

**ECONOMY IS A PERSON:
A Chinese-English Corpora and Ontological-based Comparison
Using the Conceptual Mapping Model**

Siaw Fong Chung	Kathleen Ahrens	Chu-Ren Huang
<i>National Taiwan University</i>	<i>National Taiwan University</i>	<i>Academic Sinica</i>
claricefong6376@hotmail.com	kathleenahrens@yahoo.com	churen@gate.sinica.edu.tw

Abstract

This paper proposes a corpora-based approach in comparing the Mapping Principles for economy metaphors in English and Chinese. The Mapping Principles are validated using an upper ontology (SUMO). This research extends on the work of Ahrens, Chung and Huang (2003) by examining the ‘economy’ metaphors in Chinese and English. In Ahrens, Chung and Huang (2003), they proposed to delimit the Mapping Principle via two steps: First, they used a corpora-based analysis on the word *jingji* ‘economy’ to find out the most prototypical mappings in a metaphor. Second, they used an upper ontology (SUMO) to examine whether the mapping principle is a representation of conceptual knowledge in the ontology. This paper goes a step further by examining the similarities and differences of source domains in English and Chinese. Using the Conceptual Mapping Model, this paper looks particularly into the example of ECONOMY IS A PERSON. This paper observes the representation of shared knowledge in the source domain in different languages and explains the similarities and differences by looking into the definition of inference rules in the upper ontology of SUMO.

Key Words: Corpora, Conceptual Mapping Model, Mapping Principle, SUMO, ontology

1.0 Introduction

In the framework of Lakoff and Johnson (1980) and Lakoff (1993), conceptual metaphors are mappings from a concrete source domain to an abstract target domain. Lakoff proposes a “general principle” which is “part of the conceptual system underlying English” (1993:306). Ahrens (2002), however, suggested that this ‘general principle’ can be formulated in the form of Mapping Principle, an intuitive-based principle stating the underlying reason for source-domain mappings. These rules were verified with offline experiments (Ahrens 2002 and Lu 2002) in which they successfully predicted the reading times for metaphors that follow the mapping principles and metaphors that do not. Therefore, the ‘general principle’ can be delimited by providing Mapping Principle, which is specific for a particular metaphor to reason the mappings between source and target domains.

Ahrens, Chung and Huang (2003) proposed to delimit the Mapping Principle via two steps: First, they used a corpora-based analysis on the word *jingji* ‘economy’ to find out the most prototypical mappings in a metaphor and hence formed the mapping principle. Second, they used an upper ontology (SUMO <http://ontology.teknowledge.com/>) to examine whether the Mapping Principle is a representation of conceptual knowledge in the ontology. For example, in examining ECONOMY IS COMPETITION, the knowledge of ‘competition’ has a corresponding

node with Contest in SUMO and “a War is kind of ViolentContest, which in term is a kind of Contest” (Ahrens, Chung and Huang 2003). Therefore, the metaphors ECONOMY IS COMPETITION and ECONOMY IS WAR can be subsumed under the same knowledge representation. These findings support the mapping principles that there are specific principles governing the source-target domain mappings.

In this paper, we will focus on one metaphor -- ECONOMY IS A PERSON – and compare the cross-linguistic data for the source domains of PERSON in English and Chinese. With these data, we also compare Mapping Principles cross-linguistically in both English and Mandarin. Two research questions are posed – (a) How similar or different the metaphor of ECONOMY IS A PERSON represented in English and Mandarin? (b) Are there differences in the representation of knowledge domains in English and Mandarin metaphor of ECONOMY IS A PERSON at the upper ontology level? To answer these questions, this paper adopts a similar methodology adopted by Ahrens, Chung and Huang (2003) by examining the corpora data as well as extracting the knowledge representation from SUMO to compare with the corpora data. However, this paper extends on previous research by examining the mapping in two languages. By comparing two languages, we can further investigate whether the similar Mapping Principle is extracting for the similar metaphor in two different languages. We foreshadow that if a similar metaphor with the same type of

prototypical linguistic expressions is found in two different languages, the Mapping Principle should be the same. If the Mapping Principles are the same, the knowledge representations for both speech communities in describing that metaphor are also the same. In this paper, we will demonstrate this hypothesis by using corpora analysis of both Chinese and English metaphor of ECONOMY IS A PERSON.

2.0 Economy and Conceptual Metaphors

Metaphors are present in every day's language use. Some of these metaphors are so often used that the speakers are unaware of their metaphoric meanings. Charteris-Black (2000), for instance, carried out a comparative language analysis of the *Economist* magazine and the economist section of the Bank of English corpus. The results suggested that the metaphoric lexis in the *Economist* were higher in frequency than in the general magazines. This suggested that the ESP learners are dealing with more specific types of metaphors as part of their 'technical' register.

Incorporating this idea in teaching, Boers (2000) carried out an experiment comparing the teaching of economy metaphors to two groups of learners – one with special attention to the metaphoric meanings and the other with dictionary definitions of the metaphors. The subjects were the French-speaking university students of business and economics in Belgium. The targeted items for his experiment were

overcoming a hurdle, bailing out, weaning off, shifting tack and *weeding out*. The different inputs for both groups were claimed to have affected the understandings of the learners – with the groups shown the metaphoric meanings performing better than the other group.

However, Boer's (2000) analysis of the metaphors lacks theoretical criterion in categorizing the metaphorical linguistic expressions. For instance, the examples of Health and Fitness (Boers, 2000:139) range from *sickly company* to *an acute shortage*. In addition, the target domain was unstated -- the term *storage* is ambiguous – i.e., it could have literally meant the shortage of medicine in some place or shortage of workforce. In order to define and delimit the target domain, this paper has chosen to look at economy metaphors appearing with the term 'economy.' By doing so, the target domain can be delimited. In regards of the source domain, we suggest the use of a single term and avoid overlapping scopes such as 'Health and Fitness.'

In what follows, this paper suggests the use of the Conceptual Mapping Model (Ahrens 2002), which provides a clearer theoretical analysis of metaphors.

The Conceptual Mapping Model

The CMM is a model based within the Contemporary Theory of Metaphor (CTM) (Lakoff and Johnson 1980, Lakoff 1993). It supports the idea that metaphors have

systematic source to target domain mapping. However, the CMM goes beyond the CTM by postulating a principle connecting the mapping between the source and target domains. The CMM can also be used in analyzing metaphors linguistically by dividing the metaphorical expressions into entities (nouns), qualities (adjectives) and functions (verbs).

In Ahrens (2002), the metaphor IDEA IS BUILDING was analyzed. There were five steps to this analysis. These five steps are listed in Table 1:

Table 1: Analysis of IDEA IS BUILDING using the Conceptual Mapping Model

Step1	Given the target domain of IDEA, native speakers generated all items related to IDEA
Step 2	These generated items were categorized into similar source domains such as BUILDING and WAR
Step 3	For each source domain, the conceptual real world knowledge was generated. This was done by asking the following three questions: 1. What entities does the source domain (SD) have? -- (for BUILDINGS: foundation, structure, model, base, etc.) 2. What quality does the SD or the entity in the SD have? -- (for BUILDING: shaky, high, short, strong, etc.) 3a. What does the SD do? -- (for BUILDING: to protect, to shield, etc.) b. What can somebody do to the SD? -- (for BUILDING: to live in, to build, etc.)
Step 4	Non-conventional expressions generated in Step 1 were filtered out
Step 5	The actual mapping between the target (IDEA) and source (BUILDING) were compared with what could possibly be mapped in the real world.

For the metaphor of IDEA IS BUILDING, Ahrens (2001:279) proposed the following connection between the source and target domain pairings:

Idea (originally capitalized) is understood as building because buildings involve a (physical) structure and ideas involve an (abstract) structure.

This connection is called ‘Mapping Principle’ (Ahrens 2001:279), which specifies the underlying reason for the mapping of source to target domains.

3.0 SUMO Ontology

SUMO (Suggested Upper Merged Ontology) is a shared upper ontology developed by the IEEE Standard Upper Ontology Working Group. It consists of concepts, relations and axioms that address a broad range of domains and interests. All concepts in SUMO are structured in the form of hierarchy with the root of Entity, which represents the most general concept. The Entity is divided into Physical and Abstract. These Physical and Abstract entities are then further divided into more specific nodes.

Applying ontology in linguistics, Niles (2003) suggested that the incorporation of the SUMO ontology with WordNet allows ontology to be used “automatically by applications (e.g. Information Retrieval and Natural Language Processing applications)

that process free text.” The interest of this paper lies in observing the automated processing of Mapping Principles in the source-target domain mappings in conceptual metaphors.

In this paper, we demonstrate how SUMO helps delimit the source domain knowledge of metaphorical mappings. We also want to demonstrate how the source domain knowledge differs (or show similarities) across languages. In order to examining the similarities and differences cross-linguistically, the following section first displays our corpora analyses for economy metaphors in English and Chinese. These analyses help extracting the Mapping Principles of economy metaphors in both these languages. The concepts represented by the Mapping Principles will then be examined using the SUMO ontology. This incorporation of SUMO into our analysis allows the source domain knowledge (identified in the corpora analyses) to be defined at the upper ontology level.

The following section first presents the analyses of English and Chinese economy metaphors.

4.0 Corpora Data

Methodology

The Chinese data were extracted from the Academic Sinica Balanced Corpus, a tagged corpus with over 5 million words of Mandarin usage in Taiwan. The URL address for this corpus is <http://www.sinica.edu.tw/SinicaCorpus/>. 2000 search results of the Chinese term *jingji* ‘economy’ were analyzed for conceptual metaphors.

The English data were extracted from the corpora of the Linguistic Data Consortium (LDC), University of Pennsylvania. The URL address for LDC is <http://www ldc.upenn.edu/ldc/online/index.html>. From the lists of corpora, term ‘economy’ was searched within the Wall Street Journal 1994, a corpus with the size of 14.3 MB (about 5 million words). This makes the size of both corpora almost the same for both English and Chinese. For each search, a maximum of 100 pages were extracted. Each page contains 100 instances. This paper selected the first 5 pages to look at, which constitutes approximately 500 instances of ‘economy’ in the corpus.

This paper has chosen to delimit the target domain of economy metaphors by running a search on the term ‘economy’ or *jingji* only. Other related terms such as ‘currency’ and ‘market’ are not the concerns of this current paper.

For both Chinese and English corpora, all instances were read through and metaphorical uses of ‘economy’ or *jingji* were marked manually. A metaphor was

identified when the term ‘economy’ was expressed using concrete idea. For example, in the Chinese corpus, occurrences such as *jingji chengzhang* 經濟成長 ‘economy grew’ and *jingjizhan* 經濟戰 ‘economic battle’ were identified as metaphorical instances because there are the concrete domains of ‘growth’ and ‘war’ in the description of the economy¹. Similarly, for English, instances such as ‘growing economy’ and ‘sputtering economy’ are identified as metaphorical due to the mapping of the concrete ideas of ‘growth’ and ‘engine’ in the metaphors. These metaphors were then collected and categorized according to different source domains (GROWTH CYCLE, WAR, COMPETITION, etc.) in Chinese and English respectively.

Results

The English corpus data produce a total of 209 recurring economy metaphors. Comparatively, in the Chinese data, a total of 311 recurring metaphors were found. The breakdowns of the data are shown in Table 2.

¹ In the next paper, we will demonstrate that linguistic expressions such as ‘growth’ and ‘war’ are definable as metaphors if they are hypernyms for at least one concrete and one abstract concept in the Wordnet. This incorporation of Wordnet strengthens the automation of the Conceptual Mapping Model in metaphors processing.

Table 2: Distributions of Economy Metaphors in the English and Chinese Corpora

Economy metaphors	Chinese <i>jingji</i>		English 'economy'	
	Types	Tokens	Types	Tokens
1. ECONOMY IS A PERSON	11	121	26	131
2. ECONOMY IS BUILDING	10	102	8	12
3. ECONOMY IS COMPETITION	11	40	3	15
4. ECONOMY IS WAR	12	23	--	--
5. ECONOMY IS JOURNEY	9	15	--	--
6. ECONOMY IS AEROPLANE	3	10	--	--
7. ECONOMY IS MOVING VEHICLES	--	--	25	51
TOTAL	56	311	62	209

There are three recurring source domains shown in Table 2, i.e., PERSON, BUILDING and COMPETITION (shaded above). Among these source domains, PERSON constitutes the majority of the total instances in both languages. In English, there are 131 tokens and 26 types of linguistic expressions found; In Chinese, there are 121 tokens and 11 types of linguistic expressions found. The types in the English data are more robust than in the Chinese data. Examples (1) and (2) below show examples of English and Chinese metaphor of ECONOMY IS A PERSON respectively.

- (1) The immediate plate holds an **economy** with little **growth** and low salaries, acute unemployment, expensive financing

- (2) 國家 爲 促進 經濟 成長 (資本 累積、
guojia wei zujing jingji chengzhang zhiben leiji
 country for improve economy grow capital accumulate
 增殖) 的 使命，
zengzhi de shiming
 multiply DE mission
 “In order to improve the mission of making economy grows (accumulating
 and multiplying capital), the country...”

When we discuss ECONOMY IS A PERSON in detail, we will refer to more linguistic expressions in both languages.

The second source domain that appears in both languages is BUILDING. However, in Chinese, the use of the knowledge domain of ‘Building’ is far more frequent than the English data. In Table 2, we can see that there are 102 tokens in Chinese data and in the English data, there are only 12 tokens. This suggests that the Chinese prefer to use the knowledge (source) domain of BUILDING when describing economy metaphorically. This preference is not shown in the English data. Examples of ECONOMY IS BUILDING in both languages are shown in examples (3) and (4).

- (3) being overbuilt needs to be taken in perspective of all the other parts of the economy that are overbuilt, too.”

- (4) 爲 貴國 的 經濟 建設 盡 一 份 力量
wei guiguo de jingji jianshe jing yi fen liliang
 for your country DE economy building finish one CLASS power
 “Contribute to the building of your nation’s economy.”

The third source domain is COMPETITION. As discussed in Ahrens, Chung and Huang (2003), the knowledge representation of ‘competition’ is corresponded with the node of ‘Contest,’ the same node that represents the concept of ‘War.’ If this is the case, the metaphors related to ‘Contest’ in Chinese is far more frequent than those in English. As we can see from Table 2, ECONOMY IS COMPETITION and ECONOMY IS WAR constitute 63 tokens in total whereas in the English data, ECONOMY IS COMPETITION only constitutes 15 tokens. This also shows that the concept of ‘ViolentContest’ is more viewed as a representation of ECONOMY by the Chinese speakers than the English speakers. Examples of these metaphors are shown in (5) to (7).

ECONOMY IS COMPETITION

(5) just as it is reshaping the **economy** to become more service-oriented , fragmented and **competitive** .

(6) 誰 能 掌握 **經濟** **競爭** 的 優勢 ,
shui neng zhangwo jingji jingzheng de youshi
 who can control economy competition DE advantage
 誰 就 能 立足 世界 舞台 ,
shui jiu neng lizu shijie wutai
 who then can stand word stage

“Whoever can control the advantages of economy competition, that person can then stand on the stage of the world.”

ECONOMY IS WAR

- (7) 一向 在 經濟 攻防戰 上
yixiang zai jingji fanggungzhan shang
 always at economy attack-and-defend-war above
 無堅不摧 的 日本
wujianbucui de riben
 to-overrun-all-fortifications DE Japan
 “Japan that is always overrunning fortifications at the economic battle...”

In addition to the source domains of PERSON, BUILDING, COMPETITION and WAR, there are other source domains of lower frequency. The English speakers also use the source domain of MOVING VEHICLES, which is not found in the Chinese economy metaphors. Contrastingly, the Chinese data show instances with the source domains of JOURNEY and AEROPLANE, which are also not used in the English data. Nevertheless, a comparison of these three source domains reviews that there are still similarities in these seeming different source domains. First, all these source domains are either referring to engine or moving vehicles or persons in the vehicles. Second, there are emphases on either directionality or speed when movements are concerned. For instance, the source domain of AEROPLANE in Chinese only refers to upwards movements whereas the source domain of MOVING VEHICLES refers particularly to speed of moving forwards. Examples are shown below.

ECONOMY IS AEROPLANE

- (8) 臺灣 經歷 了 經濟 起飛， 成就 非凡
taiwan jingli le jingji chifei chenjiu feifan
 Taiwan experience ASP economy take off results NEG-ordinary
 “Taiwan has experienced the rises of economy and the results are extraordinary.”

ECONOMY IS MOVING VEHICLE

- (9) the **economy** is going to **slow down** ,
 (10) the U.S. **economy** were **barreling down the highway** at 100 miles

However, we will leave this portion under future research. In the next paper when we incorporate Wordnet into account, we will examine all linguistic expressions and compare their hypernyms so that the determination of metaphors and the selection of the source domains can become automated and hence overcome the limitations of the manual analysis.

For this current paper, we focus specifically on the source domain of PERSON, which obtained the most frequent scores in both languages. The following section will address this issue.

ECONOMY IS A PERSON

The details of the Chinese metaphors are shown in Table 3 and the English ones are shown in Table 4. In both Tables 3 and 4, the most frequent linguistic expressions are shaded. Expressions that appear in both Chinese and English are marked with a star (*) in both Tables 3 and 4.

Table 3: ECONOMY IS A PERSON in Chinese

M.P.: Economy is person because people have a life cycle and economy has growth cycle.

	Metaphor	Frequency
Entities	*成長 (growth)	67
	衰退 (dysfunction)	8
	成長期 (growth period)	2
	病狀 (symptoms)	1
	命脈 (lifeblood)	2
	*衰頹(weakness and degeneration)	1
Functions	*成長 (grow)	21
	衰退 (to become dysfunctional)	5
	復甦 (regain consciousness)	9
	惡化 (deteriorate)	4
	*恢復 (recover)	1

Table 4: ECONOMY IS A PERSON in English

M.P.: Economy is person because people have a life cycle and economy has growth cycle.

	Metaphor	Frequency
Entities	*growth	15
	*growing	1
	exuberance	2
	*weakness	2
	recovery	4
	cooling	1
Quality	mature	1
	growing	4
	weak	9
	healthy	5
	ailing	5
	anemic	2
	recovering	2
	strong	20
	tiring	1
	depressed	2
Functions	*grow	41
	shrinking	1
	weakening	1
	*recover	5
	suffer	2
	shudder	1
	hurt	3
	cool	2
	cool down	1

The driving principle of the Conceptual Mapping model is that there should be a principled reason for Mapping Principles. Ahrens, Chung and Huang (2003) hypothesized that this Mapping Principle can be automatically determined on the

basis of frequency. Comparing the most frequent expressions in Tables 3 and 4, therefore, metaphorical terms that appear in both languages are ‘growth,’ ‘grow,’ ‘weakness’ and ‘recover.’ Among these expressions, ‘grow’ and ‘growth’ are the most frequent occurrences of source domain knowledge in the English and Chinese respectively. These outstanding recurring occurrences allow us to formulate the mapping principle for the Chinese and English metaphor of ECONOMY IS A PERSON as: *Economy is person because people have a life cycle and economy has growth cycle.*

This Mapping Principle is reflected in both the Chinese and English data. The English data, however, display more types (26) than the Chinese data (11). This is due to the mapping of ‘emotions’ in addition to the ‘physical growth’ in the English data. Expressions such as ‘depressed’ and ‘hurt’ are found repeatedly in the English examples (with ‘hurt’ being an ambiguous word referring to either physical or emotional hurts). However, the mapping of the emotion of a person is less frequent compared to the physical growth. Since our hypothesis considers the most frequent instances as contributors to the Mapping Principles, the occurrences of ‘emotion of a person’ do not interfere with the results.

In the next section, we will refer to the SUMO ontology in delimiting the source domain knowledge of the metaphors. The next section will explain why the source

domain of PERSON can map expressions relating to ‘growth’ and at the same time allows the mapping of ‘emotion’ to PERSON. Using the SUMO ontology, this paper explains the source-target domains mappings using representation of shared knowledge provided by SUMO.

The Knowledge domain of ‘Person’ in SUMO

In the previous sections, our corpora analyses show that both English and Chinese ‘economy’ metaphors display the most prototypical Mapping Principle relating to ‘growth’ of a PERSON. The knowledge representation of ‘growth’ (or ‘life cycle’) was found to be involving the defining knowledge of an ‘Organism’ in SUMO, as stated in Ahrens, Chung and Huang (2003):

[T]he linguistic realizations of this [PERSON] mapping do not involve any knowledge that is specific to Human. In fact, it only involves the notion of a life cycle, which is the defining knowledge involving an Organism. [Capital and word in square brackets added]

There are 16 inference rules for Organism in SUMO. All these inference rules were searched for and there is one that infers the shared knowledge of ‘living object,’ ‘internal duration’ and ‘process.’ These three concepts constitute the essential element of a ‘growth’ represented by the most prototypical linguistic expressions in the

corpora. Hence, this inference rule was selected as reflection of the Mapping Principles of ECONOMY IS A PERSON. The inference rule reads as the following:

(\Rightarrow (and (instance ?ORGANISM Organism) (agent ?PROCESS ?ORGANISM)) (holdsDuring (WhenFn ?PROCESS) (attribute ?ORGANISM Living)))

This rule encodes that ‘An Organism is the agent of a living process that holds over a duration’ (also stated in Ahrens, Chung and Huang (2003)). The consistency of this mapping (‘growth’) in English confirms the expectation of the Conceptual Mapping model that among the knowledge in the source domain, a particular aspect will show to be the most prototypical mappings. This prototypical mapping reflects the shared knowledge not only within a speech community, but across different speech communities. The data of the Chinese and English economy corpora analysis proves this point of view. In addition, the ability of an upper ontology to infer the similarity of prototypical mappings in two different languages also proposes the universality of the upper ontology.

However, in the previous section, we also observe that within the same source domain of PERSON, there are expressions referring mainly to aspect of ‘living cycle’ and there are also subsidiary frequencies of expressions relating to ‘emotion’ in the English data. The Organism, however, is defined as ‘a living individual, including all plants and animals’ in SUMO. With the occurrences of expressions relating to

‘emotions,’ we eliminate the possibility of Organism as referring to ‘a living plant’ in this metaphor. The definition of Emotion in SUMO is “the class of an attributes that denote emotional states of an Organisms.” This definition shows that ‘emotion’ is a state of an Organism and therefore a part of the shared knowledge of Organism. This complies with our analysis that categorizes expressions relating to ‘emotion’ to PERSON, which involves the node of Organism in SUMO.

From the Conceptual Mapping Model and SUMO inferences, we found that within a knowledge domain, the most prototypical mappings can be extracted using a corpus-based method. These prototypical mappings are formulated as Mapping Principles. Within two different languages, the existence of similar mapping principles can be explained using the inference rules of the shared knowledge in the upper ontology. This application of shared knowledge to similar Mapping Principles in different languages suggests the universality of the upper ontology. In addition, the inference rules also explain why there exist other aspects of knowledge aside from the most prototypical ones. This is because in different languages, a shared knowledge (such as Organism) may be chosen to express a similar metaphor (ECONOMY IS A PERSON), however, within this shared knowledge, there are elaborations of the conceptual nodes. For instance, in English, there are subsidiary elaborations referring to ‘state’ (EmotionalState) whereas in Chinese, there are elaborations referring only to

‘stage’ (living cycle) of an Organism. In general, however, the main mapping is the same (i.e., Organism) but the subsidiary mappings can differ. These results on main and subsidiary mappings are also reflected in the cross-linguistic study of TIME IS MOTION in Ahrens and Huang (2002). They proposed that when TIME IS A MOVING ENTITY the orientation of the ego is a conceptual subsidiary of the main mapping and can be parameterized differently in different languages.

In the case of ECONOMY IS A PERSON in English, the frequency of expressions relating to ‘emotions’ is low and therefore does not affect the most prototypical mapping – i.e., ‘growth.’

5.0 Conclusion

This paper provides a corpora-based analysis of the ‘economy’ metaphors in Chinese and English. The analysis supports a prototypical view of mappings that the most frequent mappings in a metaphor underlying the Mapping Principle (Ahrens 2002) for that metaphor. This paper also extends on the discussion of Ahrens, Chung and Huang (2003) in which they suggest a way of delimiting the source domain knowledge by using an upper ontology, i.e. SUMO. Looking into the example of ECONOMY IS A PERSON, we observe the representation of shared knowledge in the source domain in different languages and explain the similarities and differences by

looking into the definition of inference rules in the upper ontology.

This paper contributes to further supporting the use of ontology and corpora data to automate the process of extracting Mapping Principles. This work provides a computational approach to refine Lakoff's (1993) statement that there is only 'general mapping principle' which exists between the mappings of source to target domain. This paper has shown that Mapping principles are not only specific but also extractable from corpora analysis.

In the corpora analysis, we constrain the Mapping Principle so that there is only one main Mapping Principle per source domain. We propose that this Mapping Principle is reflected by the prototypical (i.e. most frequent) mappings in the metaphor. If there is a subsidiary mapping in the same metaphor, as long as its frequency does not exceed the most prototypical mappings (such as 'stage'—i.e., 'living cycle'-- of a PERSON), the subsidiary mapping will not interfere with the main mapping. These main-and-subsidiary mappings can reflect cross-linguistic similarities and differences in conceptual metaphor mapping.

References

- Ahrens, Kathleen. (2002). "When Love is Not Digested: Underlying Reasons for Source to Target Domain Pairings in the Contemporary Theory of Metaphor." In Yuchau E. Hsiao (ed.). *Proceedings of the First Cognitive Linguistics Conference*. Cheng-Chi University. 273-302.
- Ahrens, Kathleen and Huang Chu-Ren. (2002). "Time Passing is Motion." *Language and Linguistics*. 3/3. 491-519.
- Ahrens, Kathleen, Chung Siaw Fong and Huang Chu-Ren. (2003). "Conceptual Metaphors: Ontology-based representation and corpora driven Mapping Principles." *Proceedings of the ACL Workshop on The Lexicon and Figurative Language*. Sapporo, Japan. 53-41.
- Boers, Frank. (2000). "Enhancing Metaphoric Awareness in Specialized Reading." *English for Specific Purposes*, 19. 137-147.
- Charteris-Black, Johnathan. (2000). "Metaphor and Vocabulary Teaching in ESP Economics." *English for Specific Purposes*, 19. 149-165.
- Lakoff, George and Mark Johnson. (1980). *Metaphors We Live By*. Chicago and London: The University of Chicago Press.
- Lakoff, George. (1993). "The Contemporary Theory of Metaphor." In Andrew Ortony (ed.). *Metaphor and Thought*. Second Edition. Cambridge: Cambridge University Press. 202-251.
- Lu, Dora Hsin-yi. 2002. *Processing of Conceptual Metaphors in Mandarin Chinese A Conceptual-Mapping Model Based Study*. MA Thesis. Graduate Institute of Linguistics, National Taiwan University.
- Niles, I. and Pease, A. (2003) "Linking Lexicons and Ontologies: Mapping WordNet to the Suggested Upper Merged Ontology." In *Proceedings of the 2003 International Conference on Information and Knowledge Engineering*, Las Vegas, Nevada.