**Comparative Standards and the Feasibility of Conceptual Expansion** Paper in journals : this is the first page of a paper published in Cognitive Linguistics. [Cognitive Linguistics] 20-2, 395-423 (2009)

### Comparative standards and the feasibility of conceptual expansion

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#### Abstract

Parallelism between targets in a comparative structure is not always respected in some comparative standards in Japanese that allow the conceptual expansion of their referents, e.g., Nihon-no jinkoo-wa kankoku-yori ooi (The population of Japan is larger than Korea). We would like to investigate the conditions under which conceptual expansion is permitted. In contrast to Japanese, the standard of comparison in English adheres to the constraint of parallelism, (e.g., The population of Japan is larger than \*(that of) Korea.) and other European languages follow suit. There seems to be a typological difference between Japanese and English, and the key to understanding this lies in the positioning of the mandatory morpheme designating the concept of comparison. After discussing conceptual expansion in comparative contexts, I then move on to more general situations, and consider the availability of conceptual expansion with reference to the central/peripheral distinction of participants involved in an event. We shall see that the breaking of the parallelism constraint in Japanese comparative sentences is the result of conceptual expansion meeting general constraints on its occurrence.

Keywords: conceptual expansion; comparative construction; typological difference; salience, conventionality.

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#### The following is a comment on the published paper shown on the preceding page.

# **Comparative Standards and the Feasibility** of Conceptual Expansion

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#### The problem

It is often pointed out that the targets of comparison in a comparative construction should conform to some form of parallel structure requirement. Accordingly, we find the following examples in which the pronoun "*that*" cannot be omitted:

- (1) a. The freezing point of alcohol is much lower than\*(that of) water.
- b. The heart of a bird is more powerful than\*(that of) a mammal of similar size.

However, in Japanese, the discrepancy in (1) is allowed. In other words, the second target of comparison (comparative standard) is allowed to expand its reference in Japanese to fit itself to the parallel element in the subject position.

- (2) a. Arukooru-no hyooten-wa mizu (-no hyooten) yori hikui. [Alcohol-GEN freezing-point-TOP water (-GEN freezingpoint) than low]
- b. Tori-no shinzoo-wa onaji ookisa-no honyuurui (no shinzoo) vori tsuvoi.
- [Bird-GEN heart-TOP similar size-GEN mammal (-GEN heart) than powerful]

English does not allow the conceptual expansion of the comparative standard, while Japanese is tolerant of this type of expansion. We would like to delve into the reason for this difference, with the aim of presenting general licensing conditions for conceptual expansions subsuming this particular type as a subcase.

#### Mandatory morphemes of comparison

In examining the comparative formation, we need to pay attention to the alignment of the morpheme which is indispensable to the construction of comparison. In the case of Japanese, the crucial morpheme of comparison "yori" is directly attached to the comparative standard as in (2). Without the phrase headed by this morpheme, the sentence is not interpreted as a comparative, since no morphological marking is assigned to the comparative predicate (hikui and tsuyoi). Thus, the semantic importance of the standard expression is relatively high with respect to the formation of a comparative construction.

In contrast, the mandatory morpheme of comparison "-er" (or "more") is directly attached to the comparative predicate in English, as in (1). The comparative conjunction "than" and the comparative standard are optional, such that even without their presence, the sentence is understood as a comparative. Moreover, the comparative inflectional morpheme can never be omitted from the predicate in expressing the concept of comparison.

In English, the comparative standard is simply adjunctional, and its semantic importance is estimated to be relatively small.

As the semantic importance of the comparative standard is different between these two languages, it is not surprising that conceptual expansion is only admitted in Japanese. This is because the processing effort devoted to the proper interpretation of a noun phrase with a lot of semantic importance sounds more reasonable than the effort allotted to the same task for a noun phrase with little importance. The participant worthy of much attention deserves the processing effort of singling out the designation most suitable for the particular context in which it is employed. On the other hand, the distribution of effort to a participant in a peripheral status is not deemed effective. The conceptual expansion of comparative standards in Japanese is more motivated than the same conceptual operation allotted to the comparative standards in English. This is a realization of the general distinction between items profiled in conveying the intended message and those in the shadow. Of course, attention falls on the former items rather than the latter, and the processing effort should be distributed accordingly.

#### English-type and Japanese-type languages

Not only in English, but also in other languages (German, French, Spanish, Italian, Russian, Hungarian, Arabic and Esperanto) where the indispensable comparative morpheme is attached to the comparative predicate just as in English, the conceptual expansion of the standard expression is generally not attested.

French (Romance)

- (3) a. La population du Japon est plus grande que celle de la Corée
  - b. \*La population du Japon est plus grande que la Corée.

In contrast to the English-type, there are some languages similar to Japanese in that the mandatory morpheme of comparison is realized as a concomitant of the comparative standard (Korean, Chinese, Hindi, Swahili, and Turkish). In addition, they seem to be more tolerant of the conceptual expansion of the standard expressions.

Hindi (Indo-Aryan) comparative standard + se

(4) a. Japan kī jānsānkhya koriya kī jānsānkhya se zyada hai. [Japan-GEN population Korea-GEN population from/than

large is]

b. Japan kī jānsānkhya koriya se zyada hai.

[Japan-GEN population Korea from/than large is]

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#### **Science**

X-ray Astronomy in the Laboratory with a Miniature Compact Object Produced by Laser-Driven Implosion Paper in journals : this is the first page of a paper published in Nature Physics. [*Nature Physics*] 5, 821 – 825 (2009)

#### Comparative adverbial phrases

Another interesting fact concerning the observations developed thus far is that even in English-type languages, when the crucial morpheme designating comparison is directly attached to the standard just as in the Japanese-type, the conceptual expansion is carried out without difficulty. This is achieved by employing adverbial phrases designating comparison. The present observation holds with regard to all the English-type natural languages cited in this study.

- (5) a. Compared with (In comparison to) Japan, the population of Korea is small(er). [English]
  - b. Im Vergleich zu Japan ist die Bevölkerung von Korea [German] klein(er).

### General cases of conceptual expansion

Turning our eyes to general cases of conceptual expansion, we find that arguments lexically selected by the predicate of a clause are to be ready targets of expansion, in contrast to adjunctional phrases in the periphery of the clause. (6a) is an instance of metonymy, where "the kettle" refers to the water in the kettle. However, the parallel expansion does not obtain in (6b). As an adjunct, the water contained in the kettle is not likely to be designated by the container. The intended meaning is realized in (6c), where a specific reference is made to the content of the kettle.

- (6) a. The kettle is boiling.
  - (the kettle = the water in the kettle)
  - b. I put out the fire with the kettle.
  - (\*the kettle = the water in the kettle)
  - c. I put out the fire with the water in the kettle.

"The soup" in (7a) refers to the fire heating the soup. Even if we know that the soup is put on the cooking stove, on hearing the utterance (7b), we will not take it to mean that the speaker got burnt by the fire heating the soup. Rather, the speaker got burnt by the soup itself. Thus, in the position of an adjunct, literal interpretations are readily selected.

(7) a. Turn off the soup. (the soup = the fire heating the soup) b. I got burnt by the soup.

(\*the soup = the fire heating the soup)

From the cases shown above, we can summarize the observa-

tions thus far presented in the following general formula: (8) Entities profiled through either lexical selection or construc-

tional importance will be readily selected as a target of conceptual expansion.

#### Conventional cases

The comparative structure in English has been claimed to reject an expanded reference of the standard expression. Nevertheless, conventional examples are attested in the position of the standard even though they are not semantically parallel with the subjects at face value.

(9) a. On that matter, the American administrators seem to have more flexibility than the Kremlin. (the Kremlin = administrators in the Russian government)

b. These stories are written better than Shakespeare. (*Shakespeare* = Shakespeare's works)

The important thing in dealing with conventional cases is that it is hard to find examples where the expansion is admitted to participants only when they function as peripheral elements in the described event. "The Kremlin" will refer to the Russian administrators irrespective of the argument status of the phrase in question. In other words, this expansion has nothing to do with the peripheral character of comparative standards in English. Regarding the exceptional behavior of a conventional type of conceptual expansion, we can add a second principle to the one cited in (8) as follows:

(10) A conceptual expansion licensed only to entities in unprofiled positions is not likely to be observed.

This means when a conceptual expansion is observed in unprofiled positions, the same conceptual expansion will be readily observed in profiled positions, but not vice versa. In line with (10), (9) can be regarded as a subregularity subjected to a conventional type of expansion.

#### Summary

The discussion in the former part of the paper leads to the following generalizations which apply to the conceptual expansion in a restricted context of comparative constructions.

- (11) a. The conceptual expansion of the standard of comparison readily occurs if the mandatory morpheme of comparison is attached to the standard.
  - b. If the relevant morpheme is attached to the comparative predicate, the expansion of the standard is not likely to occur

Through the observation of expansion in more general contexts, these statements are interpreted as a realization of the principle stated in (8). And the unexpected expansions found in (9) can be treated with the principle (10) dealing mainly with the irregularity of conventional cases.

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### nature physics

## X-ray astronomy in the laboratory with a miniature compact object produced by laser-driven implosion

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X-ray spectroscopy is an important tool for understanding the extreme photoionization processes that drive the behaviour of non-thermal equilibrium plasmas in compact astrophysical objects such as black holes1-4. Even so, the distance of these objects from the Earth and the inability to control or accurately ascertain the conditions that govern their behaviour makes it difficult to interpret the origin of the features in astronomical X-ray measurements. Here, we describe an experiment that uses the implosion<sup>5</sup> driven by a 3 TW, 4 kJ laser system<sup>6</sup> to produce a 0.5 keV blackbody radiator that mimics the conditions that exist in the neighbourhood of a black hole. The X-ray spectra emitted from photoionized silicon plasmas resemble those observed from the binary stars Cygnus X-3 (refs 7, 8) and Vela X-1 (refs 9-11) with the Chandra X-ray satellite. As well as demonstrating the ability to create extreme radiation fields in a laboratory plasma, our theoretical interpretation of these laboratory spectra contrasts starkly with the generally accepted explanation for the origin of similar features in astronomical observations. Our experimental approach offers a powerful means to test and validate the computer codes used in X-ray astronomy.

X-ray spectroscopy with an X-ray satellite is the main observa-(refs 7, 9) in the astronomical observation tional method to give information about compact objects, especially Cygnus X-3 is a well-known X-ray object identified in the early black holes. Black holes are indirectly studied by observing the stages of X-ray astronomy21. It is a binary system consisting of a X-ray continuum from a heated accretion disc and the X-ray black-hole candidate and a companion star. A schematic of such fluorescence from the ambient gas of the stellar wind and the a binary system is shown in Fig. 2a, in which the gravitational energy of the accreting material is converted into thermal energy, surface of a companion star in their binary systems. To derive physical properties from the observations, X-ray astronomers rely which is the origin of the strong radiation emitted from the on non-local-thermodynamical-equilibrium (LTE) atomic physics accretion disc22. Figure 1b shows an X-ray spectrum from Cygnus in a cold ambient gas subject to an extreme radiation field, for X-3 observed with a spectrometer onboard he Chandra X-ray satellite. The spectrum is thought to be strongly redshifted by which the mean radiation temperature is of the order of 1 keV. Theoretical models have been developed on the basis of the ob-800 km s<sup>-1</sup> (ref. 7). Line X-rays from highly ionized silicon ions served spectra<sup>1-4</sup> and complex computer codes were developed are emitted from the surface of the companion star, the area of to analyse the observed X-ray spectra<sup>12-16</sup>. The underlying aswhich is much larger than that of the accretion disc and the black sumption of these models is that the spectrum originates from a hole. The electron temperature of the surface is determined to lie in the range of 5-50 eV by fitting the spectral shape of several radiative recombination continua<sup>2,8</sup>. This temperature is too low to photoionized plasma. In other words, the intense radiation from the compact object photoionizes the gas, and generates a relatively low-electron-temperature highly ionized non-LTE plasma. Howionize silicon atoms to hydrogen- and helium-like ions. This fact ever, laboratory experiments on non-LTE photoionized plasmas is direct evidence that the lines in the kiloelectronvolt range are

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have not been possible, mainly owing to the lack of an intense source of X-ray continuum radiation. Only recently has pulsed power apparatus, laser and Z-pinch, reproduced the extreme conditions in the Universe17-20

Here, we present a terrestrial generation and spectroscopy of non-LTE photoionized plasma. The novelty of the present experiment is the notion that a laser-driven implosion can create a flash of brilliant Planckian X-rays that can be used to simulate X-rays from a astronomical compact object. X-ray spectra with two characteristic spectral peaks were observed for a photoionized silicon plasma generated in the laboratory. This spectral shape closely resembles those observed from Cygnus X-3 and Vela X-1, as shown in Fig. 1a-c. In Fig. 1a,c, even the small bump between the two peaks is reproduced. The spectral resolution in the experiment was  $\Delta hv = 7 \text{ eV}$  owing to the size of the photoionized plasma (500  $\times$  500  $\mu$ m<sup>2</sup>). This resolution is similar to that of the astronomical observations in Fig. 1b,c. The error bars in the laboratory experiment originate dominantly from signal fluctuation in the three different laser shots and those in astronomy originate from photon statics. Uncertainties of the energy scale are 2 eV in the laboratory experiment and in the range between 1 and 2 eV

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