Research Article

Scientific Theory of Chee and Its New Principles and Visions for Physiology, Medicine and Healthcare

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ABSTRACT

Rapid deterioration of demographic profiles in developed countries has rendered current healthcare systems unsustainable. Thus far, viable solutions have been converging to expansion of services in complementary and alternative medicine (CAM), of which a major component is Traditional Chinese Medicine (TCM). Unfortunately, CAMs have stagnated as an ensemble of empirical technology without a scientific theory, mostly operated under the wings of conventional (western) medicine. To remedy this fundamental shortcoming, this author recently developed a scientific theory of Chee (often called Qi, meaning the power of life) and its field equations for TCM. The approach is to postulate that, for Chee to permeate the whole human body, the main pathways are in the newly discovered human organ named "Interstitium." Preliminary results published in 2022 showed that this approach metamorphosed TCM to scientific TCM (STCM). This paper reports updated and refined results on the theory and its validation, instrumentation, and clinical trial issues. It is shown that the Chee theory reveals significant new, synthetic, and macroscopic concepts and visions shedding light on human physiology, medicine, and healthcare. We have begun translational research on a broad spectrum of applications on STCM and other CAMs.

Key words: Macroscopic biophysics; Bio-electromagnetics; Biological system modelling; Complementary medicine; Healthcare; Integrative medicine; Physiology; Qi; Chee; Traditional Chinese medicine

INTRODUCTION

Rapid deterioration of demographic profiles in developed countries has rendered current healthcare systems unsustainable. As reported recently, at least 1 in 5 Americans suffers from chronic pain [1], and 1/5 of Japanese over age 65 has dementia [2]. In response, governments and individuals have ventured to measures outside conventional medicine, namely western medicine, which is about two hundred years old. Recognizing this serious upcoming problem in the late 1990s, U.S. National Institute of Health (NIH) has been expanding and escalating both intramural and extramural research on complementary and alternative medicine (CAM), recently evolving to complementary and integrative health (CIH) [3,4]. Unfortunately, CAMs still stagnate as empirical techniques without a scientific theory despite their long history of thousands of years. For example, Traditional Chinese Medicine (TCM), a leading component of CAM, still clings to its original concept of Qi and thus judged to be unscientific in a very recent thorough and rigorous review [5].

Qi is the common phonetic translation of the Chinese word 氣 that denotes air in general and the power of life in TCM. We translated it to "Chee" in order to differentiate from the ancient concept of Qi that has the following logic flaw. While Qi must continuously propagate and permeate throughout the human body to sustain vitality of life, the pathways for Qi are too sparse. Fortunately, the structure and distribution of an unrecognized "Interstitium" widespread in the human body was reported in March 2018, claiming broad implications for all organs, most tissues, and the mechanisms of most major diseases [6]. This author (hereafter I or we) was inspired to start a research effort in July to develop a scientific theory of Chee, and then scientific TCM, began with a postulate that interstitium constitutes the main pathways for Chee. Our effort accelerated during the three-year COVID-19 pandemic. In 2022 we presented key preliminary results in IEEE symposiums [7-9] and formally published in JCTR [10].

Our approach followed those of Albert Einstein in his creation of the special theory of relativity in 1905 [7] and Julius Stratton in his consummating macroscopic electromagnetics in 1941 [12]. (Serendipitously, as a sophomore majoring in electrical engineering in the 1957 winter break in college, I had read the English version of Einstein's work and in late 1980s had his own book [13] and his biography by R. Clark [14]) It is intriguing that Einstein wrote

this book in 1916 (publication delayed to 1920 due to World War I) [13] "in simple words that anyone with the equivalent of a high school education can understand" [13], in order to overcome the controversies on his 1905 paper on special relativity.

As defined by NIH [3], TCM is a medical system that has been used for thousands of years to prevent, diagnose, and treat disease. It is based on the belief that Qi (the body's vital energy) flows along meridians (channels) in the body and keeps a person's spiritual, emotional, mental, and physical health in balance. Acupuncture is a common practice in TCM that involves stimulating certain points on the body to promote health, or to lessen disease symptoms and treatment side effects. To be more precise, in STCM we have replaced the word "point" with "Shua", which is the phonetic translation for the Chinese character "穴," which means "cavity." Figure 1 shows an anatomical sketch of Shua, with a list of legends below, dated 1960 [15].

TCM's Chee theory states that human vitality relies on Chee's continuous propagation throughout fourteen (14) main and eight (8) secondary networks called Jīng Luò [16]. Jīng Luò is the phonetic translation of the Chinese word 經絡, meaning meridians or networks, serving as pathways (or channels) for the transport of Chee. Figure 2. shows, in front view, Jīng Luò's 14 main networks and a table of legends, which are obviously too sparse for Chee to circulate and permeate throughout the entire human body–until

interstitium was added.

During 1960-1990, the advent of electromagnetic wave and wireless technology offered plausible solutions to mend this logic flaw. This author (hereafter I or we) was one of several researchers, including one in the USSR, that explored electromagnetic radiation from human hands for a clue–without success [17-19]. As a result, this logic flaw in TCM continued to label TCM to an empirical technology–without a scientific theory and thus not a science–limping along by trials and errors.

RESULTS

Scientific theory of Chee

We first set forth the following seven postulates (which will become theorems after full validation):

1. Vitality of human body relies on adequate Chee continuously circulating and permeating throughout the entire body. Chee is a field vector containing four components: thermal (TH), mechanic (ME), electromagnetic (EM), and biochemical (BC). Each component may have local nonlinearity and chaotic characteristics, yet is essentially deterministic. The EM component is a Poynting vector power intensity [12] in the unit of Watt/m^2.
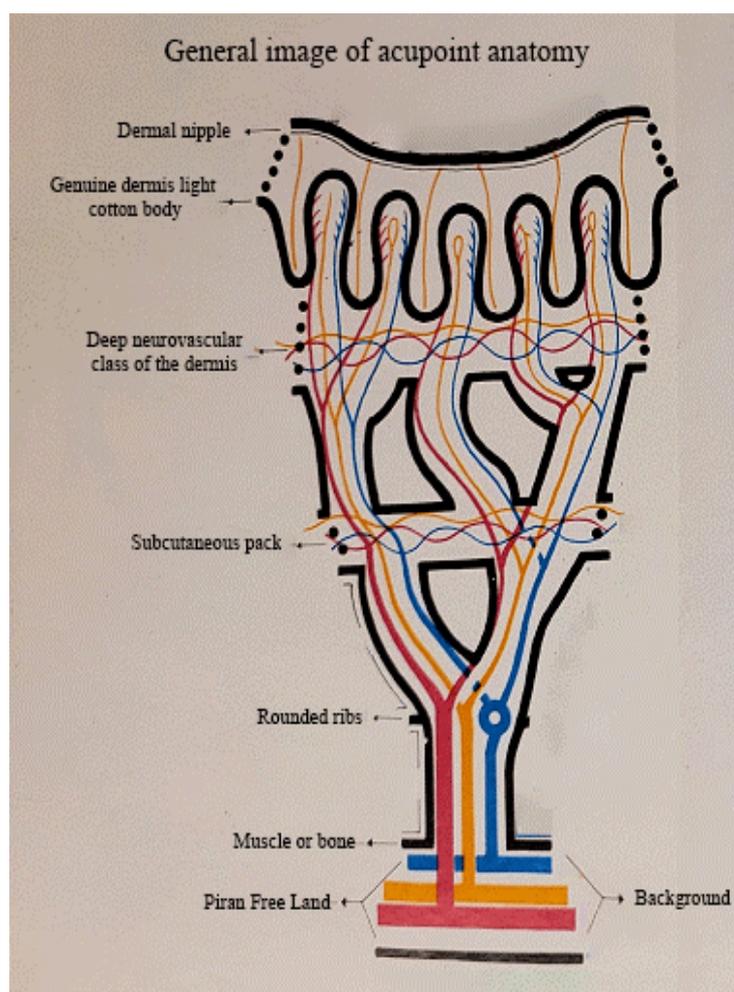
Figure 1: An anatomical illustration depicting the structural features of Shua. Note: (━━) artery; (⊙)Epidermic vein; (━━) Neural axon; (━━)Arteriole; (━━)Capillary vein; (━━)Terminal filaments (telodendria); (∿) channel for Shua; (••••)Epidermic interstice; (→) Nerve, blood vessel, epidermis, tendon

2. Interstitium constitutes the bulk of the pathways for Chee transport.

3. Major thoroughfares for Chee transport include Jīng Luò which has fourteen (14) main networks and eight (8) secondary networks (Figure 2 and Table 1).
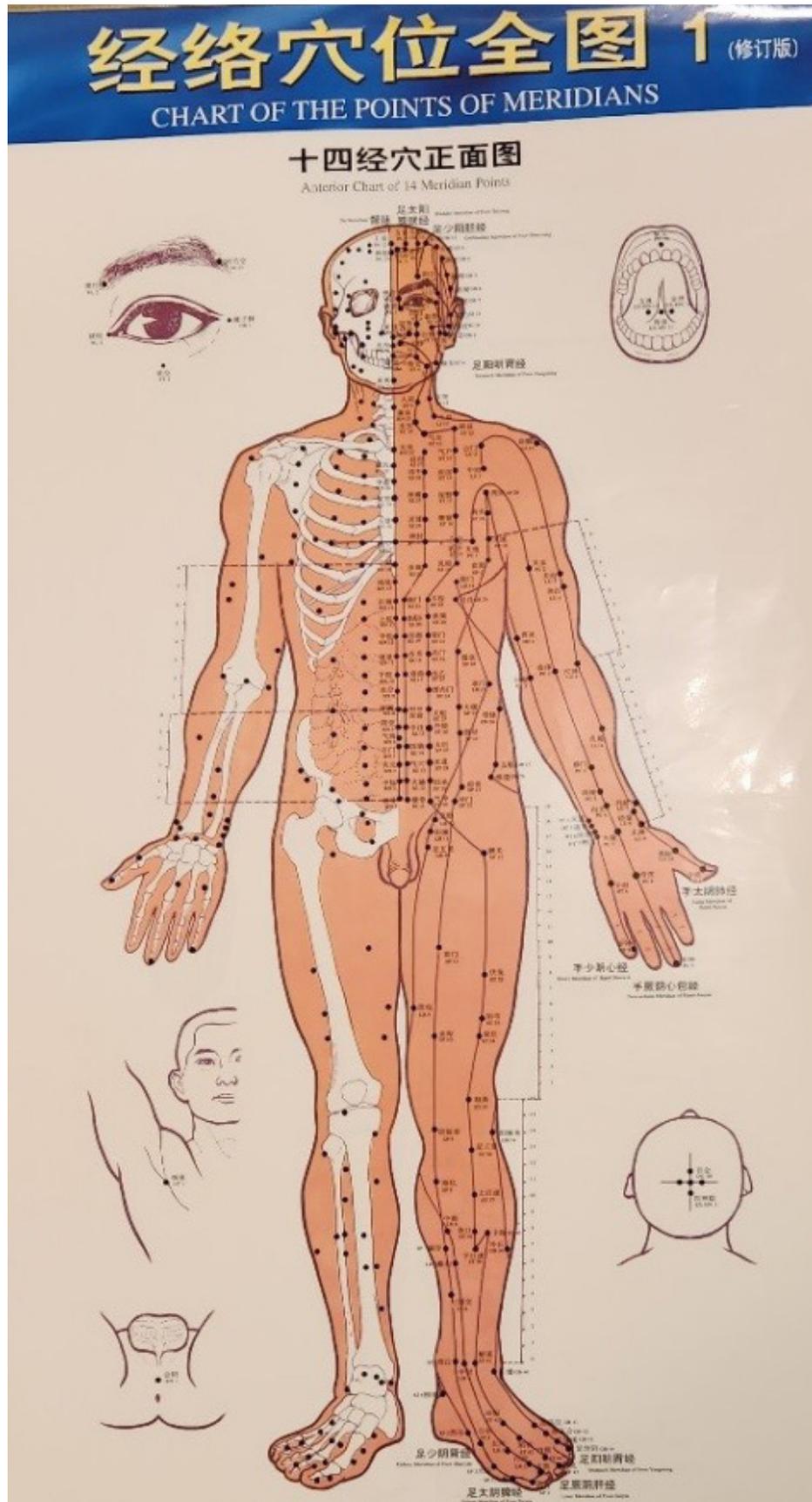
FIGURE 2: TRADITIONAL CHINESE MEDICINE'S (TCM) ENCOMPASSES A TOTAL OF FOURTEEN (14) PRIMARY NETWORKS (JING LUO).

**Table 1:** Traditional Chinese Medicine's (TCM) intricate system of meridians (Jing Luo) encompasses a total of fourteen (14) primary networks.

Stomach meridian of foot	Lung meridian of hand	Ren meridian	Gallbladder meridian of foot
Tear container (ST 1)	Central palace (LU 1)	Meeting of yin (RN 1)	Pupil crevice (GB 1)
Four whites (ST 2)	Cloud door (LU 2)	Curved bone (RN 2)	Hearing convergence (GB 2)
Great crevice (ST 3)	Heavenly residence (LU 3)	Middle pole (RN 3)	Upper gate (GB 3)
Earth granary (ST 4)	Guarding white (LU 4)	Gate of origin (RN 4)	Forehead fullness (GB 4)
Great reception (ST 5)	Cubit marsh (LU 5)	Stone gate (RN 5)	Hanging skull (GB 5)
Jaw bone (ST 6)	Maximum opening (LU 6)	Sea of qi (RN 6)	Suspended hair (GB 6)
Below the joint (ST 7)	Broken sequence (LU 7)	Yin intersection (RN 7)	Temporal hairline Curve (GB 7)
Head support (ST 8)	Channel canal (LU 8)	Spirit gateway (RN 8)	Leading valley (GB 8)
Man's welcome (ST 9)	Great abyss (LU 9)	Water separation (RN 9)	Celestial rushing (GB 9)
Water prominence (ST 10)	Fish border (LU 10)	Lower epigastrium (RN 10)	Floating white (GB 10)
Qi abode (ST 11)	Lesser metal (Lu 11)	Interior strengthening (RN 11)	Head portal yin (GB 11)
Empty basin (ST 12)	-	Middle epigastrium (RN 12)	Mastoid bone (GB 12)
Qi door (ST 13)	-	Upper epigastrium (RN 13)	Root spirit (GB 13)
Store room (ST 14)	-	Great palace (RN 14)	Yang white (GB 14)
Roof (ST 15)	-	Dove tail (RN 15)	Head overlooking tears (GB 15)
Breast window (ST 16)	-	Central palace (RN 16)	Eye window (GB 16)
Breast centre (ST 17)	-	Chest centre (RN 17)	Upright construction (GB 17)
Breast root (ST 18)	-	Jade hall (RN 18)	Spirit receiver (GB 18)
Not contained (ST 19)	-	Purple palace (RN 19)	Brain hollow (GB 19)
Assuming fullness (ST 20)	-	Floral canopy (RN 20)	Wind Pool (GB 20)
Beam gate (ST 21)	-	Jade pivot (RN 21)	Shoulder well (GB 21)
Pass gate (ST 22)	-	Celestial prominence (RN 22)	Armpit abyss (GB 22)
Supreme unity (ST 23)	-	Corner spring (RN 23)	Sinew seat (GB 23)
Slippery flesh gate (ST 24)	-	Container of fluids (RN 24)	Sun and moon (GB 24)
Celestial pivot (ST 25)	-	-	Capital gate (GB 25)
Outer mound (ST 26)	-	-	Girdle vessel (GB 26)
Big gigantic (ST 27)	-	-	Fifth pivot (GB 27)
Water passage (ST 28)	-	-	Linking path (GB 28)
Return (ST 29)	-	-	Squatting crevice (GB 29)
Penetrating qi (ST 30)	-	-	Jumping round (GB 30)
Thigh gate (ST 31)	-	-	Wind market (GB 31)
Crouching rabbit (ST 32)	-	-	Central river (GB 32)
Yin market (ST 33)	-	-	Knee yang gate (GB 33)
Beam mound (ST 34)	-	-	Yang hill spring (GB 34)
Calf's nose (ST 35)	-	-	Yang crossing (GB 35)
Leg three miles (ST 36)	-	-	Outer hill (GB 36)
Great upper hollow (ST 37)	-	-	Bright light (GB 37)
Narrow opening (ST 38)			Yang aid (GB 38)
Lower great hollow (ST 39)	-	-	Suspended bell (GB 39)
Abundant bulge (ST 40)	-	-	Hill ruins (GB 40)
Stream divide (ST 41)	-	-	Foot falling tears (GB 41)
Rushing yang (ST 42)	-	-	Earth fivefold convergence (GB 42)
Sunken valley (ST 43)	-	-	Clamped stream (GB 43)
Inner courtyard (ST 44)	-	-	Foot portal yin (GB 44)
Sick mouth (ST 45)	-	-	

4. There are over 2000 Shua's along the pathways and near epithelial and connective tissues, which regulate and optimize Chee under the top command of the brain.

5. Major Shua's have direct fast links to one another, to specific organs, and to specific parts of the brain.

6. There are super-Shua's that can generate a powerful signal that mimics distributions or generalized functions [21].

7. Each of the four components of Chee must all be adequate and continual, individually and collectively, in harmony like a symphony, for whole-body whole-life health. Diseases are due to obstructions in the pathways of Chee.

Macroscopic Field Equations for Chee

Under the seven postulates, we set up the general macroscopic problem of interest as follows. A live human body occupying a subspace H, which may be stimulated or explored by an applicator or instrument. The environments are: temperature between $1°C$ and $45°C$; atmospheric pressure 700–800 mm Hg; oxygen level 14–24%. The sources are either external or internal, denoted by J^E and J^I, where J^E is generated by applicator/instrument and J^I is by the human body. Chee in the field equations is denoted by the Greek alphabet χ. Thus, total Chee is denoted by $\chi^T(r, t)$, where r is the position vector for the location of the field and t is time [19], pp. 89-90, 453, 455. Total Chee, denoted by χ^T, contains electromagnetic (EM), mechanical (ME), thermal (TH), and biochemical (BC) components denoted by χ^{EM}, χ^{ME}, χ^{TH}, χ^{CH}, respectively. χ^T is a function, denoted by T, given by

$$\chi^T(r, t) = T[\chi^{EM}(r, t), \chi^{ME}(r, t), \chi^{TH}(r, t), \chi^{BC}(r, t)] \qquad (1)$$

Note that each χ in Eq. (1) is in the time domain thus italicized. Numerical solution of vector field equations in the time domain is generally difficult and costly, thus often performed in the frequency domain. By Fourier Transform (FT), Eq. (1) can be transformed to the frequency domain as

$$\chi^T(r, \omega) = T[\chi^{EM}(r, \omega), \chi^{ME}(r, \omega), \chi^{TH}(r, t), \chi^{CH}(r, \omega)] \qquad (2)$$

where $\omega=2\pi f$, and f is the frequency. In Eq. (2), each χ is in the frequency domain thus not italicized. For further details, one can look into Reference 10.

DISCUSSION

Remarks on Chee and the Field Equations

EM, ME, TH, and CH components of Chee are well understood and clearly defined parameters outside human tissues, but must be carefully dealt with inside human tissues, particularly for χ^{EM} and χ^{BC}.

For χ^{EM}, fields can be generated by either J^E or J^I, or both. For fields generated by J^I, χ^{EM} predominates as nerve impulses, which manifest slow speeds <100 m/sec [22], p. 195. Meanwhile, these nerve impulses could take off as EM waves when nearing nonaquatic regions—even within subspace H—and propagate at the speed of light in the medium. The speeds of χ^{ME}, χ^{TH} and χ^{BC} are slower than that of χ^{EM}.

Biochemical component χ^{BC} in the time domain is complicated, yet χ^{BC} in the frequency domain is straightforward. For example, hemoglobin in motion is a part of χ^{BC} having not only the primary function of iron-containing oxygen-transport but also several other functions such as antioxidant, regulator of iron

metabolism, etc. For χ^{BC} please note that each complete blood circulation takes about 60 seconds—with peak speed about 20 cm/sec (in large arteries) and low speed down to 0.5 mm/sec (in the capillaries). Consequently, holding breath (stopping fresh Chee) over 2 minutes is impossible for most people.

Formulation of the field equations can take either a differential equation approach or an integral equation approach. The former is simple, thus preferred for formulations in acupuncture, reflexology, chiropractic, physical therapy, etc. The latter is complicated but preferred for hyperthermia therapy, precision diagnostic instruments, etc. that require high accuracy. Under EM stimulation, each Shua becomes a source of Chee. The problem can be formulated as a network, generally a set of differential equations or even algebraic equations. Chee χ^{TH} is subject to laws of thermodynamics thus the simplest formalism. Chee χ^{ME} is governed by Newtonian physics, for which the mathematics needed is vectoral differential and integral calculus, which was well developed around 1920. χ^{EM} is governed by macroscopic electromagnetic theory extensively covered by Stratton [12], which is highly complex yet can be presented in vectoral differential and integral tensor (dyadic) calculus and is well developed.

χ^{BC} is highly complex, thus discussed here in some details [22]. Chee comes to the human body as the air full of oxygen, and is inhaled into the lungs by external respiration. The lungs then absorb the oxygen molecules O_2 into the blood stream via internal respiration, in which O_2 becomes loosely combined with hemoglobin chemically into an oxyhemoglobin state. The blood circulation system, pumped by the heart, carries oxyhemoglobin (Chee's new state) to supply the entire human body for cellular metabolism using energy in the form of glucose—the second chemical component of Chee—in the blood stream supplied by the digestive system from the foods. Therefore, χ^{BC} consists of hormones, electrolytes, minerals, etc. for other functions. Cellular metabolism (respiration) is an oxidation reaction that combines glucose ($C_6H_{12}O_6$) and oxygen O_2 to generate energy, given by Eq. 3 below:

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ATP + energy \qquad (3)$$
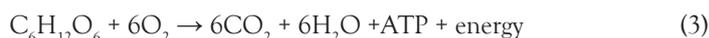
where CO_2, water, and another energy in the form of ATP (adenosine triphosphate) are also generated in the reaction. CO_2 generated in the reaction of Eq. 3 then enters the blood plasma, where it slowly forms carbonic acid, which dissociates into HCO_3^- and H^+. This would lead to the generation of hydrogen-ion in the reaction given by Eq. (4) below:

$$CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow HCO_3^- + H^+ \qquad (4)$$
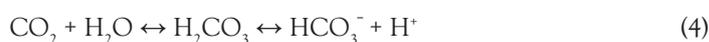
As the hydrogen-ion in the blood stream increases, respiratory system is stimulated to remove more CO_2. And the kidneys can also excrete excess acids or alkalis to maintain the normal pH of the blood; thus CO_2 is an important and convenient health indicator.

The oxygen/carbon-dioxide transport function is also intervened with the lymphatic system, which serves the function of internal defense, in the so-called Reticulo-Endothelial system (R-E system). The lymphatic system is a one-way, or collecting, system into which the tissue fluid between the cells is drained. Within the lymphatic vessels, the fluid is called lymph. As a milky fluid the lymph contains a low count of granular leukocytes and some lymphocytes, etc. The larger lymphatic vessels eventually drain into veins and thus the lymph is distributed by the arterial system. Lymphatic capillaries, the smallest vessels of the system, drain tissue fluid from extracellular spaces. The lymph below the diaphragm unites

in a collecting center in the abdomen, the cisterna chyli. Similar collections derive from the head and upper torso.

Measurement and instrumentation

Conventional TCM applicators include acupuncture needles and wooden fingers for manipulation of Jīng Luò and Shua's. There are also some electronic devices on the market that measure or stimulate Chee and Jīng Luò, or both. These are simple Chee meters or applicators; some of them have both functions. There are some applicators in other fields that are suitable for STCM. For example, equipment for physical therapies such as massage can generate mechanical waves with frequencies ranging from drum beat to ultrasonic. Acupuncture needles used in TCM will be replaced by noninvasive and noncontact EM phased arrays in STCM. This phased array is based on three technologies: (1) Stealth Communication (SC) for 5G/6G Wireless to ensure spectral efficiency and privacy/cybersecurity [24-25], (2) Ultra-wideband (UWB) Travelling Wave Array Antenna (TWAA) technology [26], and (3) Computation and measurement for planar near-field intensity. The second technology UWB TWAA, covering 2-12 GHz and scanning 60º off broadside was published in 2016 and needs to be scaled up to higher mmWave frequency bands, which is being developed at WEO [24] by leveraging similar efforts in the cellphone industry that is moving up to 28-95 GHz for 5G and 100-3000 GHz for 6G. At these high frequencies, the size of the applicators will be greatly reduced to fit smartphones. The computation and measurement of planar near-field intensity is based on the theory of plane-wave spectrum (PWS) representation of fields, which was refined in mid-1980s [27].

Empirical validations and discoveries

Analyses on secondary data and exploratory experiments on many illnesses have been conducted. The top two categories in priority are discussed here.

Allergy and infectious diseases: According to the theory of Chee, maintaining adequate Chee can keep a human body free from allergies and infectious diseases. TCM has a wide range of measures in treating infectious diseases—both acute and chronic—documented extensively over past 20 centuries. TCM treatments on infectious diseases during 1950-1990 were well discussed [15,28]. A clinic in Korea that it has successfully treated 160,000 cases of chronical respiratory illnesses over four decades [29]. (The pill is made from several TCM herb medicines.) This pill appears to be promising in treating mild and moderate cases of COVID-19 and its variants. Recently treatments on COVID-19 based on TCM were also reported [30].

Allergies often manifest tissue inflammation and excretion of fluidal histamine—both acute and chronic—and are closely related with infectious diseases. Skin allergy is often a manifestation of diseases of the organs—lungs, heart, kidney, liver, etc. [31]. Three members of our STCM team had chronic allergic rhinitis at the age of teens, late twenties, and late forties, were cured by professional master Chee experts [31]. The cures were permanent after several visits to the Chee master with no direct physical contact. Similar discussions and claims on healing allergic rhinitis in the two books by Hongchi Xiao [32].

Diseases of the nervous system: A wide range of diseases in human nervous system and their treatment by acupuncture and herb medicine were discussed in TCM records and are being practiced today. Some Shua's are super-Shua's that can generate strong or special signals as distribution or generalized function. Thus, tests exploring psychic abilities and the feasibility to deliver messages via super-Shua are investigated. This may, for example, lead to solution for the treatment of brain diseases caused by degeneration and death of its neurons in the brain, particularly chronic pains, Parkinson's disease (PD), Alzheimer's disease (AD), and depression. At this point it is worthwhile to point out that chemical treatment alone may not meet STCM's postulate (theorem) #7 that "Each of the four components of Chee must all be adequate and continual, individually and collectively, in harmony like a symphony, for whole-body whole-life health."

METHODS

As discussed earlier, the scientific theory of Chee for TCM and its field equations were developed by following the approach taken by Albert Einstein in creating the special theory of relativity published in 1905. Einstein's theory resolved the incompatibility between Newtonian mechanics and Maxwell's electromagnetics, and produced the famous equation between mass and energy, $E=mc^2$, where c is the speed of light. However, for fifteen years after his paper remained in controversy. Einstein responded by writing a book to, in his own words, "explain the theory in simple words that anyone with the equivalent of a high school education can understand" [13]. More supporting details can be found in Einstein's biography by Clark [14]. Indeed, many experiments and analyses had been conducted by others. These historical facts are briefly summarized to compare the scientific theory of Chee with the special theory of relativity and Stratton's electromagnetics, and to illustrate their similarities as well as their differences in Table 2.

Table 2: Comparison between the special theory of relativity, Stratton's electromagnetics, and scientific theory of Chee.

Theory	Year publish.	Physical Parameters	Propagation medium	Empirical data supporting postulates	Theoretic works by others with same or similar results	Year of full validation
Special Relativity	1905	t, r, v, a, m, E, P	Aether (rejected 1905)	1881-1887 (Michelson, Morley, Voigt...)	1886-1905 (Lorentz, Voigt, Larmor, Wien, Poincare, Fermi...)	1930
Stratton's EM	1941	t, E, D, M, H, J	ε, μ (1872-1882)	1881-1938 (Michelson, Morley...)	1804-1939 (Young, Fresnel, Maxwell, Heaviside, Lorentz...)	1942
Scientific Chee theory	2021	$t, r, \chi^{EM}, \chi^{ME}, \chi^{TH}, \chi^{BC}$	Interstitium (1984-2018)	4700 BC to 2022	None—to the best of the author's knowledge.	2026 Expected

It is worth noting that the special theory of relativity is based on two postulates: (1) The laws of physics are invariant in all inertial frames of reference; (2) The speed of light in vacuum is a constant for all observers regardless of the motion of light source or observer. Since Michelson and Morley experiment for postulate 2 was conducted in 1881, and Lorentz contributed to postulate 1 since1886, both Einstein and Clark stated that Einstein was not the sole creator of the special theory of relativity.

In comparison, in the seven postulates of the scientific theory of Chee, number (2), (4), (6), (7) are based on modern science. Under the support of the author's organization, weo.com, efforts to perform external validation are being pursued from three US universities within WEO's internal resources. If ongoing efforts in seeking external financial resources can be secured in 2023, full validation of the scientific theory of Chee in 2026 is expected.

A heuristic approach

I speculate that the conceptual theory of Chee created 47 centuries ago in China must have been inspired by observing other biological systems such as a tribe, a village, a city, or a country. The primitive thinkers probably noted that human vitality was similar to societal vitality. What they overlooked was a fundamental difference between their physical structures. Specifically, a village is sparsely distributed with humans—in which a human is equivalent to a cell—while the human body is tightly packed with biological tissues made of cells. Thus, while the sparse Jīng Luò are adequate for a village, they are too sparse for a human body to permeate Chee fully. This approach is heuristic, yet it can be formulated rigorously in a fashion similar to the well-established principle of model scaling in engineering EM, ME, and TH. The theory for model scaling for antennas and other devices was developed by Sinclair [34], and has been extensively employed by numerous engineers, including this author.

CONCLUSION

This paper reports updated and refined results on the theory of Chee and its validation, instrumentation, and clinical issues. It is shown that the Chee theory reveals significant new, synthetic, and macroscopic concepts and visions shedding light on human physiology, medicine, and healthcare. Translational research on a broad spectrum of applications on STCM and other CAMs has been successful. However, research conducted so far is essentially internal research. For the seven postulates to become theorems in the theory of Chee, independent evaluations are needed for the theory. STCM procedures need to be verified one by one.

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