
Editorial

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Biographical notes: Chang Lin Zhang is a Former Professor of Biophysics of Zhejiang University in China and now Visiting Professor in the University of Siegen in Germany. Since 1991, he has been working in the scientific background of acupuncture, music therapy, homeopathy, etc. He found that there is a dynamic dissipative structure of electromagnetic field in living systems, which could be some common background of many holistic medicines and a new chapter of physiology. Meanwhile, he also develops a mathematical method to understand and to evaluate the degree of coherence in living systems.

Hartmut Kapteina is a Professor for Music Education and Therapy in the University of Siegen (Germany) since 1972. He developed several music therapeutic programs for patients, who suffer from different psychic diseases. His research efforts concentrate on the efficiency of treatment with music, the symbolic functions of music instruments and the bio-psycho-social influence of sound and music on human being.

Quan Min Zhu is a Professor in Control Systems at the Faculty of Computing, Engineering and Mathematical Sciences (CEMS), University of the West of England (UWE), Bristol, UK. He had his higher education both in China and the UK and received his PhD in Faculty of Engineering, University of Warwick, UK in 1989. His main research interest is in the area of non-linear system modelling, identification and control. Recently, he started investigating electro-dynamics of acupuncture points and sensory stimulation effects in human body, modelling of human meridian systems and building up electro-acupuncture instruments. He has published over 100 papers on these topics. Currently, he is Acting as the Associate Editor of *International Journal of Systems Science* and the Editor (and founder) of *International Journal of Modelling, Identification and Control*.

Kevin Warwick is a Professor of Cybernetics at the University of Reading, England, where he carries out research in artificial intelligence, control, robotics and biomedical engineering.

He is also Director of the University KTP Centre, which links the University with Small to Medium Enterprises and raises over £2Million each year as research income for the University. He took his first degree at Aston University, followed by a PhD and a research post at Imperial College. He subsequently held positions at Oxford, Newcastle and Warwick Universities before being offered the Chair at Reading. He has been awarded higher doctorates (DScs) both by Imperial College and the Czech Academy of Sciences. He was presented with The Future of Health Technology Award from MIT (USA), was made an Honorary Member of the Academy of Sciences, St. Petersburg and received the IEE Achievement Medal in 2004. In 2000, he presented the Royal Institution Christmas Lectures.

Physiotherapy includes all medical treatments without the involvement of chemical compounds, such as sport, dance, walk, music therapy, acupuncture therapy, soft laser therapy, soft microwave therapy, electric pulse therapy, massage, foot bath, meditation, etc. and even homoeopathy.

The theoretical basis of the conventional school of medicine at the present time is mainly based on biochemistry, or more precisely, the particle pattern of the substantial part of the human body. Therefore, it appears sensible to find the mechanism to guide the development of chemotherapies, chemical remedies and many related analytic medical instruments. However, the particle pattern is not sufficient to guide the development of physiotherapeutic techniques and related instruments, without understanding the wave and field pattern of the human body.

Compared to a thorough understanding of the particle pattern or the chemical aspect of the human body, an understanding of the field aspect and the wave pattern of the human body is still very weak. For instance with acupuncture, this ancient Chinese medical therapy is now widely used and accepted by patients all over the world. However the mechanism of this ancient technique and its theory, namely meridian systems, is still a big challenge to modern science. Similar situations also exist in understanding of mechanism of the charkas systems in the Indian medicine and of homoeopathy, the strange German therapeutic method.

In the last 60 years, many scientists in several countries in China, Europe and USA have made big endeavours to study the mechanism of these ancient physiotherapeutic techniques. Much experimental work has been done and dozens of theories, hypotheses or models have been put forward. For instance, in the area of acupuncture, there are well known hypotheses of nerve-reflex theory, gate-control theory of pain, neurohormonal theory, electric conductance theory, morphogenetic singularity theory, singular points in bioelectric field, low hydrolic resistance channel theory, microwave channel theory, electrochemical theory, the third balance system theory and so on. Similarly there have been many other theories, hypotheses or models for the mechanism of homoeopathy, charkas, sports medicine and music therapy.

We believe that the series of works in this Special Issue provide a useful reference for understanding the mechanism of physiotherapies scientifically and evaluating their effectiveness and efficiency quantitatively. In total,

13 papers have been selected to reflect the thematic vision. The contents of these studies are briefly described as follows.

In the paper, 'Brief history of modern scientific research into acupuncture systems: a path from static anatomic structure of particles to dynamic dissipative structure of electromagnetic field', C. Zhang briefly introduces how the invisible structure, which is in some extent corresponding to the mysterious ancient Chinese acupuncture meridian systems, was found through the accumulation of the endeavours of many scientists all over the world in the last 60 years.

In the paper, 'Background of electronic measurement on skin', C. Zhang briefly presents some important experimental results in this period in order to show that the so called 'skin resistance' which has been widely used in the electronic measurement is actually the measurement of 'body conductivity', which is proportional to the strength of electromagnetic field inside the body. And the heterogeneous distribution of the strength of electromagnetic field comes from the superposition of electromagnetic standing waves in the body. In other words, there is an interference pattern, or dynamic dissipative structure of electromagnetic field inside the body to determine the distribution of the strength of electromagnetic field. This pattern is reflected as body conductivity and therefore can be measured electronically.

In the paper 'A fuzzy approach to overcome electroacupuncture accommodation', Q.M. Zhu, X.W. Sun and A.G. Pipe present how to use Fuzzy Decision-Making mechanism to process imprecise and linguistic characteristics of ElectroAcupuncture Accommodation Overcoming knowledge, therefore efficiently regulate pulse amplitude and width in forming the stimulating control.

In the paper, 'Mathematical, physical and physiological backgrounds of normal distribution, delta distribution and log-normal distribution', Changlin Zhang presents a practical way to evaluate the state of complex system based on the coupling relationship between elements in a system. If the elements are oscillators of electromagnetic waves, the state of the system can be electronically measured and quantitatively calculated and then expressed in a simplified Hilbert space. This method has been successfully used to evaluate the effectiveness of music therapy, sleep quality, meditation, acupuncture operation, etc. and some related experimental papers are included in this issue.

In the paper, 'Music therapy in the viewpoint of biophysics', Hartmut Kapteina and Changlin Zhang discuss the relationship between the acoustic waves in music and the electromagnetic waves in human body. Electronic measurement and statistical mathematics are introduced into the research of music therapy in order to see the effectiveness of music therapy and its ability of regaining coherence for patients.

In the paper, 'Ultraweak photon emission of *Psilocybe cubensis* mycelium tissue: comparison of tissue treated with acoustic waves and non-treated tissue', Herbert Klima, Ivan Lucić and K.W. Kratky prove the relationship between the acoustic wave on living system and the photon emission of the living system. The result clearly shows the relationship and the interaction between the acoustic wave and electromagnetic wave in living systems.

In the paper, 'Suppressive influence of periodic and chaotic laser light on cancer cells', C.M. Kacher, H. Klima and K.W. Kratky further prove that the electromagnetic wave with periodic modulation in the sound frequency makes the laser therapy more effective.

In the papers, 'Mirror-log-normal distribution of body conductivity during night-time sleeping' and 'Frequency representation of the body alive: order of the moving body-in-process', Peter Weinberg and Christof Ziaja present their astonishing experimental results in the research area of sport medicine and sleep quality, using the methods of electronic measurement and statistical mathematics.

In the papers, 'Instrumental measurement of the degree of relaxation with meditation', 'Quantitative measurement on the degree of relaxation induced by acupuncture operation' and 'Quantitative measurement on the effect of various manipulations of acupuncture operations', Hong-Zhen He, Yi-Bing Pan, Ying Li and Jian-Ping Chu conduct a series of experiments to objectively and quantitatively evaluate the effectiveness of meditation and acupuncture operation.

Overall we feel that these papers cover quite a spectrum of what is a novel and yet highly important research field. Whilst they can by no means be regarded as describing a well researched field in its entirety, they give a clear indication of the present state of play and point to exciting opportunities for future research programmes and investigations in the years ahead.