

Toward a Conceptual Framework for Complementary and Alternative Medicine: Challenges and Issues

Marcia Lei Zeng*, Fredi Kronenberg**, Pat Molholt***

*School of Library and Information Science, Kent State University

**The Richard and Hinda Rosenthal Center for Complementary & Alternative
Medicine, Columbia University, College of Physicians & Surgeons

***Office of Scholarly Resources, Columbia University Health Sciences

Marcia Lei Zeng is Associate Professor of Library and Information Sciences at Kent State University. She holds a Ph.D. from the School of Information Sciences at the University of Pittsburgh. Her major research interests include knowledge organization and representation, multilingual information processing and retrieval, electronic publishing, indexing and abstracting, and database quality control. Dr. Zeng's scholarly publications include over 50 papers and two books, in addition to many national and international conference presentations. Currently, she serves as a standing committee member of the Section on Classification and Indexing at the International Federation of Library Associations and Institutions (IFLA), and Chair of the Technical Standard Committee of the Special Libraries Association (SLA).



Fredi Kronenberg is an Associate Professor of Clinical Physiology, and is Director of the NIH-funded Center for Complementary and Alternative Medicine Research in Aging and Women's Health, and the Richard and Hinda Rosenthal Center for Complementary & Alternative Medicine at the College of Physicians and Surgeons of Columbia University. Dr. Kronenberg received her B.S. from Cornell University in neurobiology and behavior and her doctorate from Stanford University in physiology and behavior. Dr. Kronenberg is a physiologist with expertise in women's health, with a focus on menopause. Her research includes studies of the physiology of hot flashes, as well as an examination of alternative treatments for menopausal problems. She is the author of scientific and popular articles, and speaks widely across the country and abroad, as an internationally recognized expert in women's health and alternative medicine. Dr. Kronenberg was a co-founder of the North American Menopause Society. She is on the editorial board of the journal *Menopause*, and *Alternative Therapies in Women's Health*, a newsletter for clinicians. And, she was a founding editor of the *Journal of Alternative and Complementary Medicine: Research on Paradigm, Practice, and Policy*.



Pat Molholt is Associate Vice President and Associate Dean for Scholarly Resources with Columbia University Health Sciences. She has responsibility for the Health Sciences Library, the Center for Academic Information Technology, and the Center for Education Research and Evaluation. She received her Ph.D. from Rensselaer Polytechnic Institute in 1996 and has a Masters in Information Science from the University of Wisconsin – Madison. She was the co-founder and co-director of the *Art and Architecture Thesaurus*, published by Oxford University Press. The focus of her current work is the development of an electronic curriculum to supplement and augment the classroom experiences of medical and dental students at Columbia University.



Zeng, M.L., Kronenberg, F., Molholt, P. (2001). **Toward a Conceptual Framework for Complementary and Alternative Medicine: Challenges and Issues.** *Knowledge Organization*, 28(1). 27-40. 17 refs.

ABSTRACT: A problem facing information retrieval and exchange among international medical practitioners and researchers is the lack of a knowledge structure or conceptual framework that relates concepts used in the Western medical system to those used in non-Western medical systems. This paper presents challenges we have encountered in attempting to develop a general conceptual framework to cover concepts and terminology used for information retrieval in the field of complementary and alternative medicine. This is a broad field that has not been covered appropriately in knowledge organization systems such as classification schemes, thesauri, and terminology databases. The objective of the project is to improve significantly the efficiency and the quality of cross-language and cross-cultural information exchange and knowledge discovery by facilitating concept mapping and information retrieval between Western and Eastern medical traditions. Major facets of the conceptual framework include *Diagnostic Categories, Therapeutic Preparations, Human Anatomy, Selected Diseases/Medical Conditions, and Basics of Traditional Systems*. The paper discusses issues of subject coverage, the representation of medical concepts in the conceptual framework, incorporation of concept names that have existed in individual traditional systems, and the relationships among concepts. Findings reported are primarily from current work that focuses on Traditional Chinese Medicine.

I. Introduction

Over the past several years, we have been working to develop a digital library in the diverse field known in the United States as complementary and alternative medicine (hereafter CAM). Electronic databases in CAM areas have proven to be the most valuable and informative literature resources. They have grown quickly during the last decade, along with interests in CAM from many communities: researchers, medical professionals, healthcare providers, patients, government, industry, and insurance providers. Large-scale CAM databases have become available through dedicated online services or CD-ROMs, including the following:

- databases for individual traditional medicine systems, for example,
 - *TCMLARS (Traditional Chinese Medicine Literature Analysis and Retrieval System)*, China Academy of Traditional Medicine, China,
 - *Database on Clinically Important Plants in Ayurveda (DBCIP)*, Foundation for Revitalisation of Local Health Traditions, India,
 - *TradiMed (Traditional Oriental Medicine Database)*, Natural Products Research Institute, Seoul National University, Korea;
- databases focusing on particular therapies or therapeutic preparations, for example,
 - *NAPRALERT (NATURAL PRODUCTS RESEARCH ALERT)*, University of Illinois, Chicago,
 - *ACUBASE (Bibliographic Acupuncture Database)*, University of Medicine of Montpellier, France,
 - *Medicinal Plant Database of Papua New Guinea (PNG MedPlADB)*, Wau Ecology Institute, Papua New Guinea Herbal Medicine Society, Japan;

- database covering broad CAM areas, to date there is only one:
 - *AMED (Allied and Complementary Medicine Database)*, The British Library Health Care Information Service, UK.

Yet the access to, and utilization of, these resources have been very limited because of many barriers, most notably language and terminology. There has been little communication among database producers regarding terminology. Although monolingual thesauri, classification schemes, dictionaries, and other terminology tools have been established and used for these database products, there has been no systematic exploration and representation of these individual systems/schemes under one umbrella.

One must understand that even though Western and Eastern medical systems can heal the same body, the perception of the two major traditions reflects two different worlds. Western researchers unfamiliar with the concepts and practices of various traditional systems of medicine will have difficulty even knowing what terms to use to retrieve the information they want. The concepts and categorizations of disease stated in Western medicine often have no obvious parallels or similar terminology in other traditions, where different concepts of illness and imbalance exist. This situation exists between Western and traditional medicine systems, as well as among various cultures and traditional systems. In the process of developing the digital library for CAM, we found there was no conceptual framework or compatible terminology that could be used, either nationally or internationally, for CAM information retrieval and knowledge exchange.

To address this problem, we have initiated the development of one of the essential and logical components of this digital library, namely a conceptual framework. This framework will be expressed

through a terminology repository that supports the foundation of the digital library. The framework is critical to the effective integration of CAM information within a digital library. Our objective is to improve significantly the efficiency and quality of cross-language and cross-cultural information exchange and knowledge discovery by facilitating concept mapping and information retrieval between Western and non-Western medical traditions.

This paper reports the preliminary findings of our efforts to date. It is the purpose of the authors to share these findings with others in order to search for appropriate solutions to the challenges stated in Section V of this paper.

II. Basic principles for the research design

In the United States, CAM is described as a group of disparate practices including entire complex traditional health care systems, e.g., Chinese (Traditional Chinese Medicine, or TCM), East Indian (Ayurveda), and Native American; their components practiced as distinct complementary entities, e.g., medicinal herbs, acupuncture, dietary principles, manual therapy, and spiritual practices; and also a wide variety of difficult-to-categorize discrete modalities and products. In literature, clinical practice, and regulatory control, there is no clear definition of what is or is not considered CAM. What is under or outside of the umbrella in the U.S. has already changed over the past 10 years, and continues to change as what was once considered CAM enters the biomedical mainstream.

Of course, the view is different from country to country, as what is “conventional” versus what is outside of the mainstream depends on the unique history of each nation. In some Asian countries, the “traditional” system of medicine may be mainstream, may exist in parallel with Western allopathic medicine, or may itself be subordinate to a more dominant allopathic medicine. In India, there are multiple traditional systems of medicine, currently existing along with Western allopathic medicine. In France and the U.K., acupuncture is more common than it is in the US. In Germany, herbal medicine is an integral part of the health care system. Even in the U.S., the criteria by which something is judged to have moved from “alternative” to “mainstream” may differ from state to state; acupuncture, for example is covered by health insurance, taught in medical schools, and licensed in some states. The conceptual framework to be developed through this project attempts to cover these

various systems, regardless of the historical, political and social standings that they may occupy in different countries.

To develop a conceptual framework that covers these systems and practices requires careful design and an appropriate strategy. Regardless of what becomes accepted in the U.S. and other Western countries, the concepts, theories, diagnostic and therapeutic aspects of other systems of medicine are dramatically different from Western views of medicine. This requires that we establish basic principles for the proposed conceptual framework in order to make the information more readily accessible to a broader audience. The guiding principles we are using are the following:

- (1) Relatively independent, multiple systems under one umbrella structure, rather than a unified standardized structure. A universal system that tries to cover all human knowledge invariably has limitations. Classification schemes and their categories, divisions, and subdivisions are based on social consensus about knowledge. Yet consensus itself differs from one society to another, one historical period to another, as well as by discipline. Given this social basis of classification, it becomes difficult to create a universal classification system that is free of nationalistic or ideological biases. For example, in our case, although Korean medicine and Japanese Kampo medicine both originated from Chinese medicine and systematically adopted the Chinese medicine system as early as the 6th century, they have developed their own philosophies and systems throughout the centuries (Soulié de Morant, 1994). In interpreting traditional medical systems, our conceptual framework follows the principle of preserving relatively independent systems under one umbrella structure. We have designated a special facet or subdivision in the framework for this purpose. It is called *Basics of Traditional Systems*.
- (2) Focused coverage rather than complete coverage. The conceptual framework takes into account the use of the concept as found in publications (i.e. literary warrant) and how users employ the concept (i.e. user warrant) in selecting the foci to be covered by this project. In other words, we want to cover well-documented systems and modalities first. Foci will be on the areas that are used by a large number of people (in the United States, China, and other countries) and are already better accepted by the practitioners and patients in the United States and other Western countries. These

communities have expressed a great need for information exchange. Because many concepts and categories in Western medicine often have no obvious parallels or comparable terminology in other traditions, we have chosen to focus on the areas in which a general framework can be applied. Those areas are *Diagnostic Categories*, *Therapeutic Preparations*, *Human Anatomy*, and *Selected Diseases/Medical Conditions*. They form the backbone for this conceptual framework.

- (3) General framework rather than highly specific framework. In order to ensure compatibility, extensibility, and flexibility of the resource, we want to keep the framework general. Specificity will be introduced through the addition of terminology and entry vocabulary.
- (4) Common and accepted representation scheme whenever possible. To explain the terms and concepts of each in the language of the other will require us to find or develop correlations between East Asian medical models and Western medical systems.

III. Methodology

Although our long-term goal is to include a number of well-established CAM systems and modalities in the digital library, the current project focuses on CAM systems in East Asia that have established scientific research records and that have broad impact on human healthcare. Traditional Chinese Medicine (hereafter TCM) has a long history and wide influence. It is the root of subsequently developed Traditional Korean Medicine and Japanese Kampo Medicine. In addition, there are interrelated influences between TCM and Tibetan Medicine and Ayurveda from India. For these reasons, we have decided to begin with Traditional Chinese Medicine.

The following outline summarizes our overall research design and illustrates our approach to accomplishing our goals:

Our first task is to generate a conceptual framework. Using the available reference tools such as classification schemes and thesauri in the medical sciences, we have started to construct the framework for the major facets of *Diagnostic Categories*, *Therapeutic Preparations*, *Human Anatomy*, *Selected Diseases/Medical Conditions*, and *Basics of Traditional Systems*. Currently, our major attention is on TCM, with some attention to that of Korean and Japanese Medicine.

A second task includes assigning identification numbers to the concepts and supplementing the conceptual framework with terms in Chinese and English. (Other languages will be included as the project continues). For each concept, we collect data including concept names (transliteration and translation in another language), definitions or scope notes, identification numbers of related concepts, synonyms, and parallel or comparable concept names and terms used in other traditional systems. We have made significant progress in collecting data on diseases and *materia medica*. A great number of reference sources have been used. (Please refer to the list of the sources at the end of the paper.)

Finally we must represent the conceptual framework in an appropriate structure. The conceptual framework is displayed by using various facets. Concept names and related terms included in the facets are displayed in hierarchies (such as medicinal herbs, see Appendix 1, and anatomy concepts, see Appendix 2), paradigms or matrixes (such as the *Zang-Fu* (脏腑) Theory, see Appendix 3), and some visual representations as needed (such as the relationship among the Five Elements, see Appendix 4). A number of knowledge organization systems have been studied and directly employed in the project. A discussion of these resources is offered in the next section.

IV. Resources studied and used in the project

Scholars in many fields, from philosophy to medicine, have long discussed the concept of knowledge and the problems of representing knowledge in information systems. There are direct relationships between knowledge representation as manifested in classification, and the process of knowledge discovery and creation (Kwasnik, 1999). In order to obtain a clear picture of what CAM-related knowledge organization systems are available and to avoid any redundant effort, we examined a number of knowledge organization systems/schemes. In general, the use of knowledge organization theories in recording, representing, and organizing medical knowledge can be examined from three aspects: classification of knowledge; classification of a particular collection; and integration of various tools/schemes.

A. Classification of knowledge

Classification of knowledge presupposes that a classification system can be created that encompasses all

knowledge. As we have discussed in Section II, CAM consists of disparate practices deemed alternative. At present, there is no universal classification for this material or even an accepted agreement on how to group the various CAM areas.

Within individual traditional medical systems, however, one can find systematically organized knowledge. For example, the *Neijing* (内经), sometimes known as *The Yellow Emperor's Inner Canon*, written around 100 B.C.E. or earlier, is the most important and influential Chinese medical text ever written. The book discusses physiology, pathology, and therapies, and contains the first organized approach to discussing diseases and disease patterns. At around 100 B.C.E., *Shen Nong Bencaojing* (神农本草经 *The Divine Husbandman's Classic of Materia Medica*, also known as *Shen Nung Pen Tsiao Ch'ing*) became available. Husbandman Shen Nong was thought to have lived around 2500 B.C.E. or earlier, and was renowned for his tasting and testing of herbs. He was considered the original author of the book. The book records 365 herbs and their curative properties, tastes, and energies. The herbs are categorized into three classes based on a macrocosmic concept of heaven, man, and earth. These include the upper, middle, and lower classes of herbs, which are then divided according to whether the "herb" originated from living materials (animal and plant) or from the earth (mineral). The contents of both books were carried on by later publications in printed form, which have been widely used as textbooks and major references in medical schools and hospitals in modern China, Korea, and Japan. Most of the written works on herbs created during the last five centuries are based on the growth, nature, and characteristics of herbs, namely, their pharmacognostic properties. The monumental work of Li Shizhen (李时珍 1518-1593) and his famous pharmacopoeia *Bencao Gangmu*, (本草纲目 *The Categorical Lists of Herbs and Plants*, also known as *Pen Ts'ao Kang-Mu*), is a typical example. It describes 1,892 herbs or agents and over 10,000 recorded formulations. Its methodology of classifying herbs and combinations of herbs has been widely used in education and training, as well as in practice, in the East Asian countries. Modern books on Chinese medicine tend to incorporate newer knowledge from Western medicine into the explanation of TCM. For example, in *The Pharmacology of Chinese Herbs*, Huang presents hundreds of herbs based on their therapeutic value, rather than on their pharmacological properties. In this work, herbs are listed under

various systems according to Western anatomy (Huang, 1993). This represents a popular approach in modern herbal medicine books, especially those published in English.

Library classification systems that attempt to represent universal knowledge usually adopt (or partially adopt) the classifications of knowledge into their schemes. For example, the current version of the *Chinese Libraries Classification (CLC)*, developed and maintained by the National Library of China, includes the TCM in the main class "R. Medical Science and Medicine." The sub-class "R2 Traditional Chinese Medicine" systematically presents TCM as a complete discipline, encompassing prevention, physiology, pathology, diagnosis, etc. This brings our attention to the question of whether there already existed well-established classification schemes or controlled vocabularies created for libraries, databases, or other types of collections that cover major CAM knowledge. (This will be discussed below).

B. Classification and controlled vocabulary of a particular collection

Classification and controlled vocabulary of a particular collection presumes that a system and vocabulary should only be devised for the information resources that are part of a particular collection. The *Library of Congress Classification (LCC)*, the *Library of Congress Subject Headings (LCSH)*, the *National Library of Medicine Classification* and the *Medical Subject Headings (MeSH)* are the best examples of such systems. For the purpose of managing medical information, *MeSH* has been translated into many languages and used by libraries and databases all over the world.

However, a common problem of these popular systems, including *MeSH*, is the lack of an adequate and dedicated terminology to deal with non-Western medicine due to their limited collections on CAM. In a preliminary study, Zeng (1996) compared *MeSH* (1990 edition) and four Chinese thesauri and classification schemes including: (1) a *MeSH*-based *Chinese Thesaurus for Medical Science* (1985 edition), (2) the *Military Medical Thesaurus* (1993 edition), (3) the class "R Medical Science and Medicine" in *CLC* (1988 edition), and (4) the *Subject Headings of Chinese Medicine* (1987 edition). The research revealed that a very limited number of terms for TCM were included in *MeSH*. Recently, we also examined a 1996 publication entitled *Traditional Chinese Medicine and Materia Medica Subject Headings (TCMSH)*. The total number of terms

in its major categories and the matching ones found in *MeSH* are summarized in the following figure:

<i>TCMSH</i> Notation	<i>TCMSH</i> Class Caption	# of terms included in <i>TCMSH</i>	# of Match- ing <i>MeSH</i> terms
TA	TCM anatomy	730	11
TB	<i>Materia medica</i>	1060	44
TC	TCM diseases and symptoms	1088	145
TD	TCM medicines and prescriptions	3150	269
TE	TCM diagnostics and therapeutics	867	18
TF	Mental disorders (TCM) and psychology	55	14
TG	Traditional Chinese Medicine and related sciences	280	79

Figure 1: Matching *MeSH* terms with the terms covered by Traditional Chinese Medicine and *Materia Medica* Subject Headings (*TCMSH*) in major categories.

The comparison indicates that *MeSH* has a very limited range of headings with which to represent the knowledge of TCM. This analysis, however, is complicated by the fact that the National Library of Medicine (NLM) has no commitment to include terminology for subjects it does not currently cover. Because much of the published CAM literature does not meet NLM's standards for inclusion into the collection, there is little hope, at this time, for a significant expansion of *MeSH* into the CAM world.

The National Center for Complementary and Alternative Medicine (NCCAM) started to provide a web-based *CAM Citation Index* database in the late 1990s. The index allows users to browse the database by preferred *MeSH* heading terms. The interface provides subject headings under three facets: Diseases (28 subject headings), Methods (13 subject headings) and Systems (9 subject headings). Users can select terms from these facets and search for their topic. Unfortunately, because it is based on the inadequate vocabulary of *MeSH* in the CAM fields, a separate, comprehensive vocabulary is needed.

As a matter of fact, there is one (and only one) thesaurus that is dedicated to the CAM field, the *AMED (Allied and Complementary Medicine Database) Thesaurus* published by The British Library Health Care Information Service. *AMED Thesaurus* has about 3,000 descriptors grouped into the following 14 categories:

- A Anatomical terms
- B Organisms
- C Diseases
- D Chemicals and drugs
- E Methods and equipment
- F Psychiatry and psychology
- G Biological sciences
- I Social sciences education and sociology
- J Technology industry agriculture food
- K Humanities
- L Information sciences
- M Population characteristics and named groups
- N Health care
- Z Geographicals

The coverage of *AMED Thesaurus* is based on the British Library's collection and, therefore, CAM knowledge and terminology covered by it is still limited. Overall, *AMED Thesaurus* represents a Western view of CAM knowledge as reported in current publications. It does not present a macro-structure for all of CAM knowledge.

There are specialized thesauri and classification schemes for particular CAM areas, but, they do not comprise a unified, multilingual (including English), and widely accepted controlled vocabulary. For example, the four systems studied by Zeng in 1996 and *TCMSH* are limited to Chinese medicine and are published in Chinese. Other independent vocabularies in Western languages are for specific areas such as acupuncture (e.g., the *ACUBASE Thesaurus of Acupuncture* of the University of Medicine of Montpellier, France, in French and English). There has been no effort to compare and merge these vocabularies in order to provide an authoritative resource for terminology currently in use.

With the growth of Internet resources, some locally developed classificatory structures have appeared on CAM-related websites. In her important article, "Internet Sources of Information on Alternative Medicine", Snow (1998) included the following sites in her four-star websites list: (1) *McMaster University's Health Information Resources - Alternative Medicine* (URL <http://www-hsl.mcmaster.ca/tomflem/altmed.html>) organizes Internet resources into categories beginning with general resources and continuing on to thirty specific alternative medical methods or systems; and (2) *Sympatico HealthyWay: Health Links - Alternative Medicine Directory* (URL <http://www1.sympatico.ca/healthyway/DIRECTORY/B1.html>) groups websites into 10 categories. Unfortunately, although the resources themselves are regarded

as being of good quality, the categorizations they use do not follow any consistent classification criteria. At the same hierarchical level, there are categories for traditional systems, like Ayurvedic medicine, as well as categories for particular methods, ranging from acupuncture to Kombucha tea. Therefore, they provide no systematic view of CAM knowledge. Their practices also highlight the need for an adequate knowledge organization system to organize the rich contents in CAM.

Being aware that there existed independent classification schemes and thesauri for various CAM databases and library collections, one immediate thought would be to merge or integrate these systems. As a result, we further studied integrated systems and tools.

C. Integration of various tools/schemes

One of the most important and successful projects for enhancing medical information exchange is the construction of the *UMLS (Unified Medical Language System)*, led by the National Library of Medicine. The *UMLS* team identified “the variety of vocabularies and classification systems used in different sources and by different users” as one of the two major barriers for effective retrieval and integration of information from various sources. *UMLS* consists of three “*UMLS Knowledge Sources*” in which a *Metathesaurus* is the core source. The *Metathesaurus* is a database containing semantic information about biomedical concepts, their various names, and the relationships among them. It is built from over 60 thesauri, classification systems, coding systems, and lists of controlled terms that have been developed and are maintained by many different organizations. Although the *Metathesaurus* has been expanding its coverage to include resources from several European and South American countries, and a variety of languages, it has not crossed the Pacific Ocean to reach Asian resources. *SNOMED[®] RT (Systematized Nomenclature of Medicine Reference Terminology)* is another effort addressing aspects of information sharing. With over 340,000 explicit relationships, *SNOMED[®] RT* intends to provide a common reference point for comparison and aggregation of data throughout the entire health care process. Again, however, both the Asian traditional medicine systems and the Asian languages stay in their isolated “island” of information in this global pool of medical information.

Other efforts at integrating vocabularies seek to avoid involving the significant human intellectual ef-

fort that is required by the *UMLS*. Technologically, this is possible. An NSF-supported project, “Mapping Entry Vocabulary to Unfamiliar Metadata Vocabularies,” has been conducted at the University of California, Berkeley in recent years. The product includes English language indexes to *BIOSIS Concept Codes*, *INSPEC Thesaurus*, *U.S. Patent and Trademark Office Patent Classification*, and the *Standard Industrial Classification (SIC)* codes, and a multilingual index (supporting queries in English, French, German, Russian, or Spanish) to the physical sciences sections of the *Library of Congress Classification*. When the Entry Vocabulary Module leads users to a promising term in the target metadata vocabulary, a search can be executed using the newly-found metadata against a remote database (Buckland et al., 1999). To date, there has been no report on the effectiveness of this tool for information retrieval.

In the last decade, development of ontological and lexical knowledge bases and databases has led to revolutionary approaches to knowledge representation. Several projects have built ontologies covering a large portion of common vocabulary. The *Cyc[®] Ontology Guide* provides a topical listing of approximately 3,000 concepts from the *Cyc[®] Knowledge Base* (Lenat, 1995). For each concept, it lists (1) its *Cyc[®]* name, (2) an English comment on the intended meaning and use of the concept, and (3) a few of the taxonomic “links” that *Cyc[®]* uses to order and interconnect its concepts hierarchically. Another example is *WordNet*, a lexical database for English, at Princeton University. It provides a large number of terms that are organized into synonym sets, each representing one underlying lexical concept (Miller, 1995). Similar projects include the *EuroWordNet* for Dutch, Italian, and Spanish, and other projects for other European languages. The *Ontolingua* system of Stanford University provides a distributed collaborative environment to browse, create, edit, modify, and use ontologies.

These projects demonstrate various approaches to knowledge representation in a networked environment. Their experiences and products (databases, knowledge bases, as well as the software) can give us tremendous assistance in constructing a CAM conceptual framework and terminology repository. It is also possible that our CAM conceptual framework will contribute to other efforts, because these new approaches still have not reached the CAM knowledge or East Asian languages.

During the last two years, based on the sources contributed by the participants of our digital library

project, we developed a Multiple Thesauri Management and Cross-Database Search System. This system has two advanced features: first, it employs an open architecture so that thesauri can be managed in the various countries by their editors, while all data are hosted centrally on our server; second, the system is able to host multiple thesauri in a relational database, allowing cross-thesaurus searching. It enables the participants to conduct cross-thesaurus searching and view the details of the terms used in each database. The term search then enables a document search in the four databases (samples) that we have successfully integrated into our prototype. (A testing product which has functions similar to this Prototype is available at: <http://circe.slis.kent.edu/mzeng/thesaurihome.html>). Through this project, we established an electronic CAM terminology repository that currently holds two full thesauri and two partial thesauri contributed by the collaborators from the UK, France, China, and Japan. However, we still could not satisfy the needs for searching based on concept matching rather than merely word matching. It is clear that there is a need for a systematic exploration of concepts and relationships across various CAM areas and a need for a universal knowledge organization system for CAM.

The study of existing sources strongly suggests that we need to create a knowledge structure, or conceptual framework, that covers major CAM knowledge. Through this conceptual framework, we can establish bridges among various CAM areas, as well as between non-Western medicine and Western medicine, so that each system can be understood in the context of the other. That is, the conceptual framework must allow for a meaningful "translation" or encoding of concepts in one system so that they can be understood or decoded in the other system. To reach this goal, we have to face many challenges.

V. Issues and challenges

This section reports on the major issues and challenges we have encountered in developing the conceptual framework. The examples used in the following discussions are limited to TCM.

A. Coverage and Correlation

Historically, attempts at knowledge exchanges between the traditional systems and Western medicine have used three approaches (Manaka & Itaya, 1995):

- 1) Attempting to retain the original integrity of the traditional medicine, only the traditional language of the medicines is permitted. Everything is defined in that language.
- 2) Anything not scientifically measurable, or anything couched in non-scientific language and relying on concepts such as *qi* (氣) and channels, is dismissed as pseudo-science, or metaphysics and superstition. This approach is characterized by the dismissal of concepts that do not easily relate to modern or Western ideas.
- 3) Finding correlations between East Asian medical models and the Western medical system, explaining the terms and concepts of each in the language of the other. This approach attempts to avoid rejection of the models and concepts of either system, seeking instead to create a delicate symmetry between them.

We are attempting to take the third approach, recognizing the challenges involved. One good example of this approach is Dr. Yves Requena's book *Terrains and Pathology in Acupuncture* which attempts to explain concepts from traditional literature in the clinical and theoretical terms of Western biomedicine (Requena, 1986). Often the analysis and methodology used in this third method leads to new information and associations not described in the traditional literature (Manaka & Itaya, 1995). We have identified some representations that are common and well-accepted in the medical sciences worldwide, in order to help explore the correlations. For example, the core facets we set up for the conceptual framework, *Diagnostic Categories*, *Therapeutic Preparations*, *Human Anatomy*, and *Selected Diseases/Medical Conditions*, can be the broad platform for cross-cultural and cross-system concept representation and matching. Meanwhile, the facet for *Basics of Traditional Systems* will serve to preserve the functional framework of traditional categories and concepts, hence avoiding the dangers of inappropriately applying Western thinking, Western concepts, and Western medical terminology to traditional medicine systems.

B. Terminology and concept translation

It is pointed out by Wiseman and Zmiewski that preconceptions about what constitutes an effective science of healing have affected not only what is presented to the Western student, but also how it is presented. According to them, a large portion of literature in the English language on TCM, including that

produced in China, “omits the apparently irrational, while reformulating in inexact Western medical terminology much of what is acceptable” (Wiseman and Zmiewski, 1989, p. 55). Thus, the attempt to create a system of terminology in English that parallels that of traditional medical systems presents yet another great challenge. In searching for a term translation strategy for Chinese medical classes, Milsky summarized three strategies: transliteration, literal and symbolic translation, and explanatory translation (Milsky, 1989).

In our project, problems arise at many levels regarding the translation and interpretation of terminology and concepts. The following discussions not only describe the problems, but also remind us that various approaches/choices exist and that we will have to make decisions when selecting concept names for the conceptual framework.

1) Some concepts in the Eastern traditional medical systems have no historical counterpart in the West nor do they have any epistemological parallel in science (Manaka & Itaya, 1995). *Qi* (气), *jingluo* (经络), *Yin* (阴) and *Yang* (阳), *zangfu* (脏腑), for example, are special concepts for which virtually no equivalent English terms can be used. It is considered impossible to capture a concept such as *qi* (气) fully in one English word or phrase (Williams, 1996). The concept *qi* in China, or *ki* in Korea and Japan, and *prana* in India, have variously been translated into English as “energy,” “vital energy,” or “life force.” However, these translations are criticized as being misrendered (Wiseman & Zmiewski, 1989). As a result, such concepts are brought into Western systems by simple transcription.

2) Western anatomy and physiology present a sophisticated view of the structures of the physical body. Among these structures, individual organs are emphasized in terms of their anatomy and function. The Western approach tries to understand how these structures function when normal, and the ways in which this normal functioning can break down. Therapy, then, has the goal of trying to restore the malfunctioning structure to good working order (Williams, 1996). In TCM, however, very little is said about organs as structures, but a lot is said about how an organ system is part of the overall dynamic energy process of the human body. Illness is seen as a process of disharmony that needs restoring and balancing, not as a “machinery breakdown” that requires fixing.

Translation of organ concepts (*zangfu* 脏腑), therefore, is particularly difficult. The organs are described for their function rather than for their loca-

tion and structure. For example, *gan* (肝) denotes a rough correspondence to the Western term “liver”, but it refers to something different than the organ “liver”, although it may include that organ, or some anatomical and functional component of it. TCM terms refer only partly to the physical organs and their physiological functions as described by Western anatomical labeling. Some TCM dictionaries do not include the Western anatomy terms at all, other dictionaries and thesauri list two terms for each organ, such as “liver” and “liver (TCM)”. Yet in certain books, the terms used in translation have connotations for TCM. For example, the word “Liver” is capitalized to denote its TCM context, which is different from the “liver” recognized in the West (Kaptchuk, 1983; Ross, 1985).

3) There are also problems of unclear and inconsistent terminology in TCM itself. In contrast with Western science which aims for precision in dealing with concepts and definitions, many Chinese concepts are situational: the meaning depends not just on the word itself, but also on the context, the particular situation of time and space. They also interweave and overlap so that, to a Westerner, they may appear vague, imprecise, ambiguous, confused or blurred. This leads to difficulties in translation, and to misunderstanding (Ross, 1985).

4) A further incompatibility arises when Chinese and Western medicine are synthesized, i.e., when both forms of medicine are used and spoken of together, as is now increasingly the case. It is necessary to make distinctions in terminology wherever fundamental differences in the nature or understanding of diseases are observed. For example, the term of *shanghan* (伤寒) in TCM refers to “cold damage”, that is, diseases caused by harmful cold factors: febrile diseases. The same term is also used for the Western medical concept of typhoid fever. Another term, *huoluan* (霍乱) refers to sudden turmoil, any disorder marked by simultaneous vomiting and diarrhea, usually with an acute onset. The same term is also used for the Western disease cholera.¹ In other cases, many disease names in TCM are actually names of symptoms and signs of illness. For example, “lower back pain” is re-

¹ Cholera, *huoluan* (霍乱): Synonym: sudden turmoil. Disease marked by simultaneous fulminating vomiting and diarrhea, followed by severe cramps. *Western medical correspondence*: cholera and also acute gastroenteritis characterized by similar signs. (Source: *Fundamentals of Chinese Medicine*, translated and amended by Nigel Wiseman and Andrew Ellis. Brookline, MA: Paradigm Publications. 1996. p.473)

garded as a kind of kidney-deficiency disease entity in TCM, whereas a Western doctor would consider it as only a clinical symptom (Wu & Fisher, 1997). In Western medicine, diseases refer to a disorder with a specific cause and recognizable symptoms and signs designated by its etiological and pathological characteristics. As a result, for the translation of the names of some traditional Chinese diseases, even though corresponding Western terms are provided, they may not exactly reflect the way in which these terms are understood in Western medicine. TCM thesauri usually give notes under some terms that are also commonly used by Western medicine, warning that they are different from what is understood by Western medicine. An approach to solving such problems is to make distinctions of terminology wherever fundamental differences in the nature or conception of diseases are observed. For example, the Chinese term *qichuan* (气喘), which is translated into Western medicine as “asthma”, has been rendered by some translators as “wheezing and dyspnea,” because in Chinese medicine distinction is made between the two components *qi* (气) and *chuan* (喘) (Wiseman & Zmiewski, 1989, p. 95).

C. Mapping with a Western frame of reference

Another challenge is to bring in a Western frame of reference when comparing and representing the differences among concepts. For example, descriptions of the syndromes or symptoms cured by each acupuncture point (called acupoint) are scattered in a number of Chinese and Japanese classic works. A French researcher, Dr. Soulié de Morant, the first person to introduce acupuncture systematically to the West, listed the effects attributed to each point by grouping them according to their associated organs in a Western model (Soulié de Morant, 1994). Other pioneers have worked hard to determine the precise location of the acupoints through the use of skeletal anatomical references (Ellis et al., 1991). Such knowledge exists in the literature but has not been reflected by any classification scheme or similar tool.

D. Presentation of knowledge in a classification scheme

It is necessary to recognize that there is always more than one way to organize or present concepts within a classification scheme. With medicinal herbs, for example, we see the options of organizing them based on: (1) the biological taxonomy, (2) the organs

the herbs are targeting according to human anatomy, e.g., cardiac herbs, and (3) the diseases the herbs are used to treat, e.g., herbs for ulcers, or for high blood pressure. The question is whether we should present the herbs by **what they are** or by **what they do**, or whether we should present them in both ways, as Li Shizhen (李时珍) did in his pharmacopoeia *Bencao Gangmu* (本草纲目). For example, we can list *hebuan* (合欢 *albizzia julibrissin*) under *leguminosae* (by what it is) or under tranquilizers (by what it does), or make parallel lists under both categories. Presenting by **what herbs do** may be more practical for medical purposes. However, there would be some overlaps or repeated listings since one herb may treat different problems or be used in various parts of the body.

A related issue is that the Chinese concept of herbs is not necessarily the same as herbs as Westerners know them. Besides the common Western herbs, the Chinese also group under the term “herb” tuberous roots, grains, seeds, tree bark and stems, flowers and fruits of various plants, as well as their leaves. Most of the classification schemes we have examined fail to reveal such details, although the *TCMSH* includes some of the terms for the used parts of an herb. Now we have not only *hebuan* (合欢 *albizzia julibrissin*) which is a member of *leguminosae*, but also *flos albiziae* (flower of *hebuan* 合欢花), and *cortex albiziae* (bark of *hebuan* 合欢皮), which are parts of *hebuan*. Consequently, both genus-species relationships and whole-part relationships are involved. Further, animal and mineral components are often included in TCM formulas.

It is our belief that the employment of cross-reference systems, multiple-hierarchical listings, and various accesses in indexes (printed or electronic interfaces) are needed in order to present knowledge in heterogeneous structures.

E. Presentation of relationships beyond hierarchical structure

Use of a paradigm (or matrix) is not common in classifications and thesauri that are used for information organization and retrieval, but is often used by TCM books when discussing pressure pain patterns, interpretations, possible disease origins, etc. In a matrix, entities are described by the intersection of two attributes at a time. The resulting matrix reveals the presence or absence and the nature of the entity, at the intersection (Kwasnik, 1999). TCM physiology, for example, shows the concepts under the “viscera”

and “bowels” along one dimension and “Yin”, “Yang”, “qi”, and “blood” along the other dimension. (See an example in Appendix 3.) This paradigm presentation makes it easier to observe and understand related concepts in contrast to a list of alphabetically arranged concept names.

F. Visual presentation of concepts and relationships among concepts

Most classification schemes and thesauri choose to use a text-based presentation of concepts and their relationships. However, we consider visual presentation to be important in the conceptual model we are constructing. The best examples of visual presentation are charts for acupoints. It is possible now, with current technologies, to present this knowledge in digitized format, providing multi-layered presentation of acupoints according to their associated organs and effects based on the anatomy used in Western medicine. Visual presentation also will make relationships, and even semantics, clearer. For example, in describing the concept organ generating sequence and organ controlling and over-acting sequence of the Five Elements (wood, fire, earth, metal, and water), interaction among the elements and among their correspondences to the viscera is much easier to understand and remember if we present them visually according to TCM (see Appendix 4).

The great advantage of using visual presentation is that it presents relationships among individual concepts in a format that is easy to comprehend. However, a mix of visualized presentation in a classificatory structure has not to date been used.

VI. Conclusion

We have identified a number of significant challenges and issues we have encountered while attempting to establish a conceptual framework for the field of CAM, from coverage and translation, to the representation of medical concepts and the relationships among the concepts. There are still many unexplored areas and undiscovered problems ahead. Our early work has only examined TCM. We expect that the more that culturally-related systems and original languages are involved, the more challenges and issues will be raised. Michel Foucault's insights regarding medical perception in different historical periods can also be applied to these cultural traditions. He stated: “Not only the names of diseases, not only the group-

ing of systems were not the same; but the fundamental perceptual codes that were applied to patients' bodies, the field of objects to which observation addressed itself, the surfaces and depths traversed by the doctor's gaze, the whole system of orientation of his gaze also varied (Foucault, 1973, p. 54).”

This statement also partially answered a question regarding our choice: why develop a conceptual framework instead of a multi-lingual terminology database or thesaurus? The difference between the Western and non-Western medicine systems is greater than that between their descriptive languages. The actual logical structure underlying the methodology, the habitual mental operations that guide the physician's clinical insight and critical judgment, differs radically in the two traditions (Kaptchuk, 1983). It will never be enough to present the Oriental words in English or make a corresponding multilingual list of medical terminologies. “Premature attempts to mix Chinese and Western concepts only lead to confusion, and in the West, to poor understanding and practice of TCM (Ross, 1985).” A systematic view of whole systems in their cultural context will help the translation, interpretation, and understanding of the words as well as the ideas behind the words, and more important, the relationships among concepts. On the other hand, an umbrella structure of the conceptual framework that accommodates these systems will make them comparable and connected from a Western perspective, and make the words and concepts more intelligible to a Westerner.

A general conceptual framework for the CAM field, a field that has not been covered appropriately in knowledge organization systems such as classification schemes, thesauri, and terminology databases, is critical if a functional exchange of medical information is to occur rapidly and effectively. The potential impact of this project on information exchange and knowledge discovery goes beyond this theoretical level. It can be the basis for a bridge between major non-Western and Western medical systems and it will facilitate resource exchange and information sharing.

Acknowledgment

The authors gratefully acknowledge everyone at the Rosenthal Center who commented on or helped with the earlier draft and deep appreciation to Dr. John M. Lundquist of the New York Public Library for his support, advice, and timely services which allowed the authors to access and use the special collec-

tion of CAM materials in the Oriental Division. Comments and criticism by the referees and by Dr. Richard Rubin on the earlier drafts were extremely helpful.

Sources

- ACUBASE Thesaurus In Acupuncture*. (1993). Produced by Montpellier University Library Medical Section –Nimes, with the assistance of The French Association for Reflexotherapies and Acupuncture Studies (A.F.E.R.A.) and professor Jean Bossy. Nimes, France: University of Medicine of Montpellier.
- AMED/CATS Thesaurus*. (1997). The British Library Health Care Information Centre.
- Buckland, M., et al. (1999). Mapping entry vocabulary to unfamiliar metadata vocabularies, *D-Lib Magazine*, 5(1). URL: <http://www.dlib.org/dlib/january99/buckland/01buckland.html>, (retrieved 25 Feb. 2000).
- Chinese Libraries Classification*. (1988). Beijing: Bibliography and Documentation Press.
- Complementary and Alternative Medicine (CAM) Citation Index (CCI)*, The National Center for Complementary and Alternative Medicine's (NCCAM), URL: <http://altmed.od.nih.gov/nccam/resources/cam-ci/>, (retrieved 25 Feb. 2000).
- Cyc® Ontology Guide: Introduction*. URL: <http://www.cyc.com/cyc-2-1/intro-public.html>, (retrieved 10 March 2000).
- Huang, K.C. (1993). *The Pharmacology of Chinese Herbs*. Ann Arbor: CRC Press.
- Lenat, D.B. (1995). CYC: a large-scale investment in knowledge infrastructure. *Communications of the ACM*, 38(11), 33-38.
- Maciocia, G. (1989). *The Foundations of Chinese Medicine, A Comprehensive Text for Acupuncturists and Herbalists*, London: Churchill Livingstone.
- McMaster University's Health Information Resources – Alternative Medicine*. URL: <http://www-hsl.mcmaster.ca/tomflem/altmed.html>, McMaster University Health Sciences Library, Canada, (retrieved 25 Feb. 2000).
- Military Medical Thesaurus*. (1993). Beijing: Renmin Junyi Chubenshe.
- Miller, G.A. (1995). WordNet, a lexical database for English. *Communications of the ACM*, 38(11), 39-41.
- Read, B.E. (1937). *Chinese Materia Medica, Animal Drugs. From the Pen Ts'ao Kang Mu by Li Shib-chen, A.D. 1597*. Reprinted from *Peking Natural History Bulletin*, Vol. 5, Part IV, pp.37-80 and Volume 6, Part I, pp. 1-102. Beijing, China: Peking Natural History Bulletin.
- Read, B.E. (1936). *Chinese Medicinal Plants from the Pen Ts'ao Kang Mu. A.D. 1596*. Beijing, China: Peking Natural History Bulletin. Reprinted by Taipei: Southern Materials Center, Inc. 1982.
- SNOMED®RT (Systematized Nomenclature of Medicine Reference Terminology)* SNOMED International, College of American Pathologists. URL: <http://snomed.org/> (retrieved 26 Jan. 2001).
- Subject Headings of Chinese Medicine*. (1987). Beijing: Information Center of Institute of Chinese Medicine.
- Sympatico HealthyWay: Health Links – Alternative Medicine Directory*. URL: <http://www1.sympatico.ca/healthyway/DIRECTORY/B1.html>, (retrieved 22 Feb. 2000).
- Traditional Chinese Medicine and Materia Medica Subject Headings*. (1996). Compiled by Information Center of Institute of Chinese Medicine. Beijing: TCM Classics Publishing House.
- UMLS (Unified Medical Language System)*. URL: <http://www.nlm.nih.gov/research/umls/umlsmain.html>, National Library of Medicine (retrieved 25 Feb. 2000).
- WordNet – a Lexical Database for English*. Cognitive Science Laboratory, Princeton University. URL: <http://www.cogsci.princeton.edu/~wn/>, (retrieved 10 March 2000).
- Yixue Hanyu Zhutici Zishunlu [Chinese Thesaurus for Medical Science]*. (1985). Beijing: Information Center of the China Academy of Medical Science.

References

- Ellis, A., Wiseman, N. & Boss, K. (1991). *Fundamentals of Chinese Acupuncture*, revised edition. Brookline, Mass.: Paradigm Publications.
- Foucault, M. (1973). *The Birth of the Clinic : An Archaeology of Medical Perception*. Translated from the French by A.M. Sheridan Smith. New York: Pantheon Books.
- Huangdi Neijing, [Yellow Emperor's Inner Canon]*. (1994). Author unknown, Former Han, ca. 100 B.C.E. Comprises *Su Wen [Elementary Questions]* and *Ling Shu [Magic Pivot]*. Beijing: Renmin weisheng chubanshe, 1978. Translated and

- amended by Nigel Wiseman. Rev. ed. Brookline, Mass.: Paradigm Publications.
- Huang Ti Nei Ching Su Wen. The Yellow Emperor's Classic of Internal Medicine. Chapters 1-34 Translated from the Chinese with an Introductory Study by Ilza Veith.* (1972). New Edition. Berkeley, Calif.: University of California Press.
- Kaptchuk T.J. (1983). *The Web that Has No Weaver: Understanding Chinese Medicine.* New York: Congdon & Weed.
- Kwasnik, B.H. (1999). The role of classification in knowledge representation and discovery. *Library Trends*, 48(1). 22-47.
- Manaka, Y. & Itaya, K. (1995). *Chasing the Dragon's Tail: the Theory and Practice of Acupuncture in the Work of Yoshio Manaka.* Brookline, Mass.: Paradigm Publications.
- Milsky, C. (1989). In search of a term translation strategy for Chinese medical classics, in Paul U. Unschuld ed.: *Approaches to Traditional Chinese Medical Literature, Proceedings of an International Symposium on Translation Methodologies and Terminologies*, Boston: Kluwer Academic Publisher. 77-81.
- Requena, Y. (1986). *Terrains and Pathology in Acupuncture.* Brookline, Mass.: Paradigm Publications.
- Ross, J. (1985). *Zang Fu, the Organ Systems of Traditional Chinese Medicine.* 2nd ed. London: Churchill Livingstone.
- Sampson, T. (1984). *Botanical and Other Writings on China, 1867-1870; with a biographical sketch by Emil Bretschneider; edited by H. Walravens.* Hamburg: C. Bell.
- Snow, B. (1998). Internet sources of information on alternative medicine, *Database*, August, 21. 65-73.
- Soulié de Morant, G. (1994). *Chinese Acupuncture (l'Acupuncture Chinoise)*, translated by L. Grinnel, C. Jeanmougin, and M. Leveque; ed. by P. Zmiewski. English ed. Brookline, Mass.: Paradigm Publications.
- Williams, T. (1996). *The Complete Illustrated Guide to Chinese Medicine – A Comprehensive System for Health and Fitness.* Rockport, Mass.: Element.
- Wiseman, N. & Zmiewski, P. (1989). Rectifying the names: suggestions for standardizing Chinese medical terminology. In Paul U. Unschuld ed.: *Approaches to Traditional Chinese Medical Literature, Proceedings of an International Symposium on Translation Methodologies and Terminologies*, Boston: Kluwer Academic Publisher. 55-66.
- Wu, Y. & Fisher, W. (1997). *Practical Therapeutics of Traditional Chinese Medicine.* Brookline, Mass.: Paradigm Publications.
- Zeng, M.L. (1996). Towards a unified medical language in a diverse cultural environment. In R. Green ed.: *Advances in Knowledge Organization, Vol. 5: Knowledge Organization and Change.* Frankfurt/Main: INDEKS VERLAG. 51-58.

Appendix 1. Example of hierarchical presentation (“kind-of” relationship) – herbs

301 HERBS FOR CARDIOVASCULAR SYSTEM

301.1 Herbs with multiple actions

- 301.11 *ren shen*, Panax ginseng, Ginseng == >
 301.12 *ci wu jia*, Acanthopanax senticosus
 301.13 *zhu jie ren sen*, Panax japonicum

301.2 Cardiac herbs

301.3 Antiarrhythmic herbs

301.4 Antihypertensive herbs

301.5 Antianginal herbs

301.6 Antihypercholesterolemic herbs

301.7 Antishock herbs

302 HERBS FOR THE NERVOUS SYSTEM

303 HERBS FOR ALIMENTARY SYSTEM

304 HERBS FOR RESPIRATORY SYSTEM

305 HERBS FOR HEMATOPOIETIC SYSTEM

306 HERBS FOR ENDOCRINE SYSTEM

... ..

	<i>ren shen</i>	301.11
Pharmaceutical name: Radix Ginseng		
Botanical name: Panax ginseng C.A. Mey.		
Family: araliaceae		
Alternate names: (see remarks)		
Chinese: ren shen		
Japanese: ninjin		
Korean: insam		
English: ginseng root		
Literal English translation: „man root“		
Text in which first appeared: <u>Divine Husbandman's</u> <u>Classic of the Materia Medica</u>		

Appendix 2. Example of hierarchical presentation (“part-of” relationship) – anatomy concepts

180 Acupuncture Points

- 180.1 Hand Greater Yin (*tai yin*) Lung Channel
 - 180.11 LU-1 *zhong fu*, Central Treasury.
 - 180.12 LU-2 *yun men*, Cloud Gate. == =>
 - 180.13 LU-3 *tian fu*, Celestial Storehouse.
 - 180.14 LU-4 *xia bai*, Guarding White.
 - 180.15 LU-5 *chi ze*, Cubit Marsh.
 - 180.16 LU-6 *kong zui*, Collection Hole.
 - 180.17 LU-7 *lie que*, Broken Sequence.
 -

180.12

LU-2 云门
yun men, Cloud Gate

Location: On the chest, in the depression immediately below the lateral extremity of the clavicle, 6“ lateral to the conception vessel.

Source: Ellis, A., Wiseman, N. & Boss, K. (1991). *Fundamentals of Chinese Acupuncture*, revised edition. Brookline, Mass.: Paradigm Publications, pp.79-88.

Note: Here 6“ contains a relative unit of measurement called a body inch (*cun* 寸) which was developed in ancient China and has remained in use. The middle phalange bone of the middle finger is considered to be one body inch. There are many procedures for measuring the length of the *cun* (寸) of an individual.

Appendix 3. Example of paradigm presentation – the Zang-Fu (脏腑) Theory

223 Physiology

223.1 Zang-Fu Theory [Theory of Bowels and Viscera]

223.11 Five viscera [five internal organs]

	<i>heart</i>	<i>liver</i>	<i>spleen</i>	<i>lung</i>	<i>kidney</i>	<i>others (TCM)</i>
<i>qi</i>	heart <i>qi</i>	liver <i>qi</i>	spleen <i>qi</i>	lung <i>qi</i>	kidney <i>qi</i>	vital gate [the life gate]
<i>yang</i>	heart <i>yang</i>	liver <i>yang</i>	spleen <i>yang</i>	lung <i>yang</i>	kidney <i>yang</i>	anterior pudendal orifices
<i>yin</i>	heart <i>yin</i>	liver <i>yin</i>	spleen <i>yin</i>	lung <i>yin</i>	kidney <i>yin</i>	
<i>blood</i>	heart blood	liver blood	spleen blood		kidney essence	
<i>others</i>	pericardium		spleen-stomach theory		kidney water	

223.12 Six bowels [six hollow organs]

223.13 Viscera-state theory [visceral manifestation theory]

223.14 Jing-Qi-Shen theory [essence-qi-blood theory]

Appendix 4. Example of visual presentation – relationships among the Five Elements.

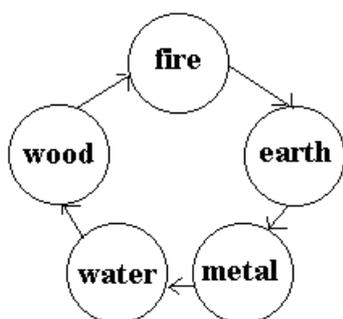


Figure 2: The Organ Generating Sequence

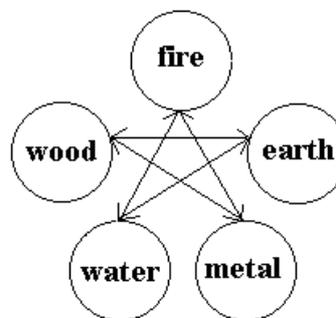


Figure 3: The Organ Controlling and Over-Acting Sequence

Source: *The Foundations of Chinese Medicine, A Comprehensive Text for Acupuncturists and Herbalists*, by Giovanni Maciocia. London: Churchill Livingstone, 1989. p. 21-22