case - the photon's polarization is a joint production of the entire experimental arrangement, and does not inhere in the photon by itself independent of a particular measurement context.

**EINSTEIN:** Forgive me, Bohr, but I have never been able to understand your subtle reasoning in this matter. Indeed, for situations like this twin-state baseball game, I have, with my colleagues Podolsky and Rosen, devised a simple argument which convinces us that this Green photon hovering in front of us possesses a definite (but unknown) polarization attribute at every angle. Permit me to show you this argument.

Our reasoning depends on a certain plausible assumption, which physicists nowadays call "the locality assumption": we assume that the real factual situation of the Green photon, after it's left the source, is not affected by how the Blue player chooses to hold her bat. In other words, we assume that Blue's batting stance does not affect the Green photon. This supposition seems reasonable since both photons are traveling in opposite directions at the speed of light. Therefore one photon cannot learn about the other's measurement situation except via signals that travel faster than light.

**BOHR:** I am suspicious of this locality assumption but please continue.

**EINSTEIN:** Here is our argument. For this present situation, Blue chose to hold her bat vertically and she got a hit. But if she had held her bat at some other angle, say 45 degrees, she would also have measured some-thing, either a hit or a miss, we do not know which. Because this photon pair is in the twin state we know that Green photon would be obliged to show the same polarization that Blue got at 45 degrees. In like manner Blue could have held her bat at any angle X and measured a certain polarization; Green photon is compelled to have an identical polarization at angle X.

If Green photon must have a definite polarization for each Blue measurement choice, and if (by the locality assumption) Blue's measurement choice does not physically affect the Green photon, then the Green photon must already possess a definite polarization for each angle - polarizations that exist regardless of Blue's actual choice.

Thus we believe we have shown that before it strikes the Green bat, this Green photon has already "made up its mind" as to how it will act no matter how Green might choose to hold his bat. This Green photon must possess a sort of hit/miss list which tells it what to do for every bat angle. Quantum theory, on the other hand, certainly does not recognize any such list: except for the N and V directions, it considers these results to be "random," utterly unknown except in a probabilistic sense. Quantum theory is therefore "incomplete" because it leaves out some attributes - this hit/miss list, for example - which this photon seems to possess.

**BOHR:** Your argument is clever but I cannot accept your conclusion. Of course there is no question of any mechanical influence traveling from Blue's bat to the Green photon, but there is essentially the question of an influence on the very conditions which define the possible types of predictions regarding the future behavior of the Green light.

**EINSTEIN:** Yes, I remember your making that very statement in 1935 in response to our original EPR paper. I did not understand it then, and despite considerable effort, I must confess that I still cannot grasp the subtlety of your thought on this matter. Since the author seems to have frozen our intellects, like that time-suspended Green photon out there, into our ancient philosophical positions, I will answer your old quote with two of my own which sum up my thinking on the EPR experiment:

"We are forced (via the EPR argument) to conclude that the quantum-mechanical description of physical reality given by wave functions is not complete".

"One can escape from this conclusion only by either assuming that the measurement of B (telepathically) changes the real situation at C, or by denying independent real situations as such to things which are spatially separated. Both alternatives appear to me entirely unacceptable".

Bohr, Einstein, and numerous other thinkers struggled with the EPR paradox but no generally acceptable solution could be found until Bell focused attention on the fragility of the locality assumption. Let's take a closer look at this locality assumption so essential to the argument of Einstein, Podolsky, and Rosen.
"Circumstances are like objects, they are not alive, you bring life to them" - Nelson

The locality assumption does not mean that what happens at the Green bat has nothing to do with what happens at the Blue bat. Since the photons are correlated at the light source, the results at the Green and Blue measurement sites will likewise be correlated. What locality means is that no action on Blue’s part (as she detects her Blue photon) can affect what Green player sees (when he detects his Green photon). Locality means that what happens at home plate is unaffected by how Blue holds her bat at second base.

The locality assumption is necessary to EPR’s argument because although Blue observer could have made any polarization measurement she pleased, she can in fact (for a single photon) make only one, because photon polarizations at different angles are incompatible attributes.

As a homely example of EPR’s reasoning, consider a shop (Enrico’s Pizza Reale) which sells three different pizzas: Sicilian, Milanese, and Neapolitan. Whenever you order a pizza from Enrico’s it arrives at your door in ten minutes. Since a pizza takes thirty minutes to bake, you know that the pizza you ordered must have been ready when you phoned. Suppose you order a pizza of your choice each night (but you can only afford one), and it’s always delivered in ten minutes. Can you conclude that Enrico keeps on hand all three kinds of pizza?

Not without a kind of locality assumption. You have to assume that Enrico has no way of knowing what kind of pizza you are going to order that night. If he can discover your choice beforehand, he need keep only one pizza hot. Your nightly freedom of choice plus the (no pizza spies) "locality assumption" allows you to infer, on the basis of a series of one-pizza observations, that Enrico in reality keeps all three pizzas ready to go each night. The argument for preexisting polarizations is the same as for preexisting pizzas. Blue player’s freedom to choose her single P measurement plus the locality assumption allows EPR to infer that all polarizations must be simultaneously present in the Green photon (in the form of a hit/miss list) before Green player makes his measurement.

Hence, in the twin state, photon C already secretly knows how it will respond to any polarization measurement that Green player might care to make upon it. According to EPR’s argument, Green photon’s polarization attribute is not indefinite at all. Green photon’s hit/miss list specifies its polarization at all measurement angles. Bohr asserts that photon C, before it’s measured, is in an indefinite state of polarization: quantum theory does not recognize any such hit/miss list. But Einstein, Podolsky, and Rosen can prove that such a list exists in nature. Hence according to EPR, quantum theory is necessarily incomplete.
Bell's Interconnectedness Theorem

"Contagious magic is based upon the assumption that substances which were once joined together possess a continuing linkage; thus an act carried out upon a smaller unit will affect the larger unit even though they are physically separate."

Sir James Frazer

Bell’s theorem states that reality must be non-local. It is important to realize what EPR did not do: Einstein, Podolsky, and Rosen did not find an experimental situation where quantum theory is factually wrong. What EPR discovered was a simple logical argument (based on the experimental fact of perfect polarization correlation in a certain two-photon system) that indirectly demonstrates the existence of photon attributes which quantum theory fails to take into account.

EPR then ask, "If quantum theory is a complete theory of reality, why does it omit these attributes?"

What's at stake here is not whether quantum theory is a complete theory of phenomena (accounting correctly for all presently conceivable measurements) but whether it is a complete theory of reality (accounting correctly for whatever exists whether measurable or not). Many "refutations" of the EPR argument consist merely of demonstrating that quantum theory describes correctly all twin-state polarization measurements. EPR do not contest quantum theory’s competence to describe phenomena; Einstein, Podolsky, and Rosen claim, however, to have demonstrated the existence of certain "elements of reality" (in Einstein’s words), parts of the world not directly observable which quantum theory simply leaves out. The EPR proof gives those who believe that what’s real is only what can be observed an opportunity to put their convictions to the test. For such no-nonsense realists, the argument of EPR which purports to demonstrate the existence of an extra-observational reality must be mistaken. However, even those convinced beforehand of EPR’s error found it surprisingly difficult to point out the fallacy in their reasoning. Hundreds of papers were published on the “EPR paradox.” For thirty years physicists and philosophers beat their heads against this proof without either refuting EPR’s logic or shedding further light on EPR’s alleged “elements of reality.”

In 1964 the long-standing EPR stalemate was broken by the efforts of theorist John Bell.

The basis of Bell’s theorem is this: if no local model of reality can explain the results of any particular experiment: then reality is non-local, if there is non-locality anywhere then there is non-locality everywhere.

Bell's theorem says that reality must be non-local.

According to von Neumann, the world cannot be made of ordinary objects, which possess dynamic attributes of their own. Bell discovered that although this proof excludes objects whose attributes combine in "reasonable ways," it does not forbid objects which can change their attributes in response to their environment. This loophole in von Neumann's proof is what allows Bohm, de Broglie, and other neorealists to build explicit ordinary-object-based models of quantum reality: all these models contain objects whose attributes are context-sensitive.

While preparing a review article on von Neumann’s proof, Bell became interested in impossibility proofs (in general) and wondered whether a proof could be constructed which would conclusively exclude any model of reality that possessed certain physical characteristics. Bell himself managed to devise such a proof which rejects all models of reality possessing the property of “locality.” This proof has since become known as Bell’s theorem. It asserts that no local model of reality can underlie the quantum facts. Bell’s theorem says that reality must be non-local.

In a letter to the author, John Bell recalls his discovery: “I had for long been fascinated by EPR. Was there a paradox or not? I was deeply impressed by Einstein’s reservations about quantum mechanics and his views of it as an incomplete theory. For several reasons the time was ripe for me to tackle the problem head on. The result was the reverse of what I had hoped. But I was delighted - in a region of wooliness and obscurity to have come upon something hard and clear”.

The structure of Bell’s proof is as follows. For a certain class of two quon experiments (the EPR experiment and its variations), Bell assumes that a local reality exists. With a bit of arithmetic he shows that this locality assumption leads directly to a certain inequality (Bell’s inequality) which the experimental results must satisfy. Whenever these experiments are done, they violate Bell’s inequality. Hence the local-reality assumption is mistaken. Conclusion: any reality that underlies the EPR experiment must be non-local.

What is a local interaction?

"It is not the situation, but whether we react negatively or respond positively to the situation that is important" - Zig Ziglar

The essence of a local interaction is direct contact - as basic as a punch in the nose. Body A affects body B locally when it either touches B or touches something else that touches B. A gear train is a typical local mechanism. Motion passes from one gear wheel to another in an unbroken chain. Break the chain by
is carried neither by particle or field but by something that partakes of both, an innately quantum aspect of the gravity field). In actuality gravity (as is true for the other three fundamental forces as well) attracts the Earth (and vice versa) via the gravity field or via an exchange of gravitons (the particle stuff now) we can equally well say these local forces are mediated by the exchange of particles. Thus the quantum theory has blurred the once sharp distinction between particle and field (both are quantum electromagnetic, and gravitational). In every case these forces act as if they are mediated by fields. Since physicists today share Newton's belief that the world is tied together by strictly local connections. All regions. Einstein's special theory of relativity restricts the velocity of the field deformation to light speed or below. According to Einstein, no mate vial object can travel faster than light; not even the less material field war can travel so fast.

Given his antipathy for non-local forces, Newton was somewhat embarrassed by his own theory of gravity. If a non-local force is "so great an absurdity," how does the sun's gravity manage to cross millions of miles of empty space to hold the Earth in its orbit? Concerning the actual nature of gravity, Newton wisely held his tongue. "Hypotheses non lingo," he declared. "I frame no hypotheses". Newton's faith in strictly local forces was vindicated by his successors, who explained gravity in terms of the field concept. The space between the sun and Earth is not empty, today's physicists say: it's filled with a gravitational field which exerts a force on any body it touches. The modern field concept allows us to regard gravity as a strictly local interaction even though it acts across vast reaches of space. The sun's mass produces a gravity field; this field pulls on the Earth and mediates the sun-Earth interaction.

Physicists today share Newton's belief that the world is tied together by strictly local connections. All presently known natural forces can be explained in terms of only four fundamental forces (strong, weak, electromagnetic, and gravitational). In every case these forces act as if they are mediated by fields. Since quantum theory has blurred the once sharp distinction between particle and field (both are quantum stuff now) we can equally well say these local forces are mediated by the exchange of particles. Thus the sun attracts the Earth (and vice versa) via the gravity field or via an exchange of gravitons (the particle aspect of the gravity field). In actuality gravity (as is true for the other three fundamental forces as well) is carried neither by particle or field but by something that partakes of both, an innately quantum go-between whose mediation makes every one of nature's forces strictly local. Although the concept of locality does not strictly demand it, most forces diminish in strength as you move away from their source. It is conceivable that a local force might stay constant or even increase with distance from its source (the force of a stretched spring, for instance increases with distance). The big four forces that hold the world together happen, however, all to decrease with distance - gravity and electromagnetism diminish as the inverse square; the strong and weak forces fall of considerably faster.

The toughest limitation on a local interaction is how fast it can travel. When you move an object A, you stretch its attached field. This field distorts first near object A, and then the field warp moves off to distant regions. Einstein's special theory of relativity restricts the velocity of the field deformation to light speed or below. According to Einstein, no mate vial object can travel faster than light; not even the less material field war can travel so fast.

• Non-local influences, if they existed, would not be mediated by fields or by anything else. When A connects to B non-locally, nothing crosses the intervening space, hence no amount of interposed matter can shield the interaction.
• Non-local influences do not diminish with distance. They are as potent at a million miles as at a millimeter.
• Non-local influences act instantaneously. The speed of their transmission is not limited by the velocity of light.
• A non-local interaction links up one location with another without crossing space, without decay, and without delay. A non-local interaction is, in short, unmediated, unmitigated, and immediate.

Despite physicists' traditional rejection of non-local interactions, despite the fact that all known forces are incontestably local, despite Einstein's prohibition against superluminal connections, and despite the fact that no experiment has ever shown a single case of unmediated faster-than-light communication, Bell maintains that the world is filled with innumerable non-local influences. Furthermore these unmediated connections are present not only in rare and exotic circumstances, but underlie the events of everyday life. Non-local connections are ubiquitous because reality itself is non-local.

Not all physicists believe Bell's proof to be an airtight demonstration of the necessary existence of non-local connections. But the alternatives these critics offer instead seem to me to be generally obscure and/or preposterous, some physicists will go so far as to actually "deny reality itself" rather than accept Bell's audacious conclusion that quantum reality must be non-local.
Bell proved reality cannot be local

"Before you change your thinking you must change what goes into your mind" - Zig Ziglar

To understand the import of Bell's theorem and the arguments of his critics, it's necessary to look at Bell's proof in some detail. Fortunately Bell's theorem is easier to prove than the Pythagorean Theorem taught in every high school. The simplicity of Bell's proof opens it to everyone, not just physicists and mathematicians.

Bell's proof is based on the same EPR experiment used by Einstein, Podolsky, and Rosen to demonstrate the existence of hidden "elements of reality" which quantum theory neglects to describe. The "EPR paradox" consists of the fact that for thirty years physicists have neither been able to refute EPR's argument nor shed further light on EPR's alleged "elements of reality".

The EPR experiment involves a source of light which produces pairs of photons (Green and Blue) in the "twin state." These photons travel in opposite directions to calcite detectors (G and B) which can measure their polarization attribute $P(\phi)$ at some angle $\theta$. In the twin state each beam by itself appears completely unpolarized - an unpredictably random 50-50 mixture of ups and downs at whatever angle you choose to measure. Though separately unpolarized, each photon's polarization is perfectly correlated with its partner's. If you measure the $P$ of both photons at the same angle (a two-photon attribute I call paired polarization), these polarizations always match.

For his proof, Bell considers another two-photon attribute called polarization correlation (PC) which can be measured on these photons. Attribute PC is measured the same way as attribute $PP$ except that the calcites are set not at the same but at different angles. To measure PC($A$), set Green calcite at a particular angle $\theta_G$ and Blue calcite at angle $\theta_B$. Now compare Green and Blue polarizations for each pair of photons. If these PS are the same (both up or both down), call this a match; if opposites, call this a miss. Angle $A$ is the angle between the two calcites, namely $A = \theta_G - \theta_B$.

For photons in the twin state, quantum theory predicts that PC($A$) depends only on the relative angle $A$ between calcites and is independent of the separate settings $\theta_G$ and $\theta_B$. Thus if the angle of the Green calcite differs by 30° (in either direction) from that of the Blue calcite, the value of PC(30) will be the same, no matter how Green and Blue happen to be tilted.

To prove Bell's theorem, we need to find a new attribute that takes on different values for different angles, even when the calcites are set at the same angle. One such attribute is $P(\theta)$ itself. The key is to compare the two photons at different angles. For example, setting Green calcite at $90°$ and Blue calcite at $60°$ gives a different result than setting Green calcite at $90°$ and Blue calcite at $30°$. If the two photons are perfectly correlated, then $P(90) = P(60)$, but if they aren't perfectly correlated, $P(90) \neq P(60)$. This is the key to Bell's proof, as it allows us to distinguish between local and non-local theories of reality.

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Fig. 1. The EPR experiment. The central mercury source emits pairs of photons (Green and Blue) in the twin state. At Green and Blue measuring sites, the polarization $P(\theta)$ of each of these photons is recorded with a calcite-based $P$ meter. Bell's theorem concerns the unusual strength of the polarization correlation existing between these Green and Blue photons.
The fact that PC(A) depends only on the difference between the two calcites has been amply verified by experiment.

For each angle A between calcites, a PC measurement asks for the fraction of matches obtained in a long series of photon pairs. Thus PC = 1 means all matches (no misses) while PC = 0 means no matches (all misses). Bell's theorem is concerned with how this match fraction changes as we vary the angle between calcites from zero to ninety degrees.

For our previous discussion of the twin state, we already know the value of PC at zero and ninety degrees. At a calcite separation of zero degrees, PC = 1. When both calcites are set at the same angle, a PC measurement is identical to what I've called a PP measurement, which for the twin state yields a 100 percent match at all angles.

At a calcite separation of ninety degrees, PC = 0. When a calcite is turned through a right angle, its photon-sorting operation is merely re-versed: its up channel passes downs and vice versa. At ninety degrees a P meter behaves like the same P meter at zero degrees with its outputs relabeled. This calcite channel reversal plus the perfect correlation at zero degrees leads to a perfect anti-correlation when the calcite axes differ by ninety degrees.

At zero degrees, PC = 1; at ninety degrees, PC = 0. In between, PC varies between 1 and 0 as the angle between calcites swings from zero to ninety degrees. The meat of Bell's proof is the actual shape of this variation. To dramatize what's happening in this EPR experiment, imagine that Green detector is on Earth, and Blue detector is on Betelgeuse (540 light-years away) while twin-state correlated light is coming from a spaceship parked halfway in between. Although in its laboratory versions the EPR experiment spans only a room-size distance, the immense dimensions of this thought experiment remind us that, in principle, photon correlations don't depend on distance.

The spaceship acts as a kind of interstellar lighthouse directing a Green light beam to Earth, a Blue light beam to Betelgeuse in the opposite direction. Forget for the moment that Green and Blue detectors are measuring something called "polarization" and regard their outputs as coded messages from the spaceship. Two synchronized binary message sequences composed of ups and downs emerge from calcite crystals 500 light-years apart. How these two messages are connected is the concern of Bell's proof.

When both calcites are set at the same angle (say, twelve o'clock), PC = 1. Green polarization matches perfectly with Blue. Two typical synchronized sequences of distant P measurements might look like this:

- GREEN: U D D D U D D D U U D U D D U D D U
- BLUE: U D D D U D D D U U D D U D D U

If we construe these polarization measurements as binary message sequences, then whenever the calcites are lined up, the Blue observer on Betelgeuse gets the same message as the Green observer on Earth.

Since PC varies from 1 to 0 as we change the relative calcite angle, there will be some angle at which PC = 3/4. At this angle, for every four photon pairs, the number of matches (on the average) is three while the number of misses is one. At this particular calcite separation, a sequence of P measurements might look like this:

- GREEN: U D D D U D D D U D U D D U D D U
- BLUE: U D D D U D D D U U D D U D D U

At angle α, the messages received by Green and Blue are not the same but contain "errors" - G's message differs from B's message by one miss in every four marks.

Now we are ready to demonstrate Bell's proof. Watch closely; this proof is so short that it goes by fast. Align the calcites at twelve o'clock. Observe that the messages are identical. Move the Green calcite by α degrees. Note that the messages are no longer the same but contain "errors" - one miss out of every four marks. Move the Green calcite back to twelve and these errors disappear; the messages are the same again. Whenever Green moves his calcite by α degrees in either direction, we see the messages differ by one character out of four. Moving the Green calcite back to twelve noon restores the identity of the two messages.

The same thing happens on Betelgeuse. With both calcites set at twelve noon, messages are identical. When Blue moves her calcite by α degrees in either direction, we see the messages differ by one part in four. Moving the Blue calcite back to twelve noon restores the identity of the two messages. Everything described so far concerns the results of certain correlation experiments which can be verified in the laboratory. Now we make an assumption about what might actually be going on - a supposition which cannot be directly verified: the locality assumption, which is the core of Bell's proof.

We assume that turning the Blue calcite can change only the Blue message; likewise turning the Green calcite can change only the Green message. This is Bell's famous locality assumption. It is identical to the assumption Einstein made in his EPR paradox: that Blue observer's acts cannot affect Green observer's results. The locality assumption - that Blue's acts don't change Green's code - seems entirely reasonable: how could an action on Betelgeuse change what's happening right now on Earth? However, as we shall see, this "reasonable" assumption leads immediately to an experimental prediction which is contrary to fact. Let's see what this locality assumption forces us to conclude about the outcome of possible experiments.

With both calcites originally set at twelve noon, turn Blue calcite by a degrees, and at the same time turn
Green calcite in the opposite direction by a degree. Now the calcites are misaligned by 2a degrees. What is the new error rate?

Since turning Blue calcite a degrees puts one miss in the Blue sequence (for every four marks) and turning the Green calcite a degrees puts one miss in the Green sequence, we might naively guess that when we turn both calcites we will get exactly two misses per four marks. However, this guess ignores the possibility that a "Blue error" might fall on the same mark as a "Green error" - a coincidence which produces an apparent match and restores character identity. Taking into account the possibility of such "error-correcting overlaps," we revise our error estimate and predict that whenever the calcites are misaligned by 2a degrees, the error rate will be two misses - or less.

This prediction is an example of a Bell inequality. This Bell inequality says: If the error rate at angle α is \( I/α \), then the error rate at twice this angle cannot be greater than 2/4.

This Bell inequality follows from the locality assumption and makes a definite prediction concerning the value of the PC attribute at a certain angle for photon pairs in the twin state. It predicts that when the calcites are misaligned by 2a degrees the difference between the Green and Blue polarization sequences will not exceed two misses out of four marks. The quantum facts, however, say otherwise. John Clauser and Stuart Freedman carried out this EPR experiment at Berkeley and showed that a calcite separation of 2a degrees gives three misses for every four marks - a quite substantial violation of the Bell inequality.

Clauser's experiment conclusively violates the Bell inequality. Hence one of the assumptions that went into its derivation must be false. But Bell's argument uses mainly facts that can be verified - photon PCs at particular angles. The only assumption not experimentally accessible is the locality assumption. Since it leads to a prediction that strongly disagrees with experimental results, this locality assumption must be wrong. To save the appearances, we must deny locality.

Denying locality means accepting the conclusion that when Blue observer turns her calcite on Betelgeuse she instantly changes some of Green's code on Earth. In other words, locations B and C some five hundred light years apart are linked somehow by a non-local interaction. This experimental refutation of the locality assumption is the factual basis of Bell's theorem: no local reality can underlie the results of the EPR experiment.

Einstein, Podolsky, and Rosen used the locality assumption to demonstrate the existence of hidden "elements of reality" which quantum theory fails to take into account. However, if Blue and Green observers are linked by a non-local interaction, as the factual violation of the Bell inequality seems to imply, then EPR's argument is invalid by virtue of a false premise. The failure of their argument does not prove, of course, that no such "elements of reality" exist, but only that one cannot make a case for their existence by using EPR's reasoning. The logical necessity of non-local interactions resolves the EPR paradox (in Bell's words) "in the way which Einstein would have liked the least".

Reviewing the EPR paradox in his autobiography, Einstein reaffirmed his faith in locality: "On one supposition we should, in my opinion, absolutely hold fast: the real factual situation of the system (G) is independent of what is done with the system (B) which is spatially separated from the former." Einstein did not live to see Bell's proof and would certainly have been surprised by Bell's refutation of his cherished postulate. But I think he would have welcomed the strange news Bell's theorem brings us concerning the true nature of the quantum world. Bell's result vindicates Einstein's intuition that something funny is going on in quantum-correlated two-particle states.

As in the case of the EPR paradox, it's important to realize what Bell did not do. He did not discover an experimental situation in which non-local interactions are directly observed. Instead he invented a simple argument based on experimental results that indirectly demonstrates the necessary existence of non-local connections.
The phenomena displayed by photon pairs in the twin state are entirely local. The only spin-space attribute accessible to Green observer is his Green photon polarization $P(c)$. This attribute is always 50 - 50 random (unpolarized) no matter how Blue observer sets her calcite. Because whatever Blue does, Green can detect no change in his own photon's polarization, Blue observer can send no message - superluminal or otherwise from Betelgeuse to Earth via these correlated photons.

However, if Bell's argument is correct, then the reality behind these seemingly local phenomena not only might be, but must be non-local. It's not the mere fact of photon correlation that necessitates non-local connections, but the fact that twin-state photons are correlated so strongly. Many situations can be envisioned which show perfect correlation at $\Lambda = 0^\circ$ and perfect anti-correlation at $\Lambda = 90^\circ$, but whose in-between correlation varies so as actually to satisfy Bell's inequality. A few examples of such weakly correlated systems are shown in Fig.5. Weak correlations can always be explained by strictly local interactions. On the other hand, strongly-correlated systems (such as Fig.6) violate the Bell inequality; their parts are lore synchronized than they have any right to be. To explain such highly operative behavior, no local model of reality will suffice. Bell's theorem gives those who share Newton's belief that non-local influences are "a great absurdity" and opportunity to put their convictions to the test. For As loyal to locality, the argument of Bell which purports to demonstrate le existence of hidden faster-than-light connections must be mistaken. Those convinced beforehand of Bell's error should be highly motivated to discover the fallacy in his reasoning. Later we will look at some recent tempts to invalidate Bell's argument and to recover a strictly local world.

On the other hand, if Bell's reasoning is correct invisible non-local connections must truly exist. Can we then devise means of making these connections directly evident instead of relying on Bell's indirect argument? The possibility of practical superluminal communication via the quantum connection has been a possibility.

Bell proved his theorem for a particular two-photon system. What justification exists for extending his conclusion (the reality underlying the EPR experiment must be non-local) to the general case of everyday experience (the reality underlying everything must be non-local)? To expand the scope of Bell's argument we turn to quantum theory.

In quantum theory's formalism, what accounts for strong photon carte-in in the twin state is phase entanglement. Whenever quantum system wets quantum system B, their phases get mixed up. Part of A's proxy wave goes off with B's wave and vice versa. Phase entanglement thereafter instantly connects any two quons which have once interacted. Before Bell's discovery, this strong quantum connection had been recognized (especially by Schrodinger, who considered it quantum theory's most distinctive feature) but regarded by physicists as a kind of mathematical fiction with no roots in reality.

Since Bell's theorem demands a superluminal connection and quantum theory provides one - in the form of ubiquitous but presumably "fictitious" phase connections - perhaps these quantum connections are not as fictitious as was once believed.

Since there is nothing that is not ultimately a quantum system, if the quantum phase connection is "real," then it links all systems that have once interacted at some time in the past - not just twin-state photons - into a single waveform whose remotest parts are joined in a manner unmediated, unmitigated, and immediate. The mechanism for this instant connectedness is not some invisible field that stretches from one part to the next, but the fact that a bit of each part's "being" is lodged in the other. Each quon leaves some of its "phase" in the other's care, and this phase exchange connects them forever after.

What phase entanglement really is we may never know, but Bell's theorem tells us that it is no limp mathematical fiction but a reality to be reckoned with.
Clauser's experiment

Does it contain any abstract reasoning concerning quantity or number? No. Does it contain any experimental reasoning concerning matter of fact and existence? No. Commit it then to the flames: for it can contain nothing but sophistry and illusion”.

David Flume

In 1964, when Bell derived his inequality, no twin-state PC measurements existed against which it could be tested. However, the calculation of twin-state polarization is an elementary exercise in quantum theory. This calculation predicts that PC(А) = cos2А, a correlation plotted as Fig. 4. The angle а at which misses = 1/4 for cos2А is 30°. Bell's inequality consequently demands that the number of misses at 2а (60° in this case) shall be no greater than 2/4. However, at 60° this expression gives a miss fraction of 3/4. Since 3/4 is considerably greater than 2/4, the theoretical expression PC = cos2А violates Bell's inequality. This violation marks the twin state as a strongly correlated system - a pair of entities linked tighter than any local reality can explain.

The fact that this calculated result violates Bell's inequality implies that any system which obeys these quantum-theoretical predictions cannot be explained by a local reality. Before Bell's discovery, one could still imagine that a local reality lurked beneath the experimental facts; after 1964, one could blissfully believe in a strictly local world only by hoping that quantum theory was wrong in its predictions concerning photons in the twin state.

Since it challenges one of physicists' most cherished beliefs - that the world is fundamentally local— one might have expected Bell's proof to explode like a bombshell in the corridors of science. Instead, Bell's proof, published in an obscure little journal, was largely ignored even by those physicists who managed to find out about it.

Most physicists are not impressed by Bell's proof because it deals with reality, not phenomena. The majority of physicists are phenomenalists - whose professional world is circumscribed by phenomena and mathematics. A phenomenalist perceives science as advancing in two directions:

1. new experiments uncover novel phenomena;
2. new mathematics explain or predict phenomena in original ways. Since it proposes no new experiments and derives no new phenomena-relevant mathematics, but merely puts certain constraints on an invisible reality, Bell's proof lies outside the fashionable formula for success in science and is generally dismissed by scientists as "mere philosophy".
Physicists' cool reception of Bell's proof is reminiscent of David Flume's famous prescription for separating truth from nonsense: "Does it contain any abstract reasoning concerning quantity or number? No. Does it contain any experimental reasoning concerning matter of fact and existence? No. Commit it then to the flames: for it can contain nothing but sophistry and illusion".

In the midst of this climate of indifference toward theories of reality, John Clauser, a young Ph.D. from Columbia, proposed actually to measure twin-state photons to see whether their polarization correlation attribute satisfied Bell's inequality (world is local; quantum theory wrong) or not (world is non-local; quantum theory right). Clauser received no support at Columbia for his proposal to put Bell's inequality to experimental test, and moved to Berkeley where apparatus already existed which he knew he could modify to measure twin-state photons.

Many kinds of excited atoms emit pairs of twin-state photons as they return to their ground state. Most experiments carried out to test Bell's inequality have used either mercury atoms excited by electron impact or calcium atoms excited by laser light. Clauser's Berkeley mercury source operates like a mercury-vapor streetlamp - both emit Blue and Green twin-state light - but Clauser's source was smaller and more intense than the lamps which nightly flood Telegraph Avenue with photons in the twin state.

Because real photon detectors are not 100 percent efficient - they count only about 10 percent of the photons which strike their phosphor faceplates - one cannot simply compare Bell's inequality to experimental results. Adapting Bell's original reasoning to existing experimental realities, Clauser and his colleagues derived a version of Bell's inequality (called the "CHSH inequality" after John F. Clauser, Michael A. Horne, Abner Shimony, and Richard A. Holt) which is testable with low-efficiency detectors.

Clauser was motivated to test the Bell inequality by his strong faith that the world was ultimately local. If quantum theory predicts a result which conflicts (via Bell's proof) with locality, so much the worse for quantum theory. Clauser anticipated that his experiment would prove quantum theory wrong at least for quantum theory right). Clauser received no support at Columbia for his proposal to put Bell's inequality to experimental test, and moved to Berkeley where apparatus already existed which he knew he could modify to measure twin-state photons.

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The basis of Bell's theorem is this: if no local model of reality can explain the results of any particular experiment; then reality is non-local, if there is non-locality anywhere then there is some non-locality everywhere.

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**Aspect's experiment**

"Human beings can choose the path and the destination"

Clauser's pioneer test of the Bell inequality contains a loophole through which a desperate logician might still derive a local world. To pinpoint this loophole, let's return to our imaginary EPR experiment in space.

Clauser's mercury source sent Blue and Green light to opposite corners of a room. Our spaceship lighthouse shoots photons to Betelgeuse and Earth five hundred light-years apart.

Clauser switched the orientation of his P meters every 100 seconds. Clauser's switching time, translated to cosmic lighthouse scale, corresponds to keeping the P meters on Earth and Betelgeuse fixed for more than a billion years. Such leisurely P measurements would permit information on how distant P meters were set to leak between Earth and Betelgeuse at sublight speed (carried perhaps in the gossip of interstellar tourists) - information which could allow most of the photons to simulate strong correlations by strictly local means. To block the possibility of subluminal security leaks during long P-meter rests, the experimenter must be able to change the P meters while the photons are in flight. To change a calcite this fast in the lab means switching its orientation in a few billions of a second.

Unfortunately, mere matter just can't move that fast. However, physicist Alain Aspect at the University of Paris devised an experiment to test Bell's inequality which uses two acousto-optical switches to deflect each photon beam to one or the other of two preset calcite detectors. Instead of rapidly moving his calcites, Aspect moves his light beams.

With his ultrafast switches, Aspect can measure a different polarization every 10 billionths of a second, fast enough to eliminate subluminal security leaks between Blue and Green P meters. If Aspect's twin-state photons violate Bell's inequality, the reality that underlies their strong correlation must connect Green and Blue measurement stations at a speed exceeding the velocity of light. Aspect completed his experiment in 1982, verifying the strongly correlated quantum theoretical predictions, hence violating Bell's inequality and supporting his contention that our phenomenally local world is in actuality supported by an invisible reality which is unmediated, unmitigated, and faster than light.

Although Bell's theorem arose in the context of quantum theory, Bell's result does not depend on the truth of quantum theory. The Clauser-Aspect experiments show that Bell's inequality is violated by the facts. This means that even if quantum theory should someday fail, its successor theory must likewise violate Bell's inequality when it comes to explaining the twin state. Physics theories are not eternal. When quantum theory joins the ranks of phlogiston, caloric, and the
luminiferous ether in the physics junkyard, Bell's theorem will still be valid. Because it's based on facts, Bell's theorem is here to stay.

The basis of Bell's theorem is this: if no local model of reality can explain the results of any particular experiment, then reality is non-local, if there is non-locality anywhere then there is some non-locality everywhere.

**Impossible worlds**

"Reality is a way to teach us that we are small and must respect a power greater than ourselves." - Nelson

Bell's theorem is an important tool for reality research because it enables folks who create imaginary worlds confidently to reject millions of impossible worlds at a single glance. Bell's theorem tells you right away: If it's local, it's holom".

One of the world's soundly obliterated by Bell's proof is the "disturbance model" of quantum reality. In this model - a species of neorealism - quantum entities actually possess attributes of their own whether measured or not, but the measuring device changes these attributes in an unpredictable and uncontrollable way. The inevitable disturbance of the quantum system by the device which measures it gives rise, in this model of reality, to quantum randomness, to the uncertainty principle and all the other quantum oddities.

As a picture of how the quantum world might actually operate, many physicists who have not given much thought to the matter take refuge in some vague disturbance model of reality. For several years I avoided thinking about the quantum reality question by supposing that a disturbance model of some kind was sufficient to account for the strange quantum facts.

Such a disturbance model would explain, for instance, the observed polarization of the Green photon in the EPR experiment as a result of the Green calcite's "uncontrollable disturbance" of some intrinsic Green photon attribute. In other words, this model explains Green observer's results by appealing to a hypothetical mechanism which involves only the Green photon and the Green calcite. Bell's theorem shows that any such local mechanism, no matter how ingenious, simply fails to fit the quantum facts: Bell's proof knocks out the disturbance model because it's local.

Facile popular expositions often invoke the disturbance model of measurement to justify Heisenberg's uncertainty principle: we cannot know a quantum entity as it is because we must inevitably disturb whatever we observe. Bell's result shows this notion of quantum measurement as local disturbance to be as outdated as the obsolete picture of the atom as miniature solar system.

Another type of impossible world is the "classical style" reality symbolized by Newton's apple. Apples, and everything else in such a world, are truly ordinary objects which possess attributes all their own even when not being measured. When measured, whether by man, woman, or machine, a classical apple merely reveals some attributes which it previously possessed.

Such an apple world (which experts call a "local non-contextual reality") is not inconceivable or illogical. But, according to Bell's theorem, apple world is impossible because it can't possibly fit the facts. As a model for the world we actually live in, apple world and all its local non-contextual cousins are, by virtue of their locality, sheer fantasy worlds.

We obviously need to be more sophisticated in our choice of possible worlds. Let's imagine, for instance, a relational reality patterned after the notions of Niels Bohr. The entities that make up such a world are like rainbows: they do not possess definite attributes except under definite measurement conditions. Upon measurement, attributes do emerge but they are a joint possession of entity and M device. In such a rainbow reality (called "local contextual"), attributes are not innate to an entity but change when the conditions of observation change. The only restriction we place upon such observer-induced changes is that distant M devices cannot change an entity's condition if such an influence would require a faster-than-light signal. In such a contextual, but local, reality, only nearby observers take part in the determination of an entity's apparent attributes.

Like apple world, rainbow world is neither inconceivable nor illogical. It is simply, on account of its locality, not the sort of world we happen to live in.

Bell's theorem rejects apple worlds; it also rejects rainbow worlds. What kinds of worlds does Bell's theorem allow?

**A possible world**

"Anything is possible for the human mind; it is just a matter of time." - Nelson

Imagine Joe Green, an inhabitant of a non-local contextual world. Up in his sky, Joe sees a rainbow made up of a glistening pattern of colored dots. Unlike the regular dots in a photographic halftone, Joe's rainbow's dots form a random array. On the other side of the same sun lies a counter-Earth, where Suzie Blue watches another rainbow in her counter-sky. Suzie's rainbow is likewise composed of a random array of colored dots. When Joe Green moves his chair, his rainbow moves too (a rainbow's position attribute is contextual, not innate), but Suzie's rainbow stands still. However, when Joe moves his chair Suzie's random array 200 million miles away instantly changes into a different (but equally random) array.
of colored dots. Suzie is not aware of this change - one random array looks pretty much like any other - but this change actually happens whether she notices it or not. The phenomenon in this hypothetical world, whether the rainbow moves or not, is completely local: Suzie's rainbow doesn't move when Joe changes places. However, this world's reality - the array of little dots that make up both rainbows - is non-local: Suzie's dots change instantly when-ever Joe moves his chair. Such a non-local contextual world, in which stable rainbows are woven upon a faster-than-light fabric, is an example of the kind of world permitted by Bell's theorem. A universe that displays local phenomena built upon a non-local reality is the only sort of world consistent with known facts and Bell's proof. Superluminal rainbow world could be the kind of world we live in. During the past twenty years Bell's theorem has been proved in many ways, some of which refer to photon attributes and some which don't. My version of Bell's proof makes no essential use of the concept of a photon or its attributes. Although Green and Blue photons and their polarization attributes are mentioned to familiarize you with the details of the EPR experiment, when it comes to the proof of Bell's theorem my argument is formulated entirely in terms of a pair of binary messages printed by particular macroscopic objects. I prove Bell's theorem here in terms of moves (orientations of calcite crystals) and marks (ups and downs on a data tape).

Bell's theorem as a relation between moves and marks takes non-locality out of the inaccessible microworld and situates it squarely in the familiar world of cats and bathtubs. Expressed in thoroughly macroscopic language, Bell's theorem says: In reality, Green's move most change Blue's mark non-locally. From arguments based on phenomena alone (no appeal to hidden attributes) we conclude that clicks in a certain counter must be instantly connected to the movement of a distant crystal of calcite. For anyone interested in reality, Bell's theorem is a remarkable intellectual achievement. Starting with fact plus a bit of mathematics, Bell goes beyond the facts to describe the contours of reality itself. Although no one has ever seen or suspected a single non-local phenomenon, Bell proves conclusively that the world behind phenomena must be non-local.

If all the world's phenomena are strictly local, what need is there to support local phenomena with a non-local fabric? Here we confront an alien design sense bizarre by human standards: the world seems strangely overbuilt. In addition the world's superluminal underpinning is almost completely concealed - non-locality would have been discovered long ago if it were more evident; it leaves its mark only indirectly through the impossibly strong correlations of certain obscure quantum systems.

In his celebrated theorem, Bell does not merely suggest or hint that reality is non-local; he actually proves it, invoking the clarity and power of mathematical reasoning. This compulsory feature of Bell's proof particularly irks physicists whose taste in realities is strictly local.

John Stewart Bell

CERN physicist John Stewart Bell, inventor of the interconnectedness theorem, which establishes non-locality as a general feature of this world.

The basis of Bell's theorem is this: if no local model of reality can explain the results of any particular experiment, then reality is non-local, if there is non-locality anywhere then there is some non-locality everywhere.

Bell's important proof has caused a furor in reality research comparable to the Einstein-Podolsky-Rosen scandal of 1935. On the one hand, Bell's theorem proves the existence of an invisible non-local reality. Those who prefer their realities to be local have so far not been able to refute Bell's argument. The fact that Bell's proof is remarkably clear and brief has not hastened its refutation. A subspace shared dimension of a mathematical convergence of multi-dimensional interactions in and past the tenth dimension. At one level of observation the universe is still just a single point. With this still shared existence perspective things can happen simultaneously, not faster than light, simultaneous. This is the Nelson subspace theory. see the PROMORPHEUS.
Although Bell's theorem indirectly necessitates a deep non-locality, Only Nelson has come up with a way to directly display this purported non-locality, such as a faster-than-light communication scheme based on these deep quantum connections. If reality research's bottom line is "Reality has consequences," then this Bell-mandated deep reality has so far failed to make a showing.

What the future holds for Bell's instantly connected but as yet inaccessible deep reality is anyone's guess. Now this theorem has been proved with technology where in Switzerland researchers have succeeded in instantaneous twin photon communication over vast distances (see appendix).

The sour grapes and twisting deceptive rationalization that scientists have towards this proof are but a defense mechanism that scientists use for their cognitive dissonance of being humiliated at being wrong.

Science has been laughing at those that believe in non-locality for years. And to now have to accept proof that they were wrong is a hard pill to swallow. Most people know that the world is non-local. There are a vast amount of stories of a non-locality. Stories of psychic connection, telepathy, intuition, etc. the PEAR group has proved this beyond a shadow of doubt, but the scientists still hold fast. All we need is one white crow, and there are forty nine billion staring us in the face.

But Motivation determines perception. So if you do not want to see non-locality or if your motivation is to protect your past stupidity, you will not see the non-local perspective no matter how evident it is. This is the last proof of non-locality. The mind effects things, and the mind can hide an inconvenient truth. A false belief is difficult to disperse. Max Plank once said that for a new idea in science to succeed all of the scientists with the old idea must die. I would hope that this is not true, but it seems to be true. When we all start to laugh at the scientist who resists new proofs, then and only then will they change, for only the insecure fear humiliation. Scientists can be very insecure. Some small minded people find criticisms like there was a reward.

Great spirits get incredible resistance from mediocre minds.

The basis of Bell's theorem is this: if no local model of reality can explain the results of any particular experiment: then reality is non-local, if there is non-locality anywhere then there is some non-locality everywhere.

In our movie and treatise on the PROOF, we established 8 steps of proof for the non-local universe. Here they are again. Bell's theore is but just #5.

Jesus taught us that the Meek will inherit the Earth. But today the Geek have stolen the Earth. The lizard mind of the Geek has taken over every aspect of our lives. Paper pushing, picayune, petty minds that over analyze and over regulate our lives. This Geek mind is cold-blooded and slithers with evil self-serving control. Geeks do not believe in God. They do not believe in prayer. They want to stop anyone from learning of the power of the mind. They will try to stop this book. They do not want a message about the powers of the mind, the seeds of sin in the mind, or the ability to transcend.

Proof of the Powers of the Mind

The most important argument in the world of science today is the clash between the people that believe in a Non-Local Universe versus those that believe in a Local Universe.

Local people believe in the direct push pull, cause and effect action, and they do not believe in the power of the mind to effect things at a distance without a direct connection. They look for repeatability and worship statistics.

Non-Local believers see a universe where there is prayer, spirit, a collective unconscious and a connection of all things. They know that there is a power of the mind to effect things and a level of connection of all things.
The Steps of the Proof are:

**Step 1. The test of time:** Humans have always felt the connection of mind and spirit. Every race of people and every tribe have had those who have greater abilities to use these powers of the mind. They know that there is a subtle but undeniable force of connection. The Bible, Koran, Bagavad Gita, the analects, and all of the religious beliefs are filled with every page referencing the power of spirit, prayer, faith, hope and God. This belief is Ageless, Universal, and Omnipresent. The test of time is met and if we had a vote on the conflict of Non-Local versus Local there would be landslide 99.9% for a Non-Local universe. The small, 09% of the people who believe in a Local universe, however have manipulated themselves into supreme power. The Geeks laugh at the rest of us for believing in God. They control our lives with their Geek ways. We must take back our planet.

**Step 2. Quantum Theory:** Physicists were shocked when they found that a very small quantic experiment could be influenced by the observer. This was called the observer effect and thus the world of science was changed forever when the Observer Effect was PROVED! But the Geek mind had to rationalize and twist away from this truth. But the proof existed none the less and science was changed, although the Geeks have been able to use treacherous and false-hearted ridicule to control the damage. They laugh at those who accept the observer effect. The Geeks also control the funding for science and they stop funding for the open minded scientist who sees the Non-Local universe. But now the tables are turned as those who accept the observer effect. This was called the observer effect and thus the world of science.

**Step 3. Medicine's Paranoiac need for Double Blind.** Medicine was shocked when they discovered the placebo effect. The mind of the researcher was able to affect the results of an experiment. The mind of a doctor can affect the patient. The mind of a patient can affect himself. From then on a double blind experiment was required. Proof of the powers of the mind, but still the Geeks twist on.

**Step 4. Fractal Complexity:** What we do not know is so vast that it should be humbling. But it takes a lot to humble a Geek. Fractal complexity has shown that reductionism is now no longer a valid process of examining complex situations. Non-Linear chaos mathematics are needed. When we use this type of analysis we can see that a small change might produce a large change. This is known as the ‘Butterfly Effect’ and it allows for the powers of the mind.

**Step 5. Bell's Theorem.** This basic theorem of Quantum Electro Dynamics has shown that twin photons can have instantaneous effects on each other even when light years apart. This has been PROVED theoretically and experimentally to the utmost level of science. But the Geek small mind has extreme powers of rationalization and self-deception. The Geek mind still resists admitting that the Local universe is a false belief. To do this would take courage and fortitude, things that most Geeks do not have.

**Step 6. PEAR = Princeton's Engineering Anomalies Research:** After over a decade of research on the effects of the mind in a prestigious American university Princeton, there is undeniable proof of the power of the mind to effect things. The evidence is astounding for its quality and quantity and is without doubt PROOF.

**Step 7. The disbeliefers always get test results that deny the proof:** The hypothesis of our theory is that the mind can effect things. This means that those who disbelieve or scoff at the theory will only be able to get test results that confirm their own disbelief. Why is it that when a researcher does a study that it usually confirms his original belief is because there is an effect of the mind. The Geek mind is simply unable to admit that the Geek mind was wrong or is there a much more sinister reason for the Geek disbelief.

**Step 8. The resistance to accepting the powers of the mind is great; in fact it is too great.** The resistance is so incredibly great that it becomes PROOF: There appears that this resistance comes from such closed minded people and often psychologically unstable people. These critics will often shake and flush and get over compassionate in their attempt to dispel the powers of the mind. Their actions and reactions are so contrived and insecure that they cause wonder that perhaps there is an ulterior motive. Is there perhaps a plan to keep the powers of the mind away from the general public? For the small minded Geek, fear of humiliation and thus loss of future standing and funding is much stronger than the pursuit of truth. The Geeks will distract, discredit, dispel, and delay any attempt to communicate the powers of the mind. Their excessive zeal and obvious hidden agenda is slowly breaking down this resistance.

**Breathairians Exist 70 Years without Eating? ‘Starving Yogi’ Says It’s True**

Prahlad Jani, an 82-year-old Indian yogi, is making headlines once again by proving claims that for the past 70 years he has had nothing -- not one calorie -- to eat and not one drop of liquid to drink. To test his claims yet again as he has for many years now, Indian military doctors put him under round-the-clock observation during a two-week hospital stay that ended last week April 2010. During that time he didn't ingest any food or water -- and remained perfectly healthy, the researchers said. He has done this under close scrutiny many times, proving he can go without food or water for long periods of time. But
that's simply impossible, said Dr. Michael Van Rooyen an emergency physician at Harvard's Brigham and Women's Hospital, an associate professor at the medical school, and the director of the Harvard Humanitarian Initiative – which focuses on aid to displaced populations who lack food and water. He represents the medical establishment which deny such things are possible in the face of evidence. They ignore such evidence that it shows them to be the most ignorant people alive. Van Rooyen says that depending on climate conditions like temperature and humidity, a human could survive five or six days without water, maybe a day or two longer in extraordinary circumstances. We can go much longer without food – even up to three months if that person is taking liquids fortified with vitamins and electrolytes. Bobby Sands, an Irish Republican convicted of firearms possession and imprisoned by the British, died in 1981 on the 66th day of his hunger strike. Gandhi was also known to go long stretches without food, including a 21-day hunger strike in 1932.

Sterling Hospitals - Prahlad Jani was studied for two weeks.

The effects of food and water deprivation are profound, Van Rooyen explained. “Ultimately, instead of metabolizing sugar and glycogen [the body's energy sources] you start to metabolize fat and then cause muscle breakdown. Without food, your body chemistry changes. Profoundly malnourished people autodigest, they consume their own body's resources. You get liver failure, tachycardia, heart strain. You fall apart.” But for certain spiritual adepts these factors can be overcome thru the powers of the mind. The yogi, though, would already be dead from lack of hydration. If he really went without any liquids at all, his cardiovascular system would have collapsed. “You lose about a liter or two of water per day just by breathing,” Van Rooyen said. You don’t have to sweat, which the yogi claims he never does. That water loss results in thicker blood and a drop in blood pressure. “You go from being a grape to a raisin,” Van Rooyen said and if you didn’t have a heart attack first, you’d die of kidney failure. But as Van Rooven watched with ignorant jaw drooping stare the yogis mind can overcome these forces.
Comments

What this yogi is doing has been done by vast numbers of yogi’s for millenia. It is an amazing feat in that it is real and it took this particular man an almost inconceivable amount of mental discipline to achieve. Our physicists are just beginning to skim the finest surface of understanding of our human potential and while going without food for so long may not seem to serve a purpose - it is one of many ways to make the journey inward that we all must make eventually. We are all connected and when one achieves the level of discipline and inward seeking that this man has - it is for all of us.

John Patton (Monday, May 10, 2010 8:27 PM)

What western medicine fails to recognize is that the human body has many secrets and capacities that few have explored. The human organism is not merely mechanical. And the capacity of the universe to surprise us with the unexpected should make modern doctors be more humble. For example; doctors dismissed germ theory as bunk just a 150 years ago. “Wash my hands? What rubbish.” Be open minded and humble you masters of medicine and the knife!!

Chuck Henderson (Monday, May 10, 2010 8:28 PM)

This can be a real event where a person gains his energy from other sources which are not nutritional in the usual sense. A term sometimes used is “breathers” getting energy from the prana in the environment.

F, Jackson, MS (Monday, May 10, 2010 8:30 PM)

The so called Buddha Boy of India pictured above was also seen to stop water and food for over 75 days. This is an easy feat to the Buddhists who accept and understand this.

The Roman Catholic Church has records of several saints (over 475 people) who have gone without any food for more than two years, some for decades. It is a massive display of medical ignorance to accuse these saints of cheating and deception, but the modern medical mind is ignorant and not as modern as he thinks he is.

The Buddhists have thousands on record, the Hindu many thousands more. And to accuse them all of deception is as stupid a thing an ill-informed, bad-mannered, impolite, IGNORANT Medical doctor can do. But arrogance and ignorance knows no bounds.

The religions of the world have tens of thousands maybe more cases of people living without food and or water beyond current medical doctrine. Hell’s Angels has none. They have Beerarians living on Beer alone but none living on Breath alone. This is because it takes a great amount of mental disciple to suspend the laws of normality and to control the laws with the power of the mind.

To make a new medicine and a new biology we must be able to account for the Breatharians and the powers of the human mind.

Quantum Levitation

Syndrome from Pixar’s The Incredibles levitates things on zero-point energy.
We study methods [1,2] for the manipulation of the force of the quantum vacuum known as the Casimir force. It is possible to turn the Casimir force from attraction to repulsion and to use it for levitating mirrors on, literally, nothing. This research may be interesting for applications in nanotechnology, because the Casimir force is the ultimate source of friction for micro- and nano-machines. In the following we explain the science behind Quantum Levitation. See also the article Perfect lens could reverse Casimir force in PhysicsWeb.

Gecko feet

A gecko can hang on a glass surface using only one toe. This extraordinary feat of their extraordinary feet is due to the forces between the glass and the gecko’s toes, the forces between neutral atoms or molecules known as the van der Waals force. The van der Waals force usually causes things to stick; the force is attractive; and it acts only across short ranges.

Field lines of the van der Waals force between two atoms or molecules. From a lecture course at MIT.

What is the van der Waals force? Although a neutral atom or molecule is not electrically charged in total, the charges in the molecule may separate, forming a dipole. The plus side of one dipole is attracted towards the minus side of another dipole, and vice versa: the molecules attract each other.

The physics behind the van der Waals force: neutral atoms or molecules electrically polarize each other. From a lecture course at Columbia University.

However, the dipole of one molecule does only form in the presence of another particle. On its own, the molecule relaxes to an electrical equilibrium state. So, when two molecules meet, which one will form and stretch out the plus side to the other and which one the minus? The answer is very strange: each molecule will form a plus and a minus pole at the same time; the pole will be in a quantum-superposition state of plus and minus.

According to quantum physics, the world is teeming with possibilities, virtual processes where Nature tries out infinitely many things at the same time, before some of them materialize into solid fact. Sometimes they never do, but the virtual processes may still have a real effect. The van der Waals force is a good example: it is not necessary that the molecules decide which one points the plus side and which one the minus side to each other; they attract each other regardless.
Casimir cavity: the left picture shows a cavity made by two metal plates (by two mirrors); the right picture illustrates standing electromagnetic waves in the cavity. Even if the cavity is empty, without any electromagnetic field inside, the sheer possibility that such standing waves may exist is important in the Casimir effect.

Imagine that you replace the molecules by larger bodies, say glass or metal plates. Even if the plates are electrically neutral in total, virtual patterns of charge variations could form on the surfaces, local pluses on one plate that are attracted to minuses on the other plate, and vice versa. Like in the case of the van der Waals force between molecules, the pluses and minuses are undecided, they are in quantum-superposition states, even across relatively large distances (a few 100 nanometers) and between extended bodies; causing a force known as the Casimir force.

Casimir effect and vacuum fluctuations: roughly speaking, the difference in the pressure of the quantum vacuum inside and outside the cavity causes the plates to attract each other.

Casimir effect and vacuum fluctuations: roughly speaking, the difference in the pressure of the quantum vacuum inside and outside the cavity causes the plates to attract each other. Maritime analogy of the Casimir force. In calm weather and without any water currents, ripples on the sea may cause two tall ships to attract each other, with potentially catastrophic consequences. The pressure difference of the ripples between the ships and the ripples outside them causes the attractive force, similar to the Casimir force. In the Casimir effect, the ships are the cavity plates and the quantum ripples of the empty electromagnetic field play the role of the water waves.

Hendrik Casimir discovered the theoretical possibility of such a force in 1948. He told Niels Bohr about his strange and surprisingly simple formulas during a walk. Bohr suggested in a cryptic remark that one can also understand the force between the plates as being caused by the zero-point energy of the electromagnetic field, by vacuum fluctuations. Empty space is not empty, but is filled with the quantum vacuum, with endless virtual processes.

The energy of the quantum vacuum, the zero-point energy is infinite according to our present theories. Clearly, this infinity is an artifact - it would make the electromagnetic field infinitely massive, because energy and mass are related according to Einstein's $E=mc^2$. The empty electromagnetic field would collapse under the weight of its own gravity. Some unknown mechanism beyond quantum electromagnetism must regularize the infinity of the electromagnetic vacuum energy.

Nevertheless, the zero-point energy results in perfectly finite and experimentally confirmed facts, for example the Casimir force.
Apparatus for measuring and manipulating the Casimir force. Instead of two parallel plates, a Gold sphere and a nano-fabricated silicon swing form a cavity. The torsion of the swing measures the Casimir force. These experiments are done in the group of Federico Capasso.

In 1997 the first precise observation of the Casimir force was reported. Since then, a series of ever-more sophisticated experiments showed that the Casimir force is not only real and does agree with quantum theory to an astonishing accuracy, but that it can be applied in nano-fabricated devices such as Microelectromechanical Systems (MEMS) [8,9]. MEMS combine tiny mechanical structures with electronics on one chip. For example, the chip that triggers the airbag in a car contains both the mechanical elements for measuring violent de-acceleration and the electronics needed for deciding when to explode the airbag.

Accelerometer and electronics on one chip - the trigger chip of an airbag, for example. From Sandia’s MEMS page.

The Casimir force is the ultimate cause of friction in the nano-world. Micro- or nano-machines could run smoother and with less or no friction at all if one can manipulate the Casimir force.

Micro-machinery. From Sandia’s MEMS page.
Imagine that you put a transparent material between the Casimir plates. The material may influence the way in which the virtual dipoles of the plates respond to each other, or, equivalently, the distribution of the zero-point energy. We found out that the plates repel each other if the material is electromagnetically left-handed. Such materials show negative refraction.

A negatively refracting medium transforms space. The top figure shows the graph of a coordinate transformation from the real Cartesian $x$ to $x'$. The medium shown in the lower picture turns out to perform this transformation. The transformation changes right-handed into left-handed coordinates and so the medium creates left-handed electromagnetism. Our picture shows why left-handed media make perfect lenses: each point $x$ in physical space corresponds to one $x'$, but this $x'$ has two more images in $x$; one inside the device and one outside. Since this map is perfect in principle, the electromagnetic fields at the three $x$ points are identical; the device acts as a perfect lens. The lower picture shows that light rays are negatively refracted. Such transformations turn the attractive Casimir force in $x'$ space into a repulsive force in real space.

In transformed space the Casimir plates attract each other, but the transformation causes the plates to repel each other in real space. One plate could hover over the other at the distance where the repulsive Casimir force of the quantum vacuum balances the weight of the plate; the plate levitates on, literally, nothing.

Levitating mirror

Our idea is not the only option of making the Casimir force repulsive, but it may shed light on the general mechanism acting behind the scenes, because our theory is inspired by a simple picture of how space is transformed; it visualizes Casimir repulsion. As you have seen, Quantum Levitation uses a fascinating piece of quantum physics and it may find applications in nanotechnology. Incredible!
Fleming's left hand rule for motors

Fleming's left hand rule (for electric motors) shows the direction of the thrust on a conductor carrying a current in a magnetic field.

The left hand is held with the thumb, index finger and middle finger mutually at right angles. It can be recalled by remembering that “motors drive on the left, in Britain anyway.”

- The First finger represents the direction of the Field.
- The Second finger represents the direction of the Current [conventional current, positive(+) to negative(-)].
- The Thumb represents the direction of the Thrust or resultant Motion.

This can also be remembered using “FBI” and moving from thumb to second finger.

- The thumb is the force $F$
- The first finger is the magnetic field $B$
- The second finger is the of current $I$

There also exists Fleming's right hand rule (for generators). The appropriately-handed rule can be recalled by remembering that the letter “g” is in “right” and “generator”.

Both mnemonics are named after British engineer John Ambrose Fleming who invented them.
Other mnemonics also exist that use a left hand rule or a right hand rule for predicting resulting motion from a pre-existing current and field.

De Graaf’s translation of Fleming’s left-hand rule - which also uses thrust, field and current - and the right-hand rule, is the FBI rule. The FBI rule changes Thrust into F (Lorentz force), B (direction of the magnetic field) and I (current). The FBI rule is easily remembered by US citizens because of the commonly known abbreviation for the Federal Bureau of Investigation. There is an excellent analogy, pioneered many years ago in Canada, which does away with the need for either of Fleming’s complex rules. Imagine that electrons are eskimos, running through a forest. The fir trees look like arrows pointing up, and represent lines of force (i.e. a north pole is beneath the eskimos). As the eskimos run they always veer towards the left. That is the only rule needed.

This works for both dynamos and motors. If electrons flow forwards (away from us) in a wire held horizontally between a south pole on its left and a north pole on its right, the electrons will try to move to their left, through the lines of force (“forest”) running across from the north pole. This will pull the wire downwards. If the wire itself is pulled downwards the electrons in it will be moving down through the lines of force and will wish to move to their left, i.e. towards us (the opposite direction from the previous one) which is exactly as it should be.

Hold a north pole at the left side of a cathode ray tube TV, in which electrons are rushing toward the screen. The lines of force run, roughly, from left to right across the tube. The electrons will turn to their left in this “forest”, i.e. downwards, and therefore the image will move down. A south pole will make the image rise.

**Fleming’s right hand rule**

[Fleming’s right hand rule diagram]

Fleming’s right hand rule (for generators) shows the direction of induced current flow when a conductor moves in a magnetic field.

The right hand is held with the thumb, first finger and second finger mutually perpendicular to each other at right angles, as shown in the diagram.

- The Thumb represents the direction of Motion of the conductor.
- The First finger represents the direction of the Field.
- The Second finger represents the direction of the induced or generated Current (in the classical direction, from positive to negative).
- One particular way of remembering the rule is the “FBI” acronym for Force (or otherwise motion), B as the magnetic field sign and I as the current. The subsequent letters correspond to subsequent fingers, counting from the top. Thumb -> F; First finger -> B; Second finger -> I
- Another mnemonic for this rule is “Manchester Football Club - starting from the thumb and taking the initial letters gives “MFC”, as described above.

There is also a Fleming’s left hand rule (for electric motors). The appropriately-handed rule can be recalled from the letter “g”, which is in “right” and “generator”.

These mnemonics are named after British engineer John Ambrose Fleming, who invented them.

### Symmetry

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References


This computer-generated graphic shows how electronic charges are distributed across the surface of a molecule made of two cobalt atoms. Visualizing molecules this way helps scientists understand how different molecules merge and break apart in chemical reactions.

In this striking image, negative charges are represented by shades of blue (the darker the denser), and the black spots show the parts of the molecule out of the computer program’s range.

Cobalt the element may be less well known than its namesake, the color. But not coincidentally, the color is so-named because the element is the key ingredient in a pigment that transforms ordinary glass into a fabulous blue tint.

In its natural form, cobalt is usually combined with other metals. When isolated, it looks more like a chunk of iron than a leggy blue blob. It’s usually found in meteorites or recovered as a byproduct when minerals like nickel, lead, and copper are mined and refined.

It’s useful, too, and not just for little glass bluebirds. In fact, Cobalt-60, a radioactive isotope, is a source of gamma rays used to treat some forms of cancer. Cobalt is also a part of metal alloys employed in jet engines and gas turbines.

**MAJOR PROBLEMS OF MODERN MEDICINE**

1. Profit over people, greed has gone unchecked
2. Mistake of SYNthetic chemicals, we now know that the SYNthetic drugs cause more disease than they cure, and they are incompatible with the body, Nature knows better
3. Allopathy is a wrong answer, we need to be more holistic and look at the overall risks to help people
4. Big Tobacco, Big Sugar, Big Pharma are all unchecked and their money controls the process, they hire the little minds of the regulatory geeks to attack any that threaten them. And the FDA look the other way as Big Tobacco, Big Sugar, Big Pharma kill and injure vast millions
5. The wrong use of reductionistic statistics has led to a loss of safety
6. There is no Health Care, just Disease Care as nobody is made healthier in the system, just symptoms are abated and side effects spiral down the system
7. There is a lack of truly modern science in “Modern Medicine” as they cling to antiquated chemical views and reductionistic science and resist ideas of quantum, electrical philosophies of the body, or of the powers of the mind.
8. Massive monies are spent on an inaccurate system of diagnosis (30% accurate by AMA statistics). 80% of the multi trillion dollar medical budget is spent on wasted diagnosis to guide the next pharmaceutical and nobody builds responsibility, education, or simple health care into the system. Has nobody watched “You are What You Eat or the Diet Doctor”
9. The costs are spiraling out of control, this massive debt and cost is crippling.
Solutions

1. Big Tobacco, Big Sugar, Big Pharma must be removed from their controlling position and limit the lobby groups control of legislation.

2. Quit attacking new minds that have solutions but threaten Big Tobacco, Big Sugar, Big Pharma for they are the real bad guys

3. Emphasize Health in Health Care, emphasize responsibility, education

4. Stop the overuse of dextrose, and switch to fructose

5. Stop bad oil use and switch to good oils

6. Stop the 19 out of 20 significance hold and allow fractal non-linear systems of statistics to be used.

7. Insurance should be triple or more for those that smoke, eat, drink, stress and risk excessively. Insurance companies have the statistics and the cost of these addictions and behaviors should not be borne by the population of healthy people but should be on the shoulders of the addicts.

8. Allow more modern systems of safe electrical biofeedback to educate and de-stress people.

9. Look at the philosophy of medicine and compare the Dr. Nelson and Hans Selye system to the present one

10. Make a new group of care givers to detect early signs of disease and educate and consul stress reduction, compassion, understanding, diet, exercise, and basic health. These should be Registered Wellness Consultants (RWC).

11. If we truly CARE for people not for profit the cost will come down and the health will go up. Society will benefit by immeasurable ways.

These are simple techniques that all could be done easily. There is one thing more powerful than all the armies of the world. It is an idea whose time has come. Who of you could help get these ideas out to the masses.

TWIN PHOTONS PROVE BELL’S THEOREM AND NON-LOCALITY OF UNIVERSE

Physicist RAYMOND Y. CHIAO is widely known for pioneering experiments in the twilight zone of quantum mechanics where objects can pass through solid walls. His recent work involves investigations of faster-than-light phenomena. He has measured how long photons take to “tunnel” through a barrier that ought to be impenetrable and found that they appear to outpace the speed of light when they are successful in reaching the other side. Born in Hong Kong and educated in the United States, he earned a bachelor’s degree from Princeton University, where he was elected to Phi Beta Kappa in his junior year, and a Ph.D. in physics from the Massachusetts Institute of Technology in 1965. After teaching at MIT for two years, he joined the physics faculty of the University of California, Berkeley and was named a full professor in 1977. Dr. Chiao has held a Woodrow Wilson Fellowship and an Alfred P. Sloan Fellowship. A member of Sigma Xi, he won the second prize of the Gravity Research Foundation in 1981 and the Scientific Innovation Award for Outstanding Work in Modern Optics from the Center for Advanced Study at the University of New Mexico in 1986. He is a fellow of both the American Physical Society and the Optical Society of America. Dr. Chiao has published some 125 papers in major scientific journals. He edited Amazing Light (1996), a volume dedicated to the Nobel laureate Charles H. Townes on the occasion of his eightieth birthday.

Quantum physics: Single photons stick together

Philippe Grangier - Abstract

In the right circumstances, two photons can meet and ‘coalesce’. This effect has now been observed for photons emitted independently from a single-photon source, and has implications for quantum computing.

Can two photons that have never met know something about each other? The question bothered Einstein, and, reporting on page 594 of this issue, Santori et al.1 demonstrate in a new context that the answer is ‘yes’.

Quantum Theory and Reality

• A new scientific truth does not triumph by convincing its opponents and making them see light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.

Max Planck
• What we observe is not nature itself, but nature exposed to our method of questioning. Werner Heisenberg

• Anyone who has not been shocked by quantum physics has not understood it. Niels Bohr

• One can't believe impossible things. Alice in Wonderland

What is an Electron? Of Particles and Waves

Our story will be begin here because it is the electron, and our knowledge of it, that has been responsible for so much of the technology that we take for granted today. Without the electron there would be no electricity, no electric lights, no TV, radio, CDs, DVDs, thumb drives, cell phones, computers and electronic social networking. We would not have supermarket doors that open automatically or computers to play video games, surf the Web, and do word processing and spreadsheets for business. But what exactly is an electron? In the early moments of the twentieth century scientists found themselves asking this very question. The discovery of radiation and the atom promised to open up a strange new world of knowledge, understanding, and power.

At first physicists assumed that the atom was like a miniature solar system. At the center was a nucleus consisting of particles glued together somehow; and that circling this nucleus were the swiftly moving electrons, like little particle planets. This model did not last very long. Although we still use a version of this model today to have some visual handle on what the atom looks like, the pioneers of atomic physics discovered fairly quickly that mathematical calculations based on this model predicted that the electron would crash into the nucleus in an instant.

Physicists also discovered that electrons could be stripped from the atoms and made into beams of radiation. This was a great breakthrough, because they could manipulate these beams, and begin to deduce from the behavior of these beams the nature of the electron itself. A similar channel of investigation was taking place in attempting to understand the nature of light. From this another remarkable discovery was made: Beams of electrons behaved very much like beams of light. We saw that the speed of light was considered a paradox by many at the turn of the century. By this time the nature of light was also very controversial and something of a paradox. Under some conditions light seemed to have a definite location at any given definite time.

A particle is a localized piece of matter, like a baseball, that at any given time has a definite size. It can in be only one place at a time. A baseball thrown in Hawaii cannot be in New York at the same time. Furthermore, we assume, ontologically speaking, that we may discover in this marvelous universe some very strange objects but that, regardless of how strange they are, if they are objects, then they will have a definite location at any given definite time.

A wave, on the other hand, is a very different kind of thing. In fact it is appropriate not to refer to it as a thing at all, but rather as an event or phenomenon. Things by definition have a definite localized size at a given definite time. Waves do not. Imagine dropping a pebble into a still pond of water. At first there is a small splash, and then circular waves move away from the spot where we dropped the pebble. The wave spreads out; it does not stay in one place, but can be in many places at the same time. Also, it is the medium of the water that transmits the energy of the dropped pebble. The wave is simply a disturbance of the medium. It does not have an existence of its own like the smile of the Cheshire cat in Alice in Wonderland. Without the water being in the pond there would be no waves.

On the north shore of the Island of Oahu in the State of Hawaii, every winter large waves pound the shoreline. These waves are caused by the seasonal winter storms migrating northeast of the state in the jet stream on their way to make life miserable for people in the Pacific Northwest, and eventually much of the rest of the continental United States. The winds from the migrating storms cause a significant disturbance in the sea and a series of undulations are transmitted many miles until finally, reaching the reef on the north shore of Oahu, spectacular waves of thirty feet or higher break and push forward a mountain of water and foam toward the beach. On the cliffs overlooking Waimea Bay you can watch a gigantic half circle of water march relentlessly toward the beach and then simultaneously, across a quarter mile area, surge onto the beach. It is a very spectacular sight. Tourists travel many thousands of miles to see it, and single-intentioned surfers wait in anticipation all year, hoping to be the first to ride the biggest wave on record and survive.

It would be a strange event indeed, if one day while watching wave after wave break, we saw one wave flow in its normal way toward the beach, and then, just as the wave was about to touch the fringes of the vulnerable beach, the entire half circle of water collapsed instantly to a single unpredictable point on the beach and exploded! The wave would have turned into a massive particle located at one place, rather than spread out as waves normally are. Imagine wave after wave doing this, with the location of the collapse being unpredictable each time. Strange indeed this would be, but something like this is what electrons and photons seem to do!
Thought Experiments

• All of modern physics is governed by that magnificent and thoroughly confusing discipline called quantum mechanics. It has survived all tests and there is no reason to believe that there is any flaw in it. We all know how to use it and how to apply it to problems; and so we have learned to live with the fact that nobody can understand it.

The science of the subatomic realm is called quantum physics or quantum mechanics. The word “quantum” refers to the fact that energy at the subatomic realm comes in packets, or quanta; energy is said to be “discrete” rather than continuous. The best way of understanding the implications of discrete motion is to understand the most famous phrase in this science, the “quantum jump.” As we will see, this does not refer to a continuous quick motion, such as a child jumping from one place to another, but rather a discontinuous, instantaneous movement from one place to another. In other words, quantum objects seem to be able to move from place to place without being anywhere in between. They seem to “pop” in and out of existence.

In the following pages we are going to retrace the same baffling steps taken by physicists in the twentieth century. The goal was simply to understand the nature of subatomic objects such as the electron and the photon. The result was a revolution in thought so radical that even Einstein could not accept it. We will be using, though a method Einstein would have approved of, what are called “thought” experiments. Instead of looking at the actual technical experiments, we will imagine a series of composite pictures that remain true to the actual experimental findings.

Imagine first a lead box impenetrable except for two microscopic slits on one side. Inside the box the side opposite the slits is coated with photographic film. Imagine that on the outside facing the two slits we have a source of radiation, beams of electrons or light, and that we aim this radiation at the face of the box with the two slits. By looking at the kind of exposure that results on the photographic film, we can infer what kind of radiation is penetrating the box. For instance, if the radiation consists of beams of electrons or light, and that we aim this radiation at the face of the box with the two slits, the radiation would spread throughout the length of the photographic film, producing alternating bands of exposure. Some of the wave crests would meet and accentuate each other, and some would meet the troughs of other waves and cancel each other. The exposed bands on the photographic film would be the result of the crests meeting. Such a resourceful experimental process is what Einstein had in mind with his clock analogy. We may not be able to see the invisible electron, but we can infer a reasonable representation of what it is by observing the effects it has on macroscopic objects.

When similar experiments are done, the result is remarkable. The photographic film always shows an interference effect indicating a wave. Amazingly, the radiation produces this same effect in passing through a vacuum, presumably a physical state with no wave medium such as air or water. How can a wave exist without a substance of some sort to disturb it? Also, when we look closely at the exposure of the film, the exposed areas show piles of little hits, as if millions of individual particles hit the film, each blackening only a single grain of film in unpredictable locations. Remember that if the radiation is a wave, then as it reaches the film, it should be spread out along the entire length of the film like a wave breaking on a beach. But how can it hit at only one unpredictable place? This is as ridiculous as the possibility of watching a wave march toward a beach and seeing the entire wave collapse at a single point on the beach!

• In the universe great acts are made up of small deeds. Lao Tsu

Obviously, more experiments are necessary. Baffling results are common in science. So let’s close one of the slits and see what happens. Perhaps the particles are so small that as they penetrate the slits they ricochet all over the interior of the chamber, bouncing off each other in a wild unpredictable manner which eventually somehow produces the illusion of an interference effect. After all, the electron is about 10,000 times smaller in mass than an average atom. Thus, in closing one of the slits, we would lessen this wild ricocheting, and a piling effect should result adjacent to the single slit.

Sometimes nature cooperates. If we alternate in opening and closing each slit, the result appears consistent with the particle hypothesis -- a double piling effect adjacent to each slit.

But wait. To be sure that we are dealing with a particle, let’s return to our original experimental setup with two slits open simultaneously. This time, however, we will lower the intensity of the radiation. Another way to lessen the possibility of the ricocheting effect, and at the same time rule out once and for all the
Let's try one more example. What we want to know is, does the radiation pass through both open slits or be in two places at the same time and ricochet off itself.

Conducting this experiment will take more time for an exposure to develop because millions of particle hits will be required to make an exposure, and there are three possible paths for each particle: to penetrate the chamber through either of the two slits or be stopped by the lead barrier. Nevertheless, we should eventually observe a particle effect -- a double piling effect of hits adjacent to the two slits.

- The “paradox” is only a conflict between reality and your feeling of what reality “ought to be.” Richard Feynman

Alas, nature fails to cooperate. The result is an interference effect, exactly as in our first case. Now we are really in trouble. Why should we get a wave effect with two slits open, even though the exposure is the result of cumulative unpredictable hits, and a particle effect with only one slit open? With two slits open the radiation is acting as if it penetrates the chamber at two places simultaneously, something only a wave can do. With one slit, however, the radiation is more localized, as we would expect from particles that can be in only one place at a time.

It is easy to lose sight of the philosophical significance of these results. Many of the great names of science, however, who were working at understanding this baffling microscopic realm, also had a background in philosophy, and it was immediately apparent that there was something major at stake here. Since the time of the ancient Greeks and the fledgling beginnings of scientific exploration, we have assumed that we are dealing with one world, one consistent reality. That is, even though we expect the world to be baffling at times, with strange and new details of discoveries, we also expect that whatever these details are, they stay the same independent of our knowing. They are objectively “out there” waiting for us to discover, and they are what we are regardless of our knowledge or ignorance. We assume as Newton did that the world does not depend on us or how we choose to make our observations of it. We do not expect something to be in only one place at a time.

But what if nature is not so straightforward? What if the world is more complex than we have thought? What if the world is not what we expect it to be?

- If we take quantum theory seriously as a picture of what's really going on, each measurement does more than disturb: it profoundly reshapes the very fabric of reality. Nick Herbert

Let's try one more example. What we want to know is, does the radiation pass through both open slits simultaneously or only one? Consider then the following experimental arrangement: both slits open, one measure of radiation entering the chamber at a time, but with one added feature -- a detection device inside the chamber that will reveal whether or not the radiation is passing through both slits as a wave would or only one or the other of the slits as a particle would. Because the situation is almost identical to the case in which an interference effect was recorded, we would expect to see the detection device react as if a wave was surging through both openings simultaneously. On the other hand, if the radiation consists of particles, then only one instance of detection should be recorded at a time. Remarkably, the latter is the case -- only one instance of detection is recorded at a time -- and the photographic result is now consistent with the arrangement with only one slit or the other open!!

As physicists conducted further experiments with subatomic phenomena, they found that all subatomic phenomena display this same ambiguity. This ambiguity has come to be known as wave-particle duality. This result was not easy to accept. One of the most fundamental principles of science seemed to be mocked by these results: the notion that we are dealing with, and can know the details of, an objective world. To use Einstein’s cosmic clock analogy, we expect that the internal mechanism stays the same regardless of our hypotheses and beliefs about what the internal mechanism is. We do not expect the internal mechanism to change as we change our experimental attempts to know the internal mechanism.

It is perhaps one of the greatest achievements of the twentieth century that in spite of this shock, a very successful mathematics was developed that not only allowed physicists to predict the results of the above experiments but also produced one of the greatest scientific and technological success stories in recorded history. In 1926 the physicist Erwin Schrödinger discovered a wave equation that predicts the above results, but with a high epistemological and ontological price.

As we would expect from the name, the equation literally portrays the radiation as a wave, but a very strange wave. According to the equation, in our two-slits-open configuration as soon as the radiation leaves its preparation point, it begins to spread out in a strange multidimensional “hyperspace.” As it encounters the slits it splits, as any real wave would, passing through into the chamber and interfering with itself. As the radiation touches the photographic film, however, all of the energy of the wave collapses to a single unpredictable point! We can never predict at what exact point the radiation will be received, but we can always, with a remarkable consistency, predict the probability of where it will strike and the overall statistical pattern, not only for this particular arrangement, but for all the others as well.

Because of the influence of the twentieth century philosophy called logical positivism, most physicists have been taught to think of the equation as a calculation device, not as depicting what is literally real. The special mathematical function used is thought to represent only a “probability function” for, given initial
conditions, the probability of finding a hit, or a pattern of hits, at a particular location. Thus, the only waves that exist are said to be “probability waves.” Thus, just as some astronomers during the middle ages thought of Ptolemy’s epicycle as just a device used for making predictions where planets would be, the wave equation is just a device for predicting what electrons will do. For the logical positivists, the question of reality was a nonsolvable useless philosophical question.

But wait. Given the tremendous success of our electronic technology in the twentieth century are we really no longer interested in the foundational reality behind all this success? Don’t we still want to know what electrons and photons are? Let’s look at one more example.

Imagine a light source directed at a half-silvered mirror, a mirror covered with a very light reflective coating. Such a mirror functions as a beam-splitter. Shining light on the mirror tilted at an angle will cause the light to split into two separate beams. If we assume that light consists of little particles called photons, then the physical properties of the half-silvered mirror should cause each individual photon to pass through the mirror or be reflected at an angle. Each photon must become part of one beam or the other. If we set up photon detectors at the appropriate angles, at points A and B, individual detections at A or B should result. With this experimental arrangement, the mathematics predicts that over a sufficient period of time 50 percent of the light will be received at A and 50 percent will be received at B. Furthermore, if the intensity is lowered through filtering, such that only a single photon approaches the mirror at a time, then only a single whole photon should be detected at a time. Detections at A and B should never be recorded simultaneously. This prediction is just common sense. If the photon is an individual object, it cannot be in two places at the same time.

- We have sought for firm ground and found none. The deeper we penetrate, the more restless becomes the universe; all is rushing about and vibrating in a wild dance. Max Born

When such an experiment is actually conducted one whole unit of energy is detected at either A or B, confirming the particle interpretation of subatomic phenomena. If a photon is a particle, it will pass through the mirror and be detected at A or be reflected and detected at B. However, remember that the Schrödinger equation is a wave equation. If the equation is interpreted literally, the equation describes that the light energy is in both channels! The half-silvered mirror splits a wave packet into two “hyperspatial, virtual/real, probability” waves. Then at the exact moment that the energy reaches the detectors, some sort of strange decision is made, and the entire unit of energy is received at only one point, at either A or B! The wave packet “collapses.” If a whole unit is received at A, then the energy that was approaching B has jumped over to A. In addition, the equation predicts this will happen even if the two detectors are separated by many light years, and even if one detector is much closer to the half-silvered mirror than the other. The latter case implies that the energy that is approaching the one that is closer, say B, waits until the energy approaches A, and then either jumps to A or the energy that was approaching A goes “backward in time” and collapses at B. The mathematics always works, but what it describes literally seems impossible. Like Alice in Wonderland, we cannot believe in impossible things can we? According to the mathematics, there is an instantaneous collapse of potentiality in multidimensional hyperspace to a three-dimensional location. Strange indeed. So physicists who follow the logical positivists party line tell us that we must not think of the split wave packets as real, but only as a description of the probability of where photons will go.

But wait. Can we prove that the light really passes through both channels? Quantum jumping and wave collapsing aside, we can at least test for the photons passing through both channels. Consider the following arrangement. This time we will create an interferometer by placing totally reflecting mirrors at the points where detectors A and B were. Thus, if the light beam is really split by the half-silvered mirror, the totally reflecting mirrors will now reflect the split beams of light. If we aim these totally reflecting mirrors so that the beams will meet again, it is possible to take a picture of the waves interfering with each other, just as we did in the two slit experiment. With this arrangement, interference fringes result similar to that found in the two slit experiment. The interference effect can be produced by having one of the totally reflecting mirrors slightly farther away than the other, so that the light waves will arrive out of phase. The beams are recombined by another half-silvered mirror and transmitted to a chamber with a photographic plate.

If the intensity of the light is reduced to one photon at a time, the interference effect can only be accounted for by assuming the photon really splits into two wave packets and then recombines. In fact, if we pick up an ordinary playing card and block one of the paths, there is no interference picture. Instead, a defused piling exposure is created, similar to the particle picture we received when only one slit was open in the previous experiment. If the energy is a wave, then we can understand the interference picture. If the energy is a particle, then we can understand the fact that only one detector at a time receives one whole unit of energy.

The result of one arrangement indicates that a wave of some kind is really passing through both channels simultaneously. The result of the other makes sense, if we assume that the energy is passing through only one channel at a time. If the energy is passing through both channels at the same time, why do the detectors not trigger simultaneously? How does the energy passing through one channel get over to the other detector? How could this possibly happen if the detectors are far enough away that any transmission of a signal between them would require a speed greater than the speed of light? It is time for a little philosophy.
Nature at the subatomic level apparently does not conform to normal logic. Since the time of the ancient Greeks, Western logic, through Aristotle’s law of excluded middle, has demanded an “either-or” in our relationship with the universe. Either light is a particle or it is not a particle. Either light is a wave or it is not a wave. Either the light splits and goes through both channels or it does not. If it goes through both channels, it should be detected at both channels. It is not detected at both channels, yet it does go through both channels. If it goes through both channels, why is one whole unit of energy detected at only one detector? How do two halves spatially separated become one whole unit instantaneously?

No logical inconsistency exists within the mathematics itself. In the particle-effect case, the mathematics allows us to predict that approximately 50 percent of the time detector A will record a unit of energy and 50 percent of the time detector B will record a unit of energy. In the interferometer arrangement, the mathematics predicts an interference effect, and even allows a straightforward calculation of the wave length of light by measuring the interference fringes. The problem is more in our reaction to the results of these experiments and the success of the mathematics. We want to know what kind of a thing is producing these strange results. What is going on “out there” that enables the mathematics to be successful? Our minds desire a complete understanding. What is real? What is the truth?

Atoms are not things. Werner Heisenberg

These questions reflect our natural curiosity about reality. We want to go deeper, to find the basic, hidden causes of all things. Western science since the ancient Greeks has assumed an ontology: The cosmos consists of one distinct, complete reality full of individual separated details. We have also assumed an epistemology: The details, whatever they might be, can be known, and the process of knowing these details does not affect what the details actually are independent of the knower. This is consistent with our common sense and what each of us experiences everyday: a world undisturbed by human thoughts, wishes and desires, full of things, spatially separated from each other, and interacting with each other through distinct recognizable forces. If someone has a tangerine tree in his yard, he might wish that it would be an apple tree, but it will still be a tangerine tree. Similarly, we do not think of someone thinking cancer into existence or wishing it away. We think of the cancer being objectively “out there,” something beyond our mental control, like trees. We can cut down trees and operate on cancer, but they are distinct
realities that we discover with our thinking, not something that we create with our thinking.

When Einstein has criticized quantum theory he has done so from the basis of dogmatic realism. Werner Heisenberg  So it is natural for us to think of electrons or photons as some sort of independent things. They show signs of being particles, so we begin to think of them as if they really are particles independent of our observations of them. But they also show signs of being waves, and they cannot be both waves and particles at the same time, no more than a tree can be both a tangerine and apple tree at the same time or someone can have cancer and not have cancer at the same time.

- Causality may be considered as a mode of perception by which we reduce our sense impressions to order. Niels Bohr

In the 1920s a few philosophically minded physicists, led by the Nobel Prize-winning physicist Niels Bohr, realized that nature was trying to tell us something very important. Once again nature was using paradox to alert us to a fundamental error in the assumptions we were making and the way we were asking our questions. According to Bohr, and what is known as the Copenhagen interpretation the results of these encounters with subatomic phenomena amount to a major epistemological discovery. Descriptive terms such as “particle,” “wave,” “position,” “mass,” and “spin,” are human concepts. These concepts involving assumptions of space and time work for us at a normal macroscopic level and will always be indispensable for describing the results of our physical experiments. But nature is now making it very clear to us that we have reached a barrier in our attempt to describe it fully in terms of human concepts derived from ordinary experience.

Wave-particle duality is nature’s way of informing us that cannot impose our human concepts on the subatomic level. Just as Einstein had discovered that we cannot impose our normal assumptions of space and time to all levels of reality, so quantum physics reveals that we have no empirical justification to impose our most basic thoughts about the nature of reality on the subatomic realm. The idea of an extended thing sitting in a three-dimensional space, waiting for us to discover it, is revealed as another human projection, a limited image of reality, more of an echo of the way our minds work than reality itself. According to Bohr, nature empirically reveals this understanding to us by showing that we can have only complementary views of reality. If we set up an experimental arrangement that allows for a wave manifestation of subatomic phenomena, wave effects will be observed. If we set up an experimental arrangement to view subatomic phenomena as particles, particle effects will be observed. According to Werner Heisenberg, another major contributor to the Copenhagen interpretation, what we observe in our experiments is not nature itself, but nature exposed to our methods of questioning nature. In short, an electron is not a thing until we observe it.

- When Einstein has criticized quantum theory he has done so from the basis of dogmatic realism. Werner Heisenberg

Bohr argued that this interpretation is a necessary, “pragmatic” response. Experiments must be conducted in human terms, in laboratories full of macroscopic equipment in three dimensions. Our laboratory equipment must be capable of measurements that are understandable through the conceptual reference frame of human beings. This barrier, however, should not be seen as an end to science or as an imposed state of ignorance. It is a discovery, a momentous discovery about ourselves and the nature of science.

To discover that complementary views of reality exist, rather than only one unified view, is as important as Einstein’s discovery that the reference frame of an observer is crucial for measuring space and time. Rather than limiting science, Bohr viewed this new knowledge as liberating the sciences from the tyranny of thinking that each science must explain itself in terms of a more basic science such as physics and chemistry.

Biology, for instance, could very well be a complementary perspective on living things, not totally reducible to physics and chemistry.

A Debate: Bohr and Einstein

- We believe in the possibility of a theory which is able to give a complete description of reality, the laws of which establish relations between the things themselves and not merely between their probabilities... God does not play dice. Albert Einstein

Ironically, the main resistance to the Copenhagen interpretation came from Albert Einstein and a few of his followers. Einstein objected very much to the idea that we had stumbled upon a barrier to knowing what is real. Philosophically, Einstein was a realist who believed that the goal of science was to conjecture boldly about the nature of reality from the details of our empirical observations. He acknowledged that as we continued to probe nature for her secrets, we would encounter more and more exotic features, the majority of which would never be directly observable because of human limitations. He believed, however, that the human mind could always infer at least the most likely hypothesis about the nature of the reality causing the events we do observe. Thus, although Einstein introduced the world to a revolutionary view of space and time, one that destroyed the classical or Newtonian conceptions of absolute space and time, he nevertheless remained a classical physicist faithful to the concept of reality Descartes stated centuries earlier: “There is nothing so far removed from us to be beyond our reach or so hidden that we cannot discover it.”

As we noted previously, for Einstein, nature was like a mysterious clock. We are limited to observing
only the exterior features of this clock. We may never be able to see directly inside and know for certain how the clock works, but by observing and thinking about the movement of the hands long enough, the human mind will provide a very likely answer as to how the clock works. For Einstein a clockwork for the universe exists and can be known. For Bohr, for us to assume that a clockwork exists independent of our observations that we can picture in human terms is only another human philosophical bias, another example in a long line of assumptions that experience validates at a certain level, but which experience at another level now demonstrates cannot be considered to be true.

• It is wrong to think that the task of physics is to find out how nature is. Physics concerns what we can say about nature. Niels Bohr

Although Bohr thought quantum physics to be in part an important epistemological discovery, and the barrier between the human mind and reality primarily pragmatic, the Copenhagen interpretation does raise the question of whether this epistemological discovery is also an ontological one. For Einstein, Bohr's interpretation was much too close to, and in fact seemed to imply, a traditional ontology -- an ontology historically very much opposed to the major goal of scientific method. If an electron is not a thing until it is observed by some instrument, does this not imply that reality depends on our observations, and hence, ultimately the thoughts we use to frame the world? Does this not imply that reality is created by human thoughts?

Metaphysical Idealism is an old and widespread belief stating that the physical world as we experience it is basically an illusion; the perception of a world of material things separated in space is said to be only an appearance. Individual things exist only in so far as we have an idea of them. Supporters of this metaphysics argue that if there were no human observer or recording instrument of any kind in a forest, then a falling tree would make no sound. In fact, there would be no trees to fall and no forest. When I walk out of a room, I assume that the physical room and all its contents are still objectively there. But according to the Idealist, the room ceases to exist if there is no one there to have a thought of the room.

The majority of scientists have always viewed this metaphysics with disdain, as more of a symptom of despair of the sometimes harsh realities of the physical world, as primarily a religious view associated with those who find the physical universe threatening and who desire a more perfect world. Does the Copenhagen interpretation of quantum physics validate this philosophy? How embarrassing for Western science if this is so. Imagine that after thousands of years of struggling to know the details of Democritus’ atom, Western science shipwrecks into a religious philosophy it thought it had left behind at a more primitive time!

• Would it (the world) otherwise (without consciousness) have remained a play before empty benches, not existing for anybody, thus quite properly not existing? Erwin Schrödinger

Thus, Einstein viewed quantum physics to be an incomplete theory. He argued that we simply do not know enough yet. Our knowledge is not complete. Because we cannot produce a consistent picture of subatomic phenomena, we obviously do not know exactly what these things are yet and enough about the mysterious forces governing their motions and manifestations. Einstein summarized his view with the famous statement, “God does not play dice with the universe.” In other words, God has created one universe and does not choose to have it manifest itself as full of waves at one moment and as particles at another for no reason.

• First they told us the world was flat. Then they told us it was round. Now they are telling us it isn't even there! Irving Oyle

Bohr and Einstein had several public debates over what was the proper interpretation to give to the results of quantum physics. These were fascinating discussions between two intellectual giants, but little was resolved at the time. The vast majority of physicists heeded Bohr’s advice that there was a pragmatic limitation inherent in our measuring devices. Physicists should be interested primarily in being able to predict experimental results and not in the question of what is real. They were persuaded, with the help of a philosophical tradition that began with Hume, that the question of what is real is primarily an unanswerable philosophical question. Physics must concern itself primarily with complex experimental arrangements and the derivation of the complex mathematical formulas needed to predict the “constant conjunctions” of appearances first discussed by Hume.

On the other hand, motivated by the goal of finding a hidden reality, physicists have also pursued Einstein’s dream of a unified picture of reality, of seeking a theory that enables us to understand at a fundamental level all the forces of nature.

Bohr claimed he was being the better empiricist. He argued that the results of quantum experiments provide empirical evidence that nature does not have a hidden true self that can be pictured with human concepts. It seems so obvious that nature must have some objective true self. But it also seemed so obvious that time was absolute. Einstein provided the means to demonstrate with empirical evidence that there is no universal, objective, absolute time, one slice of simultaneity throughout the universe. Today, to continue to believe that there is an absolute time is simply metaphysical dogma, given the overwhelming reliable empirical evidence to the contrary. But Einstein failed, according to Bohr, to understand that the empirical evidence also demonstrates that the faith in a hidden, objective reality is but faith in a dogma.
Bell's Discovery

- Bell's theorem is easy to understand but hard to believe. Nick Herbert

So, is there any way of answering the question whether nature has a hidden objective reality? Following Bohr, experiments have been conducted that are consistent with the view that it does not; that in our relationship with the universe we can have only different pictures of its clockwork -- actually, to be more precise, that a precise clockwork does not exist until we attempt to picture it. For many years following the Bohr-Einstein debates it was thought that the issue between them must forever be relegated to the realm of inconclusive philosophical perspectives. No conceivable experiment was known that could be conducted to disconfirm either one. Bohr could argue that the experimental results are most consistent with his theory of complementarity, but he could not prove that some day we would not discover some bizarre hidden reality that explained how an electron could manifest itself as a wave in one situation and a particle in another. Similarly, the followers of Einstein could argue that if we think, and search, long enough someday we will find this hidden reality. No one knew of an experiment that would decide such an apparent metaphysical issue and eliminate or confirm the possibility of a hidden reality.

In 1964 physicist John Bell discovered that it was theoretically possible to test whether or not quantum physics was a complete theory. By tinkering with the mathematics, he discovered that an experiment could be devised to confirm or disconfirm hidden processes, or “variables” as physicists refer to them.

Before we describe this discovery and its application in crucial experiments, let us review first why quantum measurements are so puzzling. The essence of all the puzzles, according to the physicist-philosopher Henry Stapp, is “How do energy and information get around so fast?” In the interferometer experiment we can demonstrate that a wave is passing through both channels. But when we modify the experiment to detect the radiation in each channel, we detect only one whole unit of energy at a time per channel, implying not only that the radiation consists of particles, and therefore not waves, but also that the radiation is not in both channels. In the particle detection experiment the Schrodinger equation describes a wave splitting process with a “probability” wave in both channels, and then an instantaneous collapse of a potential existence to one localized “actual” spot, to either detector A or B. The Copenhagen interpretation deals with this puzzle by claiming it is inappropriate to think of the radiation as some kind of definite real thing before we measure it. The radiation “becomes” something definite, conceptualizable by human beings, only after we measure it. (It is always a particle after we measure it, even though some measurements suggest the particle had wave-like properties between measurements.) Reality, specific attributes possessed by things, according to the Copenhagen interpretation, can only be discussed in terms of an “entire experimental arrangement.”

- No elementary phenomenon is a phenomenon until it is a recorded phenomenon. John Archibald Wheeler

According to Bohr, the problem of quantum measurement can be interpreted as a pragmatic epistemological discovery and does not necessarily imply an idealist metaphysics. Concepts such as “particle” and “wave” are human concepts, and we have discovered that nature will not allow us to picture it consistently with these concepts. Insofar as we must always conduct our experiments through a human framework, with human concepts, there is an epistemological barrier that no future scientific discovery will change. For Bohr, the success of quantum theory represents a “treasure chest” of scientific and philosophical discoveries. The Copenhagen interpretation should not be viewed as advocating a dogmatic end to research and discovery, but rather a dramatic discovery that continues a trend first started by Copernicus and sustained by the startling discoveries of Einstein: The universe is not required to conform to human concepts. Our belief that nature must have one true self, one consistent clockwork for us to tinker with, is revealed to be merely another human belief and not necessarily the way things are.

In a fundamental way Bell’s discovery allowed physicists to test Bohr’s claimed epistemological discovery. A test was now possible to see if the subatomic realm had a true self independent of our measurements.

Quantum Jogging

- The hope that new experiments will lead us back to objective events in time and space is about as well founded as the hope of discovering the end of the world in the unexplored regions of the Antarctic. Werner Heisenberg

To understand Bell’s discovery and the eventual experiments, let us try an analogy first. Suppose we have a large group of runners. Half of the runners are tall and half are short. Suppose that each of the short runners and each of the tall runners has a twin. Each of the twins will begin running at the same point, but will run a course in the opposite direction to a finish line that is the same distance from the original point of departure. Suppose also that each runner will run the course at the same speed, and that the spacing between the times when each runner leaves is such that no runner will be able to overtake the one immediately preceding him. No tall runners will overtake short runners or vice versa. Imagine then a continuous stream of runners leaving the original point and running in opposite directions. We might have something like this: Two short runners leave the starting point one after the other simultaneously with their respective twins, then two tall, then two short again, then one tall, and one short after that, then two tall, and so on. Suppose that overall the pattern is random. Suppose further that the contingencies of the course and physical training of each runner are such that many of the runners will not finish. Now we are
ready to carry out the implications of our thought experiment. Suppose each twin has a strong desire to finish if and only if the other does. Our common sense would predict that finishing together is not likely. Suppose one of the short runners pulls a muscle just before the finish line. How likely would it be that the twin, running on an independent track, separated by a considerable distance, either knows this and decides to stop running or pulls a muscle also and does not finish? In other words, if we were to observe the runners finishing and established a mathematical correlation of completion, we would not expect it to be very high. Suppose that about 90 percent of the tall and short runners did not finish; it would not be likely that every time a short or tall runner finished or did not finish, the respective twin finished or did not finish as well. If we found the random result at one finish line to be T, T, S, T, S, T, S, S, we would not expect this result to be highly correlated or equal to the result at the other finish line. We would expect an inequality in the results.

There is one possibility, however, where the results could be highly correlated. Suppose each runner carried an electronic pager, such that whenever a runner knew they could not finish, he would signal the twin not to finish. In other words, if the runners could communicate, a very high correlation could be established.

Suppose though that we change our thought experiment a little. This time we will control, at one finish line, which runners finish and which ones do not. Suppose at a point immediately before one of the finish lines we set up a fork in the course, such that the short runners must take one path and the tall runners another. Suppose further that we have control over an electronic switch that closes each path by throwing up a barrier for either the short or tall runners. By randomly changing the switch we can change which path is open and which type of runner finishes. It is important to be able to do this after the runners have already left. Otherwise the runners could know ahead of time what kind of course they must run and adjust their actions accordingly. Suppose that the barriers are so close to the finish line, and we are able to switch the barriers so rapidly, that there is no time for each twin to signal the other whether he is going to finish or not. Now clearly there could not possibly be a very high correlation. It would be a strange result, indeed, if even most of the time when a tall runner finished, his twin also finished, and most of the time when one did not, his twin did not, and likewise for the short runners.

- I think I can safely say that nobody understands quantum mechanics... Do not keep saying to yourself "But how can it be like that?" because you will get "down the drain," into a blind alley from which nobody has yet escaped. Nobody knows how it can be like that. Richard Feynman

We assume that the local conditions at a barrier cannot instantaneously influence the local conditions at the other finish line. This locality assumption is an inherent part of our normal view of reality. We assume that the runners are independent individuals who will face independent conditions at independent places. What Bell showed is that if this assumption is correct and also applies to the subatomic realm, then the results we obtain in the subatomic realm with particles should reflect the same kind of inequality in correlation we expect to find in our macroscopic realm of short and tall runners.

Quantum theory, on the other hand, predicts an entirely different result for subatomic particles. Because it is incorrect to refer to subatomic particles as having any definite state with a definite place until a measurement takes place, an analogous runner's example to what happens in the subatomic realm would be the following: Our runners do not exist as definite runners until they are observed to finish, and a measurement at one finish line will instantaneously produce a correlated set of characteristics at the other finish line! From a quantum perspective, the locality assumption is denied; it is incorrect to think of our runners as real independent entities, in real independent places, experiencing real, local independent circumstances. Instead, between the time we see them leave and finish, our runners are a “superposition of states” of existence. They are neither tall, nor short, nor fast nor slow, but all these potential states at once.

If quantum theory is true, an analogous experiment in the subatomic realm should result in a significant violation of Bell's inequality deduction, because it is incorrect to think of subatomic particles as independent things with definite properties until a measurement takes place. If experiments are devised where “twin” particles are created and fly off in opposite directions like our runners, then quantum theory predicts that there will be a high correlation of the particle states when they are measured at a quantum finish line, because a measurement of one particle instantaneously collapses a wave function of potential (or entangled) states, a wave function that was created at the time of the twin particle creation.

The Aspect Experiment

- Nature loves to hide. Heraclitus

Because the locality assumption seems so obvious to our common sense, and because the technological tools were not sufficiently developed to conduct the proper experiments, recognition of the significance of Bell's work was slow in coming. A decade after Bell published his work intense discussion and experimental work finally began. As is so often the case in science, the results of the first experiments were inconclusive. By the 1980s using a reliable experimental design results supported decisively that in the subatomic realm Bell's inequality is violated and the predictions of quantum theory are correct. The results were consistent with the interpretation that the measurement of a subatomic particle at one finish line instantaneously determines the state of its twin at another finish line, regardless of how far the two
finish lines are apart.

- My own suspicion is that the universe is not only queerer than we suppose, but queerer than we can suppose … I suspect that there are more things in heaven and Earth than are dreamed of, or can be dreamed of, in any philosophy. That is … why I have no philosophy myself, and must be my excuse for dreaming. J.H.S. Haldane

In the realm of subatomic particles our runners are replaced by mathematical objects with attributes such as “charge,” “spin,” “velocity”, and “momentum.” We naturally tend to think of these attributes in the same way we think of the attributes of our runners. Just as we think of each runner as a real independent body with definite characteristics such as being short or tall, fast or slow, we are more comfortable thinking of a particle having a real location or a real spin. Quantum physics, however, seldom allows us to be comfortable. Consider quantum spin. What kind of real attribute requires a subatomic particle to turn around twice before it shows its original face! Imagine looking at a position on the Earth from the Moon, say New York, and watching the Earth spin around twice before New York is visible again.

As bizarre as quantum attributes are, quantum physicists have learned how to deal with them mathematically and even set up experiments which create twin particles with opposite spin. The most notable, and most conclusive, we will call the Aspect experiment. Using polarization, a property that can be thought of as similar to spin, physicists tested Bell's inequality prediction. Atoms were excited to produce twin photons of light that sped away with opposite polarization. Methods were developed to test the states of the photons at their respective finish lines. In many respects this experiment was analogous to our thought experiment with the barriers and electronic switch. Bell's inequality theorem was violated. The spins of particles at distant finish lines were highly correlated. (In this experiment the main interest was as similar to spin, physicists tested Bell's inequality prediction. Atoms were excited to produce twin photons of light that sped away with opposite polarization. Methods were developed to test the states of the photons at their respective finish lines. In many respects this experiment was analogous to our thought experiment with the barriers and electronic switch. Bell's inequality theorem was violated. The spins of particles at distant finish lines were highly correlated. (In this experiment the main interest was)

- Physics tells us much less about the physical world than we thought it did. Bertrand Russell

It is important to realize that the violation of Bell's inequality is a “factual” demonstration that at least one assumption of Einstein's realism must be false, what we referred to above as the locality assumption. To accept the totality of Einstein's realism we must assume that the local conditions at one finish line could influence the local conditions at the other finish line only if the two locations are linked by a causal chain whose transmission of effects does not exceed the speed of light. In other words, if reality consists of separate objects, then one object cannot influence another object unless some sort of signal or influence travels from one object to the other during some amount of time. If the movement of one object “instantaneously” influences the movement of another object, then they are not really separate objects.

In addition, if someone is standing on one side of a dark room with a flashlight, the flashlight must be turned on before an object can be illuminated on the other side of the room. Recall that some very strange results are possible if the speed of light can be exceeded. Our mother astronaut could return to Earth and be involved in a fatal automobile accident before her child was conceived and before leaving for her space voyage. Thus, for many reasons, a hidden force travelling faster than the speed of light is ruled out as a possible explanation for the puzzling results of quantum experiments. The Aspect experiment shows that we must reject the totality of Einstein's realism, but not necessarily all possible versions of realism. For instance, the entire universe at the subatomic level could be one interconnected object.

The results of the Aspect experiment and the violation of Bell's inequality are also consistent with the Copenhagen interpretation: Quantum objects should not be considered things until a measurement takes place. Unfortunately, the implications of this interpretation for the nature of reality are philosophically disturbing for most physicists. Thus, most physicists accept the pragmatic aspect of the Copenhagen interpretation and ignore the reality question. The reality question is something for “the philosophers” to worry about. This response is often portrayed as a sophisticated, modern point of view: physics should not be concerned with futile philosophical questions, but keep to the business of predicting results and applying quantum mathematics to novel situations such as computer technology, fiber optics, and superconductivity.

By any standard this approach has been very successful. Today, even quantum cryptographic devices are becoming a reality, allowing the transfer of money between banks allegedly guaranteeing absolute secrecy. By using pairs of entangled photons to send information, any electronic interference from an eavesdropper immediately disturbs the quantum entanglement and signals a breach of security as well.

However, is the instrumentalist approach any different from the reaction of past scientists to Ptolemy's epicycles, Copernicus's circles around invisible points, or Newton's gravity?
Quantum Ignorance and Reality

- No language which lends itself to visualizability can describe the quantum jumps. Max Born

For many, the reality question beckons still. The history of physics, and science in general, shows that the traditional pursuit of a deep objective truth is not just an idle ivory tower game. A quest for a deep understanding of reality has been valuable not only for its own sake but for the purpose of maximum practical application as well. The history of science has demonstrated repeatedly that when we understand the way things are at a deep invisible level, we are better able to understand, control, and predict the visible world in which we live. Until quantum physics, the vast span of scientific endeavor has vindicated Einstein's simple vision: The better we have been able to understand the invisible mechanism of the cosmic clock, the better we have been able to understand the motions of its visible hands.

We may not be able to see Kepler's ellipses nor Newton's gravity in the starry night, but an understanding of these veiled realities has enabled us to embrace the night sky -- to predict, to control, to see, to explore -- in a manner undreamt of by the ancients who so patiently and relentlessly watched this surface reality. Other examples abound: The understanding of the molecular and atomic constitution of matter has enabled us to deal with the surface experiences of heat, temperature, and pressure; by understanding a deeper level of reality, we have been able to create objects that do not exist in nature, such as plastics; and now, by understanding the invisible structure of DNA we are controlling the development of life itself, with many practical applications in agriculture and medicine.

Is it over? The Copenhagen interpretation implies a strange kind of ignorance -- call it quantum ignorance. According to Bohr, it is a mistake to search for a hidden, deeper mechanism that will explain the results of quantum measurements, because between measurements there is nothing there to know, that is, nothing there that can be conceptualized in human terms. This is nature's way of educating us, of revealing its ultimate message: "Picture me with your human pictures if you must, but do not take your pictures too seriously." According to Max Born, another contributor to this interpretation, "No language which lends itself to visualizability can describe the quantum jumps."

For those sympathetic with Einstein, there must be something more; the results of quantum experiments must be only an example of what can be called classical ignorance. There must be something there that we are "disturbing" when we interact with it in attempting to measure it. We are ignorant of why quantum events happen as they do only because we do not know all the forces acting on subatomic particles, just as we cannot predict each throw of the dice in a dice game, because there are too many minute factors involved and because any attempt on our part to measure these factors in the act would disturb the results.
In the case of dice there are other ways of demonstrating the existence of these factors, and thus we have every reason to believe that they are there, even if we cannot control them.

- Reality is the real business of physics. Albert Einstein

Bell's theorem and the consequent experiments do not rule out some kind of realism, that some kind of hidden force or reality is at work in the subatomic realm. They do demonstrate, however, that these forces, if they exist, must be very strange forces that are capable of propagating instantaneously regardless of distance. If our finish lines for subatomic particles were billions of miles away, the violation of inequality would be the same. If one of our finish lines was located in the vicinity of the star Betelgeuse, 540 light years distant, and the other on Earth, quantum physics predicts the same results. The results of Bell's theorem and the Aspect experiment show not only that quantum theory is a complete theory but also that any interpretation of quantum physics must incorporate the fact of instantaneous action.

So what kind of a reality do we live in? Notice that even the language of this question is misleading. To ask what kind of a reality we live in suggests that there is one reality independent of human beings and our attempt to know and measure this reality. Human language has evolved in a context of ordinary macroscopic reality. So how can we even begin to describe the subatomic realm? If it is a mistake to think of the electron as a thing with a definite place, with a definite velocity, until "it" is actually observed with a measurement, then it is difficult, to say the least, to understand how an "it" can exist without a location prior to a measurement which then gives it a location.

The concept is less difficult mathematically but no less strange. Mathematically, quantum physics allows a distinction between the static properties of the electron, such as "charge" and "mass," and the dynamic properties, such as "position" and "velocity." In this way most physicists believe that they can avoid a distinction between the static properties of the electron, such as "charge" and "mass," and the dynamic properties of physical matter and empty space; thoughts, ideas, colors, emotions were all considered to be secondary realities, as not real, but rather the result of the movement and interactions of particles. This view, which we will call metaphysical reductionism, is seriously contradicted by the science of the twentieth-century, particularly the Copenhagen interpretation. What is real does seem to depend on us and our method of questioning nature. As the physicist E.P. Wigner has claimed, a measurement cannot legitimately be said to have taken place until it is acknowledged by the conscious awareness of a human being. Far from being a secondary reality, consciousness has a much greater significance in quantum theory.

We know that the paradigm of Newtonianism involved a combination of epistemological and metaphysical assumptions: What is real does not depend on us, and reality is reducible to small independent particles of physical matter and empty space; thoughts, ideas, colors, emotions were all considered to be secondary realities, as not real, but rather the result of the movement and interactions of particles. This view, which we will call metaphysical reductionism, is seriously contradicted by the science of the twentieth-century, particularly the Copenhagen interpretation. What is real does seem to depend on us and our method of questioning nature. As the physicist E.P. Wigner has claimed, a measurement cannot legitimately be said to have taken place until it is acknowledged by the conscious awareness of a human being. Far from being a secondary reality, consciousness has a much greater significance in quantum theory. We confront the world with the filters of our human thoughts about the world, and nature conforms to these thoughts to some extent. A reality becomes manifest based upon the thoughts behind one of our experiments. We do not measure reality as Newton and all classical physicists believed; we measure the “relationship” between reality and our thoughts.

In the quantum realm it is not possible to pin down a consistent reality, and nature teaches us in the process not to take our thoughts about reality too seriously, on the one hand, and to take them very seriously, on the other hand. We should not think of our human concepts of “particle” and “wave” as reflecting an independent reality, but we have been forced to recognize the creative power of human
concepts. The mathematics of quantum theory does not picture a precise clock with definite parts but a strange indefinite cosmic substance capable of manifesting an infinite number of fleeting faces. Quantum theory pictures the particles that make up everything that we touch and feel not as little, hard, definite, independent things, but a tangle of possibilities that are entangled with every other tangle of possibilities throughout the universe. As with the particles in the Aspect experiment, the particles in my body may be connected in some way with the particles of your body, and these in turn with particles in a distant sun, in a distant galaxy, billions of light years away.

Neorealism

• There is the immense “sea” of energy... a multidimensional implicate order... the entire universe of matter as we generally observe it is to be treated as a comparatively small pattern of excitation. This excitation pattern is relatively autonomous and gives rise to approximately recurrent, stable and separable projections into a three-dimensional explicate order of manifestation, which is more or less equivalent to that of space as we commonly experience it. David Bohm

There is little disagreement today among physicists and philosophers of science that the metaphysical reductionism of the seventeenth, eighteenth, and nineteenth centuries has been destroyed by the science of the twentieth century. But there is no consensus on a replacement. The results of relativity and quantum theory have sent physicists and philosophers of science scurrying in many different philosophical directions. Although most physicists have accepted the practical dictates of the Copenhagen interpretation, David Bohm, among others, has refused to abandon entirely the realism of Einstein, opting instead for a radical neorealism. For Bohm, the Aspect experiment does not disprove a hidden reality, but only one that consists of separate things! A universe of “undivided wholeness” is consistent with all the experimental results. A real universe exists independent of our observations of it, but it is not like the room that I am in now: a bowl of space with apparent independent objects separated into different locations. This normal perception is only my human macroscopic view of the room. “Underneath,” so to speak, from a perspective of a multidimensional hyperspace or superspace this appearance of separateness can be seen to melt like ink dots in water.

Mathematical equations that literally describe a hyperspace, a multidimensional space, which scientists often cryptically referred to as “configuration” or “phase” space, are common in the mathematics of modern physics. As we have noted, most physicists have been taught during their university educations to think of these as only mathematical devices because it makes no sense to use ordinary language or pictures in an attempt to ascribe a reality to such bizarre number juggling. Bohm, following the epistemological lead of Einstein, suggested that what works in our equations may point to an underlying reality.

Consider the following analogy from Bohm’s Wholeness and the Implicate Order. Imagine a fishbowl with fish slowly swimming round and round, occasionally darting here and there, changing direction unpredictably. Imagine two TV cameras filming the activity of the fish from different points of view. Imagine that in another room a person is sitting watching two TV sets receiving the transmissions from the two cameras. This person at first might think that he is watching two different fishbowls and fish movements, except that he would notice an amazing correlation in the movements of the two sets of fish. Every time one of the fish in one TV screen unpredictably changes direction by darting to the left or right, a fish in the other screen changes directions also. After watching this activity for awhile, this person should be able to infer that the separate images are different perspectives of one reality. According to Bohm, this is what the long road of scientific endeavor, culminating in the experiments of quantum physics, has revealed to us: Our normal world of separate objects is but separate images of one underlying reality. We set up our three-dimensional experiments and then wonder how particles separated by light-years can be correlated, but from the standpoint of hyperspace the particles are right “next” to each other, so to speak; the two apparently separated particles are the same particle, just as the two apparently separated fish are the same fish.

Flat Land and Hyperspace

• All things will be in everything; nor is it possible for them to be apart, but all things have a portion of everything. Anaxagoras

Because of our Kantian-Newtonian filters, it is impossible for us to imagine what a multidimensional hyperspace is like. We can, however, get an idea of what existence in a higher dimension is like by comparing our three-dimensional existence with a hypothetical two-dimensional existence called Flat Land.

Imagine a world that is flat like a piece of writing paper upon which flat two-dimensional creatures live. Imagine that on this world there are flat two-dimensional houses and flat two-dimensional creatures that look like triangles, squares, and circles. Because they are two-dimensional, these peculiar characters can go about their two-dimensional business by moving forward or backward, left or right, but “up” and “down” have no meaning in this world. Relative to this world, we would find that three-dimensional creatures like ourselves have supernatural powers.

We could peer into their houses from above and watch what they are doing; we could cause strange events to happen at great distances simultaneously; we could cause correlated behavior in objects that seem separated to our flatlanders. We could even cause strange objects to appear out of nowhere. We could easily produce quantum jumps.
There is no logical necessity for believing in one universe any more than there is for believing that
nothingness.

Many Worlds

• The various particles have to be taken literally as projections of a higher -dimensional reality which
cannot be accounted for in terms of any force of interaction between them. David Bohm

Suppose we picked up an ordinary salad fork from our three-dimensional world and poked it in and out
of this two-dimensional world. A flatland creature observing this event from its two-dimensional world
would see only four mysterious dots appear from nowhere, move around in a coordinated manner, and
then vanish as mysteriously as they appeared. If we picked up one of these two-dimensional creatures and
pulled it up into our three-dimensional world, the poor creature would have a mystical experience; it would
experience a reality for which there was no language. If we then placed the creature back onto its two-
dimensional world, perhaps where a number of his friends are discussing his mysterious disappearance,
the flatlander would appear to have materialized out of nowhere. If the creature attempted to explain to
his friends in flatlander language what he had experienced, he would undoubtedly sound like a crazy fool,
much like the enlightened man in Plato’s cave.

According to Bohm, our observations of electrons and other subatomic phenomena in our three-
dimensional laboratories with three-dimensional equipment are not the result of an act of creation of
consciousness, but rather an interfacing of a multidimensional reality with a three-dimensional one. Just as
our flatlanders experienced mysterious unpredictable events that were explainable from the point of view
of another dimension, so the behavior of electrons and other subatomic phenomena are understandable
from the point of view of an overlaying, but concealed, “implicate” hyperspace. Just as the actions of
the four correlated dots produced by the three-dimensional fork are seen to be one reality, so our entire
world of apparent separate particles that seem to make up separate objects is but a manifestation of one
undivided hyperspatial whole.

The philosophical virtue of such an interpretation of the mathematics and experimental results of
quantum physics is that the realism of our normal three-dimensional world is preserved. When we walk
out of a room, the room is still “there” in a sense. From a hyperspatial perspective, more than a three-
dimensional room may be there, but the three-dimensional room is still there for any three-dimensional
creature to see. We do not create the room with our consciousness out of some strange indeterminate
nothingness.

Many Worlds

• By the act of observation we have selected a “real” history out of the many realities, and once
someone has seen a tree in our world it stays there even when nobody is looking at it. John Gribbin

There is no logical necessity for believing in one universe any more than there is for believing that
Earth is the center of existence. Another interpretation of quantum physics that attempts to preserve the
genral philosophical position of realism is known as the Many Worlds interpretation. This interpretation
preserves realism with a vengeance. In the 1950’s Hugh Everett III, then a graduate student at Princeton
University, decided to see what would happen if the mathematical equations of quantum physics were
consistently taken literally. To see how this would work let’s return to our previous experiments.

Recall the experiment attempting to prove that single particles of light pass through only one channel. The
result of detecting only one whole unit of energy at detector A or B was consistent with this interpretation.
Yet a particle interpretation was not consistent with the outcome of the experiment with totally reflecting
mirrors replacing detectors A and B. The Schrodinger equation depicts waves of some sort passing
through both channels, and the experiment with totally reflecting mirrors demonstrates that light, as a
wave that splits into two waves, is in both channels. According to the Many World’s interpretation there
is a simple, but shocking, explanation for the first result. The Schrodinger equation depicts the radiation
in both channels as real; the reason we only observe it at one detector or the other is because when a
measurement is made the world splits into two equally real worlds! When the radiation is detected at A, it
has also been detected at B. We do not detect it at B, because B is an event taking place in another world!
And if you ask who is in this other world to detect the different result, the answer is equally shocking --
the split versions of the experimenters who detected the radiation at A in the other world.

• Saint Augustine... suggested that there might be “worlds without end”... an infinite number of different
universes... though he was reluctant to decide on the issue. Where saints hesitate, cosmologists rush
in. Keith Ward

According to this interpretation all the possibilities delineated by the Schrödinger equation are real. In
making an observation of a particular possibility we are not collapsing a wave packet or creating a reality
from a number of possibilities. Rather, like a road with many forks, we are choosing a world to travel on
from many possible worlds. All the alternate worlds are paths in hyperspace; they are equally real, but we
are probably forever cut off from them. In every observation we are choosing a branch of reality. If the
Copenhagen interpretation implies that nothing is real independent of observation, the Many Worlds
interpretation implies that everything is real. We do not create a universe with an act of observation;
we choose a universe that is already there as a possible path. According the astrophysicist and science
writer John Gribbin, an enthusiastic supporter of this interpretation, “By the act of observation we have
selected a ‘real’ history out of the many realities, and once someone has seen a tree in our world it stays
there even when nobody is looking at it.”

In the two slit experiment when an attempt was made to see if the photons pass through both slits, we
found the radiation passing through only one slit or the other. According to Gribbin, in his book In Search of Schrodinger's Cat, here is the proper interpretation of what the electron is doing.

_Fixed with a choice at the quantum level, not only the particle itself but the entire universe splits into two versions. In one universe, the particle goes through... (one hole), in the other it goes through... (the other hole). In each universe there is an observer who sees the particle go through just one hole. And forever afterward the two universes are completely separate and noninteracting—which is why there is no interference on the screen of the experiment._

- Physics is neither epistemologically nor ontologically neutral. _F.S.C. Northrop_

This means, however, that just as there are many routes to the future, there are many versions of “us” that will follow these paths. Because every observation splits the path we are on into alternate universes again and again, there are literally billions of alternate paths through hyperspace. These alternate worlds, however, are not parallel to us, as in so many science fiction novels, but like our three-dimensional view of two-dimensional flat land, they are at right angles. Somewhere in this hyperspace there is a world where the South won the American Civil War; a world where the Spanish Armada defeated the British; a world where John F. Kennedy was not assassinated, and a world where World War III happened and the human species is extinct.

The same kind of thinking that led to this interpretation of the quantum mathematics and experiments has more recently produced theories on the origin of our universe and the cause of the Big Bang. According to one version of these theories, the Big Bang and the parameters of our particular universe make up simply one particular bubble in an infinite sea of other bubble universes. Just as the successors of Einstein have sought for a deep explanation of quantum phenomena, so scientists have sought a “Theory of Everything” that would explain exactly why we have the type of universe that we do. Scientists worry about what they call “undetermined parameters.” For instance, in our universe the electron and the proton have a particular mass and charge. Why do they have these values? If any of the values were just a little different, the universe would be completely different. Scientists are working on theories that will explain these values as a particular manifestation of a more fundamental process of universe creation, just as a climatologist can explain why the weather in one location on the Earth is different than another. Our universe would then be just a little bubble created along with an infinite number of other bubbles by some process that stirs up an infinite sea of hyperspace.

**The Participatory Universe**

- Physics, too, is only an interpretation of the universe, an arrangement of it (to suit us, if I may be so bold!), rather than a clarification. _Friedrich Nietzsche_

Some scientists have found it less shocking to carry out the implications of the Copenhagen interpretation than to believe that each moment we are splitting into 10^100 equally real copies of ourselves. The distinguished American physicist John Wheeler argued that we must abandon the basic tenet of traditional realism—that the universe is in some sense “sitting out there” for us to uncover. In its place, according to Wheeler, we must boldly embrace the concept of a “participatory universe.”

Adherents of this view claim that all vestiges of traditional realism must be abandoned. Both Bohm’s neorealism and the Many Worlds interpretation are but symptoms of our inability to give up a traditional metaphysics. There is no clocklike world in any sense sitting out there for our observational benefit alone. We do not observe “the real world”; we participate with reality by creating a reality for us. More precisely, we do not create reality; we select a concrete reality from out of an intermingled dance of intangible possibilities. (In the Many Worlds interpretation, all the possibilities are concrete.)

- My mind, in an undisciplined way, detects the cosmic within the nitty-gritty and the trivial within the infinite. _Harold Morowitz_

This concept is not as difficult to understand as it may seem. Wherever you are right now there are many hidden, potential manifestations of energy that all of us have come to take for granted in modern life. There are many potential channels of electromagnetic information. Although we cannot see them or feel them, there are many AM, FM, TV, cell phone, text and paging signals passing by us at any given moment. They are both here and not here. To make these signals of information manifest, to make them concrete, we must “tune them in”; we must have a device like a radio, TV, pager, or cell phone to collapse the indefinite electromagnetic waves into concrete electronic digits of information. The human mind is like a radio receiver stuck on one channel. When we set up our three-dimensional laboratory equipment, when we peer into our big telescopes and see galaxies millions of light years away, we participate with the infinite by manifesting one of its faces. It is not a mask; it is definitely there. But only as we observe it; just as radio music is music only as we tune it in.

Our confrontation with the microcosmos has taught us this: The results of our experiments are due to our being on one channel, but the microcosmos reveals to us, both through the gift of mathematics and observational paradoxes, that there are many other channels. It has taught us that when we go out on a cool, clear night and peer through a pair of binoculars at the Andromeda galaxy and receive the light that in our normal mode of thinking is two million light years old, we are instantly creating in a sense a two million year old past. The universe, in a sense, is here because we are here. There is still a kind of a past even if I am not looking, just as there is potential music in my room, even if my radio is off.
Mysticism and the Convergence Thesis

• For if those who hold that there must be a physical basis for everything hold that these mystical views are nonsense, we may ask – What then is the physical basis of nonsense? In a world of ether and electrons we might perhaps encounter nonsense; we could not encounter damned nonsense. *Arthur Eddington*

One more interpretation of the implications quantum physics deserves some comment. It is a very controversial interpretation because it claims that the results of modern science have validated a particular religious orientation. The possibility of such a development is one of the reasons scientists are often reluctant to communicate with the general public. However, the possible misuse of an idea does not prove the idea false.

For the purpose of identification let’s refer to this final interpretation as the convergence thesis. Essentially, this view argues that our confrontation with the quantum realm has demonstrated that Western science, founded upon the logic and philosophy of the ancient Greeks, has, after travelling a much different philosophical path, converged with the philosophy of the East, especially the mystical philosophies of Hinduism and Buddhism. This view was popularized in the 1970s by physicist Fritjof Capra in The Tao of Physics and philosopher Gary Zukav in The Dancing Wu Li Masters. According to Capra, “What Buddhists have realized through their mystical experience of nature has now been rediscovered through the experiments and mathematical theories of modern science.” And Zukav said, “Hindu mythology is virtually a large scale projection into the psychological realm of microscopic scientific discoveries.”

For many thousands of years the mystics have had a cosmological, ontological, and epistemological view of things that the Western world is just beginning to understand. Cosmologically, Western science has understood only recently that the universe is remarkably old. In 1965 the temperature of the universe was measured for the first time, eventually resulting in our present estimate of the age of the universe as about 14 billion years. In the ancient literature of the East one does not, of course, find such precise figures. Instead there are analogies such as the following. Imagine an immortal eagle flying over the Himalayas only once every 1,000 years; it carries a feather in its beak and each time it passes, it lightly brushes the tops of the gigantic mountain peaks. The amount of time it would take the eagle to completely erode the mighty Himalayas is said to be the age of only the present manifestation of the universe. Predating of things that the Western world is just beginning to understand. Cosmologically, Western science has understood only recently that the universe is remarkably old. In 1965 the temperature of the universe was measured for the first time, eventually resulting in our present estimate of the age of the universe as about 14 billion years. In the ancient literature of the East one does not, of course, find such precise figures. Instead there are analogies such as the following. Imagine an immortal eagle flying over the Himalayas only once every 1,000 years; it carries a feather in its beak and each time it passes, it lightly brushes the tops of the gigantic mountain peaks. The amount of time it would take the eagle to completely erode the mighty Himalayas is said to be the age of only the present manifestation of the universe. Predating of things that the Western world is just beginning to understand. Cosmologically, Western science has understood only recently that the universe is remarkably old. In 1965 the temperature of the universe was measured for the first time, eventually resulting in our present estimate of the age of the universe as about 14 billion years. In the ancient literature of the East one does not, of course, find such precise figures. Instead there are analogies such as the following. Imagine an immortal eagle flying over the Himalayas only once every 1,000 years; it carries a feather in its beak and each time it passes, it lightly brushes the tops of the gigantic mountain peaks. The amount of time it would take the eagle to completely erode the mighty Himalayas is said to be the age of only the present manifestation of the universe. Predating of things that the Western world is just beginning to understand. Cosmologically, Western science has understood only recently that the universe is remarkably old. In 1965 the temperature of the universe was measured for the first time, eventually resulting in our present estimate of the age of the universe as about 14 billion years. In the ancient literature of the East one does not, of course, find such precise figures. Instead there are analogies such as the following. Imagine an immortal eagle flying over the Himalayas only once every 1,000 years; it carries a feather in its beak and each time it passes, it lightly brushes the tops of the gigantic mountain peaks. The amount of time it would take the eagle to completely erode

Ontologically, Eastern mysticism is also consistent with the results of quantum physics. The mystics have always rejected the idea of a hidden clocklike mechanism, sitting out there, independent of human observation. The number one truth is that reality does not consist of separate things, but is an indescribable, interconnected oneness. Each object of our normal experience is seen to be but a brief disturbance of a universal ocean of existence. Maya is the illusion that the phenomenal world of separate objects and people is the only reality. For the mystics this manifestation is real, but it is a fleeting reality; it is a mistake, although a natural one, to believe that maya represents a fundamental reality. Each person, each physical object, from the perspective of eternity is like a brief, disturbed drop of water from an unbounded ocean. The goal of enlightenment is to understand this – more precisely, to experience this to see intuitively that the distinction between me and the universe is a false dichotomy. The distinction between consciousness and physical matter, between mind and body, is said to be the result of an unenlightened perspective.

• [We must] continue to insist on the centuries long tradition of science in which we exclude all mysticism and insist on the rule of reason. And let no one use -- [quantum] experiment to claim that information can be transmitted faster than light or to postulate any so-called “quantum connectedness” between separate consciousnesses. Both are baseless. Both are mysticism. Both are moonshine. *John Archibald Wheeler*

Epistemologically, our so-called knowledge of the world is actually only a projection or creation of our thoughts. Reality is ambiguous. It requires thoughts for distinctions to become manifest. We have seen that in the realm of the quantum, dynamic particle attributes such as “spin,” “location,” and “velocity” are best thought of as relational or phenomenal realities. It is a mistake to think of these properties as sitting out there; rather they are the result of experimental arrangements and ultimately the thoughts of experimenters. Quantum particles have a partial appearance of individuality, but experiments show that the true nature of the quantum lies beyond description in human terms. Our filters produce the manifestations we see, and the result is just incomplete enough to point to another kind of reality, an ambiguous reality of “not this, not that.”

For the mystic, the paradoxes of quantum physics are just another symptom of humankind’s attempt to describe what can only be experienced. We are like a man with a torch surrounded by darkness. The man wants to experience the darkness, but keeps running senselessly at the darkness with his torch still in hand. He does not realize that he must drop the torch and plunge into the darkness. The proliferation of philosophical interpretations of quantum physics is a symptom of the shipwreck of a traditional Western way of understanding, of our inability to “let go” of our Western torch -- our traditional logic, epistemology, and ontology. It is also a symptom of our inability to let go of our egocentricity, our
persistent attempt to define everything in purely human terms, as if we are somehow special and separate from the rest of the universe. Like a nervous, self-centered teenager at a party, concerned only with what others think of him, our entire field of vision and understanding is narrowly defined in terms of a “me.” Because of our fear of letting go, there is much that is right in front of us that we are missing.

• In our teaching we have an obligation to help our students to think about the uncertainties and ambiguities of nature as they are found at the interface between the known and the conjectural, but we have also...the higher responsibility to help them function on this side of that interface. On this side -- well back from the exciting and esoteric frontier where Einstein and Bohr still wrestle to a draw, our students are presented with obstacles to clear thinking and daily assaults against science and against the integrity and reasoning of the people who do it. Charles Stires, a master teacher.

According to this interpretation, the mathematics is complete just as it is. What the Schrodinger equation depicts for microscopic objects is also true for any macroscopic object. The universe is not full of separate objects, of separate people and places. Rather, it is an unbounded field of entangled possibilities. Because of the level of our conscious awareness, we fail to realize that duality, ambiguity, and interdependence are the rule rather than the exception. Mathematics may be one of the closest languages we have to representing these truths. All languages, however, are ultimately inadequate. Myths, stories, analogies, pictures, mathematical equations -- all such symbolic systems can but point to that which can only be fully understood through a deep meditative experience.

In the episode entitled “The Edge of Forever” in the “Cosmos” television series, Carl Sagan visits India, and by way of introducing some of the bizarre ideas of modern physics, he acknowledges that of all the world’s philosophies and religions those originating in India are remarkably consistent with contemporary scenarios of space, time, and existence. However, adamantly skeptical of the knowledge value of a nonrational mystical intuition, he concludes that although these religious ideas are worthy of our deep respect, this consistency is obviously only a “coincidence.” Using natural selection as a model, he proposes that it is “no doubt an accident,” because given enough time and possible proposals, given enough creative responses to the great mystery of existence, some ideas will fit the truth just right.

Other critics of the convergence thesis have not been as charitable. They argue that it is just plain silly to interpret an ancient belief system, founded upon certain psychological needs and within a historical context, in terms of any modern perspective. It is obvious, they argue, how the Hindu and Buddhist beliefs could soothe people living under extreme conditions. If our day-to-day reality is but a fleeting manifestation, then the vicious misfortune and meaningless suffering of this world are not real. For these critics, the methodology of psychological need as an origin of these ideas implies there is no connection.

By understanding the obvious psychological motivation for a set of beliefs, it is argued, one can question the truth of these beliefs. To further suggest that there is any connection between these beliefs and the results of rigorous experimental science is ludicrous.

Defenders of the convergence thesis argue that these arguments are flawed. If the ideas of Hinduism and Buddhism are simply the result of a lot of guessing, and the serendipitous contingency of evolutionary processes the appropriate model, then shouldn’t all the guessing that takes place over time should be consistent with a macroscopic environment, not a microscopic environment with which a primitive people have no experience? And even if it is true that a belief system serves a set of psychological needs, does this prove the belief system false? Many scientists are also surely motivated for many reasons to hold the beliefs they do: a philosophical perspective, the need for certainty, the need for security (be it a government grant or tenure at a prestigious university). That scientists have biases and motivations to believe what they do does not prove that what they finally believe is false.

Both of these arguments, however, do reveal a sobering point. The philosophical consistency between Hinduism and Buddhism and the results of modern science does not prove much by itself. Historically, we have seen many instances of a philosophy or a religious view being consistent with the science of a time, and a consequent rush to claim that the new science validates a religion or a philosophy. For both Copernicus and Kepler, the sun-centered system of the planets was consistent with their Neoplatonism and the idea that the sun was the “material domicile” of God. Similarly, for Bruno the sun-centered system was consistent with a larger universe and a greater God. For Newton a universe based upon the laws of universal gravitation was consistent with a conception of God as a master craftsman, a creator of an almost perfect machine who left a few defects with which to give Himself something to do. For some of the initial supporters of Darwin, natural selection was interpreted as a vindication of a philosophy of inevitable progress based upon a capitalistic economic system.

Perhaps the more pertinent question, applicable to all the interpretations of quantum physics, is not which offered paradigm is the truth, but which one will give us the most mileage? Which one, if followed as a guide, will be the most fruitful in stimulating the imagination of the next generation of scientists in devising new ideas, mathematical relationships, and experiments? In this chapter we have not given much attention to that area of modern physics that recently has gotten the most notoriety. In spite of the overwhelming success of the experimental demonstration that a traditional metaphysics of reductionism is inadequate, most physicists, concerned with the day to day demands of obtaining research grants and Nobel prizes, have simply filed such demonstrations away and continued with the Einsteinian quest, searching for more and more exotic particles, new “things” that will prove the supersymmetry theories,
unifying all the known forces of nature and catapulting our understanding to the first microseconds of the universe and perhaps beyond.

String Theory

- I believe that certain erroneous developments in particle theory...are caused by a misconception by some physicists that it is possible to avoid philosophical arguments altogether. Starting with poor philosophy, they pose the wrong questions. It is only a slight exaggeration to say that good physics has at times been spoiled by poor philosophy. Werner Heisenberg

In spite of the tremendous explanatory, experimental, and technological success of quantum theory, physicists are still bothered today over the fact that the theory has not been unified with Einstein's general theory of relativity. Even more important, when our best physical theories are used to explain the origin, development, and current state of the universe, there remains an underlying lack of elegance similar to what bothered Copernicus, Kepler, and Galileo about the Ptolemaic universe. Just as retrograde motion was not rigorously determined by the Ptolemaic geometric machinery, so our current understanding of why the elementary particles have the properties that they do and why there are four forces in nature seems incomplete. For instance, why is a muon (mostly detected in cosmic rays from outer space) very similar to an electron except have a mass 200 times heavier? Why does a proton have the mass that it does? Why does a photon have zero mass? Physicists call these quantities undetermined “parameters,” and like Copernicus and Kepler they want to find the God equation, one master principle or set of equations that explains everything.

Today, physicists interested in such cosmological holy grails the place to be working in developing a career is in what is called String theory. Direct empirical evidence does not yet exist for the theory; and some physicists have estimated that it would require an accelerator like CERN, the size of a galaxy to produce the necessary energy for direct empirical evidence of the foundational ingredients of the theory. Nevertheless, the potential elegance and explanatory power of the theory are so great that thousands of physicists in the past several decades have dropped former projects to pursue the new theory.

According to this theory, all the particles of matter and the forces of nature might be explained by purely mathematical objects, tiny strings that vibrate in and out of various multidimensional spaces, called Calabi-Yau spaces. Just as music is made by the vibration of piano or violin strings, in String theory an electron is explained as a particular resonant pulsation of a string vibrating in a particular way in multidimensional space and a muon results from a different type of vibration. According to physicist Brian Greene,

Werner Heisenberg

It is important to note the possible philosophical implications of such a theory. The table my computer is sitting on is already seen as somewhat illusory by the standards of quantum physics. It is not really hard and solid. The hardness is simply a human perception based on how we physically feel the result of the interaction between the opposing negative electric charges from the electrons on the surface of our hands and the table. Our perception of hardness is actually the result of electromagnetic forces. Furthermore, the atoms in the table are 99.9% empty space, and if the Schrodinger equation is taken literally, a big “if” remember, the electrons are only mostly “there” in the table I see. Some of the energy of the electrons is smeared throughout the universe. Now, String theory goes even further. Not only are the electrons, protons, and neutrons not little solid particles of matter, they seem to be as ephemeral as music. To use Galileo’s language, a point though that would certainly have shocked Galileo himself, particles of matter appear to be “secondary qualities.” But what then are the primary qualities? Ultimately, what is reality made of?

- What holds true in the world of electrons does not govern the world of chess and apples. James Randi

Now, do not think that these strings are like strings in our commonsense world. A piano string is of course made of atoms, but the strings of String theory are mathematical objects that can have a certain mathematical tension and vibrate in certain ways, but they are not made of anything more basic. They are geometric objects. Most important, strings vibrate the way they do due to the “spaces” they are in - the multidimensional spaces. According to Brian Greene,

Werner Heisenberg

This means that extradimensional geometry determines fundamental physical attributes like particle masses and charges that we observe in the usual three large space dimensions of common experience . . . that . . . fundamental properties of the universe are determined, in large measure, by the geometrical size and shape of the extra dimensions.

But what is the ontological status of these extradimensional geometric spaces? Democritus’ solid little atom is surely gone. What should we think about metaphysical materialism in general? What we call matter and physical things seem to be made of mathematical objects. Defenders of Idealism will surely claim that these objects are thoughts or concepts, and that Plato basically had it right about reality over 2,000 years ago.
years ago. Recall that for Plato the idea of a triangle was more real than any physical manifestation of a triangle. Matter is the illusion; ideas are real. Math existed before the physical universe. Now in String theory mathematical relationships make the universe that we see, and these mathematical relationships are not relationships between pieces of matter. They make the matter!

Einstein complained that quantum physics was incomplete because of unification problems and because he believed in an objective universe, not one created by our thoughts. What if String theory is successful? What are we to make of reality if the unification of physics implies thoughts are ontologically prior to matter?

The pursuit of String theory continues in earnest. Debates rage over the philosophical implications. One senses that nature is not yet ready to succumb completely to our latest gestures of understanding. Every past success at understanding has produced new mysteries. Why should it be any different now? There is every reason to believe that our romance will continue, that there are many mysteries left for a new generation of physicists. Although there have been many pretenders since the time of Kepler, no one has yet read the mind of God.

1. Technically these are known as the Photoelectric effect, Compton effect, Young and Davison-Germer diffraction wave experiments, Stern-Gerlach interferometer experiments, Bell’s inequality theorem and the Aspect experiments. (Click Back to return to text.)

2. Actually a diffraction pattern, a diffused piling effect, results, which is also a wave effect. So the wave effect shows particle characteristics, the individual hits on the film, and the particle effect shows wave characteristics, the diffraction pattern.

3. So called because much of the work done by Bohr, Werner Heisenberg, and others was done in Copenhagen, Denmark.

4. After the French physicist Alain Aspect, who was the leader of a team that conducted this crucial experiment. The results were published in an unassuming three page paper “Experimental Tests of Realistic Local Theories via Bell’s Theorem,” Physics Review Letters, Aug. 17, 1981.

5. Polarization is what makes Polaroid lenses and dark glasses possible. A Polaroid lens allows photons of light with only a particular spin orientation to pass through. Those without this orientation are blocked, thus selectively lessening the intensity of light that passes through.

6. Switching devices were activated by high-frequency waves at a rate 100 million times per second. Because the finish lines were 10 meters apart, no signal could be exchanged between the separated particles at the speed of light.

7. Some attempts at unifying all the known physical forces into a superforce have used mathematical devices that refer to between 11 and 26 dimensions.

8. John Gribbin, In Search of Schrodinger’s Cat: Quantum Physics and Reality (N.Y.: Bantam Books, 1984), p. 241. The title is taken from a paradox first discussed by Schrodinger. If a cat is placed in a special box with a deadly vial of poison and a quantum device is used to trigger its release, then until we open the box to measure the state of the cat, the cat is both alive and dead. Like the electron, the cat is represented by a superposition of states. The Many World’s interpretation solves this paradox by claiming that in one world the cat is alive and in another it is dead.

9. This process would not be a one time event. It would be on-going with many universes being created before and after ours.

10. However, Wheeler has been very critical of those who would use this abandonment of realism as an excuse for believing in the occult or mysticism. See the next section.


13. Although space does not permit us to discuss this further, it is worth noting that there are two types of Idealism, objective and subjective. For an objective idealist, ideas have an independent reality. Plato believed that the idea of a triangle existed even if there were no human minds around to discover it. For a subjective idealist, our thoughts create reality. For the philosopher Berkeley if there were no mind around, a tree falling in a forest would have no sound. In fact, there would be no forest. The type of Idealism that Einstein objected the most to was subjective idealism, which seems to be implied by the Copenhagen interpretation. String theory seems to support objective Idealism. Einstein may have approved of this type of Idealism, because he did believe in Spinoza’s God, a God of pure consciousness and thought. Spinoza also believed studying mathematics was the closest we could come to in understanding God.
Quantum Reality: Beyond the New Physics, by Nick Herbert (Garden City, N.Y.: Anchor Press, 1985).

Although many books have attempted to convey to a generalist audience the philosophical excitement and perplexities inherent in the development of quantum physics, this book is highly recommended for its readable style, objectivity, and boldness. It presents each of the major interpretations of quantum physics fairly and is written by a physicist willing to discuss issues of reality in a nonmathematical language (something most physicists have been taught not to do). It also incorporates historical perspective with the important work by Bell and Aspect. For other introductory presentations for the nonspecialist see Taking the Quantum Leap, by Fred Alan Wolf (San Francisco: Harper and Row, 1981) and In Search of Schrödinger’s Cat: Quantum Physics and Reality, by John Gribbin (New York: Bantam Books, 1984), both of which advocate a particular philosophical perspective.

The Dancing Wu Li Masters: an Overview of the New Physics, by Gary Zukav (New York: Morrow, 1979), and The Tao of Physics: An Exploration of the Parallels between Modern Physics and Eastern Mysticism, by Fritjof Capra (Berkeley, Calif.: Shambhala, 1975). Although these books are also intended to be introductory, both are controversial, as noted in this chapter, in advocating the convergence thesis. If nothing else, both books show how developments in the quantum domain have caused the Western mind to reach beyond its cultural tradition for some philosophical help and guidance in constructing a new image of reality. Also see, Einstein’s Space and Van Gogh’s Sky: Physical Reality and Beyond, by Lawrence L. LeShan (a psychologist) and Henry Margenau (a physicist) (New York: Macmillan, 1982) for an attempt to frame a new view of reality and mind using Eastern philosophy as a guide. The authors even discuss parapsychology and extrasensory perception within this context.


In these books three of the major players in the development of quantum physics give their interpretations of what this development means. Also see Heisenberg’s Philosophical Problems of Quantum Physics (Woodbridge, Conn.: Ox Bow Press, 1979), and Across the Frontiers (New York: Harper & Row, 1974).

The Philosophy of Quantum Mechanics; the Interpretations of Quantum Mechanics in Historical Perspective, by Max Jammer (New York: Wiley, 1974).

A complete scholarly resource for anyone ready to get serious about understanding the different schools of thought, and their historical origin, that have arisen in response to quantum physics. With some higher
order mathematics the book covers from the 1920s up through the significance of Bell's work and the Many Worlds interpretation. Includes a very nice development of the Copenhagen interpretation and the Bohr-Einstein debates.


The book's title is taken from Einstein's concern that the Copenhagen interpretation implies playing a “risky game” with reality, that physics was abandoning its role of determining the independent physical states of a natural world. The author argues that Einstein was misunderstood and that the Bell and Aspect developments in quantum physics may be incompatible with a “reductive” and classical realism, but are not necessarily incompatible with a “minimal” realism or what the author calls a “natural ontological attitude.” Although the author's attempt to semantically navigate around the implications of the Aspect experiment is suspect, the book summarizes the philosophical issues well.


This compilation of writings and thoughts on quantum physics starts in the 1920s. It represents an attempt by one of the major philosophical figures of the twentieth century to counter the “subjectivism,” and what the author calls “the great quantum muddle,” produced by Heisenberg's and Bohr's Copenhagen Interpretation. Popper argues that a proper understanding of quantum physics, involving a “propensity” particle interpretation, where there are no waves and only objective probabilities of (admittedly queer) particles, can return science to its rightful enterprise of relentlessly getting us closer to the truth. Because this interpretation would ultimately have us return to thinking of electrons, photons, and protons as independent real things capable of precise locations, a position apparently refuted by the Aspect experiment, the author has accused of violating his own epistemology and imposing a dogmatic metaphysics upon science. For an especially scathing criticism of Popper's interpretation, see Paul Feyerabend's "On the Attitude." Although the author's attempt to semantically navigate around the implications of the Aspect experiment is suspect, the book summarizes the philosophical issues well.


An important work. Bohm is most noted for his unsuccessful attempt at creating a “hidden variable” interpretation of quantum physics that will lead to novel, testable predictions. Bohm's book gives us a glimpse of a possible, creative neorealism that preserves the undefinable, undescribable, and immeasurable nature of quantum reality. The book also contains comments on Eastern mysticism and the ultimate philosophical questions generated by modern science. For Bohm's thoughts on the latter, also see his discussions with the noted mystic, Jiddu Krishnamurti, in their Truth and Actuality (San Francisco: Harper & Row, 1980). For two other interesting attempts to reestablish some kind of realism in quantum physics, see Bernard d'Espagnat's In Search of Reality (New York: Springer-Verlag, 1983), and Alastair I. M. Rae's Quantum Physics, Illusion or Reality? (Cambridge, England: Cambridge University Press, 1986).

AN INTRODUCTION TO REALITY SHIFTS

Most of us have noticed things missing from places where we’re certain we last saw them. Lost socks, missing keys, wallets, and tools often seem to have a mind of their own... disappearing from the places we know we put them and sometimes reappearing unexpectedly. Mechanics are so familiar with this phenomenon that they refer to “gremlins” who must be responsible for moving their tools around.

We also notice synchronicities and coincidences in our lives... times when the events happening around us seem orchestrated to bring together ideas, people, and situations.

Take a moment now to consider the possibility that your thoughts and feelings are responsible for creating your experience of reality... that the very way you observe the universe is affecting what you are observing. Just as the most fundamental building blocks of matter and energy are non-locally connected across time and space so that they change their spin simultaneously when they are observed, so too can we notice such “spooky action at a distance” when we make wishes or prayers that come true.

Albert Einstein used the expression “spooky action at a distance” to convey his doubt that quantum non-locality could exist. Quantum non-locality was experimentally proven in the 1980’s in Paris in a series of experiments conducted by Alain Aspect and his colleagues. These experiments measured the polarization of two twin photons... one photon being “up” and the other “down” as they traveled in different directions. Aspect’s experiments dealt with beams of correlated photons (pairs of one up and one down photon), and these experiments showed that as the angle of measurement changed for measuring the first group of photons, the statistical probability of the second group of photons going through the filter at a different angle was changed.

Physicists seeking to prove that the world operates locally (a measurement taken in one place cannot have a remote effect) conducted an experiment in the early 1970’s in Berkeley, California. John Clauser, Michael Horne, Ahnner Shimony and Richard Holt were surprised to find that quantum particles DO change their polarization across distances of space. This experiment was especially significant, because the experimenters set out to prove locality, and were unable to do so.

The connection between “spooky action at a distance” and wishes and prayers is that everything in this universe is made up of quantum material at its very core. You and I and everything else that exists consists of particles that have twin particles located elsewhere. When changes occur within us, twin particles elsewhere are simultaneously affected. Since quantum particles appear as “particles” at the point in time and space where they are observed... the very act of observation in one place (wishing or hoping or praying) brings about change elsewhere.

Reality shift experiences have been almost universally ignored or denied until now, when the subject can finally be raised in a non-stigmatizing way with the explanation that these changes are not in violation of the laws of physics, but are a natural part of the way we interact with the world.

Why Reality Shifts

Physics is a science, and as such, its answers will be ever-changing. We can find eternal answers in spiritual teachings by enlightened men and women who have understood the basic truths about the nature of reality. In other words, we may think we finally know what’s going on according to the latest discoveries in science, yet each new discovery is just a step on a path of ever-greater understanding. Wise spiritual teachers have long known that reality shifts with our thoughts and feelings.

All matter has a quantum nature

Quantum mechanics does not merely apply to the realm of the very small. Physicists working on finding the theory of everything (TOE) are currently working to unify quantum physics with relativity... so that one theory can explain the physical behavior of everything from the tiniest subatomic particles to the biggest celestial bodies. As physicist David Greene writes from the perspective of a physicist on the front-lines of the TOE quest in his book, The Elegant Universe,

“The strategy of beginning with a theoretical description that is classical and then subsequently including
The features of quantum mechanics has been extremely fruitful for years. It underlies, for example, the standard model of quantum physics. But it is possible, and there is growing evidence that it is likely, that this method is too conservative for dealing with theories that are as far-reaching as string theory and M-theory. The reason is that once we realize that the universe is governed by quantum mechanical principles, our theories really should be quantum mechanical from the start. We have successfully gotten away with starting from a classical perspective until now because we have not been probing the universe at a deep enough level for this coarse approach to mislead us. But with the depth of string/M-theory, we may well have come to the end of the line for this battle-tested strategy.

These physics pioneers on the cutting edge of finding the TOE believe that our universe most likely consists of many more than the three spatial dimensions we are familiar with... and that many more dimensions lie hidden all around and inside us, curled up.

Quantum behavior changes our assumptions about reality

Our old assumptions about the true nature of reality don't work in the realm of the very small ("quantum")... so that means they need to be replaced with better assumptions. Experiments in quantum physics have proven that assumptions of locality, causality, objectivity, and material monism (only matter matters) are incorrect. Better assumptions at the quantum level are:

- Non-locality
- Probability
- Interconnectivity
- Mind and Matter are inseparable

What is really happening at the quantum level?

There are four leading quantum theories, all of which work equally well at predicting the behavior of quantum particles. Whichever interpretation you prefer, remember that it describes quantum particles as behaving non-locally according to probabilities... and every time an observer makes any measurement, that observation changes the world.

Copenhagen Interpretation

The Copenhagen interpretation of quantum physics was first described and presented by Niels Bohr in Italy in 1927. Bohr suggested that quantum particles exist as waves which might be anywhere until the wave function is collapsed. As long as nobody looks, each quantum particle is equally distributed in a series of overlapping probability waves, in a superposition of states.

Many Worlds Interpretation

In the 1950s, Hugh Everett III proposed that every possibility inherent in each wave function is real, and that ALL of them occur. Possibilities become actualities with each measurement that is made, and infinite slightly different realities come into existence as each quantum event is observed. All possibilities are equally real.

Transactional Interpretation

John Cramer's transactional interpretation of quantum physics suggests that "handshakes" take place between quantum particles in different points in time and space. In Cramer's interpretation, a particle here and now on Earth instantaneously communicates with particles light-years away in time and space, as one particle sends an “offer” wave and another responds with a “confirmation” wave.

Holographic Interpretation

Physicist David Bohm and neurophysiologist Karl Pribram proposed that the universe may be like a giant hologram, containing both matter and consciousness as a single field. This model suggests that the objective world “out there” is a vast ocean of waves and frequencies which appears solid to us only because our brains convert that enfolded hologram into an unfolded sense of material we can perceive with our senses.

Alain Aspect of the University of Paris, in 1982 discovered that subatomic particles like electrons are capable of immediate communication no matter the distance. If a particle by interventions of the researcher received an opposite “spin”, this would have an immediate effect on its “twin particle” whether the distance was 10 miles or 10,000 miles, or 10,000,000 miles for that matter. This would mean that the transfer of communication between these particles took place faster than light, which is in contradiction with Einstein's theories that tell us that nothing can go faster than light.

NON-LOCAL CORRELATION by two particles is demonstrated in the Franson experiment which sends two photons to separate but identical interferometer. Each photon may take a short route or a longer 'detour' at the first beam splitter. They may leave through the upper or lower exit ports. A detector looks at the photons leaving the upper exit ports. Before entering its interferometer, neither photon knows which way it will go. After leaving, each knows instantly and nonlocally what its twin has done and so behaves accordingly. Although in these experiments the photons were separated by only a few feet,
quantum mechanics predicts that the correlations would have been observed no matter how far apart the two interferometers were.

In order to keep Einstein’s theory of relativity and the principles of causality intact, some scientists are explaining this effect away as being random.

One of the oddities of quantum particles is that their properties only take on definite values when measured. The electron and positron, for instance, are both effectively spinning. Either particle’s spin is equally likely to be clockwise (known as “up”) or anticlockwise (“down”)—but you won’t know which unless you measure it. Until that measurement is made the particle is in a weird indefinite state, a “superposition” of both spins. What is definite, however, is that in an entangled state, the spins of the two particles are intimately linked. Since the original pion had no spin, the positron and electron must always spin in opposite senses so that their net spin remains zero. If you find the electron’s spin to be “up”, you’ll find the positron’s to be “down”, and vice versa. So it is as if the two entangled particles, no matter how far they are apart, are not really separate at all. Measure one, and as its spin becomes definite this triggers the other to respond. Its indeterminate spin also becomes definite, in the opposite direction to that of its partner. What is astonishing and disturbing is that this response happens instantaneously even if the particles are separated by huge distances. Consequently, quantum theory requires action at a distance. What happens in one part of the Universe can have instantaneous “nonlocal” consequences in other parts, no matter how far away they might be. And this poses a problem, because instantaneous action at a distance is a punch in the nose for Einstein. His theory of relativity—the cornerstone of physics—claims that our Universe has an absolute speed limit.

Nothing, according to Einstein, can travel faster than light. So you might wonder—do we really need to swallow this nonlocal quantum weirdness? Perhaps there is a better theory that accounts for these entanglements without action at a distance? Think of this: if someone separated a pair of your shoes by a great distance and then weighed one, they would immediately have a good estimate of the weight of the other. There’s no mystery here. Nothing nonlocal. Shoes have weight. And if they come from a pair, their weights are correlated from the outset. Could something similar be true for entangled particle pairs? Despite what quantum theory says, perhaps the particles do have definite spins, arranged oppositely at all times, and measurements merely reflect this pre-existing situation. This is an obvious possibility. It might even be true. The trouble is, it doesn’t cushion the blow for relativity. In 1964, physicist John Bell of CERN, the European Laboratory for Particle Physics, examined this line of argument in detail and proved a famous theorem which fellow physicist Henry Stapp of the Lawrence Berkeley Laboratory in California calls “the greatest discovery of all science”. Bell first supposed that quantum theory doesn’t say all there is to say about quantum particles. He then proved that if any more complete theory—any theory imaginable—were to give predictions in agreement with quantum theory, it would necessarily still contain the same kind of nonlocal influences as ordinary quantum theory. “What Bell gave us,” says philosopher David Albert of Columbia University in New York, “is a proof that there is a genuine nonlocality in the workings of nature, however we attempt to describe it, period.” Every conceivable story about entangled states has to be nonlocal. There is no escape. Unless, of course, entangled states don’t really exist, and quantum theory is wrong.

Some extragalactic sources also seem to expand faster than Light. Or maybe it is all part of the illusion.
What is the Limit of Human Intelligence?

Daniel Tammet holds the record for reciting Pi to 22,514 decimal places and has what is known as “Savant Syndrome”.

What makes Daniel unique from other Savants with extraordinary mind capabilities is he can explain to scientists what is going on in his head.

Daniel explains his ability to memorize numbers is due to his mind perceiving numbers as complex multidimensional colored and textured shapes. Daniel is a unique example of savant syndrome because he is the only one so far that can describe his inner world. His ability puts an new spin on what is “intelligence”.

“I was able to visualize the digits in my mind’s eye as beautiful rolling numerical panorama, with prime numbers as signposts”

Be sure to watch the “Chess Hustlers” in Video 3 and the Japanese Students manipulating numbers with an “imaginary abacas” in their minds to do extraordinary calculations in their minds. The Japanese Children are not Savants as they have been practicing hours per day for years.

If you only have time to watch 1 of the 5 parts below make it number 4!

In video #5 Daniel is given the ultimate linguistics challenge – Learn the Icelandic language in 7 days. And of course he does!

Note: There is another series of videos that are not the same but very close to this series. Search for “The boy with the incredible brain”

While possessing Savant Syndrome, Daniel can describe his inner world to scientists.

When Dustin Hoffman starred in the 1989 Hollywood movie Rain Man the “autistic savant” was suddenly transformed from being a rare disability that few people had heard of into a familiar household term.

In fact the term savant syndrome is preferable to “autistic savant”, as only about 50% of people with savant syndrome actually have autism. The others have a different cause of severe mental disabilities coexisting with some outstanding talent or ability. The “island of genius” is always linked to incredible memory capacity, and may involve musical, artistic, mathematical or mechanical talents. It is all the more remarkable as it exists within a sea of mental handicap.

Some History

The first recorded case of savant syndrome was the severely mentally handicapped Thomas Fuller, in 1789, who displayed remarkable lightening calculating abilities. When asked how long a man had lived who was 70 years, 17 days and 12 hours old, he gave the correct answer after 90 seconds, even correcting for the 17 leap years! Yet apart from this astounding ability, Fuller was able to “comprehend scarcely
The term “idiot savant” was introduced in 1887, as at that time idiot was the term for anyone with an IQ of less than 25. “Savant” is derived from the French “savoir”, meaning “to know”. Like in Latin the word to know is SCIO. In fact, almost all cases occur in people with IQ over 40, and the current term savant syndrome is more accurate as well as being less offensive.

How Common Is It?

About 10% of people with autistic disorders have savant abilities, and in the non autistic population, including those with mental retardation, the prevalence is less than 1%. It’s much more common in men than in women.

Some Examples of Savant Abilities

Impressive mathematical abilities that savants possess often include lightning calculation. Calendar memory is sometimes seen, whereby the savant is asked a question like what day of the week was January 14th 1973? and can give the answer within seconds. At the 1964 American Psychiatric Association Annual Meeting, two autistic identical twin brothers were presented who had a calendar calculating span of over 40,000 years backwards and forwards. Others can multiply and divide huge numbers and calculate square roots in their heads, yet often have difficulty with simple arithmetic and are unable to accomplish simple mathematical transactions in daily life, like counting out change in a shop.

Some savants are incredibly talented artists and musicians. For example, the successful artist Stephen Wiltshire is a savant, with autism. He has been filmed completing a highly accurate and detailed sketch of London covering 4 square miles, 12 major landmarks and 200 other buildings, all drawn to scale and perspective, after observing it all during a helicopter ride that only took 12 minutes! Musically talented savants often have perfect pitch and remarkable musical memory.

Some savants have remarkable mechanical or spatial skills, like the ability to construct complex and detailed models, or to measure distances very precisely without instruments. The real savant who was the inspiration for Dustin Hoffman’s character in Rain Man had memorized over 8600 books and possessed encyclopedic knowledge of geography, music, literature, history and sports. He also had a fascinating ability to read extremely rapidly, scanning one page with the left eye and the other with the right simultaneously.

Inside the Savant’s Brain

Many researchers believe that the underlying cause of savant syndrome is left brain injury with right brain compensation. Brain imaging with CT, PET and MRI scanning often shows evidence of left brain deficits or damage in savants. The theory is also backed up by cases of acquired savant syndrome, where savant abilities appear after damage to the left side of the brain, either following trauma like a fall or gunshot wound, or after the onset of dementia that particularly damaged the left brain. The savant mentioned above, upon whom the Rain Man character was based, was found on MRI to have substantial brain damage, including entire absence of the corpus callosum, which normally connects the left and right hemispheres of the brain.

Research Directions – Can We All Find Our Inner Savant?

Ever since the existence of this remarkable syndrome was first recognized, people have been fascinated by how such prodigious talents can coexist with severe disabilities within the same individual. In recent years, researchers have begun asking whether they can reveal savant like abilities in healthy volunteers if they temporarily immobilize parts of the left brain with a technique called Repetitive Transcranial Magnetic Stimulation. In some people, there was an improvement in savant type skills, like drawing and proofreading, but the improvements were not dramatic, and did not occur in everyone. Some subjects even experienced temporary short term memory loss afterwards.

The existence of savant syndrome remains a conundrum that fascinates us and challenges our understanding of what the human brain is capable of.
those who are different and what tolerance and understanding really mean.

In conjunction with this event, we have compiled a bibliography consisting of books, journal articles and websites on Daniel Tammet, Asperger's syndrome, synesthesia and savant syndrome.

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If you watch the videos of Daniel it will show you a new way of seeing things. Please take the time for my words cannot capture the way your perceptions of thought will change. The above article points out some very interesting and unavoidable truths for the world today.

First what we know about thought and the human mind is all wrong.

Second the verbal area of the Brain is not only very limited it is extremely limited and there are capacities in the brain way beyond verbal capacities. The verbal brain is but a tool for our real bodies. It is the language interface. It is not the master, it is not the intellect we thought it was, it is not the height of the mind. It is a tool. The mind has capacities unknown.

The Buddhists have many quote major unknowables, one the beginning of all things. If we think too much on the beginning of all things we will get a headache and still not know. Second is the power of the Buddha mind to see and affect things at a distance. And third is the power of any human mind. Its capacities are quote unknowable. There is always more we can do once we transcend the limitations of our doubting self limiting verbal mind. As Helen Keller once said “the only obstacles are in the human mind”. And she ought to know, and we ought to listen.

Dedication

So in our new biology of the Neomorpheus we need to account for and deal with Daniel. It was my son Daniel whose life helped me to understand things better. So to this end I dedicate this book to my son Daniel. I named him after the Bible's Daniel who had dreams that shaped reality, fought with a lion, lived in the furnace, and proved many things for us to see. And I named him Perseverance for his middle name to give him the energy of focus dedication. Daniel was born autistic because of a SINthetic drug. And when I researched this I found that all SINthetic drugs make disease and the whole of medicine was wrong to depend solely on their use. This led me to discover and then champion natural medicine, all because of my son Daniel. In the name of dedication I dedicate this book to my son Daniel.

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SCIO SPORT STUDY REVIEW

This study was presented to the 7th Congress of the Hungarian Sport Science Review May 28, 2009, Budapest, Hungary

By IMUNE Prof. Emeritus, Desire Dubounet

Abstract

The SCIO device has a long history of use in sports. The device was first registered in the USA for re-education of the muscles. In China the word for sport is TU meaning education of the muscles. This is the designed intent of the device. This article will review the basic philosophy of the device and its history of use in sports. There have been many uses of the device by many different sportsmen; this will be reviewed, leading up to the most recent study of the Chinese Olympic athletes of 2008.

Overall the Chinese fielded 637 athletes. 150 were run on the SCIO device. The test group was of many injured and sick athletes who were run on the SCIO device. But these were in categories not supposed to do well in the Olympics, or they were injured or sick. Some were just about to be removed from the team. The device worked wonders. The doctors saw an incredible 5% increase in stamina, strength, and coordination. With biological factors such as hydration, oxidation, power and muscle function more stabilized, the athletes performed better. The device especially deals with muscular reeducation to restore or maximize peak muscle performance.

When the medal count was final, 33 medals were won by the tested group. Many athletes ranked below the top 50 won medals in their areas. A fact not happening in the other control group. This has led us to the measured conclusion that our SCIO device is capable of increasing an athlete performance by approximately 5%. This could be the difference from 20th to first place. Over 30% of the medal China won came from our group of sick and injured athletes and our group was less than 25% of the whole. By statistical analysis of the performance ratings and expected outcome, there was a phenomenal increase of over 75% in performance in the SCIO group. This made a distinct impression on the Chinese who were prompted to thank Dr. Nelson for his work.

Basic Physics

Basic 5th grade science tells us. We are made of atoms and atoms are made almost exclusively of electrons, protons and neutrons. None of us can in any way perceive this simple truth presented to us in 5th grade.

We live in the false belief that there is solid flesh in our bodies, when we know that it is not true. The outer area of any atom or molecule is made of the electrons. The electrons have a very strong electric charge. So strong that two electrons can almost never touch, the energetic charge will repel them. No atom ever touches another atom. No molecule ever touches another molecule. Everything is held together with energetic, quantum, electro-static-magnetic, or other subatomic forces. All of life is mostly electrons and protons that never touch but only interact trough electro-magnetic fields. These are the basic forces of electricity. All of the interactions of life are energetic and electrical at some level, 5th grade fact.

Chemistry has been taught with the analogy of rods and balls. Every chemistry student has been shown molecules with balls for atoms and rods for the bonds. This implies there is a solid nature. There is not. The atoms are energy fields, the bonds are also fields not much different than two magnets that repel on the table. There is no rod or ball, but this analogy is used by the pharmaceutical companies to sell their wares. It is a false belief.

The field of voltammetry tells us this simple fact. We appear solid because these forces are strong. But we cannot touch anything but just interact with energy fields. This is basic 5th grade science but our society has decided that since this interferes with the sale of pharmaceuticals, we will ignore this simple truth in medicine. People such as me, who try to reposition medicine to this truth are attacked and persecuted.

The molecular structure hypothesis - that a molecule is a collection of atoms linked by a network of energetic bonds - was developed in the nineteenth century experimental chemistry. It has served as the principal means of ordering and classifying the observations of chemistry. But the advent of Quantum Physics allowed us to better understand and clarify this field of knowledge.

Richard Feynman and Julian Schwinger redeveloped the science of physics to enable one to ask and answer the questions "what is an atom in a molecule and how does one describe its properties?" These questions were posed in the laboratory where it was demonstrated that this new formulation of quantum physics, when applied to the observed topology of the distribution of electronic charge in real space, gave us a unique idea of some total system into a set of bounded spatial regions. The form and properties of the groups of electronic charge so defined predictably can describe the characteristics ascribed to the atoms and functional groups of chemistry. The Mendeleev table was shown to be a simple exercise in Quantum Physics. All of Chemistry can only be described in quantum physics. This is also clear cut science fact. By establishing these quantum associations, the molecular structure hypothesis is set free from its empirical restraints and the full predictive power of quantum mechanics can be incorporated into the resulting theory - a theory of atoms in molecules, crystals and biology.
The theory tells us the central operational ideas of the molecular structure hypothesis. That a functional grouping of atoms with an additive and characteristic set of energetic properties, together with a description of the energetic bonds that link the atoms and impart the molecular structure. This theory thereby quantifies and provides the physical understanding of the existing concepts of chemistry. This theory also makes possible new applications. These new applications will eventually enable one to approximate on a computer, in a manner closely paralleling experiment, most everything that can now be approximated in the laboratory.

Quantum Electro-Dynamics is a science that further takes our understanding of science to a new level. Here any change in a quantum state of a subatomic particle such as electron and proton has a photonic release or absorption. When a photon hits an electron in the right way the electron goes to a higher energy state (Calvin Cycle). When an electron goes to a lower energy state it gives off a photon. Sun light goes into the plant making the energy of high charged electrons into carbohydrates. The body takes in the highly charged electrons and uses them to make ATP for energy (Krebs Cycle). This releases photonic energy in the form of body heat. The energetic fields that bind us together and make us appear solid have a photonic relationship. Only QED allows us to understand this. But since the chemical companies cannot change the energy states of an electron, their synthetic medicines and foods are not really compatible with the human. So the use of the word quantum is discouraged by them and our science stagnates because of the drive for profit.

The absorption of photons through photosynthesis allows for the formation of stronger covalent bonds and the development of biology. The animals and others release this photonic energy as body heat. Thus the cycle of photonic absorption and release is the basis of our biology. This is an integral by product of the energetic bonds that make up everything, especially our biology.

This simple article reviews and recounts this simple scientific fact of how our biology is made up. There is a fixation on the false belief that we are solid and not energetic, when in fact using our 5th grade science we show that we are indeed energetic in nature.

The human body has cells that take the energy stored in the plants for food. The photons of the sun hit the plants and slowly elevate them to higher energy states.

Since we are an energetic being with excess electrical energy in every cell, all of life’s functions are basically electrical. The highly charged electrons in carbohydrate sugars have their energy converted to ATP for energy in every cell. There is an intricate extremely complex chain of events leading to this process, but all processes must involve electrons, photons, protons and other forms of energy.

Voltammetry is the study of how a substance usually a hormone reacts at a receptor site to exchange the energy of a molecule via electron transfer which makes up a voltammetric reaction. Thus the shape and nature of the energetic field of an item can be measured. This field can be used to approximate the item itself and measure the electrophysiological reaction of an organism to a substance.

Global analysis of the charge stability of a person is akin to measuring the amount of free electrons to free protons. Most electrons and protons are bond tightly inside an atom. Electrons in the outer shell can be free or in a quantum imbalance seeking to balance a outer shell. This accounts for chemical bonds. So a direct global measure of pH can be detected and affected. There is a profound science of analysis of the body electric. ECG, EMG, EEG, GSR, to mention a few. But till now the body electric has been secondary and not of primary concern.

There has also been a vast body of research showing that electro-stimulation can be helpful to the body. Work on tens, electro-osmosis, wound healing, and micro-current device of an incredible range. Few have sought to interface these two areas of medicine of measuring the body electric and then affecting the body electric. We can detect electrical aberrations in the body and then affect them. To measure an factor of the body electric and stimulate the body with a safe signal and then auto-focus the next pulse using a cybernetic loop using feedback principles. The SCIO was developed to measure the body electric, find aberrations of oscillation, reactivity, electro potential, resistance etc, and then to affect or repair these aberrations through micro-current stimulations. This is the design of the SCIO.

The SCIO system measures 238 electrical variables every 2000th of a second or more. The oscillations of these variables allow us to calculate electro-potential (EEG, EMG, ECG). We can calculate voltage, amperage, resistance, hydration index, oxidation index, Proton pressure, Electron pressure, reactance, wattage power index, susceptance, capacitance, inductance and other electrical readings of the body. The computer will read these signals and over 250,000 bits of data a sec. and check for anomalies or aberrations in the body electric. ECG, EMG, EEG, GSR, to mention a few. But till now the body electric has been secondary and not of primary concern.

The computer will read these signals and over 250,000 bits of data a sec. and check for anomalies or aberrations in the body electric. The non-linear fuzzy logic system can assay problems in the body electric such as but not inclusive, osmotic distension, dehydration from osmotic irregularities, oxidation disturbances, muscle tone disorders, dystonia, low voltage potential, low amperage, power index disorders, membrane capacitance dysfunction, ionic inductance dysfunction, reaction profile dysfunction, brain wave irregularities, heart rhythm irregularities, muscular problems of power transfer, and many others. In short dysfunction in the global body electric. We can measure muscle disorders and effect repair. When a current of known oscillations is sent through healthy tissue (input) a known output is received on the other side (output). When there is soft tissue damage the output readings are different in a known way. When there is hard tissue or muscle damage there is also a predictable output.
Then with a medically safe micro-current pulse the SCIO can attempt repair of these aberrations. The pulse is designed to electrically rectify or remedy injured tissue through muscular re-education or wound healing in the vernacular. The pulse can reduce pain, rejuvenate tissue, promote healing, and promote osmosis, balance oxidation issues, correct aberrant brain wave, muscle load disorders, and many other electrical issues. It is designed as an universal electro-physiological feedback system.

Now as to the history of use in Sports:

This science was started by an electrical engineer, medical doctor, quantum physicist Prof. Nelson who worked on the Apollo project in America in the sixties. The science was outlined in the 1982 book the PROMORPHEUS. The first registration of the technology was in 1989 with the FDA of America. Since then over 28,000 devices have been sold all over the world. The device was first registered in Europe in 1996 and now is registered for use in several countries. There have been over 100 peer reviewed journal articles written several with double blind modalities. A list is in the references.

As for the sport studies, there has been several famous sportsmen who have used the device very successfully. Our studies show that the overall wellness of a person can be enhanced about 5%.

The effects are temporary and depend on the Suppression and or Obstruction to disease that is displayed. In other words smoking, alcohol abuse, stress, old age, and other lifestyle conditions that interfere with the life force limit the effect. Athletes mostly have very little suppression of their curative process and thus they get the greatest effect and it lasts the longest.

AC Milan bought 5 devices and within one month their injury level dropped 91%. The next year they won both the Italian league and the European championship. This alarming statistic bought them to invite Prof. Nelson to Milan for more discussion. In a visit to Milan the team thanked Prof. Nelson for his work. AC Milan led Europe for the next two years. A plan for advertising was struck but was later dismissed when some of the staff could not understand the body electric.

Members of Lance Armstrong’s bicycle team used the device from one of the teams’ doctors. The doctor told of how he used his technology on Lance to help him win the French tour de France several times. Valantino Rossi has used the device to lead the world in motorbike racing for years. Michael Shumaker used the device to help him get an edge.

Dennis Johnson was the NBA MVP 2 times and lead two teams to the championship game. He started to use the device on some of the San Antonio Spurs team. They won the NBA championship that year. Dennis reported incredible results with strength and stamina, but he never used the device on himself.

His early death stopped the study.

In China the word for sport is pronounced T U. It means education of the muscles. This device is registered in America to re-educate the muscles. Education of the muscles is sport. The perfect test of the technology was about to come.

Then in early 2008 the Chinese Olympic team heard of these incredible results, and the incredible device. They were desperate to do as well as possible in their home Olympics. They contacted Prof. Nelson and offered to let him do a study on some of their team. A deal was struck and two technicians and two devices were used in the study. They were sent to the Olympic training village I China. They worked feverishly at first just to get the respect of the Chinese doctors. The Chinese doctors were mired in the chemical training and were difficult to convince about energetic medicine. When a false belief is exposed to be false, especially to people with strong egos, there is incredible resistance. But one by one the resistance was broken down at just how well the device functioned.

A double blind study was not possible for the Chinese presented athletes for testing based on need. Many injured and sick athletes were run on the SCIO device. Overall the Chinese fielded 637 athletes. 150 were run on our device. But these were in categories not supposed to do well in the Olympics, or they were injured or sick. Some were just about to be removed from the team. The device worked wonders. The doctors saw an incredible 5% increase in stamina, strength, and coordination. With biological factors such as hydration, oxidation, power and muscle function more stabilized, the athletes performed better. The device especially deals with muscular reeducation and restoring peak muscle performance.

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Dr. Li Guoping is President of the Beijing Sports Hospital, Director of the National Institute of Sports Medicine (NISM), Chief Medical Officer of Chinese Olympic Committee (COC), President of Chinese Association of Sports Medicine (CASM) Vice Pres of Asian Federation of Sports Medicine (AFSM), exec committee member of International Federation of Sports Medicine (FIMS), Chief editor of Chinese
Journal of Sports Medicine (CJSM). He wrote a thank you letter and congratulations to Dr. Nelson. And Dr. Nelson was awarded an honorary Gold Medal for his work and participation in the 2008 summer Olympics. Dr. Nelson was an unofficial alternate in the 1968 Olympics in Mexico City and after 40 years is awarded an honorary gold medal for his work in sports.

While some elite athletes and Olympic teams using the SCIO are secretive, in order to protect their advantage over competitors, the ones that contributed to this review reported various medically significant results and performance improvements that warrant attention and further research investigation. On the basis of the device’s safety and result record, it is recommended that SCIO Quantum Biofeedback be provided for athletes seeking safe and legal performance advantages.

Discussion

In this review of science and sports research, we can see that the validity of energetic medicine is not only incredibly valid but the ignorance of this art is completely unjustified. The prejudice of the pharmaceutical companies against such energetic techniques lies in their cognitive dissonance against admitting their ignorance of electrical terminology and a lack of a modern scientific analysis of the body human which is a body electric. The prejudice against homosexuality, freedom of thought and perspectives is incredible.

The research quoted here undeniably validates and verifies the SCIO as a safe and effective technique of sports medicine. The modern sciences of quantum physics, and electronics need to be applied not just to the technology of measuring the body, but to the physiology of the body’s workings. Voltammetry is an undeniable art of medical analysis and treatment.

The sports medical world among the entire medical world is ignorant for ignoring such research as presented in this paper. Ego, cognitive dissonance, sour grapes, and fear of humiliation should not be the lead in science. Science should be the pursuit of knowledge not the pursuit of funding or fear of persecution. Sports medicine might be the way to further this, because some people want to win not just to conform. And this offers the motivation to overcome fear and ignorance and stop ignoring energetic medicine.

Let us now explore the nature of our true existence by asking the question posed in fifth grade. If we are made of atoms, and atoms are made of electrons and protons, then what are we? A better question for medicine is “Why has medicine ignored this simple fifth grade truth?”

What are we made of?

Matter is an illusion composed of energetic electronic atoms. This is a consequence of the manner in which the negatively charged electrons are distributed throughout space in the attractive field exerted by the positively charged nuclei. The proton positively charged nuclei act as point attractors immersed in a cloud of negative charge, the electron density (r). The electron density describes the manner in which the electronic charge is distributed throughout real space time. The electron density has a measurable property and it determines the appearance and form of matter. This is illustrated in the following figures. Figure 1 displays the spatial distribution of the electron density in the plane containing the two carbon and four hydrogen nuclei of the ethene molecule. The electron density is a maximum at the position of each nucleus and decays rapidly away from these positions. When this diagram is translated into three dimensions, the cloud of negative charge is seen to be most dense at nuclear positions and to become more diffuse as one moves away from these centres of attraction, as illustrated in Figure 2. The presence of local maxima at the positions of the nuclei is the general and also the dominant topological property of (r). Figure 3 illustrates the same feature for the 110 plane of carbon nuclei in the diamond lattice.

Figure 1. (a) The electron density in the plane containing the two carbon and four hydrogen nuclei of the ethene molecule, portrayed as a projection in the third dimension and in the form of a contour map. The absolute maxima in (r) attained at the positions of the carbon nuclei are not shown because of their large values.
Figure 1. (b) Same as in Figure 1a, but for a plane obtained by a rotation of 90° about the C-C axis, a plane containing only the carbon nuclei.

Figure 1. (c) Again, the same portrayal as in Figure 1a, but this time for a plane perpendicular to the C-C axis at its mid-point. What appears as a C-C saddle in (a) is seen to be a maximum in the plane perpendicular to the C-C axis. The point exhibits two negative curvatures perpendicular to this axis and one positive curvature along the axis.

Figure 2. Envelopes of the electron density for the ethene molecule for values (in atomic units) of 0.002 in (a), 0.20 in (b) and 0.36 in (c). Matter consists of point-like nuclei embedded in a spatial distribution of negative charge that becomes increasingly diffuse for points progressively removed from the nuclei.

Figure 3. The electron density for diamond as projection above a 110 plane. The second diagram displays the tetrahedral structure of the bond paths linking the carbon nuclei in diamond, lines that are a consequence of the topology exhibited by the electron density.

To describe this property of the electron density one must consider not the density itself but the energetic field one obtains by following the trajectories traced out by the gradient vectors of the density. Starting at any point, one determines the gradient of \( \rho \). This is an energetic vector that points in the direction of maximum increase in the density. One makes an infinitesimal step in this direction and then recalculates the gradient to obtain the new direction. By continued repetition of this process, one traces out a trajectory of \( \rho \). A gradient vector map generated in this manner is illustrated in the upper diagram of Figure 4 for the same plane of the ethene molecule shown in Figure 1. Since the density exhibits a maximum at the position of each nucleus, sets of trajectories terminate at each nucleus. The nuclei are the attractors of the gradient vector field of the electron density. Because of this fundamental property, the space of the
molecule is disjoint and exhaustively partitioned into basins, a basin being the region of space traversed by the trajectories terminating at a given nucleus or attractor. Since a single attractor is associated with each basin, an atom is defined as the union of an attractor and its basin.

Figure 4. Maps of the gradient vector field of the electron density for the same plane containing the nuclei shown in Figure 1. Each line represents a trajectory traced out by the vector \( \mathbf{r} \).

Figure 4. (a) A display of the trajectories that terminate at the nuclei. Each trajectory is arbitrarily terminated at the surface of a small circle centered on the nucleus. The set of trajectories that terminate at a given nucleus (attractor) cover the basin of the attractor.

Figure 4. (b) The same as (a) but including the sets of trajectories which terminate and originate at the bond critical points (denoted by dots). Only one pair of an (infinite) set of trajectories that terminate at the critical point lie in this plane.

Figure 4. (c) A contour map of the electron density overlaid with the bond paths that define the molecular graph and with the trajectories that mark the intersection of the interatomic surfaces with this plane and define the boundaries of the atomic basins.

What is a Bond?

The second gradient vector field map in Figure 4 includes the trajectories, shown in bold, that both originate and terminate at the critical points found between nuclei that appear linked by a saddle in \( \mathbf{r} \) in Figure 1. A critical point denotes an extremum in \( \mathbf{r} \), a point where \( \mathbf{r} = 0 \). Associated with each such critical point is a set of trajectories that start at infinity and terminate at the critical point, only two of which appear in the symmetry plane shown in the figure. They define an interatomic surface, a surface that separates the basins of neighbouring atoms. There is a unique pair of trajectories that originate at each such critical point and terminate, one each, at the neighbouring nuclei. They define a line through space along which the electron density is a maximum. The two sets of trajectories associated with such a critical point, a bond critical point, the set that terminates at the critical point and defines the interatomic surface and the pair that originates there and defines the line of maximum density, are shown in Figure 5.

Figure 5. A three-dimensional display of the set of trajectories of \( \mathbf{r} \) that terminate at a bond critical point and define an interatomic surface and of the unique pair of trajectories that originate at the same point and define the bond path. Only one pair of each set that terminates at the critical point appears in the plane illustrated in Figure 4 (b) and (c).
In an equilibrium geometry the line of maximum density is called a bond path because the set of bond paths for a given molecule, the molecular graph, faithfully recovers the network of chemical bonds that are assigned on the basis of chemical considerations. Thus a pair of bonded atoms are linked by a line along which the electron density, the glue of chemistry, is maximally concentrated. Molecular structures predicted by the molecular graphs determined by the electron density are shown in Figure 6.

**Figure 6.** Molecular graphs - lines of maximum electron density linking bonded nuclei - in hydrocarbon molecules in diagrams 1 through 26, and boranes and carboranes below these. Bond critical points, where the trajectories defining the bond path originate, are denoted by dots. Note that the bond paths can be curved away from the internuclear axis in strained or in electron deficient molecules. A molecular graph and the characteristics of the density at the bond critical points provide a concise summary of the bonding within a molecule or crystal.
The molecular graph undergoes discontinuous and abrupt changes if the nuclei are displaced into critical configurations. When this occurs, one makes or breaks certain of the bonds and changes one structure into another. These changes are described and predicted using the mathematics of qualitative dynamics and the resulting theory of structural stability is illustrated in Figure 7 for the very strained molecule called \([1,1,1]\) propellane.

Figure 7. Diagrams illustrating changes in structure induced by the dynamics of the nuclei. The molecular graph in a is for the highly strained \([1,1,1]\) propellane molecule, C5H6 (the two hydrogens attached to each apical carbon atom are not indicated). The gradient vector field maps are for the symmetry plane containing the C-C bridgehead bond critical point and the three apical carbon atoms. When the separation between the two bridgehead nuclei is increased to a critical value, the bond critical point coalesces with the three neighbouring ring critical points to form a singularity in \((r)\), as depicted by the gradient vector field map in b. The singularity is unstable and its formation signifies the breaking of the C-C bridgehead bond. Further separation of the nuclei causes it to bifurcate into a cage critical point yielding a new structure in which the bridgehead carbon atoms are not bonded to one another, the cage structure depicted in c.
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The Topological Atom is the Quantum Atom

The definition of an atom in terms of the topology of the electron density is neither valid nor useful if its properties are not predicted by quantum mechanics. The fundamental nature of the atom, as the building block of matter, follows from the demonstration that the topological and quantum definitions of an atom coincide. An atom can be alternatively defined as a region of real space bounded by surfaces through which there is a zero flux in the gradient vector field of the electron density. This is clear from Figure 5, which shows that an interatomic surface is defined by the set of trajectories that terminate at a point where \( \rho(r) = 0 \). Thus an interatomic surface satisfies the "zero-flux" boundary condition stated in equation (1):

\[
\rho(r) \cdot n(r) = 0, \quad \text{for every point } r \text{ on the surface } S(r) \quad (1)
\]

where \( n(r) \) is the unit vector normal to the surface at \( r \). In words, the surface is not crossed by any trajectories of \( \rho \). An atom, as a constituent of some larger system, is itself an open system subject to fluxes in charge and momentum through its bounding surface.

Around 1950, Feynman and Schwinger, following along a path first traversed by Dirac, developed a new formulation of quantum mechanics based upon the classical principle of least action. Their work enables one to ask and answer questions that could not be answered using the Hamiltonian-based approach to quantum mechanics. Schwinger's generalization of the action principle, as contained in his principle of stationary action, in addition to determining the field equation, yields a variational derivation of Heisenberg's equation of motion for any observable. This principle equates the change in action to the infinitesimal \( \delta \) transformations caused by the generators \( i\lambda j \) acting in the space-like and time-like surfaces that bound the space-time volume swept out by a system, as well as to displacements in these surfaces. A time-like surface describes the temporal evolution of the spatial boundary enclosing a portion of some total system. Thus Schwinger's principle enables one to derive a quantum description of an open system. In doing so one obtains the remarkable result that only an open system bounded by surfaces satisfying the 'zero-flux' boundary condition stated in equation (1) yields an expression for the change in action that is the same in form and content to that for an isolated system and in addition, yields equations of motion for the observables that are identical to those predicted by the field equation. Thus the definition of an open system at the atomic level is not open to choice but is determined by physics. Consequently, an open system satisfying equation (1) is termed a proper open system.

A total isolated system also satisfies equation (1). Thus a single principle of physics determines the properties of the total system and its constituent atoms. The properties of the topological atoms coincide with those ascribed to the atoms of chemistry; (i) they are additive to yield the corresponding property for the total system and (ii) they are transferable from one system to another to the extent that the transfer leaves their distribution of charge unchanged. It is known from experiment that atoms and functional groupings of atoms can be transferable to a remarkable degree and that when this occurs, one can determine the atomic or group contributions to the total properties of a system. The theory of atoms in molecules recovers the experimentally determined characteristic and additive group contributions to all properties, as has been demonstrated for the volume, energy, electric polarizability and magnetic susceptibility. These are the atoms of chemistry.

The envelope of the electron density, of value 0.001 atomic units, contains almost all of the electronic charge of a system and provides a measure of its van der Waals size and shape. The intersection of the interatomic surfaces of an atom or a group with this envelope thus yields a display of the group as a space-filling object, examples of which are shown in Figures 8 and 9. All proper open systems are transferable to some extent, this property underlying the usefulness of the atomic model in chemistry.

Figure 8. Depictions of atoms and functional groupings of atoms as space-filling objects - regions bounded by the intersection of the interatomic surfaces and the van der Waals envelope of the electron density. The second-row hydrides \( \text{AH}_n \) where \( \text{A} = \text{Li, Be, B, C, N, O and F} \). Note the change in the size and form of the hydrogen atom, from one characteristic of the hydride ion in \( \text{LiH} \) to the positively charged one in \( \text{HF} \); wherein the atom has been stripped of more than half of its electron density.
Quantum Mechanics of a Proper Open System

There is no such thing as an isolated system, and all systems are open systems that experience varying degrees of interaction through their shared zero-flux surfaces. Thus the statement of the principle of stationary action for a proper open system is simply a generalization of quantum mechanics that applies to all physical systems. The operational statement of this theory is most elegantly and simply stated using the language of field theory. The principle, when stated in terms of a variation of the Lagrange-function operator \([\mathcal{L}](\partial^2/\partial t^2)\) for the observable \(S\), and in a form that is applicable to any region of space bounded by a zero-flux surface, is

\[
\delta \mathcal{L} = (\varepsilon/2) \left( \partial^{2} \langle \Psi | \mathcal{H} \Psi \rangle + \text{cc} \right) \partial t
\]

The observable multiplied by \((\varepsilon/2)\), where \(\varepsilon\) denotes a real infinitesimal, is the generator of a corresponding unitary transformation in the Lagrange-function and one sees that Schwinger’s principle combines the action principle with Dirac’s transformation theory. The variation in \(\mathcal{L}\) may be alternatively expressed as

\[
\delta \mathcal{L} = (\varepsilon/2) \left[ \partial \left( \mathcal{H} \Psi \right) - \mathcal{H} \partial \Psi \right] + \text{cc} \partial t
\]

that is, by the time rate-of-change of the property density for \(G\) together with a term accounting for the flux in \(J_G(r)\), the vector current of this density, through the surface \(S(s)\) bounding the region. This latter term vanishes for an isolated system.

The Table below lists the atomic theorems obtained using equation (2) for a number of important generators. The Schrödinger representation is used in these equations and the expression \(d’\) denotes a summation over all spins and an integration over the spatial coordinates of all electrons but the one whose coordinates appear in the observable.
Atomic Theorems

Atomic Continuity Theorem \( \hat{G} = \hat{N} \)

\[ \int_{\Omega} \! d\mathbf{r} \, \frac{\partial \rho(\mathbf{r})}{\partial t} = - \oint_{\partial \Omega} \! dS \, \mathbf{J}(\mathbf{r}) \cdot \mathbf{n}(\mathbf{r}) \]

Atomic Current Theorem \( \hat{G} = \hat{F} \)

\[ \int_{\Omega} \! d\mathbf{r} \, \mathbf{r} \, \frac{\partial \rho(\mathbf{r})}{\partial t} = \int_{\Omega} \! d\mathbf{r} \, \mathbf{J}(\mathbf{r}) - \oint_{\partial \Omega} \! dS \, \mathbf{n}(\mathbf{r}) \cdot \mathbf{J}(\mathbf{r}) \mathbf{r} \]

Atomic Force Theorem \( \hat{G} = \hat{P} \)

\[ m \int_{\Omega} \! d\mathbf{r} \, \frac{\partial \mathbf{J}(\mathbf{r})}{\partial t} = \int_{\Omega} \! d\mathbf{r} \, [\mathbf{d} \Psi^*(\mathbf{\nabla} \mathbf{\nabla}) \Psi - \Psi^* \Psi \mathbf{\nabla} \cdot \mathbf{\nabla} \Psi + \Psi^* \Psi \mathbf{\nabla}^2 \mathbf{\nabla}] + \oint_{\partial \Omega} \! dS \sigma(\mathbf{r}) \mathbf{n}(\mathbf{r}) \]

Atomic Power Theorem \( \hat{G} = \hat{P}^{2/2m} \), written without \( 1/2m \)

\[ \int_{\Omega} \! d\mathbf{r} \, \mathbf{r} \cdot \frac{\partial \mathbf{\rho}(\mathbf{r})}{\partial t} = \int_{\Omega} \! d\mathbf{r} \, [\mathbf{d} \Psi^*(\mathbf{\nabla} \mathbf{\nabla}) \Psi - \Psi^* \Psi \mathbf{\nabla} \cdot \mathbf{\nabla} \Psi + \Psi^* \Psi \mathbf{\nabla}^2 \mathbf{\nabla}] + \oint_{\partial \Omega} \! dS \mathbf{Re}[\mathbf{d} \mathbf{\rho}(\mathbf{r})] \]

Atomic Torque Theorem \( \hat{G} = \hat{R} \hat{\mathbf{P}} \)

\[ m \int_{\Omega} \! d\mathbf{r} \, \mathbf{r} \times \frac{\partial \mathbf{J}(\mathbf{r})}{\partial t} = \int_{\Omega} \! d\mathbf{r} \, [\mathbf{d} \Psi^*(\mathbf{\nabla} \mathbf{\nabla}) \Psi - \Psi^* \Psi \mathbf{\nabla} \cdot \mathbf{\nabla} \Psi + \Psi^* \Psi \mathbf{\nabla}^2 \mathbf{\nabla}] + \oint_{\partial \Omega} \! dS \mathbf{\sigma}(\mathbf{r}) \times \mathbf{r} \mathbf{n} \]

Atomic Virial Theorem \( \hat{G} = \hat{P} \)

\[ m \int_{\Omega} \! d\mathbf{r} \, \mathbf{r} \times \frac{\partial \mathbf{J}(\mathbf{r})}{\partial t} = 2T(\Omega) + \int_{\Omega} \! d\mathbf{r} \, [\mathbf{d} \Psi^*(-\mathbf{r} \mathbf{\nabla}) \Psi + \mathbf{\sigma}(\mathbf{r}) \mathbf{n}(\mathbf{r})] \]

Quantum Stress Tensor Density

\[ \sigma(\mathbf{r}) = (\hbar^2/4m) \int_{d^2} \! (\mathbf{\nabla} \mathbf{\nabla}) \Psi^* \mathbf{\nabla} \Psi - \Psi^* \Psi \mathbf{\nabla} \cdot \mathbf{\nabla} \Psi + \Psi^* \mathbf{\nabla} \Psi \]

Quantum Vector Current Density

\[ \mathbf{J}(\mathbf{r}) = (\hbar/2mi) \int_{d^2} \! (\Psi^* \mathbf{\nabla} \Psi - \Psi \mathbf{\nabla} \Psi^*) \]

For example, the time rate-of-change of momentum is force and when \( \omega \), one obtains the Ehrenfest atomic force theorem. In this case \( e \), which is the total potential energy operator. The vector current \( \mathbf{J}(\mathbf{r}) \) is the momentum density divided by the mass of the electron \( m \) and the integral of its time rate-of-change multiplied by \( m \) yields the force acting on the atom. This force is equated to the sum of a basin and a surface contribution: the basin contribution is the commutator average and the surface term is the momentum flux through the surface, a term described by the quantum stress tensor \( \sigma(\mathbf{r}) \). In a stationary state, the basin term for a given \( \mathbf{r} \) is balanced by its surface flux contribution.

The \( \mathbf{d} \) averaging of the commutator yields the force exerted on an electron at a point \( \mathbf{r} \), as determined by averaging over the motions of all the remaining particles in the system. Thus it describes a force density and its integral over yields the average force exerted on the basin of the atom. The basin contributions to all properties are determined by a corresponding property density. Thus when \( \mathbf{d} \) the commutator yields \( \mathbf{\sigma} \) whose \( \mathbf{d} \) averaging yields the electronic potential energy density. This density expresses in a rigorous manner, the local potential energy experienced by a single electron determined in the average field of all the remaining particles in a many-particle system. The kinetic energy \( T(\mathbf{r}) \) and the potential energy defined
by the atomic virial theorem have the remarkable and necessary property that they are as transferable as is the electron density. Proper open systems are the most transferable pieces of matter one can define in an exhaustive partitioning of the real space of any system, leading to their most important property; if the distribution of electronic charge is essentially unchanged for a given atom in two different systems, then its properties, including its energy, are transferable as well as additive, the atom contributing the same amounts to all properties in both systems. It is the energy defined by the atomic virial theorem that exhibits the essential physical requirement that two identical pieces of matter possess identical energies, be they of macroscopic or microscopic dimensions, in the form of equivalent atoms at different sites within a crystal or two identical peptide units in a polypeptide.

When a molecule is placed in a uniform external magnetic field, a flow of electric current is induced within the molecule. This current is described by the quantum current density $J(r)$ introduced above and appearing in the atomic current theorem. This theorem states that the atomic average of $J(r)$, the average velocity of the electrons within the atom as induced by the applied field, is equal to the flux through its atomic surface of the tensor corresponding to the position weighted current. Because of this theorem, the magnetic susceptibility of a molecule can be equated to a sum of atomic or group contributions and the values so defined recover Pascal's experimentally determined values for the corresponding group increments for the hydrocarbons. The same current determines the shielding or deshielding of a nucleus from the applied magnetic field in an NMR experiment, and this shielding is also expressible as a sum of atomic contributions; see references 6 and 7.

Figure 10 illustrates the current induced in the carbon dioxide molecule for a magnetic field directed out of the plane of the diagram. This display of the calculated current is made possible through the use of the theory of atoms in molecules in overcoming the "gauge origin" problem. One sees the presence of both diamagnetic (clockwise) and paramagnetic (counter-clockwise) currents with the former dominating. The current induced by an externally applied magnetic field determines all of the magnetic response properties exhibited by a molecule and understanding these properties requires an understanding of the induced current and its atomic contributions. Thus the presence of the paramagnetic currents within the basin of the carbon atom in carbon dioxide provides a clear physical explanation of the magnetic susceptibility and the magnetic shielding of the nuclei in this molecule.

The Laplacian of the Electron Density and the Lewis and VSEPR Models

While the topology of the electron density provides a faithful mapping of the concepts of atoms, bonds and structure, it provides no indication of maxima in corresponding to the electron pairs of the Lewis model. This model is secondary only to the atomic hypothesis itself in understanding chemical bonding and reactivity and the geometry of molecules, the latter as predicted in terms of the localized electron pairs assumed in the VSEPR model. The physical basis of this most important model is one level of abstraction above the visible topology of the electron density, appearing in the topology of the Laplacian of the density. This function is the scalar derivative of the gradient vector field of the electron density, the quantity $\nabla^2 \rho$, and it determines where electronic charge is locally concentrated, $\nabla^2 \rho < 0$, and depleted, $\nabla^2 \rho > 0$, the local charge concentrations providing a mapping of the electron pairs of the Lewis and VSEPR models.

The Laplacian of the electron density recovers the shell structure of an atom by displaying a corresponding number of alternating shells of charge concentration and charge depletion. The uniform sphere of charge concentration present in the valence shell of a free atom is distorted upon chemical combination to form local maxima and minima. The number of local maxima in $\nabla^2 \rho$ in the valence shell, the local valence charge concentrations, together with their relative positions and magnitudes, coincide with the number and corresponding properties of the localized electron pairs assumed to exist in the VSEPR model of molecular geometry.
The realization of the VSEPR model in terms of the Laplacian of is illustrated in Figure 11 showing a relief map of the Laplacian for the ClF₃ molecule.

Figure 11. A relief map of the Laplacian of the electron density for the ClF₃ molecule in the equatorial plane (left) and in the plane containing all four nuclei (right).

The chlorine atom exhibits three shells of charge concentration, the fluorine atom two such shells, corresponding to the presence of three and two quantum shells respectively. The VSEPR model predicts a T-shaped geometry for ClF₃. This geometry enables the two non-bonded electron pairs, which are assumed to be larger than the bonded pairs, to occupy the least crowded equatorial positions. The equatorial plane (top diagram) shows the presence of two non-bonded and one smaller bonded charge concentrations. In the axial plane there are three bonded charge concentrations and a fourth apparent maximum which is actually another view of the (3, 1) critical point between the two non-bonded maxima, that is, a critical point with one positive curvature. Thus the valence shell charge concentration of the chlorine atom possesses two non-bonded and three bonded charge concentrations in agreement with the five electron pairs assumed in the Lewis model and in this geometry, they maximally avoid one another, in agreement with the VSEPR model.

The sizes of the charge concentrations decrease in the order, nonbonded > equatorial bonded > axial bonded, as assumed in the VSEPR model, the bonded sizes reflecting a greater net charge on the axial fluorines.

The Lewis model is also used to rationalize chemical reactivity. In addition to a local charge concentration in the valence shell that behaves as Lewis base or nucleophile, there are also local charge depletions, and such charge depletions behave as Lewis acids or electrophiles. A chemical reaction corresponds to the combination of a charge concentration in the valence shell charge concentration of the base with a charge depletion in the valence shell charge concentration of the acid, the reactivity paralleling the magnitude of the charge concentration and the depth of the charge depletion.

The geometry of approach of the acid and base molecules is predicted through the alignment of the corresponding "lumps" and "holes" in their Laplacian distributions, as illustrated for the approach of the non-bonded charge concentration on carbon of the CO molecule to the hole on the boron atom in BH₃ , Figure 12. This predictive property of the Laplacian has been illustrated in many different reactions including those as diverse as the approach of methane to the oxygen atom of a metal oxide surface and the geometries of hydrogen bonded complexes.

The final Figure illustrates the charge concentrations present in the outer core of the barium atom in BaH₂, a bent molecule. The use of the Laplacian of the electron density to account for the bent geometries of the hydride, halide and methylide molecules of calcium, strontium and barium, in terms of a distortion of the outer core of the electron density of the metal atom is discussed in reference 12.

The zero value surfaces of 2 for carbon monoxide (blue) and borane, BH₃ (red). These surfaces enclose regions where the electronic charge is maximally concentrated and they define the reactive surface. The same surfaces also show the inner shell charge concentrations on the carbon and boron nuclei, evident as small inner spheres. The molecules are orientated so that the "lump" in the valence shell charge concentration (VSACC) of carbon is aligned with the "hole" in the VSACC of boron. The VSACC of boron is reduced to a belt-like distribution lying in the plane of the hydrogen nuclei, giving the base atom direct access to the core of the boron, the feature that makes BH₃ a strong Lewis acid. Note the torus of charge depletion encircling the carbon nucleus. This feature corresponds to the localization of the * antibonding orbital on carbon.
Figure 13. The zero envelope of the Laplacian distribution for the barium core in BaH$_2$ showing the presence of four charge concentrations in the outer core of the shell and the spherical inner core. The two charge concentrations at the bottom edges of the diagram are portions of the charge concentrations associated with the protons.

Quantum electrodynamics (QED) is a relativistic quantum field theory of electrodynamics. QED was developed by a number of physicists, beginning in the late 1920s. It basically describes how light and matter interact. More specifically it deals with the interactions between electrons, positrons and photons. QED mathematically describes all phenomena involving electrically charged particles interacting by means of exchange of photons. It has been called "the jewel of physics" for its extremely accurate predictions of quantities like the anomalous magnetic moment of the electron, and the Lamb shift of the energy levels of hydrogen.[1]

In technical terms, QED can be described as a perturbation theory of the electromagnetic quantum vacuum.

History

Main article: History of quantum mechanics

The word 'quantum' is Latin, meaning "how much" (neut. sing. of quantus "how great").[2] The word 'electrodynamics' was coined by André-Marie Ampère in 1822.[3] The word 'quantum', as used in physics, i.e. with reference to the notion of count, was first used by Max Planck, in 1900 and reinforced by Einstein in 1905 with his use of the term light quanta.

Quantum theory began in 1900, when Max Planck assumed that energy is quantized in order to derive a formula predicting the observed frequency dependence of the energy emitted by a black body. This dependence is completely at variance with classical physics. In 1905, Einstein explained the photoelectric effect by postulating that light energy comes in quanta later called photons. In 1913, Bohr invoked quantization in his proposed explanation of the spectral lines of the hydrogen atom. In 1924, Louis de Broglie proposed a quantum theory of the wave-like nature of subatomic particles. The phrase "quantum physics" was first employed in Johnston's Planck's Universe in Light of Modern Physics. These theories, while they fit the experimental facts to some extent, were strictly phenomenological: they provided no rigorous justification for the quantization they employed.

Modern quantum mechanics was born in 1925 with Werner Heisenberg's matrix mechanics and Erwin Schrödinger's wave mechanics and the Schrödinger equation, which was a non-relativistic generalization of de Broglie's(1925) relativistic approach. Schrödinger subsequently showed that these two approaches were equivalent. In 1927, Heisenberg formulated his uncertainty principle, and the Copenhagen interpretation of quantum mechanics began to take shape. Around this time, Paul Dirac, in work culminating in his 1930 monograph finally joined quantum mechanics and special relativity, pioneered the use of operator theory, and devised the bra-ket notation widely used since. In 1932, John von Neumann formulated the rigorous mathematical basis for quantum mechanics as the theory of linear operators on Hilbert spaces. This and other work from the founding period remains valid and widely used.

Quantum chemistry began with Walter Heitler and Fritz London's 1927 quantum account of the covalent bond of the hydrogen molecule. Linus Pauling and others contributed to the subsequent development of quantum chemistry.

The application of quantum mechanics to fields rather than single particles, resulting in what are known as quantum field theories, began in 1927. Early contributors included Dirac, Wolfgang Pauli, Weisskopf, and Jordan. This line of research culminated in the 1940s in the quantum electrodynamics (QED) of Richard Feynman, Freeman Dyson, Julian Schwinger, and Sin-Itiro Tomonaga, for which Feynman, Schwinger and Tomonaga received the 1965 Nobel Prize in Physics. QED, a quantum theory of electrons, positrons, and the electromagnetic field, was the first satisfactory quantum description of a physical field and of the creation and annihilation of quantum particles.

QED involves a covariant and gauge invariant prescription for the calculation of observable quantities. Feynman's mathematical technique, based on his diagrams, initially seemed very different from the field-theoretic, operator-based approach of Schwinger and Tomonaga, but Freeman Dyson later showed that the two approaches were equivalent. The renormalization procedure for eliminating the awkward infinite predictions of quantum field theory was first implemented in QED. Even though renormalization works very well in practice, Feynman was never entirely comfortable with its mathematical validity, even referring to renormalization as a "shell game" and "hocus pocus". (Feynman, 1985: 128)
QED has served as the model and template for all subsequent quantum field theories. One such subsequent theory is quantum chromodynamics, which began in the early 1960s and attained its present form in the 1975 work by H. David Politzer, Sidney Coleman, David Gross and Frank Wilczek. Building on the pioneering work of Schwinger, Peter Higgs, Goldstone, and others, Sheldon Glashow, Steven Weinberg and Abdus Salam independently showed how the weak nuclear force and quantum electrodynamics could be merged into a single electroweak force.

Physical interpretation of QED

In classical optics, light travels over all allowed paths and their interference results in Fermat’s principle. Similarly, in QED, light (or any other particle like an electron or a proton) passes over every possible path allowed by apertures or lenses. The observer (at a particular location) simply detects the mathematical result of all wave functions added up, as a sum of all line integrals. For other interpretations, paths are viewed as non physical, mathematical constructs that are equivalent to other, possibly infinite, sets of mathematical expansions. According to QED, light can go slower or faster than c, but will travel at velocity c on average.

Physically, QED describes charged particles (and their antiparticles) interacting with each other by the exchange of photons. The magnitude of these interactions can be computed using perturbation theory; these rather complex formulas have a remarkable pictorial representation as Feynman diagrams. QED was the theory to which Feynman diagrams were first applied. These diagrams were invented on the basis of Lagrangian mechanics. Using a Feynman diagram, one decides every possible path between the start and end points. Each path is assigned a complex-valued probability amplitude, and the actual amplitude we observe is the sum of all amplitudes over all possible paths. The paths with stationary phase contribute most (due to lack of destructive interference with some neighboring counter-phase paths) — this results in the stationary classical path between the two points.

QED doesn’t predict what will happen in an experiment, but it can predict the probability of what will happen in an experiment, which is how (statistically) it is experimentally verified. Predictions of QED agree with experiments to an extremely high degree of accuracy: currently about 10^{-12} (and limited by experimental errors); for details see precision tests of QED. This makes QED one of the most accurate physical theories constructed thus far.

Near the end of his life, Richard P. Feynman gave a series of lectures on QED intended for the lay public. These lectures were transcribed and published as Feynman (1985), QED: The strange theory of light and matter, a classic non-mathematical exposition of QED from the point of view articulated above.

Mathematics

Mathematically, QED is an abelian gauge theory with the symmetry group U(1). The gauge field, which mediates the interaction between the charged spin-1/2 fields, is the electromagnetic field. The QED Lagrangian for a spin-1/2 field interacting with the electromagnetic field is given by the real part of

$$\mathcal{L} = \bar{\psi} (i \gamma^\mu D_\mu - m) \psi - \frac{1}{4} F_{\mu\nu} F^{\mu\nu},$$

where

- $\gamma^\mu$ are Dirac matrices;
- $\bar{\psi}$ a bispinor field of spin-1/2 particles (e.g. electron-positron field);
- $\bar{\psi}$, called “psi-bar”, is sometimes referred to as Dirac adjoint;
- $D_\mu = \partial_\mu + ieA_\mu + ieB_\mu$ is the gauge covariant derivative;
- $\epsilon$ is the coupling constant, equal to the electric charge of the bispinor field;
- $A_\mu$ is the covariant four-potential of the electromagnetic field generated by electron itself;
- $B_\mu$ is the external field imposed by external source;
- $F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu$ is the electromagnetic field tensor.

Euler-Lagrange equations

To begin, substituting the definition of D into the Lagrangian gives us:

$$\mathcal{L} = i\bar{\psi} (\gamma^\mu \partial_\mu \psi - e i \bar{\psi} (A^\mu + B^\mu) \psi - m \bar{\psi} \psi - \frac{1}{4} F_{\mu\nu} F^{\mu\nu}.$$

Next, we can substitute this Lagrangian into the Euler-Lagrange equation of motion for a field:
The two terms from this Lagrangian are then:
\[ \partial_\mu \left( \frac{\partial L}{\partial (\partial_\mu \psi)} \right) = \partial_\mu \left( i \bar{\psi} \gamma^\mu \right) \]
\[ \frac{\partial L}{\partial (\partial_\psi \psi)} = -e \bar{\psi} \gamma_\mu (A^\mu + B^\mu) - m \bar{\psi}. \]
Substituting these two back into the Euler-Lagrange equation (2) results in:
\[ i \partial_\mu \bar{\psi} \gamma^\mu + e \bar{\psi} \gamma_\mu (A^\mu + B^\mu) + m \bar{\psi} = 0 \]

with complex conjugate:
\[ i \gamma^\mu \partial_\mu \psi - e \gamma_\mu (A^\mu + B^\mu) \psi - m \psi = 0. \]
Bringing the middle term to the right-hand side transforms this second equation into:
\[ i \gamma^\mu \partial_\mu \psi - m \psi = e \gamma_\mu (A^\mu + B^\mu) \psi. \]
The left-hand side is like the original Dirac equation and the right-hand side is the interaction with the electromagnetic field.

One further important equation can be found by substituting the Lagrangian into another Euler-Lagrange equation, this time for the field, \( A_\mu \):
\[ \partial_\nu \left( \frac{\partial L}{\partial (\partial_\nu A_\mu)} \right) = \partial_\nu \left( \partial^\nu A^\nu - \partial_\nu A^\mu \right) \]
\[ \frac{\partial L}{\partial A_\mu} = -e \bar{\psi} \gamma^\mu \psi \]
and these two terms, when substituted back into (3) give us:
\[ \partial_\nu F^{\nu\mu} = e \bar{\psi} \gamma^\mu \psi. \]
Using perturbation theory, we could divide result into different parts according to the order of electric charge \( Q \):
\[ \psi = \psi_0 + q \psi_1 + q^2 \psi_2 + o(q^3) \]
here we use instead of \( Q \) to avoid confusion between electric charge and natural logarithm.
The zeroth order result is:
\[ \psi_0(t, \vec{p}) = e^{\mp i t \sqrt{p^2 + m^2}} \frac{1}{2} \left( \frac{\alpha \cdot \vec{p} + \beta m}{2 \sqrt{p^2 + m^2}} \right) \psi(0, \vec{p}), \]
\[ \psi(t, \vec{p}) \] is the 3-dimension momentum space expression of wave function:
\[ \psi(t, \vec{p}) = (2\pi)^{-3} \int \psi(t, \vec{x}) e^{-i \vec{p} \cdot \vec{x}} d\vec{x} \]
The 1st order result (ignore the self energy \( A_\mu \)) is:
\[ \psi(t, \vec{p}) = (2\pi)^{-3} \int \left\{ \sum_{n, n_1} \left\{ \frac{1}{2} \left( \frac{\alpha \cdot \vec{p} + \beta m}{2 \sqrt{p^2 + m^2}} \right)^n \right\} \psi(0, \vec{p}) e^{i \vec{p} \cdot \vec{x}} \right\} e^{i \vec{A}_n(t, \vec{x}) \cdot \vec{p} - i \nu_n(t, \vec{x})} d\vec{x} \]
The term \( B^\mu(E, \vec{r}) \) is the external field in 4-dimension momentum space:
The solution of can be achieved in the same way (using Lorentz gauge \( \partial_\mu A^\mu = 0 \)):

\[
B^\mu(E, \vec{p}) = (2\pi)^{-2} \int B^\mu(t, \vec{x}) \exp(iEt - \vec{p} \cdot \vec{x}) dt d\vec{x}
\]

The part of the Lagrangian containing the electromagnetic field tensor describes the free evolution of the electromagnetic field, whereas the Dirac-like equation with the gauge covariant derivative describes the free evolution of the electron and positron fields as well as their interaction with the electromagnetic field.

The one-loop contribution to the vacuum polarization function

The one-loop contribution to the electron self-energy function

The one-loop contribution to the vertex function

Discussion

In this review of science and sports research, we can see that the validity of energetic medicine is not only incredibly valid but the ignorance of this art is completely unjustified. The prejudice of the pharmaceutical companies against such energetic techniques lies in their cognitive dissonance against admitting their ignorance of electrical terminology and a lack of a modern scientific analysis of the body human which is a body electric. The prejudice against homosexuality, freedom of thought and perspectives is incredible.

The research quoted here undeniably validates and verifies the SCIO as a safe and effective technique of sports medicine. The modern sciences of quantum physics, and electronics need to be applied not just to the technology of measuring the body, but to the physiology of the body's workings. Voltammetry is a undeniable art of medical analysis.

The sports medical world among the entire medical world is ignorant for ignoring such research as presented in this paper. Ego, cognitive dissonance, sour grapes, and fear of humiliation should not be the lead in science. Science should be the pursuit of knowledge not the pursuit of funding or fear of persecution. Sports medicine might be the way to further this, because some people want to win not just to conform.

References QED

- Online Etymology Dictionary
- Richard P. Feynman QED (book) p89-90 "the light has an amplitude to go faster or slower than the speed c, but these amplitudes cancel each other out over long distances"; see also accompanying text

Atoms references


Further Proof of the Bio-Incompatibility of Synthetic Chemicals

As we have pointed out, photons strike the electrons and make the go to a higher energy state. When a photon is released the electron goes to a lower state. This is the principle of Quantum Electro-Dynamics. This process is the master equation of life and is in the master equation we see light, photons as the key ingredient. This is the process the chemical companies have not mastered. Here lies the proof that the synthetic compounds are not only different from real natural compounds but that the synthetic compounds are incompatible with the human body.

My first professor of pharmacology is medical school started the course with an announcement. He stood up and said in a deep serious voice “To use a Synthetic anything is an insult to the body”. He clarified this by explaining that the human body knows when it is given a synthetic. The body natural can recognize a synthetic and it is an insult. It is not the same it is similar but not as good or as complete as the natural compounds. Whether it is a vitamin, hormone, enzyme or anything synthetic it is an insult to the body.

“How” he explained “We will spend the rest of this course learning how to Insult the Body”. For this is what modern medicine makes money on it SINthetics.
The chemical companies can build molecules that are similar but energetically or in the quantic electron states there are major differences. Let us look at some vitamins that have been crystallized in the natural state and then look at similar crystals form their synthetic form. The shimmer and color of the natural is from the outer electrons being in high energy orbits. The sun during the day makes the electrons in the sky vibrate at the frequency blue. At night they cool down and become see thru. The SINthetic vitamins have lower electron energy. Thus we see different low level colors. Also there are even shape differences from the SINthetic process.
Ascorbic Acid (Vitamin C)

Birefringent specimens often reveal a spectacular display of color and crystal form upon illumination with polarized light. When Hoffman modulation contrast is added to the mixture, the colorful image takes on a three-dimensional appearance as illustrated below with crystallites of vitamin C.

Vitamin C is one of the most ubiquitous vitamins ever discovered. In natural vitamin C most of the outer electrons are in high quantum energy states, so they play with the light and make the shimmer.

In synthetic vitamin C the electrons are in lower stats and are photonic duds.

Besides playing a paramount role as an anti-oxidant and free radical scavenger, Vitamin C has been suggested to be an effective antiviral agent by some very respected scientists. Although the antiviral properties of vitamin C remain the subject of great debate in some circles, this water-soluble vitamin remains one of the most popular and important vitamins. Vitamin C is commonly found naturally in peppers, citrus fruits, tomatoes, melons, broccoli, and green leafy vegetables such as spinach, turnip, and mustard greens. The primary function of vitamin C is to assist in the production of collagen, although it is becoming rapidly identified as a key player in detoxifying the body from foreign substances. Other reported uses of vitamin C are healing wounds and burns, accelerate healing after surgery, decreasing blood cholesterol, reduce blood clotting, offer protection against cancer agents, and extend life.

Photosynthesis

**Ingredients**

- Sunlight
- \( \text{H}_2\text{O} + \text{CO}_2 + \text{Nutrients} \)

**Product**

- “CH\(_2\)O” + O\(_2\)

Water  Carbon  Nitrate NO\(_3\)  “Organic  Oxygen
dioxide  dioxide  Phosphate PO\(_4\)  matter”  
Iron  Silica  ...

**Same rule applies to marine life that applies to terrestrial life.**
Vitamin E (alpha-Tocopheryl)

Known to millions as vitamin E, d-alpha-tocopheryl acetate is a fat-soluble vitamin, which is stored in the liver, muscle, adipose tissue, red blood cells, and several vital organs and glands. Vitamin E, a strong antioxidant, plays a starring role in protecting body tissues from damaging free radicals as well as critical functions in cellular respiration and for prolonging the life of red blood cells. In natural vitamin E most of the outer electrons are in high quantum energy states, so they play with the light and make the shimmer. In synthetic vitamin E the electrons are in lower states and are photonic duds.
Naturally, vitamin E occurs in wheat germ oil, nuts, seeds, vegetable oils, whole grains, egg yolks, and leafy green vegetables. Discovered in 1922 by American anatomists and physiologists Herbert McLean Evans and Katherine Scott Bishop, alpha-tocopheryl was known as food factor X and found essential for rat pregnancy. In the same year, food factor X was discovered in yeast and lettuce. By 1924, it was renamed vitamin E and in 1936, Evans and his colleagues extracted and isolated alpha-tocopheryl from wheat germ oil. Synthesis was completed in 1938 by the Swiss Nobel laureate for Chemistry, Paul Karrer, and in 1968, the United States Food and Drug Administration set the recommended dietary (or daily) allowance (RDA) for vitamin E at a conservative 20 milligrams or 30 international units (IU). Over-the-counter synthesized forms as dl-alpha-tocopheryl acetate (or succinate) are often 200 international units (or 165 milligrams) or 400 international units (13.3 times the recommended daily allowance), with a dosage of one capsule per day.

Research on the many uses of vitamin E started in 1950 with its use in a topical skin cream formulation for treating frostbite, and then as antioxidant fighting free radicals and reducing the risks of heart disease. Vitamin E is unstable when exposed to heat, light, and oxygen, but may help prevent and fight cancers, protect cell membranes from breaking down, and may play a role in therapy for Alzheimer’s patients. Interestingly, alpha-tocopheryl helps the body effectively use and store vitamin A and protects B-complex and vitamin C from oxidation reactions.

The human body does not make its own vitamin E, so it must be taken from nutritional sources or as a dietary supplement. While the acetate form is fat soluble, the succinate compound is water-soluble. As a crystalline solid, d-alpha-tocopheryl acetate has a melting point of 28 degrees Celsius and a boiling point of 184 degrees Celsius. Alpha-tocopheryl is only one of a group of the lipid-soluble compounds known as tocopherols and tocotrienols (or tocols), but it is considered the most biopotent or powerful.

The synthesized version, dl-alpha-tocopheryl acetate exists in equal amounts of eight isomers while the natural extraction from vegetable oils, d-alpha-tocopheryl acetate, exists only as one isomer. Some indications are that the natural version is a better alternative to the synthesized form of the vitamin for increasing levels in body tissues and extending retention time.
Natural Glucose crystals (no such thing as Synthetic Glucose)

SINThetic Vitamin B12

Natural Vitamin B12

This graphic shows how electronic charges are distributed across the surface of a molecule made of two cobalt atoms of mineral low level of energy. Sunlight photons act thru photosynthesis to make the plant and animal electrons have a higher energy level.

This graphic shows how electronic charges are distributed across the surface of a molecule made of two cobalt atoms after it has been in a plant and the energy of the sun makes the electronic charges more powerfull and dynamic.
Folic acid

There are many examples of the differences between SINthetic versus natural compounds not just vitamins. But at all levels one thing is clear we should have a choice. If we were to go to a restaurant where there were synthetic wine or beer or other food we would most likely not choose the synthetic. We all know now as a society that the synthetic foods are incompatible. But when we go to the doctor there is no choice. The doctor / hospital menu has only SINthetic on it. This should change and let people choose more natural methods of healing and therapy.
In Quantum Atom Theory we have these infinities not because there is something wrong with the mathematics of QED but because we have no fundamental understanding of time. Sir Isaac Newton thought time existed as a ‘thing in itself’ and that time is intimately connected to motion. But if time exists in itself there must also be a process creating new moments in time that are also moments of infinity. I believe each coupling on a Feynman diagram represents such a moment in time and this is why we have infinities.

Illustrated as existing simultaneously as a 3D hypersphere, the light sphere occurs in three-space, and as a 2D transverse wave occurring in 3D hyperspace and completing three-space.

In QAT instead of having a beginning of time with the Big Bang we have time unfolding continuously at the quantum level. Everything that happens in our Universe was first started at the quantum level. At the smallest unit of radiant energy the Planck Constant is 1.6 × 10⁻³⁵ J/s. It is because energy and therefore mass is quantized that we see the Universe moment by moment and have a flow of time. The only reason why we have a future and a past is because light (EMR) is radiating out from its central source creating the momentum of time.

Broken Symmetry

Therefore the observer will see and feel time as only having one dimension. But in reality the observer is creating their own spacetime reality. Within Einstein’s curvature of three-dimensional spacetime this is seen as a reflection formed by the spherical forward momentum of light creating the arrow of time.

Mirror Line as Time Line
The magnificent human body has been designed to be nourished simply by eating food. However, today, finding food that is truly nourishing is becoming harder and harder. Due to commercial production farming, we have seen our food sources become so altered - from toxic poisons and chemicals to gene splicing - that we are now eating food that eventually devastates our own health.

In the early 1970s, a U.S. government study found the mineral levels of our food was as much as 50% lower than when tested in 1950. It took only twenty years to create such a nutrient wipeout. We wonder what has happened during the last thirty years, since the 1970 study. Sadly, our food is now saturated with new classes of dangerous chemicals, chemicals so common we rarely lift a hand to protest anymore. In 1986, the FDA released its long-range Total Diet Study. In the study, the FDA obtained food from grocery stores throughout the United States. They measured the total number of pesticide/chemical residues in certain fruits and vegetables. Here are a few typical examples of the stunning levels of toxics they found in vegetables: broccoli-45; potatoes-96; tomatoes-50; celery-78. Toxics found in fruits included: apples-80; peaches-97; grapes-63; raisins-110. Since the FDA study ended in 1986, we can only guess what the toxic residue numbers reflect one of the reasons cancer is increasing so rapidly today, and these toxic residue numbers are simply unacceptable.

To further pollute our food supply, splicing bacterial and viral genes into our God-given food seeds has created what many call "Franken-foods" - genetically tampered food - that can slowly poison and sicken consumers over time with a whole spectrum of uncharted symptoms. Current estimates are that up to 70 percent of the products on our grocery store shelves contain ingredients which have been genetically altered. Do you remember voting for bacterial genes to be spliced into the potatoes you eat? Or voting for fish genes in your tomatoes? These "Franken-foods" are a ticking time bomb that may prove to be an exploding health bomb - sooner or later. What about eating "Organically Grown" food? Unfortunately, organically grown foods are often sprayed with chemicals after harvest, during transport, or in storage. We suggest finding a farmer's market and getting to know a farmer who does not use toxic chemicals and pesticides in their growing of fruits and vegetables. If there are not enough critical nutrients, especially antioxidants, or your body is not able to replace them fast enough, your body cannot fight the incoming
toxic barrage. Without antioxidant power, your body has no choice but to try to store the toxics in the fat of the body, in the brain, or other organs and body tissues. The body then creates more fat cells for the toxics to hide in. This is how the tired get more tired and how we gain more and more weight.

Considering the big picture - this ever-raging battle of nutrients vs. toxic chemicals and antioxidants vs. "free radicals" (cells that have become destructive to other cells) - we have to realize that lowered amounts of vital nutrients translates into exactly what we don’t want: rapid aging, feeling tired, weight gain, greater risk of chronic disease, and deficiency symptoms (from poor memory to chronic fatigue to headaches). Supplying the body with high levels of nutrients can mean feeling great. Low levels of nutrients can mean feeling half dead. Deficient nutrient levels also mean being at risk for the most dreaded chronic diseases such as arthritis, prostatitis, neuritis, tendinitis, diabetes, asthma, and even cancer. To get protection from the efforts of toxic damage and stress, the smart person has to realize that regular food is not the answer.

It is a real challenge today to get sufficient amounts of nutrients from food, including "organically grown" food. Many people have turned to nutritional supplements. The rapidly growing market of nutritional supplements is now a multibillion dollar industry. But are supplements giving you what you really need?

Vitamins originate mainly in plants. Vitamins are substances which are essential in small amounts for good health of the body, including growth, maintenance, repair, and reproduction. Many vitamins must be derived from food since they cannot be synthesized in sufficient quantities in the body. Each vitamin has a specific action and function and one vitamin cannot replace another.

Only since the 1920s have we begun extracting nutrients from food or synthesizing them in a laboratory, then putting them into pills to supplement our diets. But buyer beware! The body was designed to get nutrients from food, not a laboratory. In trying to isolate the active factors in food, USP (United States Pharmacopoeia) vitamins were created to mimic real vitamins. But synthetic USP vitamins are not food, even though they are often called "natural". USP vitamins are chemical isolates synthesized in a laboratory. In whole food, vitamins are never isolated. They are always present as a part of a larger nutrient complex.

Vitamins which occur naturally in food have a wide spectrum of actions in the body whereas isolated USP vitamins are analogues of these vitamins and appear to have only some of these actions. Synthetic vitamins are not the same as "life within", once living, food source vitamins. Synthetic USP vitamins are not a part of plant tissues and have never been proven to safely and fully replace natural vitamins and their complex activities. Many studies suggest that natural vitamins in food complexes have better bio-availability than isolated USP synthetic vitamins. Electron microscopy shows that isolated USP vitamins have a larger matrix with sharp jutting edges (crystal-like) compared to natural vitamins in food complexes, which are much smaller and appear spherical without angles.
found in living source nutrients. German research has shown that all living food, including natural food complexes, have sophisticated cellular structures which incorporate spin-ahead and spin-reverse electrons that have aligned to produce pure light.

Living source nutrients produce this strong energy field. Synthetic vitamins do not!

One tablet of one of the largest-selling “Natural” Multivitamins (USP) in the world

One gelatin capsule of a top-selling “Chelated” Multivitamin in a Whole Food Concentrate
When you consume 100% living source nutrients, they deliver not only life-essential nutrients, but also a spectrum of pure light energy which has been shown to facilitate DNA repair of the cell. The cell's life can be greatly extended when its DNA is continually repaired and maintained. For the body, ongoing DNA repair, from living source nutrients, can mean a return to great health and prolonged life!

This scenario is in sharp contrast to using synthetic nutrients, which can boost the metabolism of the cell in the short run (which may help you feel better temporarily), but in the long run, allow the DNA to degrade. Unfortunately, DNA repair is not possible with synthetic source nutrients. This is what we refer to as the "Feels good, but isn't" concept. It reminds us of an ancient scripture: "There is a way that seems wise to a man, that leads to destruction."
A new method for wide frequency range dynamic olfactory stimulation and characterization.

French AS, Meisner S.

Department of Physiology and Biophysics, Dalhousie University, Halifax, Nova Scotia B3H1X5, Canada. andrew.french@dal.ca

Sensory receptors often receive strongly dynamic, or time varying, inputs in their natural environments. Characterizing their dynamic properties requires control and measurement of the stimulus over a frequency range that equals or exceeds the receptor response. Techniques for dynamic stimulation of olfactory receptors have lagged behind other major sensory modalities because of difficulties in controlling and measuring the concentration of odorants at the receptor. We present a new method for delivering olfactory stimulation that gives linear, low-noise, wide frequency range control of odorant concentration. A servo-controlled moving bead of silicone elastomer occludes the tip of a Pasteur pipette that releases odorant plus tracer gas into a flow tube. Tracer gas serves as a surrogate indicator of odorant concentration and is measured by a photoionization detector. The system has well-defined time-dependent behavior (frequency response and impulse response functions) and gives predictable control of odorant over a significant volume surrounding the animal. The frequency range of the system is about 0-100 Hz. System characterization was based on random (white noise) stimulation, which allows more rapid and accurate estimation of dynamic behavior than deterministic signals such as sinusoids or step functions. Frequency response functions of Drosophila electroantennograms stimulated by fruit odors were used to demonstrate a typical application of the system.

Chemoelectrical signal transduction in olfactory sensory neurons of air-breathing vertebrates.

Frings S.

Institut für Biologische Informationverarbeitung 1, Forschungszentrum Jülich, Germany. s.frings@fz-juelich.de

When odorants bind to the sensory cilia of olfactory sensory neurons, the cells respond with an electrical output signal, typically a short train of action potentials. This review describes the present state of knowledge about the olfactory signal transduction process. In the last decade, a set of transduction molecules has been identified which help to explain many aspects of the sensory response. Odor-induced second-messenger production, activation of transduction channels, the central role of the ciliary Ca2+...
concentration, as well as mechanisms that mediate adaptation, are all qualitatively understood on the basis of a consistent scheme for chemoelectrical transduction. This scheme, although necessarily incomplete, can serve as a working model for further experimentation which may reveal kinetical aspects of signal transduction processes in olfactory sensory neurons.

Electrophysiological evidence for detection and discrimination of pheromonal bile acids by the olfactory epithelium of female sea lampreys (*Petromyzon marinus*).

Siefkes MJ, Li W.

Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI 48824, USA.

Electro-olfactograms were used to determine sensitivity and specificity of olfactory organs of female sea lampreys (*Petromyzon marinus*) to four bile acids: 3-keto petromyzonol sulfate and 3-keto allocholic acid from spermiating males and petromyzonol sulfate and allocholic acid from larvae. Spermiating male bile acids are thought to function as a mating pheromone and larval bile acids as a migratory pheromone. The response threshold was 10(-12) mol l(-1) for 3-keto petromyzonol sulfate and 10(-10) mol l(-1) for the other bile acids. At concentrations above 10(-9) mol l(-1), the sulfated bile acids showed almost identical potency, as did the non-sulfated bile acids. The two sulfated bile acids were more potent than the two non-sulfated ones. In addition, 3-keto petromyzonol sulfate and water conditioned with spermiating males induced similar concentration-response curves and response thresholds. Cross-adaptation experiments demonstrated that the sulfated and non-sulfated bile acids represent different odors to the olfactory epithelium of females. Further exploration revealed that 3-keto petromyzonol sulfate represents a different odor than petromyzonol sulfate, while 3-keto allocholic acid and allocholic acid represent the same odor. Results indicate that male-specific bile acids are potent and specific stimulants to the female olfactory organ, supporting the previous hypothesis that these bile acids function as a pheromone.

Steric Effects in the Reaction of Aryl Radicals on Surfaces.

Combellas C, Jiang DE, Kanoufi F, Pinson J, Podvorica FI.

Laboratoire Environnement et Chimie Analytique, UMR 7121, CNRS-ESPCI Paris Tech, 10 rue Vauquelin, 75231 Paris Cedex 05, France, Chemical Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831, Alachiber, 15 rue du Buisson aux Fauxes, 91300, Marny, France, and Chemistry Department of Natural Sciences Faculty, University of Pristina, rr. “Nena Tereza” nr. 5, 10000 Pristina, Kosovo.

Steric effects are investigated in the reaction of ary radicals with surfaces. The electrochemical reduction of 2-, 3-, 4-methyl, 2-methoxy, 2-ethyl, 2,6-, 2,4-, and 3,5-dimethyl, 4-tert-buty1, 3,5-bis-tert-buty1 benzenediazonium, 3,5-bis(trifluoromethyl), and pentfluoro benzenediazonium tetrafluoroborates is examined in acetonitrile solutions. It leads to the formation of grafted layers only if the steric hindrance at the 2- or 2,6-position(s) is small. When the 3,5-positions are crowded with tert-buty1 groups, the growth of the organic layer is limited by steric effects and a monolayer is formed. The efficiency of the grafting process is assessed by cyclic voltammetry, X-ray photoelectron spectroscopy, infrared, and ellipsometry. These experiments, together with density functional computations of bonding energies of substituted phenyl groups on a copper surface, are discussed in terms of the reactivity of ary1 radicals in the electrografting reaction and in the growth of the polyaryl layer.

Olfaction in fish.

Hara TJ.

Department of the Environment, Freshwater Institute, Winnipeg, Manitoba, Canada.

1. Recent progress in the studies on olfaction in fish, with particular emphasis on electrophysiological and behavioral responses to biological odors and related chemicals, is reviewed.

2. One of the most characteristic features in fish olfaction is that it takes place entirely in the aquatic environment. The carrier of stimulant molecules is not air but water; therefore, chemicals that are detected olfactorily by fish need not be volatile, but must be soluble in water.

3. The olfactory organs of fishes are diversely developed. At one extreme they are well developed (macromastic) such as in sharks and eels, and at the other they are poorly developed (micromastic) such as in pike and stickleback.

4. The nasal cavity is lined with the olfactory epithelium, which is raised from the floor of the organ into a series of lamellae to make a rosette. The arrangement, shape and degree of development of the lamellae in the rosette vary considerably from species to species.

5. It is doubtful whether simple relation exists between the surface area of the olfactory epithelium and sensitivity to odors, since the sensory epithelium is not distributed uniformly over the surface of the olfactory lamellae.

6. The olfactory epithelium of fish, like other vertebrates, consists of three cell types: receptor cells, supporting cells and basal cells.
7. The receptor cell, which is a bipolar primary sensory cell, sends a slender cylindrical dendrite toward the surface of the epithelium and is directly connected with the olfactory bulb by its axon. The dendrite terminates in a minute swelling (olfactory knob) which bears a variable number of cilia.

8. The information from the receptor cell is conveyed into the olfactory bulb, the first relay station, where signals are processed and integrated. The dominant feature of the bulb is the synaptic contact between the primary and secondary olfactory neurones in the form of glomerulus.

9. All the available evidence points to a great acuity of the olfactory sense in many fish species both in the capability and discriminating odorous chemicals. However, much discrepancies exist among data obtained by behavioral and electrophysiological techniques mainly because of the lack of systematic investigations.

10. Electrophysiological studies of olfaction have been hampered by the extremely small size of the olfactory neurones.

11. A slow negative monophasic potential is induced in the olfactory epithelium when stimulated with odorous chemicals (electro-olfactogram, EOG).

The application of electroencephalographic techniques to the study of human olfaction: a review and tutorial.

Lorig TS.
Washington and Lee University, Department of Psychology, Lexington, VA 24450, USA. lorig@wlu.edu

The use of a variety of electrophysiological techniques to determine the effects of odor on the nervous system is reviewed. Methods and problems associated with the collection of on-going EEG, chemosensory event-related potentials, and contingent negative variation data are discussed in depth as is the use of odors as modulators of brain potentials produced by other senses. In addition, the advantages of several seldom used EEG analysis techniques are discussed with respect to the unique problems of understanding olfaction.

Electrophysiology of the Olfactory System

Moulting DG, Tucker D.

Electrical charge distribution and olfactory methodology and theory.

Frey AH

New morphologic principles of the physiology of smell and taste (Article in German)

Andres KH.

Lehrstuhl für Anatomie II, Ruhr-Universität Bochum.

New results as revealed by scanning and transmission electron microscopy have given us further knowledge about the structure of the olfactory region of vertebrates. With comparative studies we are now able to discuss the functional relationship of this region. In all vertebrates the olfactory cell is a primary sensory cell. The apical segment of the olfactory cell with its olfactory vesicle is involved in the formation of the olfactory border. As a rule of the receptor possesses cilia or cilia-like processes. These are absent in the olfactory receptor of the shark, the microvillus receptor of the fish and the olfactory cell of Jonsons organ of amphibians, reptiles and mammals. The odorous substances in the fish are brought to the receptor membrane by the water flow. In air breathing vertebrates a terminal film is present. This film is a product of secretion from the Bowmans glands. Gasous odorous substances must first be dissolved in the terminal film and penetrate it before reaching the receptor membrane. The cilia-like olfactory process of the fish in the proximal segment is not essentially different from the kinocilia of the supporting cell, except that they are shorter. In contrast the olfactory cell of air-breathing vertebrates form cilia-like processes with a short cilia-like proximal segment and a long and very thin distal end piece. In the amphibians and sauropsidians the end pieces can have a length of up to 150 mu and up to 80 mu in mammals.

The olfactory vesicles with its processes undergo continuous regeneration. The olfactory epithelium of man show the same structural formation as observed in other mammals. Regressive changes in the adult can lead to a reduction in the number of sensory cells and also to a flattening of the epithelium. Morphological criteria for regenerative processes in the sensory cell structures are present. A specialized olfactory cell type has been found in some teleosts. This cell is characterized by a small pit below the olfactory border in which the cilia of the olfactory cell are redrawn. There is some evidence that this olfactory cell type may be compared with the olfactory cells in the parafollicular tubes of lamprey. The so called rod-shaped receptor in the olfactory mucosa of fishes has no axon and is therefore no olfactory cell. The same kind of cell is also present in the olfactory mucosa of air-breathing animals. We classify this cell as brush cell.
Physiology of smell and taste (Article in German)

von Baumgarten R.
Physiologisches Institut, Universität Mainz.

The functional organization of olfaction and taste are briefly discussed in morphological, physiological, biochemical and behavioural terms. Olfaction in animals serves often for long range navigational purposes whereas taste acts as a close up “last moment food checking system”. Special attention is given to the coding problems in both systems. In taste, the spatial coding mode is prevalent. In olfaction a very complex coding system exists, which used temporal as well as spatial means and in which a whole set of olfactory nerve fibers is activated during the transmission of any specific odor information, each fiber of the set discharging at a specific impulse pattern. The role of the olfactory bulb is seen as an integrating center with the capabilities for short and long term information storage. The impact of von Békésy’s microstimulation experiments on the physiology of taste is discussed. Research on taste modifiers such as gymnemic acid or of the taste modifying protein “miraculin” enrich our present understanding of the interaction between taste stimulants and the chemoreceptor sites in the taste buds.

Receptor cell regeneration and connectivity in olfaction and taste.
Oakley B, Riddle DR.
Department of Biology, University of Michigan, Ann Arbor 48109.

The capacity of adult mammalian gustatory and olfactory receptor cells to regenerate and make synaptic reconnections provides examples that may be useful in initiating replacement of other kinds of sensory receptor cells. The sensory code for taste quality may not be degraded by taste receptor cell turnover because axons probably recouple to the appropriate type of new receptor cell by axon-receptor cell affinity. Experiments on the development and regeneration of taste receptor cells suggest that they regenerate and turn over by recapitulating the late but not the early steps in taste bud development. To evaluate the replacement of vertebrate olfactory receptors, we began by characterizing the spatial pattern of primary olfactory projections in rainbow trout. Contiguous clusters of HRP-labeled olfactory receptor neurons (ORN) make highly divergent projections to the olfactory bulb. Retrograde transport of fluorescent latex beads revealed that a given restricted site in the glomerular layer received axons from ORNs widely scattered in the epithelium. Hence, ORN axons do not form point-to-point or regional topographic maps. Rather, the olfactory epithelial sheet makes a plane-to-point or holographic-like projection, since any given point in the glomerular layer receives information from the entire olfactory epithelial plane.

Receptor cells that reacted with the lectin pokeweed agglutinin were highly dispersed in the olfactory epithelium with axons widely scattered in the olfactory nerve. Yet, as a consequence of the extensive reaggregation of axons at the nerve-bulb interface, the lectin-positive axons fasciculated and converged into a subregion of the glomerular layer. (ABSTRACT TRUNCATED AT 250 WORDS)

Recording of the human electro-olfactogram.
Knecht M, Hummel T.
Smell and Taste Clinic, Department of Otorhinolaryngology, University of Dresden Medical School, Fetscherstrasse 74, 01307 Dresden, Germany.

Electro-olfactograms (EOG) are electrical potentials of the olfactory epithelium that occur in response to olfactory stimulation. The EOG represents the sum of generator potentials of olfactory receptor neurons. While this response has been used extensively in animal research, there are only a handful of papers describing the properties of the human EOG. In addition to a discussion of methodological issues related to the EOG, this review summarizes the characteristics and uses of these recordings. Among other results, EOGs have been used to provide evidence for the dominant role of the central nervous system in olfactory desensitization, for the functional characterization of the olfactory epithelium, the specific topographical distribution of olfactory receptors, or the expression of olfactory receptor neurons in response to exposure to odorants, and the characterization of certain odorants as olfactory receptor antagonists. In conclusion, in combination with nasal endoscopy and air-dilution olfactometry, the EOG is a unique part of a large array of techniques used to provide a complete picture of the processing of olfactory information in humans.

Induced peripheral sensitivity in the developing vertebrate olfactory system.
Hudson R, Distel H.
Instituto de Investigaciones Biomédicas, Universidad Nacional Autónoma de México, Ciudad Universitaria, México.
robyn@imp.med.uni-muenchen.de

The high dimensionality and unpredictability of the chemical world makes it difficult for the olfactory system to anticipate relevant stimuli and construct neural filters accordingly. A developmental solution to this problem would be to alter the sensory surface according to environmental conditions so as to enhance sensitivity to molecules of particular relevance. Evidence for this has been obtained in the rabbit. By feeding pregnant does aromatic juniper berries, it could be shown that newborn, weanling and
electro-olfactogram (EOG). This is consistent with the report that in young salmon olfactory imprinting is associated with enhanced, odor-specific sensitivity of receptor cells as measured by patch clamp. The mechanisms underlying such changes are unknown, including the extent to which they are a particular feature of developing systems.

Electro-olfactograms are present when odorous stimuli have not been perceived.

Hummel T, Mojet J, Kobal G.
Smell & Taste Clinic, Department of Otorhinolaryngology, University of Dresden Medical School, Fetscherstrasse 74, 01307 Dresden, Germany. thummel@rcsurz.tu-dresden.de

After chemical stimulation of the human olfactory epithelium it is possible to record a negative response (electro-olfactogram, EOG) which is interpreted as the summated generator potential of olfactory neurons. The aim of the present investigation was to test whether the EOG is present when olfactory stimuli had not been perceived. Stimulation was performed with vanillin and eugenol at supraliminal and subliminal levels. Twelve healthy volunteers participated in the experiments. Stimuli were applied at an interstimulus interval of approximately 60s. Although recordings were successful in 4 of the 12 subjects, for both stimulants EOG could be obtained even when the stimuli had not been perceived by the subjects. EOG recordings in response to supra- and subliminal stimuli exhibited no major differences, except for the onset of the EOG in response to subliminal eugenol-stimuli which were prolonged compared to supraliminal stimulation. All in all, the present data provide a physiological basis for the subliminal influence of odor stimuli on human behavior.

A new non-invasive method for recording the electro-olfactogram using external electrodes.

Wang L, Hari C, Chen L, Jacob T.
School of Biosciences, Cardiff University, Museum Avenue, Cardiff CF10 3US, UK.

OBJECTIVE: The aim of this investigation was to explore the possibility of recording the electro-olfactogram (EOG) using external electrodes placed on the root of the nose on either side of the bridge and at the medial termination of the eyebrows. The EOG is considered to be the summated generator potential of olfactory receptor cells and therefore represents peripheral olfactory events. Recording of human EOG is technically difficult due to poor access to the olfactory mucosa and the nasal irritation is tolerated by few subjects. METHODS: The evoked potentials at these sites in response to two odourants, n-amyl acetate and benzaldehyde, were recorded simultaneously with the EOG, recorded conventionally with an intranasal electrode, and the olfactory event-related potential (OERP) recorded using scalp electrodes. RESULTS: The extranasal potential recorded at the root of the nose, 0.5-1 cm below the nasion, 1 cm from the ridge and ipsilateral with the stimulus, had the highest degree of correlation with the intranasal EOG. We refer to this site as N1 (left side) and N2 (right side). Further analysis demonstrated that the latency, the time constant of the rising phase and the amplitude of the evoked potential recorded at N1 also had a higher correlation coefficient with the EOG than did those potentials recorded at other sites. Statistical analysis indicated that the latency and time constant of the response recorded externally at N1 were the same as those of the EOG recorded intranasally. CONCLUSIONS: We conclude that an olfactory evoked potential, with many of the characteristics of the EOG recorded from the olfactory mucosa, can be recorded externally at a site close to the bridge of the nose. SIGNIFICANCE: This non-invasive method of recording the EOG will have benefits for the objective assessment of olfactory function.

Transduction physiology of olfactory receptor cilia.

Adamek GD, Gesteland RC, Mair RG, Oakley B.

Electro-olfactograms (EOGs) evoked by 8 odorants from frog olfactory epithelia during ciliary regrowth and during epithelial regeneration were analyzed. During ciliary regrowth following detergent-induced ciliary removal, EOG amplitudes initially increase proportionately with ciliary length. EOGs reach maximal amplitudes after 2 days of growth, when cilia are 40 micron long. Therefore olfactory transduction sites are located primarily on cilia rather than on the dendrite terminal and most of the receptor current enters through the proximal portion of the cillum. Zinc sulfate lavage of the nasal cavity causes selective necrosis of the receptor epithelium. During epithelial regeneration, EOGs increase linearly with time from 13 days after zinc lavage, the time of first cillum emergence, through 30 days. The rate of increase is different for different odorants. At 30 days and within a period of a few days, EOG amplitudes increase abruptly, then asymptote. Thus the development of receptors for different substances occurs at different rates and occurs in two steps. The transition between the two developmental states is coincident with arrival of receptor axon terminals at the central nervous system and with the immobilization of the ciliary contractile apparatus. Since there is continual generation of new receptor neurons throughout life, EOGs recorded in a normal nose reflect a complex combination of the differing receptor processes of cells of differing developmental stages.
Characterization of electro-olfactogram oscillations and their computational reconstruction.

Suzuki N, Takahata M, Shoji T, Suzuki Y.

Animal Behavior and Intelligence, Division of Biological Sciences, Graduate School of Science, Hokkaido University, Sapporo 060-0810, Japan. suzuki@sci.hokudai.ac.jp

Electro-olfactogram (EOG) oscillations induced by odorant stimulation have been often reported in various vertebrates from fishes to mammals. However, the mechanism of generation of EOG oscillations remains unclear. In the present study, we first characterized the properties of EOG oscillations induced by amino acid odorants in the rainbow trout and then performed a computer simulation based on the main assumption that olfactory receptor neurons (ORNs) have intrinsic oscillatory properties due to two types of voltage-gated ion channels, which have not yet been reported in vertebrate ORNs. EOG oscillations appeared mostly on the peak and decay phases of negative EOG responses, when odorant stimuli at high intensity flowed regularly anterior to posterior olfactory lamellae in the olfactory organ. The appearance of EOG oscillations was dependent on the odorant intensity but not on the flow rate. The maximum amplitude and the maximum power frequency of EOG oscillations were 3.51 +/- 3.35 mV (mean +/- SD, n = 232, range 0.12-16.79 mV) and 10.59 +/- 5.05 Hz (mean +/- SD, n = 232, range 3.51-40.03 Hz), respectively. The simulation represented sufficiently well the characteristics of EOG oscillations; occurrence at high odorant concentration, odorant concentration-dependent amplitude and the maximum power frequency range actually observed. Our results suggest that EOG oscillations are due to the intrinsic oscillatory properties of individual ORNs, which have two novel types of voltage-gated ion channels (resonant and amplifying channels). The simulation program for Macintosh (‘oscillation 3.2.4’ for MacOS 8.6 or later) is available on the world wide web (http://bio2.sci.hokudai.ac.jp/bio/chinou1/nortyo_home.html).

The electroolfactogram: a review of its history and uses.

Scott JW, Scott-Johnson PE.

Department of Cell Biology, Emory University School of Medicine, Atlanta, Georgia 30322, U.S.A. johns@cellbio.emory.edu

The electroolfactogram (EOG) is a negative electrical potential recorded at the surface of the olfactory epithelium of vertebrates. It represents primarily, if not exclusively, the summed generator potential in the olfactory receptor neurons (ORNs). While a number of studies suggest that secretory or inhibitory events may also contribute to the EOG, these are not well established. This review outlines (1) the cellular and physiological nature of the EOG response; (2) methodological considerations regarding odor selection and delivery, surgical preparation, response descriptions, and analysis; and (3) application of the EOG in human, fish, and insect olfaction and pheromonal responsivity. A number of technical issues associated with EOG recording are also discussed. Copyright 2002 Wiley-Liss, Inc.

Spatial variation in response to odorants on the rat olfactory epithelium.

Edwards DA, Mather RA, Dodd GH.

Chemistry Department, Warwick University, Coventry, England.

We have measured the electro-olfactogram produced by four odorants, nicotine, i-pentyl acetate, i-pentanoic acid and cineole from twelve positions on an in vitro preparation of rat olfactory tissue. Each odorant shows a different pattern of response over the twelve positions which can be explained by differences in olfactory receptor populations between regions of the rat olfactory epithelium. The result for nicotine is further evidence that there are olfactory receptors which are stimulated by nicotine when it is presented as a vapour.

Masera’s organ responds to odorants.

Marshall DA, Maruniak JA.

Electroolfactogram (EOG) recordings from the rat septal olfactory organ (SO) provide the first demonstration of its broad-range chemosensitivity, and clearly establish this structure as a functioning component of the mammalian intranasal chemosensory system. SO sensitivity to lower concentrations of at least one common test odorant (pentyl acetate) exceeds that at sites located on the septal portion of the main olfactory neuroepithelium. Signals from the SO, as first proposed, thus could have an alerting function and provide information relevant to odor stimulus assessment.

Electroolfactogram responses from organotypic cultures of the olfactory epithelium from postnatal mice.

Pinato G, Rievaj J, Pifferi S, Dibattista M, Masten L, Menini A.

Neurobiology Sector, International School for Advanced Studies, SISSA, SS 14 Km 163.5, 34012 Basovizza, Trieste, Italy.
Organotypic cultures of the mouse olfactory epithelium connected to the olfactory bulb were obtained with the roller tube technique from postnatal mice aged between 13 and 66 days. To test the functionality of the cultures, we measured electroolfactograms (EOGs) at different days in vitro (DIV), up to 7 DIV, and we compared them with EOGs from identical acute preparations (0 DIV). Average amplitudes of EOG responses to 2 mixtures of various odorants at concentrations of 1 mM or 100 microM decreased in cultures between 2 and 5 DIV compared with 0 DIV. The percentage of responsive cultures was 57%. We also used the phosphodiesterase inhibitor 3-isobutyl-1-methylxanthine (IBMX) to trigger the olfactory transduction cascade bypassing odorant receptor activation. Average amplitudes of EOG responses to 500 microM IBMX were not significantly different in cultures up to 6 DIV or 0 DIV, and the average percentage of responsive cultures between 2 and 5 DIV was 72%. The dose-response curve to IBMX measured in cultures up to 7 DIV was similar to that at 0 DIV. Moreover, the percentage of EOG response to IBMX blocked by niflumic acid, a blocker of Ca-activated Cl channels, was not significantly different in cultured or acute preparations.

How the choice of method influence on the results in electrophysiological studies of insect olfaction.

Wibe A.
Norwegian Centre for Ecological Agriculture, Tingvoll gard, N-6630, Norway. atle.wibe@norsok.no

In identifying the volatiles that insects use to locate suitable host plants, electrophysiological recordings of olfactory responses to plant volatiles may give important information. However, divergent results may be obtained with different recording techniques. To illustrate these differences, the results of a previous investigation using single cell recordings linked to a gas chromatograph (SCR-GC) are compared with the results obtained with an electroantennogram linked to a gas chromatograph (EAG-GC). Testing insects of the same species (Hylobius abietis) for the same test sample, 30 potent volatile compounds were identified by SCR-GC and 18 by EAG-GC. Of the 34 different compounds, 14 were identified by both techniques. Furthermore, when the same compound elicited detectable responses by both techniques, the response strength was usually not the same relative to the strongest response recorded by each technique. This shows that both EAG-GC and SCR-GC are important techniques in the identification of potent plant volatiles for insects. However, by using SCR-GC more information was obtained, information that can be crucial for understanding the insect-plant relationship.

The sense of smell: reception of flavors.

Breer H.
University of Hohenheim, Institute of Physiology, Garbenstrasse 30, D-70599 Stuttgart, Germany. breer@uni-hohenheim.de

The sensory and hedonic evaluation of most food-related flavors is mainly dependent on olfactory perception. The sense of smell is able to recognize and discriminate myriads of airborne molecules with great accuracy and sensitivity. The primary processes of odor perception are mediated by the chemosensory olfactory neurons in the nasal epithelium, which upon interaction with appropriate odorants elicit a chemo-electrical transduction process converting the chemical signal into electrical impulses. The encoded information is conveyed onto distinct glomeruli, inducing topographic activity patterns in the olfactory bulb. The emerging chemotopic maps are decoded in the olfactory cortex, leading to the perception of distinct flavors.

Electrophysiological evidence for the broad distribution of specific odorant receptor molecules across the olfactory organ of the channel catfish.

Chang Q, Caprio J.
Department of Zoology and Physiology, Louisiana State University, Baton Rouge 70803-1725, USA.

To determine if there is a spatial segregation of responsiveness to odorants within the olfactory epithelium, microelectrode recordings were obtained from small populations of olfactory receptor neurons located across different lamellar sensory regions of the olfactory organ of the channel catfish, lctalurus punctatus. Stimuli included L-alanine, L-methionine, L-arginine hydrochloride, L-glutamic acid, ATP and a mixture of bile salts-odorants previously reported to stimulate independent receptor sites in aquatic species. The peak integrated olfactory receptor responses at each recording site were standardized to the response to L-alanine. The relative stimulatory effectiveness of the stimuli was preserved across the 10 olfactory lamellae recording sites. These data support previous molecular biological results of a broad distribution of receptor neurons that express specific receptor genes across the olfactory organ of the channel catfish.

Study of the human electro-olfactogram (EOG) (Article in Russian)

Demirchoglian GG, Melikian RG, Avetisian ZA, Narimanian VA
Evidence for peripheral plasticity in human odour response.

Wang L, Chen L, Jacob T.

School of Biosciences, Cardiff University, Museum Avenue, Cardiff CF10 3US, UK.

Of those people who are anosmic to androstenone, a proportion can acquire sensitivity to it by repeated exposure and even those who are able to smell it can lower their threshold with this treatment. Using olfactory threshold testing, intranasal electrophysiology and EEG we show for the first time that: (1) the subjects’ detection threshold is proportional to the amplitude of the olfactory evoked potential (EOG) recorded inside the nose; (2) the EOG amplitude is correlated with the amplitude of the olfactory event-related potential (OERP) recorded on the scalp; and (3) with repetitive exposure, human subjects acquire a reduced threshold for androstenone and, as they do so, their EOG and OERP increase. These observations support the existence of odourant-specific plasticity in the peripheral olfactory system.

Effects of electrical stimulation of the human olfactory mucosa.

Straschill M, Stahl H, Gorkisch K.

Electrical stimulation of the human olfactory mucosa was performed by means of an electrode attached to a rhinoscope. Stimulation of the nasal mucosa did not evoke smell sensations, but suppressed smell sensations of presented odorants. When electrical stimulation followed the exposure to an odorant within a certain interval, the stimulus recalled the already faded sensation of the preceding odorant. Electrical stimulation without prior natural stimulation produced unpleasant sensations in 3 patients with a history of temporal lobe seizures and olfactory auras, but not in patients with primary, generalized or focal epilepsy.

Olfactory evoked potentials: experimental and clinical studies.

Sato M, Kodama N, Sasaki T, Ohta M.

Department of Neurosurgery, Fukushima Medical School, Japan.

Olfactory evoked potentials (OEPs), obtained by electrical stimulation of the olfactory mucosa, were recorded in dogs and humans to develop an objective method for evaluating olfactory functions. In dogs, OEPs were recorded from the olfactory tract and the scalp. The latency of the first negative peak was approximately 40 msec. A response was not obtained after stimulation of the nasal mucosa and disappeared after sectioning of the olfactory nerve. With increasing frequencies of repetitive stimulation, the amplitude was reduced, suggesting that the response was synaptically mediated. These results demonstrate that evoked potentials from the olfactory tract and the scalp following electrical stimulation of the olfactory mucosa originate specifically from the olfactory system. In humans, a stimulating electrode with a soft catheter was fixed on the olfactory mucosa. The OEPs from the olfactory tract, recorded with a negative peak of approximately 27 msec, had similar characteristics to OEPs found in dogs. The OEPs from the olfactory tract in humans also originate specifically from the olfactory system. The authors postulate that OEPs obtained by electrical stimulation of the olfactory mucosa may prove useful for intraoperative monitoring of olfactory functions.

Electroreceptor model of the weakly electric fish Gnathonemus petersii. I. The model and the origin of differences between A- and B-receptors.

Shuai J, Kashimori Y, Kambara T.


We present an electroreceptor model of the A- and B-receptors of the weakly electric fish Gnathonemus petersii. The model consists of a sensory cell, whose membrane is separated into an apical and basal portions by support cells, and an afferent fiber. The apical membrane of the cell contains only leak channels, while the basal membrane contains voltage-sensitive Ca2+ channels, voltage-sensitive and Ca2+-activated K+ channels, and leak channels. The afferent fiber is described with the modified Hodgkin-Huxley equation, in which the voltage-sensitive gate of the K+ channels is a dynamic variable. In our model we suggest that the electroreceptors detect and process the information provided by an electric organ discharge (EOD) as follows: the current caused by an EOD stimulus depolarizes the basal membrane to a greatly depolarized state. Then the release of transmitter excites the afferent fiber to oscillate after a certain time interval. Due to the resistance-capacitance structure of the cells, they not only perceive the EOD intensity, but also sense the variation of the EOD waveform, which can be strongly distorted by the capacitive component of an object. Because of the different morphologies of A- and B-cells, as well as the different conductance of leak ion channels in the apical membrane and the different capacitance of A- and B-cells, A-receptors mainly respond to the EOD intensity, while B-receptors are sensitive to the variation of EOD waveform.
Towards a truly biomimetic olfactory microsystem: an artificial olfactory mucosa.

Covington JA, Gardner JW, Hamilton A, Pearce TC, Tan SL.

University of Warwick, School of Engineering, Coventry, UK. j.a.covington@warwick.ac.uk

Today, the capability of the human olfactory system is still, in many ways, superior to that of the electronic nose. Although electronic noses are often compared with their biological counterpart, they neither mimic its neural architecture nor achieve its discriminating performance. Experimental studies on the mammalian olfactory system suggest that the nasal cavity, comprising of the mucous layer and the olfactory epithelium, performs a degree of chromatographic separation of complex mixtures. Thus receptor cells distributed beneath the mucous layer provide both spatial and temporal chemosensory information. Here we report on the development of an artificial olfactory microsystem that replicates this basic structure. This contains an integrated channel to emulate the nasal cavity and coated with a polymer to mimic the partitioning mucous layer, which is positioned directly over a sensor array. Our system employs an 80 element chemoresistive microsensor array with carbon black/polymer odour-sensitive films combined with a microfluidic package fabricated by micro-stereolithography. Results show that this biomimetic system generates both spatial and temporal odorant signals, with a temporal chemical retention period of up to 170 s. Data analysis has revealed improvements in its ability to discriminate between two simple odours and a set of complex odours. We believe such emulation of the olfactory system can lead to improved odour discrimination within the field of electronic noses.

Development of wiring specificity in the olfactory system.

Komiyama T, Luo L.

Howard Hughes Medical Institute, Department of Biological Sciences and Neurosciences Program, Stanford University, Stanford, CA, 94305, USA.

The olfactory system discriminates a large number of odorants using precisely wired neural circuits. It offers an excellent opportunity to study mechanisms of neuronal wiring specificity at the single synapse level. Each olfactory receptor neuron typically expresses only one olfactory receptor from many receptor genes (1000 in mice). In mice, this striking singularity appears to be ensured by a negative feedback mechanism. Olfactory receptor neurons expressing the same receptor converge their axons to stereotypical positions with high precision, a feature that is conserved from insects to mammals. Several molecules have recently been identified that control this process, including olfactory receptor proteins in mice. The second order neurons, mitral cells in mammals and projection neurons in insects, have a similar degree of wiring specificity: studies in Drosophila suggest that projection neuron-intrinsic mechanisms regulate their precise dendritic targeting. Finally, recent studies have revealed interactions of different cell types during circuit assembly, including axon-axon interactions among olfactory receptor neurons and dendro-dendritic interactions of projection neurons, that are essential in establishing wiring specificity of the olfactory circuit.

Study of the human electroolfactogram (EOG) (Article in Russian)

Demirchogli G, Melikian RG, Avetisian ZA, Natumanian V.A

Oscillatory Electric Potential on the Olfactory Epithelium Observed during the Breeding Migration Period in the Japanese Toad, Bufo japonicus.

Nakazawa H, Kaji S, Ishii S.

Japanese toad (Bufo japonicus) tracks the route to and from the breeding sites using the olfactory cues from the migration route and not from the destination (). We recorded a slow extracellular potential change (electro-olfactogram or EOG) evoked on the olfactory epithelium by applying an olfactory stimulus with an air stream. In September toads, only a simple typical EOG that is common in various vertebrate species was observed. Oscillatory potential changes (OSC) superimposed on the typical EOG were observed in the breeding season when studied throughout a year. There were no sexual differences in the occurrence and the amplitude of the OSC. Oscillatory potentials were observed also from the olfactory nerve of the brain. The OSC in the olfactory epithelium remained even after denervation. In addition, it was suggested that there are multiple sites of OSC initiation in the olfactory epithelium. These results suggest an intimate relationship between OSC appearance and the breeding migration in the toad.

Cognition and olfaction: a review.

Richardson JT, Zucco GM.

Examines research in cognitive psychology, which has in the past paid little attention to the olfactory modality. But there is now a significant body of literature on the role of the olfactory system in memory and cognition. Human beings possess an excellent ability to detect and discriminate odors, but they typically have great difficulty in identifying particular odorants. This results partly from the use of an impoverished and idiosyncratic language to describe olfactory experiences, which are normally encoded...
either in a rudimentary sensory form or as part of a complex but highly specific biographical episode. Consequently, linguistic processes play only a very limited role in olfactory processing, whereas hedonic factors seem to be of considerable importance.

Neurophysiologic detector—a selective and sensitive tool in high-performance liquid chromatography.

Brondz I, Hamdani el H, Døving K.

Department of Biochemistry, University of Oslo, P.O. Box 1041, Blindern, 0316 Oslo, Norway. ilia.brondz@biokjemi.uio.no

In the present study neurons from the olfactory system of the fish crucian carp, Carassius carassius L. were used as components in an in-line neurophysiologic detector (NPD) to measure physiological activities following the separation of substances by high-performance liquid chromatography (HPLC). The skin of crucian carp, C. carassius L. contains pheromones that induce an alarm reaction in conspecifics. Extracellular recordings were made from neurons situated in the posterior part of the medial region of the olfactory bulb known to mediate this alarm reaction. The nervous activity of these specific neurons in the olfactory bulb of crucian carp was used as an in-line neurophysiologic detector. HPLC was performed with an HP 1100 model equipped with a diode array detector (DAD) and ChemStation software. An adsorbosphere nucleotide-nucleoside 7 microm column was used to separate the substances in the skin extract using artificial pound water (APW) as the mobile phase. UV spectral detection was performed at 214, 254 and 345 nm, and scans (190-400 nm) were collected continuously. This system enabled the selection of peaks in the chromatogram with fish alarm pheromone activity. The neurons in parts of the olfactory system from different aquatic organisms and vertebrates can be used for the detection of species-specific stimuli such as sexual and alarm signals, food odours, and other physiologically significant substances. NPDs clearly offer new and promising options for in-line HPLC as highly selective and sensitive detectors in biological, medical and pharmaceutical research.

Electroencephalographic olfactometry (EEGO) analysis of odour responses in dogs.

Hirano Y, Oosawa T, Tonosaki K.

Department of Veterinary Physiology, Faculty of Agriculture, Gifu University, 1-1 Yanagida, Gifu, Gifu 501-1193, Japan.

Scientists in many fields have studied olfaction in dogs, but no simple method exists to study this function. The olfactory ability of dogs is used in many fields. However, the owners of the dogs have a frustrating experience because there is not an easy method to measure olfactory function. The purpose of this study was to examine the characteristics of olfactory function of the dog with electroencephalographic olfactometry (EEGO) recording. It was found that slow waves decreased and rapid waves increased in response to odours. From these results, it is suggested that the rapid waves of EEGO activity are important in determining a dog’s olfactory ability. The EEGO recording is effective in diagnosing anosmia in the dog and is easier than a behavioural experiment. Additionally, this method may not cause distress to an animal. Copyright 2000 Harcourt Publishers Ltd

An electrophysiological study of odour similarities of homologous substances.

Døving KB.

1. The activity of single bulbar units in the olfactory system of the frog was recorded extracellularly by means of micro-electrodes. The electro-olfactogram was recorded simultaneously from the receptor epithelium.
2. The olfactory epithelium was stimulated with substances of homologous series of normal aliphatic alcohols, acetates and ketones.
3. The effect on a bulbar unit was classified as excitatory or inhibitory, and the chi-square values calculated with one degree of freedom for all pairs in a given series. The statistical values obtained indicated the degree of similarity in olfactory stimulative properties between the odours.
4. The results show that the degree of similarity in olfactory properties is greatest among neighbouring substances and gradually decreases with increasing separation in chain length.
5. Significant rank correlation coefficients were found between the chi-square values and the molecular weight ratios for alcohols and acetates. The results are discussed in relation to psychophysical findings obtained with the same substances.

Modification of the electrical activity of the olfactory bulb by other central nervous structures.

Hara TJ, Gorbman A

Electrophysiological studies of the olfactory system of the goldfish, Carassius auratus L. I.

Modification of the electrical activity of the olfactory bulb by other central nervous structures.
Psychogalvanic skin response olfactometry.
Borsany SJ, Blanchard CL

Olfactory stimulation and galvanic skin response. (Article in Japanese)
ICHIHARA M, KOMATSU A, ICHIHARA F, ASAKA H

Electrophysiological studies on the nasal mucosa.

Bibliographic review of electrophysiological research on the olfactory system. II. Electrical activity of the olfactory centers of the rhinencephalon.

Electromagnetic fields on a quantum scale. I.
Grimes DM, Grimes CA.

Department of Electrical Engineering, Pennsylvania State University, University Park, Pennsylvania, USA.

This is the first in a series of two articles, the second of which provides an exact electro-magnetic field description of photon emission, absorption, and radiation pattern. Photon energy exchanges are analyzed and shown to be the triggered, regenerative response of a non-local eigenstate electron. This first article presents a model-based, hidden variable analysis of quantum theory that provides the statistical nature of wave functions. The analysis uses the equations of classical electro-magnetism and conservation of energy while modeling an eigenstate electron as a nonlocal entity. Essential to the analysis are physical properties that were discovered and analyzed only after the historical interpretation of quantum mechanics was established: electron non-locality and the standing electro-magnetic energy that accompanies and encompasses an active, electrically small volume. The standing energy produces a driving radiation reaction force that, under certain circumstances, is many orders of magnitude larger than currently accepted values. These properties provide a sufficient basis for the Schrödinger equation as a descriptor of non-relativistic eigenstate electrons in or near equilibrium. The uncertainty principle follows, as does the exclusion principle. The analysis leads to atomic stability and causality in the sense that the status of physical phenomena at any instant specifies the status an instant later.

Law of Interpretation not Attraction

The Movie “The Secret” is wrong. You do not completely create the world or the events around you. You do completely control your interpretation of the world and the events around you. It is not the Law of Attraction, it is an Effect of Attraction. It is a Law of Interpretation. There is the law of gravity. What goes up must come down, but there some few exemptions. This constitutes a law. It is seldom changed. The Law of Interpretation says that any verbal human will interpret what has happened to him based on his experiences, beliefs, and philosophies. He will always impose an attempt to explain what happens to him. Even “Shit Doth Happen” is an explanation.

In physics a weak force can affect things. We have the “observer effect” and the mind has been proven to be able to effect things. There is power in the human mind to affect objects. Telekinesis, remote viewing, Extra-Sensory Perception etc are all proven to be possible, but the effect is weak. But the effect is there. (see the “Proof” movie)

We can affect our lives and we have some very small control over objects, the world, and the events around us. But we have great and complete control over how we interpret the objects, the world, and the events around us.

All of the people in Hiroshima did not wake up that August morning and create the bomb, nor did they deserve it. All of them later interpreted the results. Most saw the bomb as a negative event. But some saw it as a growing event and a positive result. Nelson Mandela came out of jail after more than two decades and saw it as a positive thing. Some people can find the positive in the most horrendous events. We completely control the interpretation of the objects, the world, and the events around us. Some use negativity to describe the events, some use positivity but all interpret the events. All do this from within their own brains. The state of your brain determines the state of your interpretation of the world around you.

Some people are always happy and they learn to find the silver lining in every cloud. Some people are always dissatisfied and find fault in all around them. But all of us completely control the interpretation of the world around us. We do have some limited control of the world around us but we will never have complete control.

“The Secret” is wrong, in that you cannot just sit at home and think of things and bring them into your life. “The Secret” is right that you can affect your life positively and you can dramatically increase your chances of getting what you want. If you want to get a job you must fill out an application or two.

People think there is a law of attraction, but it does not hold out as a way to predict things. If it were a law then we could predict things. Example: if someone throws a rock off of a building and there is a crowd below, someone in the crowd will get hit by the rock. Now we might say the bad guy got it because he deserved it. The good guy got it because he was too good. The sad guy got it because he was negative and he brought it to him. The happy guy got it because he needed to learn a lesson. But in truth we do not know who gets it before it is done.
If there were a law we could predict the outcome easily. We could put a crowd in place and let one guy focus on wanting the rock to hit him and he does chants of mantras I want the rock. The rest of the people do chants of protection and affirmations that they are protected from rocks. We throw the rock and no matter how powerful the meditations we just don’t know who will get it till after it hits. After it hits we then are always able to explain it. We say the bad guy got it because he deserved it. The good guy got it because he was too good. The sad guy got it because he was negative and he brought it to him. The happy guy got it because he needed to learn a lesson. The human mind can interpret things very well after the fact. President Gerald Ford said that Hind Sight is 20/20. But Fore Sight is just probability theory. The law of interpretation holds fast.

When President Harry Truman dropped two bombs on non-military target cities of women and children, there was so much radioactive fallout thrown into the air. If one of these alpha ray or beta ray fallout products were to be ingested or breathed in the person would get cancer and die. There was such an increase in cancer in America after the three atmospheric detonations of atomic weapons of mass destruction that the world had to declare atmospheric atomic detonation illegal. Harry S. Truman killed more Americans with fallout over the next fifteen years than he killed Japanese on that day. Here once again people interpret his actions based on their own perceptions. In some minds he was a hero, in another mind he is a War Crime criminal. But I feel if more people knew what happened there would be more people thinking the later. (see the movie “War Crimes Trail of Harry S Truman”)

Now who got the radioactive fallout, the good, the bad, the ugly, the deserving? The answer is we cannot predict, but we can always explain. Whatever happens people will step forward and explain why. You do not completely create the world or the events around you. You do completely control your interpretation of the world and the events around you. Your mind interprets what is around you.

In sports we can analyze, study and examine the details of the two teams competing. If there was a law of attraction we could always or at least generally predict a winner from who attracts it the most. But this is not the case. We must play the game. And no one knows the outcome. But after the outcome everyone steps forward with and explanation. Your mind has a weak power to affect your surrounding but a strong firm power to interpret events after they are completed.

The condition of your mind, spirit and soul determines how you perceive the world around you.

God and The Cosmos

I believe firmly in a God that does guide all of us for growth and spiritual development. This allows for karma as well. The theory of the big bang states that all of the energy in the universe or at least a big chunk of it came through a singularity in one to the minus forty third of a second. Matter will later evolve from condensation of this energy. This means that all things all particles have a quantum entwined history. Particles of quantum energy that were once entwined can communicate with each other as in Bell’s theorem. The PEAR project proved that there was a connectivity of things and that the human mind a known quantum engine could communicate with things. There is a God consciousness of the universe. This God consciousness determines who gets the radioactive particle.
We have a part of the God consciousness in us. But just because a drop of water has the same characteristics as the ocean the drop should not think it is the ocean. We have some small part of this power in us but we need to be humble.

So the message to the “What the Beep” people is firmly you can affect your world slightly. God controls your world completely. We need to have humility. You need to act not just think. And you do control your interpretation of the events completely.

And people will interpret their reality as they see fit, and often this means they will adjust their interpretation to fit their belief system. I have seen scientists observe undeniable data on UFOs, the powers of the mind, psychic phenomena, Ghosts etc and after seeing irrefutable evidence they adapt an interpretation to fit their dogma. It is difficult for people to face their disbeliefs.

We don’t create the world around us we interpret how we see it.

They say there is always a quote “RATIONAL EXPLANATION”. Of course the rational human mind after the fact can always make a rational explanation. This does not mean it is true but they must do it to preserve their belief system. Any rational explanation will do to allow them to drop pursuit into paranormal. For maintain a false belief is more important than truth.

Science has lost itself into a search for funding and in saving face. It ignores many obvious truths that should get more consideration and Rational explanations are easily accepted for too many phenomena that should be explored. Rationality and Rational explanations becomes a religion to these people who rationally reject religion.

The human mind must try to preserve its integrity. Everything we do has error built in. Some would say that this alone guarantees the uncertainty problem. But this alone would imply that technology might solve the problem with less error. But in fact indeterminacy goes beyond error and extends to all things at the core of existence.
They Say "god made man but Samuel Colt made them equal!"

\[ \Delta x \Delta p \geq \frac{1}{2} \hbar \]

"Heisenberg gave Man free will"

The World we Live in Has Indeterminacy built into it
There is Error in all things but the Indeterminacy Principle goes beyond Error the basic core of all existence is indeterminant

Even when we know the way things should turn out we must Play the Game. Because we just don't know, in life things have a degree of indeterminacy built in, and sometimes "Shit Happens", Owen's Law

Institute for Advanced Hindsight Research into What Should Have Been

Here Rational Science explains the ParaNormal

Institute for Advanced Hindsight Research into What Should Have Been

Our job is to Po Po the Paranormal and Quantum Physics as Long as we can hide the truth

Here Rational Science explains the ParaNormal
You Can Take the Indeterminacy principle too far. Even though it is true and we do have Free Will. We must act on what we know and try to act on our predictions of outcomes. We need to play the game of life as best we can. And see where the outcomes lead us. We need to find a balance of rationality and indeterminacy. The Yin versus Yang. There is a need for rational logical linear thought as in Western philosophy, but it is not the only path to knowledge. The Eastern ways have more of the other side of the brain working finding dreams, art, beauty, intuition. There is a male and female mind, a left and right hemisphere, a dreamer and doer, a 'see'-er and a 'be'-er, a watcher and a player, an active agent and a passive one all in each of us and many more. As we learn about the differences and the polarities we learn about ourselves. We learn to be the best we can and how to face life when 'Shit Happens'.

The best doctor is the doctor within. The best teacher is the teacher within. When you discover this and you activate it with modesty and humility recognizing what you don't know is always greater than what you know, life is much better. You can do anything it is just a matter of time.

\[
\Delta x \Delta p \geq \frac{\hbar}{2}
\]

"But you can't go through life applying Heisenberg's Uncertainty Principle to everything."
The Angel of God DESIRE says:

The World is contained in our Minds... to Change the World we must change the Way We Think.

If you want things to be Different then Something Must Change.

Repetition is the key to change...

Everything entered the Universe via a Singularity, thus all photons from the Big Bang share a twin commonality.

The Cosmic BG Microwave Radiation photons share all Information. These photons tickle the free protons they encounter, thus there is scientific proof for a Collective Unconscious, a Universal Consciousness, the Mind of God...

There are truly powers of the mind and truly a Subspace Connectivity of all things in the Universe.

The Bible says there will be 100,000,000 Angels at the End to Save the Humanity.

The Black Hole at the center of the Milky Way will align with the Sun on 20.12.2012, this will pull at the unbalanced Gravity of the Earth. It could produce a dramatic catastrophe.

If these 100,000,000 Angels can learn to use their power of mind together maybe they can avert the gravity catastrophe, but standing in our way is the Small Minded Scientists who do not have the power of mind to see the power of the mind...

The Angel has come to Save Humanity and lead us to 1,000 years of Peace, Prosperity and Harmony.
Laws Versus Rules

You can call me anything except late for dinner.

But if people respect personal freedom they will call me my chosen name Desiré.

Some people are more caught up in the way something looks rather than it’s true nature and some people have limited minds but if you are true to truth, and you respect freedom over conformity then you can call me Desiré. I am deeply respectful of the law, in that way I am very very conservative. But I am very suspicious and not respectful of rules. There is a law in South Carolina that says a person labeled male on his birth certificate cannot openly dress as a female. So I won’t visit South Carolina. For the rest of America this is a rule not a law. I do not respect the rules of conformity. I do not respect the rules of convention or tradition. I challenge them with one word freedom. Small petty minds try to take away freedom and prefer tradition.

Once a FDA agent came into my office in Denver Colorado and he demanded we close up the shop because he said homeopathy was illegal. It was a rule he said. I took him into the office and showed him the FDA law. The FDA was founded by a homeopath. Homeopathy appears three times in the first three pages. He apologized and left.

You see the law is how we run our society. And our society makes and assumes rules. Many governmental people do not know the difference. They even think a rule is sometimes a law. But the law is always written on paper and can be read and enforced. Still there are times we need courts to decide when police or enforcement people have differing opinions than the public. Such was the case in 1996, when the FDA had a rule to ban acupuncture. The FDA thought that this was a law. I challenged this rule. And I won acupuncture became a real medical art in March 1996 because of me. I used the law to change the rule.

Right now many people thing that energetic medicine is illegal. This is a rule not a law, and I fight to defeat this rule and preserve the law. The law allows energetic medicine today. I am sure that we will need to go to a judge to decide this someday.

I do not break laws. I work diligently to obey laws. The FDA has broken the law in their vendetta against me and One day I will prove that. I left America in March right after Judge Matsch made the FDA and the Prosecutor dismiss the case against me on leap day 1996. The FDA went to Washington in June 1996 and tricked a Grand Jury into illegally making a bogus indictment against me. There was no charge against me when I left. So I did not flee, nor am I a fugitive.

I am a concerned citizen who is waiting for an American judge to rule on the validity of my case before I return. I have obeyed every law and always do. But everyone has denied me a judge to rule on the validity of the indictment against me. I have been warned of a conspiracy against me to have me put away without the chance of seeing a judge how could free me like the last one did.

I do not respect nor do I feel obligated to obey rules. Salesmen think that it is a rule they should wear a suit. I tried to tell them that most everyone knows to never trust a suit. But he is caught between people who are confused by rules and think their rules are law.

I have changed my name and sex rating in America. There are three American ID papers used, Passport, Driver’s License, and Voter’s registration. My medical papers say I am both sexes and can chose which one I want. My only driver’s license from Kentucky lists me as Desiré Dubounet and female. My voter’s registration in Colorado is as Desiré Dubounet and lists me as female as well. So by American law I am Desiré Dubouen and female. This is the law, but for some this voids a rule. For some rules are more important than laws. It is a pity. For me law is more important than rules.

My name is legally in America, Europe, Africa, and around the world is Desiré Billie Dubounet.
I studied the Buddhist way and that the cause of all suffering is Desire. To stop suffering you must control Desire. This was my doctoral thesis, in New Orleans. So when I choose my female name I choose Desiré to always remind me that desire has to be controlled. It can be expressed but controlled.

When Dustin Hoffman first became Tootsie in the movie he was in the Russian Tea Room in NY and he ordered a Dubonnet with a Twist, I said well I my life has now a twist.

But Dubonnet is the drink, Dubounet in French is a beautiful sexy bonnet worn by the most elegant of women. I am an elegant woman. Dubounet rhymed with Desiré so I choose my name.

For my middle name I choose Delicious, in my stand up comedy I say that “Delicious is my middle name. It is not my whole name. It is the name of my hole.” Ta Da drum role

By American law of the 14th amendment you can change your name by yourself in most states (not in California, but yes in Colorado) but the law says you cannot use trivial sexy terms and the specifically use the word “Delicious” as an example of words you can’t use. So I cannot make my middle name Delicious.

When my father was born at first they thought the child was female, same with me. So the name on his birth certificate is Billie. The female spelling not Billy the male spelling. One week later my father’s penis popped out and then on the birth certificate you can see where they erased female and changed it to male but they did not change the spelling of his name.

So my dad went thru life with a female name and he was tortured and troubled by the sex identity crisis with his hermaphrodite heart. He was bitter, mean, fearful, nasty and cruel and he hated almost everybody. He was abusive and brutal to my mother. But he was my dad and to honor him I took the middle name Billie. This reminds me of how a person can twist their soul, mind and those around him when they have to suppress and repress their inner feelings. It reminds me to love the sinner and hate the sin. It reminds me that to suppress a truth is to give it power over you.

For me to have the courage, the fortitude, the power of mind to be me what I am and not what others want me to be. It takes extreme power of personality and intellect.
Be Good To You — author unknown

Be Yourself — Truthfully
Accept Yourself — Graciously
Value Yourself — Joyfully
Forgive Yourself — Completely
Treat Yourself — Generously
Balance Yourself — Harmoniously
Bless Yourself — Abundantly
Trust Yourself — Confidently
Love Yourself — Wholeheartedly
Give Of Yourself — Enthusiastically
Empower Yourself — Prayerfully
Express Yourself — Radiantly

A Few Shots To SHAMAN
"I am not as Jung as I used to be."

Carl Jung and his ideas of the Collective Unconscious

Professor Desiré Dubounet
and her friends have spent over 35 million dollars to bring the world a professional and thorough course on Wellness, Naturopathy and Neuro-Electro-Physiology of Biofeedback as Bioresonance.

She is such a humanitarian Angel, she lets you pay for the course videos, books and materials with Karma...

FOR MORE INFORMATION GO TO: WWW.IMUNE.NAME

These are the TOP FIVE REASONS to get a Doctorate in Wellness PhD International Medical University degree at home.

1. Getting a degree means you will increase your earning potential. Studies have shown that at home study is just as good as attended classes.

2. Study and Complete Courses At Your Own Pace. Use this to maximize the learning.

3. Scheduling Convenience. Work when you are ready to work.

4. Teaching Faculty Who Actually Have Work Experience in Your Field of Study. Global faculty at IMUNE is with worldwide famous doctors.

5. Save Money on Travel, Parking, Childcare, and Books: You save money the world saves energy, this makes you and the world better.

6. Employer Support. Many employers offer tuition reimbursement for employees’ tuition associated with training in their fields. Employers also tend to encourage enrollment in online degree programs because they know employees will be able to go to school and still be able to be committed to their jobs. Don’t be afraid to ask your employer. Every company needs a wellness consultant.

Professor Desiré Dubounet the world’s most famous Naturopath and her friends have spent over 35 million dollars to bring the world a professional and thorough course on Wellness, Naturopathy and Neuro-Electro-Physiology of Biofeedback as Bioresonance. She is such a humanitarian Angel, she lets you pay for the course videos, books and materials with Karma go to www.imune.name for more information.
Desire 
Delicious 
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