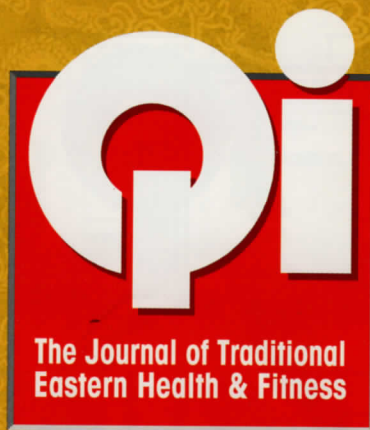


Wuji—The fist;
Wuji—The Dao

Yangsheng and the
Way We Live Now



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What is Qi?

The Body is the
Temple for the Spirit



Departments:

- Tai Chi and Sensitivity
- I'd Rather Be a Happy Turtle
- Frankl's Logotherapy, Zen, and the Quest for Human Identity
- News & Events



WHAT IS QI?

BY C.P. ONG. PH.D.

BACKGROUND

Qi is an energy concept born of an age-old non-science era, under the auspices of the Taiji Theory of Yin-Yang, but not of an alternate universe. The challenge has been to explicate Qi without being entangled in the esoterica of its ancient wrappings.

Qi is pervasive in the Chinese culture, from fengshui geomancy and cosmogony to food, health, and medicine. Colloquially, Qi means "air, breath, or vapor," but in technical use, it takes on the meaning of a "refined substance" or energy, distilled in the essence of a life-force or vital energy that animates all things. Cosmic Qi moves galaxies in the universe and in the microcosm of the human body, Qi energizes all physiological activities.

It is indeed a wonder that such an ancient concept has survived the ravages of time, not as a historical relic, but as a functional and relevant construct still in current usage, much like the written Chinese characters. Common concerns of health and nutrition are denominated in Qi values. Good health and the body's self-healing ability are characterized by a robust Qi coursing through the meridian network interconnecting the internal organs in harmony. Qi theory underpins the practice of Traditional Chinese Medicine (TCM).

TCM's functional efficacy has been well accepted in the Far East but it is not science-based. In the West, about 38% of adults use some form of not science-based medicine too, referred to as Complementary or Alternative Medicine (CAM), of which TCM is one, to treat a variety of chronic disease syndromes, as reported by the National Center for Complementary and Integrative Health (NCCIH)². Not just patients, 80% of family practice physicians surveyed, expressed an interest in receiving training in "acupuncture, hynotherapy, and massage therapy."

Despite its rich store of knowledge and materia medica accumulated over two millennia from clinical practice, Chinese Medicine is still dismissed as pseudoscience, if not as quackery. Nevertheless, the public demand has led U.S. hospitals to open clinics that offer CAM treatments,³ and form *The Consortium of Academic Health Centers for Integrative Medicine*. It appears that scientific skepticism of alternative medicine has been trumped by the economics of the healthcare marketplace.

The public trust in TCM is not misplaced. A share of the 2015 Nobel Prize of Medicine was awarded to Tu Youyou, for her discovery of artemisinin that she isolated from the *qinghao* herb, long used in TCM for treating malaria symptoms. The discovery provided the world's cure for a new strain of malaria parasite (*Plasmodium*

falciparum) that had become resistant to the existing quinine drugs.⁵

The Nobel recognition might have shone a bright light on TCM but it seemed to have engendered only a passing interest by Medical Science. Lacking in Science, the West could not apply the *Qingfei Paidu* decoction or the other herbal combinations deployed in China that successfully contained the Covid-19 pandemic. With no cure on hand, TCM could point to a "dampness toxin" (*shidu*) as the pathogenic agent of the pestilent Qi causing the infectious pneumonia disease. Though unscientific, TCM could turn immediately to the herbal and physical therapies that invigorate the Spleen Qi to remove dampness.

However, invoking Qi only muddies the discussion. Qi, thus far, has escaped scientific definition and measurement. Also problematic is the conspicuous absence of the study of anatomy in TCM, but in lieu of that, it is served by an elaborate chart of the system of meridians and acupuncture points. The underlying theory of Qi, based on the Principles of Yin and Yang and *Wuxing* (The Five Phases), may not transcribe well in Science, but it does not mean that it is devoid of Science.

The scores of published research papers on TCM modalities (such as acupuncture, Tai Chi, or herbal therapies) are mostly clinical studies or scientific that are affirming the therapeutic benefits of improving the quality of life or certain pain conditions. However, the studies seldom address the Qi theory itself.

The primary focus of this essay is to look at the science in Qi to bring the old energy concept closer to Science. The review of Qi here is grounded in bioenergy in its multiple functional forms towards unraveling its philosophical underpinnings.

THE BASIC SCIENCE APPROACH

Practitioners of Taijiquan (Tai Chi Chuan) or Qigong (Qi Energetics) experience Qi sensations. The pioneering work of Dr. Shin Lin takes the basic science approach to investigate the bioenergy responses associated with the Qi nurturing exercises. With hi-tech sensitive instruments, Dr. Lin's research team was able to measure changes in bioenergy emissions

associated with the Qi exercises.⁶ The measurements showed a significant increase in peripheral blood flow and elevation of bioenergy in the form of heat, light photons, and electrical charges which are referred to as *biomarkers of Qi*.

Of the Qi biomarkers, the most readily relatable is that of blood perfusion. It is thus not surprising that blood flow is traditionally regarded as a window to Qi. Qi and blood are treated inseparably as one, *Xue-Qi* (*Blood-Qi*), and expressed as:

*Qi is the commander of blood;
Blood is the mother of Qi.*

The Lao-Gong acupoint (PC8 at the center of the palm) is considered a center of Qi flow. To validate the premise of the blood-and-Qi relationship, the research team took local blood perfusion and other Qi biomarker measurements at PC8 and compared them with other points on the palm. The measurements of blood perfusion, electrical conductance, temperature, and biophoton count, were highest at the *Lao-Gong* point, affirming the acupoint as a local center of Qi.⁷ Also, the high correlation of the bioenergy values validates them as biomarkers of Qi, in addition to affirming the relationship between the blood-flow biomarker and Qi.⁸ The traditional conflation of Blood-Qi and Qi is not scientific, but as we shall see, it fits functionally and philosophically.⁹

Subsequent experiments also showed that the TCM modalities of acupuncture, cupping, Guasha scraping, moxibustion and Tui-na massage, as well as topical herbal remedies, brought about increases in blood flow and heat, as well as in some other biomarkers. These findings again confirm the relationship between Qi and blood and the link of science to Qi, and give basis to healing therapies by the intervention of external energy in the form of heat, light, and electricity.

The innovations of enhancing acupuncture therapy with heat, electricity, and laser are thus consistent with the manipulation of Qi by its biomarker representation. In electroacupuncture, a mild electrical current is sent through the acupuncture needle to stimulate the acupoints. In laser acupuncture, the acupoints are individually stimulated by low-intensity laser irradiation focused at the appropriate depth.

For a more up-to-date review, the reader is referred to *Vital Energy, Health, and Medicine*, by Shin Lin and Gaetan Chevalier.¹⁰

QI FORMS IN TRADITIONAL THEORY

Qi takes on many forms, depending on its functional and regulatory roles, location, meridian or organ, such as Blood-Qi, Spleen-Qi, Lung-Qi, and so on. While that may exemplify its universal applicability, confusion will inevitably arise because the functions described in Qi theory often do not correspond with that in physiology and anatomy.

Nevertheless, in reviewing the life-force vitality of Qi in its multiple forms, we are led to the life-sustaining activities of metabolism. Rather than fight the abstruseness of Qi, we take the pragmatic approach to simply look for the science in the Qi forms as they relate to the body's generation and use of energy.

Traditional Qi theory posits that at birth one is bestowed with a store of Original Qi (*Yuan Qi* 元气), which is also called Prenatal Qi. The theory holds that Yuan Qi is in the form of an innate essence (Jing) or energy, which sparks life in the embryo. This hereditary endowment comes in a fixed amount. Yuan Qi, is subsequently stored in the Kidneys, and cannot be replenished but it can be preserved by the regulation of its consumption. In old age, the supply dwindles, the body slows down and weakens, and finally, when depleted, life expires.

The Qi energy that we consume all the time is produced by the body, and is referred to as Postnatal Qi, to differentiate it from the inherited Prenatal Yuan Qi. The supply of Qi is replenished by the transformations of the many Qi forms from a basic Qi, called True Qi or *Zhen Qi* (真气). Thus the body's energy production is about the production of *Zhen Qi*.

The three main sources of Qi-essences involved in the production of *Zhen Qi* are: 1) *Gu-Qi* 谷气 or Food-Qi, the Qi of food essence, which comes from the ingestion of food, 2) Air-Qi, the essence from natural air, and 3) *Yuan Qi*, from the store of Prenatal Qi.

Air-Qi essence in the lungs comes from the air we breathe. The production of Gu-Qi is a process of transforming ingested food by the action of Spleen Qi to refined food essence

and then to Gu-Qi. Air-Qi and Gu-Qi combine to transform to *Zong-Qi* (宗气) or Pectoral Qi. Yuan Qi enters next in the last step of the production process, promoting and transforming the Pectoral Qi to the final state of *Zhen Qi* (True Qi or more appropriately Realized Qi) (see Fig. 2 on page 30).

Zhen Qi is deployed in the many functional Qi forms, which fall into two main categories: Nutritive Qi (*Ying Qi* 营气) and Defensive Qi (*Wei Qi* 卫气). Nutritive Qi supports the growth, development and maintenance of the body, including the Qi energy for actuating functions, transportation and motion. In the form of Blood-Qi, Nutritive Qi (nutrients in the blood flow) nourishes the whole body, and Defensive Qi (immune agents) protects and defends the body.

There are other subcategories, such as of *Zhong Qi* (Central Qi) and *Zheng Qi* (Upright Qi), which refer to Qi functions that cross over with those of *Pectoral Qi* and *Wei Qi*. For example, *Zheng Qi* is described as protective Qi but is nuanced by its fortitude of Qi strength in guarding against attacks from external pathogens.

The most intriguing organ is TCM's designation of a Fu organ, called the *Sanjiao* (三焦) or *Triple Burner*. This "organ" does not take on a physical form nor does it identify with any of the internal organs in anatomy, yet it plays a very significant role in Qi transformations. All the functional Qi forms, including *Zhen Qi*, undergo a complex of mechanisms involving the Triple Burner. (TCM refers to Food-Qi being produced in the Middle Burner with Spleen Qi, transformed to *Zong Qi* with Air-Qi and further refined with *Yuan Qi* to *Zhen Qi* in the Upper Burner.) The redoubtable *Sanjiao*, whether as a process or organ, highlights the complex nature of Qi transformations. For a more comprehensive account, the reader is referred to "*An Approach to the Nature of Qi – Qi and Bioenergy*." These Qi processes parallel the complex of biochemical processes of metabolism.

QI, METABOLISM, AND ATP

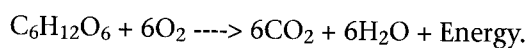
The body needs energy to run but it can relate to only certain sources of energy. An automobile gets its energy from gasoline. We

cook with the heat energy from fire but we do not harness the heat from a car crash to cook. An electric car is engineered to run on electricity but we cannot bioengineer the body's metabolic processes to run on heat, electricity or light. The body can access energy only in the form of food and oxygen. Qi's answer to the body's energy is Blood-Qi, which implicitly includes oxygen (Air-Qi) and food nutrients (Food-Qi) in the blood circulation. The discussion here thus brings science right at Qi's doorstep.

The micro activities of physiology are mainly about the metabolism of four macromolecules, proteins, fats, carbohydrates, and nucleic acids, which we consume as food. These are broken down into their subunits of amino acids, fatty acids, glucose, and nucleotides respectively, which are processed at the cellular level. The body is constantly consuming energy to power the muscle contractile actions and to synthesize macromolecules from their subunit building blocks, as well as to send nerve signals, move ions, regulate hormones, and other functions.

However, the only form of energy accepted in metabolism at the cellular level is not Air-Qi or Food-Qi, but the energy in the chemical bonds of adenosine triphosphate (ATP). At the micro level, ATP is the only energy currency that can be used in physiology.

A lot of ATPs are needed and recycled. The ATPs that work the muscles are recharged more frequently, in seconds, while others may take minutes. The energy for ATP comes from the burning the food-fuel in the body, which goes through a series of biochemical reactions. The actual process of the burning of glucose (broken down from carbohydrates by digestive enzymes) occurs after it enters the cells, in the overall chemical reaction:



Interestingly, the oxidation of glucose that releases the energy is represented in the composition of the Chinese character of Qi (see Fig 1).

The basic chemistry of combustion is the same as that of wood burning but the combustion of food inside the body is highly regulated to prevent it from getting out of control

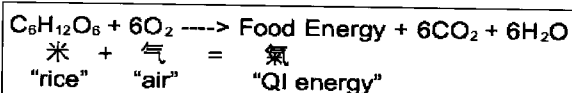


Fig 1. Oxidation of glucose in the Chinese character of Qi

as in a forest fire. The combustion inside the cell goes through three major stages to gather the energy in the ATPs. Each stage is a series of regulated reactions with enzymes and co-enzymes, with the last two stages taking place in the highly controlled microenvironment of the mitochondria, which are aptly described as the ATP factories of the cell.

To control the combustion process, the protons H^+ and electrons e^- released from the hydrocarbon in the early stages of burning, are immediately harnessed by the coenzymes (NADH and $FADH_2$, also called electron carriers) to segregate them from reacting with oxygen as occurs in an open burning. The high-energy protons are released in the final phase, and are driven by a concentration gradient to turn a nano rotary device that assembles the ATPs in the mitochondrial factories.

The overall chemical reaction, the sum of a complex of biochemical mechanisms, is the science behind the processes of Qi transformations from ingested food through the Triple Burner to the final Qi form of Zhen Qi. Little wonder that the processes of Qi transformations are relegated to the three chambers of the mysterious Triple Burner. This leads to Zhen Qi as representing ATP energy (See Fig, 2), giving us Proposition 1.

Proposition 1:

ATP energy is represented by Zhen Qi (真气), the basic Qi form in Qi transformations.

The number of mitochondrial factories in each human cell varies, from hundreds to thousands. In heart muscle cells where the demand for ATPs is extremely high, the mitochondria take up about 40% of the cell's cytoplasmic space. In the liver, there are 1000 to 2000 mitochondrial factories per cell. The mitochondrial factories keep us going.

BLOOD-QI AND RED BLOOD CELLS (HEMOGLOBIN)

In the conflation of blood and Qi as Blood-Qi, Qi assumes the life-force vitality of blood

alchemy that combat aging, which studied in mitochondrial biology, "may reveal previously unrecognized mitochondrial pathways and new therapeutics to manipulate them."¹⁵

THE DAO OF HARMONY AND YIN-YANG BALANCE

Yin-Yang Balance is at the core of Qi theory and is pivotal in the functional harmony of the Zang-Fu organs. Homeostasis is a representation of this balance. Quite remarkably, the metaphysics of Yin-Yang Balance is captured fully with all its dynamics and multi-dimensionality in the ubiquitous *Taijitu* (太极图) or Taiji Diagram (Fig. 4). Wellness in TCM is a harmony of the physiological entities in function, just as music is a harmony of the orchestral entities in performance.

Physiological harmony is not just the balance of an entity but of a matrix of entities that are interrelated. In the dynamics of the interrelated multi-dimensional factors, the quest of integrating them in harmony would seem intractable. To resolve this problem, the ancient thinkers resorted to philosophy and the adaptability of the soft logic of Yin and Yang to come up with a practical solution in the art of Qi nurturing. The art develops the cognition of the functional effects of balancing as Qi is nurtured. Qi nurturing thus holds the key to harmony.

However, harmony is a highly ordered state that eludes targeting, while the states of disharmony are prevalent. The art is to cognize disharmony, discern the imbalance of Qi in the matrix of entities, and then to resolve it towards harmony. Resolving imbalance involves a combination of Yin and Yang. Too Yin may be resolved by reducing Yin and/or increasing Yang, while too Yang, by reducing Yang and/or increasing Yin. The genius in the art of Qi nurturing is to cognize imbalance as Qi being in excess or in deficiency, and to resolve it by restraining what is in excess and invigorating what is in deficiency, thereby reducing the errors.

This requires the sensation of Qi to be able to differentiate between the error of being over (excessive) or under (deficient). The discipline to restrain excessive Qi or to invigorate deficient Qi requires the sensation to be able to differentiate between the degrees of error, so that the margin

of errors can be reduced towards balance. The art of Qi nurturing develops both the perceptive differentiation in the Qi cognition. The Qi nurtured thus comes equipped to resolve the Qi imbalance of the matrix and to keep reducing the margin of errors towards harmony.

THE OPERATIVE PRINCIPLE OF QI IN BALANCE

Qigong and Taijiquan practices are drawn from the ancient Qi-nurturing arts of daoyin tuna 导引吐纳 ("guiding-pulling and breathing") that enhance yangsheng (养生) or health wellbeing by integrating body, mind, and breath in the training. The art of Qi nurturing is grounded in the functional effects of yangsheng. Thus, inherent in the nature of Qi nurturing is its operational effect of Yin-Yang balancing that regulates the functions of the physiological entities.

The operating principle of Yin-Yang balancing regulates the Qi dynamics, which restrains Qi that is excessive and invigorates Qi that is deficient. In other words, Qi nurturing operationally serves as a homeostatic control in physiology that enhances Qi harmony, thus Wellness.

Qi nurturing is not just about the bioenergy per se, but is coupled with its operating principle of Yin-Yang balancing. This principle is developed in the daoyin tuna practice of nurturing Qi, which leads to:

Proposition 2:

Qi nurturing embodies the operative principle of Yin-Yang balancing towards harmony.

The Proposition implies that Qi nurturing operationally enhances yangsheng health wellbeing. This is applied in Qi therapy to resolve disharmony that represents an illness. Thus, the Proposition forms the rationale of Chinese Medicine's therapy of "ingesting Qi to cure illness" (服气疗病 *fuqi liaobing*).

A TCM physician is trained to have cognitive perception of Qi and to decipher the "patterns of disharmony of Qi" in clinical diagnosis. Qigong practice develops Qi sensation of health wellbeing from a transduction of bioenergy of a matrix of entities. A Taijiquan practitioner cultivates cognitive perception of Qi to harness it to discipline body motion to be in accord with Yin-Yang balance (see Fig. 3).

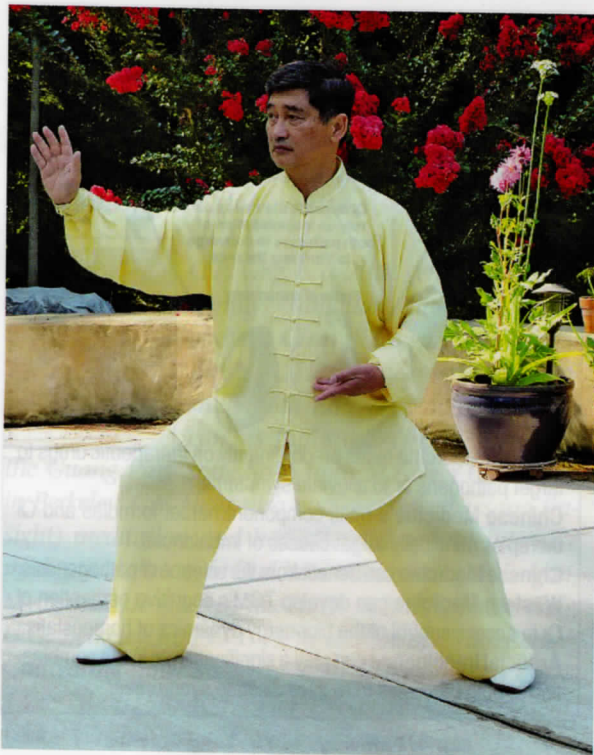


Figure 3. Taijiquan postures of balance between internal tensile forces against the external force of gravity. Taijiquan practice cultivates cognitive perception of Qi as it is harnessed in the discipline body motion to be in accord with Yin-Yang Balance.

The science of Qi in Taijiquan is more transparent based on fascial tension, as explained in the author's just published paper, *Healthcare and Sports from the Perspective of Qi, Fascia, and Taijiquan*.¹⁶

THE COGNITIVE PERCEPTION OF QI

Qi experience is often described by Qigong or Taijiquan practitioners as a warm and tingling sensation as well as a sudden surge of heat. These Qi sensations can be attributed to an increase in blood perfusion and a higher level of muscle activations, which extend the senses of vision, sound, touch, smell, and taste.

The bioenergy dynamics of the body's entities can engender an internally driven Qi sensation. Dysfunction in one or more entities causes imbalance resulting in a physiological disharmony, which can give rise to a sensation of being unwell. The psychophysics of TCM is the perception of the sensation of being unwell as Qi disharmony of the functional entities. This establishes a qualitative relationship between Qi as a sensation of Wellness and the stimulus bioenergy of the functional entities. In short, Qi represents the cognitive percep-

tion of a basket of sensations of Yin-Yang imbalances.

The cognitive perception of Qi cultivated by Qi nurturing incorporates the operative principle of balancing which can be harnessed to discipline and manipulate Qi. The ingenuity of the art of Qi nurturing is that the practice carves out a solution-path of invigorating Qi that is deficient and restraining Qi that is excessive that reduces via feedback the error margins of imbalance towards harmony. This is art in the service of science.

Additionally, the cognitive perception offers an insight of Qi as embodied in the Three Phases of Essence, Energy, and Spirit (*Jing Qi Shen* 精气神). *Essence* (*Jing* 精) represents the distilled essence of Qi material. Thus *Jing* and *Qi* are viewed as the material basis of the body part, and *Spirit* (*Shen* 神), the spirit of life, the mind part. More specifically, the cognitive perception of Qi represents the *Spirit Phase* of Qi.

Proposition 3:

The cognitive perception of Qi represents the *Spirit* (*Shen* 精) of Qi in the Three Phases of *Jing Qi Shen* (精气神).

The practice of Qi nurturing has two components, the body part of exercise and breath, and the spirit part of meditation. The meditative or mind part is induced by the attentiveness and awareness of the practice. Both the body and meditative disciplines reinforce each other in the process of cultivating the cognitive perception of Qi, the achievement of which leads to the mastery of the art and the realization of the full flavor of the *Jing Qi Shen* of Qi. This is the prize of the *yangsheng* culture of nurturing longevity (changshou 长寿). It also provides a base for other spiritual experiences.

One does not have to achieve mastery to gain the *yangsheng* health benefits of Qi-nurturing practices. Qi may be evasive scientifically, but the body picks it up and relates to it readily. Beginning practitioners commonly experience Qi as a tingling or warm sensation in the hands in the first few days of practice. Initially, the sensation is intermittent, appearing and disappearing but over time gains clarity. Along with the developing perception of Qi, the body enjoys clearly the benefits of health wellbeing which accrue and keep the practice going.

THE QI CROSSROADS OF EAST AND WEST

Western Medicine is pathogen-centric; it traces diseases to specific pathogens and finds medicine to treat them. However, the causes of illnesses cannot always be identified as in the chronic ailments of syndromes, and even if known, the cause-and-effect mechanisms are often not deterministic. The same initial conditions do not always produce the same final states of outcome as in the physical sciences with mathematical equations. We may trace the pathway from state A to state B, but the micro states of physiology are irreversible. Cancerous cells can remain benign or become malignant and metastasize. Covid-19 infections can be asymptomatic or can develop into mild or severe cases.

TCM views disharmony within the functional entities and a weak Qi flow as ill health. Without the science of pathogenesis, etiology, and pharmacology, Chinese Medicine relies on the diagnosis of "patterns of disharmony" and the operative principle

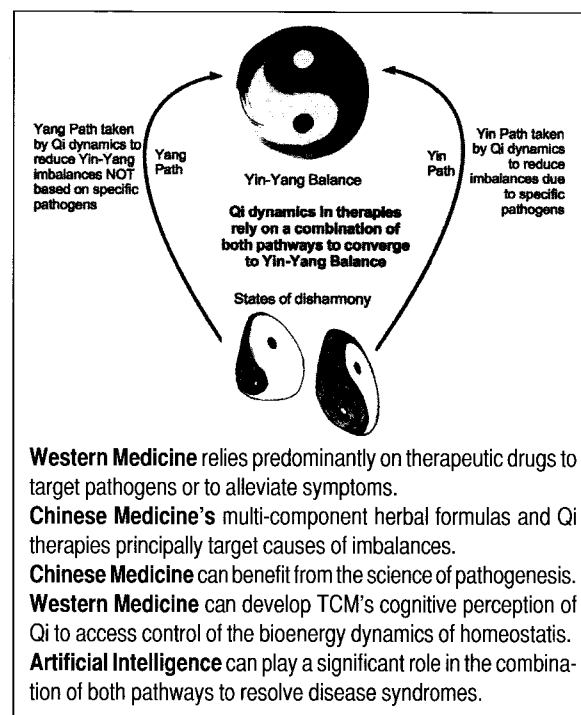


Fig. 4: Pathways to Yin-Yang Balance

Western Medicine relies predominantly on therapeutic drugs to target pathogens or to alleviate symptoms. **Chinese Medicine's** multi-component herbal formulas and Qi therapies principally target causes of imbalances. **Chinese Medicine** can benefit from the science of pathogenesis. **Western Medicine** can develop TCM's cognitive perception of Qi to access control of the bioenergy dynamics of homeostasis. **Artificial Intelligence** can play a significant role in the combination of both pathways to resolve disease syndromes.

of Qi therapy to resolve the impairments of physiological entities, whether or not caused by pathogens. TCM's therapeutic strategy relies primarily on regulating Qi towards balance and harmony along a combination of pathways (see Fig. 4). Advantageously, the non-pathogen-specific and soft approach covers syndromes caused by stress and emotion as well, such as of vexation, anger, anxiety, fright, and grief.

Western Medicine may gain some insight by applying the operative principle of Qi to regulate the bioenergy dynamics. This may lead to the discovery of new indices of Qi Wellness in the bioenergy of homeostasis and the incorporation of Qi in Medical Science.

Chinese Medicine can develop the Qi cognition of the bioenergy dynamics of disease diagnostics and therapeutics of Western Medicine. TCM can incorporate the test data of glucose level, blood counts, and the profiles of metabolic, lipid or other health panels to complement its Qi-diagnostics.

If a TCM physician can be trained to develop the cognitive perception of Qi to decipher and manipulate Qi dynamics, Artificial Intelligence (AI) cannot be far behind. This brings to

the forefront the inevitable role of AI in Chinese Medicine, which is being pursued.¹⁷ ■

(This essay is an abridged version of the author's paper, *Science in Qi*, recently published in the *Journal of Alternative Medicine*.)¹



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FOOTNOTES:

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