1. INTRODUCTION

Technical terms or scientific terms are linguistic expressions referring to some particular notion and conception and some specialized activity in a particular field. Their users are supposed to share their definition as a common background, and the same technical expression should refer to the same thing or event among users. This faithfulness to the definition should be maintained even across languages. Translations of technical languages provide us with valuable data on how languages differ in form to convey the same information, and are worth linguistic investigation.

When some technical expression in Language A is translated into Language B, the translated version in Language B should refer to the same particular notion or activity. Suppose that the two languages are typologically unrelated and that their grammars, such as word orders, richness of inflections, and so on, are rather different. If so, what happens in the translation of technical expressions from Language A to Language B? Is the word order kept unchanged? Is the technical word in Language A just borrowed into Language B? Is the word order determined according to the grammar of Language B? Is a new expression produced in Language B? The topic of the translation of technical terms is thus related
to the linguistic issues on structural similarities and differences between languages, language changes and borrowings.

In this paper, bearing these questions in mind, we are concerned with the translation patterns of technical terms employed in medical sciences between two typologically-unrelated languages, English and Japanese. Specifically, we address the question of how prefix-like elements in medical terminologies in English are translated into Japanese, since prefixes are generally assumed to be limited in Japanese. The comparison between English and Japanese in medical terms is based on Nagano’s (2013) morphosyntactic analysis of spatio-temporal prefixes, and leads us to propose the wordness requirement that technical names should satisfy.

The organization of this paper is as follows. In section 2, we introduce medical expressions involving prefixes in English and their Japanese translations, and point out that there are two patterns of translation. In section 3, we are concerned with the question of why the two patterns are found, and suggest that it is solved by Nagano’s (2013) analysis of spatio-temporal prefixes, which is based on Baker’s category theory and multi-layered PP structures developed in cartographic research, like Svenonius (2010). In section 4, we observe that the two translation patterns are used in a different manner, and consider how they are different. Section 5 concludes the discussion.

2. PREFIXATION IN MEDICAL TERMS IN ENGLISH AND ITS JAPANESE COUNTERPARTS

2.1. TWO TYPES OF PREFIXES

Prefixes are widely used to derive medical terminologies in English. Most of them are etymologically traced back to Greek or Latin. They are divided into two types in terms of their function. The first type is a prefix functioning as a modifier. Some examples belonging to this type are given in the following list, cited from *Mosby’s Medical, Nursing, & Allied Health Dictionary, Fifth Edition* (1998):

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Meaning</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. anti-</td>
<td>against, opposing</td>
<td>Antisepsis (= against infection)</td>
</tr>
<tr>
<td>b. contra-</td>
<td>opposed, against</td>
<td>Contralateral (= opposite side)</td>
</tr>
</tbody>
</table>
c. dys- difficult, bad, painful  Dyskinesis (= difficult motion)
d. micr(o)- small  Micracoustic (= faint sounds)
e. hemi- half  Hemiepilepsy (= epilepsy on one side of the body)
f. mult(i)- many  Multiarticular (= many joints)
g. poly- many, much, excessive  Polycystic (= with many cysts)
h. pachy- thick  Pachyderma (= abnormally thick skin)
i. pseud(o)- false  Pseudarthrosis (= false joints)
j. semi- half  Semiconscious (= partly aware)

Most of the prefixes given above can be paraphrased to adjectives, numerals or quantifiers, and modify their head. For instance, *micro-* in (1d) means ‘small’ and modifies its head *acoustic*, producing *microacoustic* ‘small sounds’. Likewise, *multi-* in (1f) means ‘many’ and modifies its head *articular*, producing *multiarticular* ‘many joints’.

In contrast to modificational prefixes, spatio-temporal prefixes like *pre-* and *post-* are similar to prepositions which function as heads. (2) is a list of spatio-temporal prefixes used in medical terms, again cited from *Mosby’s Medical, Nursing, & Allied Health Dictionary, Fifth Edition* (1998):

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Meaning</th>
<th>Examples of adjectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. pre-</td>
<td>before, in front of</td>
<td>Prenatal (= before birth)</td>
</tr>
<tr>
<td>b. post-</td>
<td>after, behind</td>
<td>Postoperative (= after surgery)</td>
</tr>
<tr>
<td>c. infra-</td>
<td>below, beneath</td>
<td>Infraorbital (= beneath the eyes)</td>
</tr>
<tr>
<td>d. sub-</td>
<td>under, beneath</td>
<td>Infracostal (= below a rib)</td>
</tr>
<tr>
<td>e. extra-, extro-</td>
<td>outside of, beyond, outward</td>
<td>Extraoral (= outside of the mouth)</td>
</tr>
<tr>
<td>f. end(o)-, ent(o)-</td>
<td>within, inner</td>
<td>Endaural (= within the ear)</td>
</tr>
<tr>
<td>g. intra-</td>
<td>within</td>
<td>Intracardiac (= within the heart)</td>
</tr>
<tr>
<td>h. mes(o)-</td>
<td>middle</td>
<td>Mesonasal (= middle of the nose)</td>
</tr>
<tr>
<td>i. inter-</td>
<td>between</td>
<td>Intercostal (= between ribs)</td>
</tr>
<tr>
<td>j. para-</td>
<td>beside, beyond, after</td>
<td>Paracardiac (= beside the heart)</td>
</tr>
</tbody>
</table>
Prenatal in (2a) and postoperative in (2b), for example, can be paraphrased into before birth and after surgery, respectively. Pre- corresponds to the preposition before, and post- to the preposition after. Further examples of medical terms with pre- or post- are given in (3):

(3) a. precostal, preauricular, preaortic, precapillary, prerectal, preretinal,
    b. postoral, postauricular, postbrachial, postcapillary, postnasal, postpalatine

Interestingly, these prefixes are ambiguous between a spatial interpretation and a time interpretation in some cases. For example, as indicated by the definitions in the medical dictionary, presynaptic means either ‘situated near or before a synapse’, or ‘before a synapse is crossed’, and postsynaptic means either ‘situated after synapse’ or ‘occurring after a synapse has been crossed’:

(4) a. presynaptic
    1. situated near or before a synapse.
    2. before a synapse is crossed
    b. postsynaptic
    1. situated after a synapse.
    2. occurring after a synapse has been crossed


As is well known, English shows right-headedness in word formation, though phrases have left-headed structures. From this point of view, it can be said that spatio-temporal prefixes behave exceptionally, occurring leftward as heads in words.

What should be noted here is that prefixes of the prepositional type, that is, spatio-temporal prefixes, are difficult to translate into Japanese. They are paraphrased to, or correspond to, prepositions in English. However, Japanese has no prepositions. This raises the question of how English medical terms with spatio-temporal prefixes are translated into Japanese.
2.2. JAPANESE TRANSLATIONS OF SPATIO-TEMPORAL PREFIXES

Focusing on the spatial usage of the prefix *post-* as an example, let us see how it is translated into Japanese in a representative English-Japanese dictionary for medical terms. The Japanese translations of the English medical terms, *postsynaptic*, *postbranchial*, *postoral*, *postauricular* and *post-nasal*, for instance, are as follows:

\begin{enumerate}
  \item \textbf{postsynaptic} → \textit{sinapusu koobu (no)}
    \begin{itemize}
      \item \textit{synapsis posterior (NO)}
      \item \textit{‘situated after a synapse’}
    \end{itemize}
  \item \textbf{postbranchial} → \textit{zyoowan koobu (no)}
    \begin{itemize}
      \item \textit{upper arm posterior (NO)}
    \end{itemize}
  \item \textbf{postoral} → \textit{kuti koohoo (no)}
    \begin{itemize}
      \item \textit{mouth posterior (NO)}
    \end{itemize}
  \item \textbf{postauricular} → \textit{zikai koohoo (no)}
    \begin{itemize}
      \item \textit{ear auricle posterior (NO)}
    \end{itemize}
  \item \textbf{postnasal} → \textit{hana no koohoo (no)}
    \begin{itemize}
      \item \textit{nose Gen posterior (NO)}
    \end{itemize}
\end{enumerate}

(English-Japanese Dictionary of Medical Science)

First consider (5a) and (5b). In these cases, *post-* is translated as *koobu*. Literally, *koo-* means ‘posterior’ and *–bu* means ‘part’, and *koobu* is thus a kind of compound of free form, literally meaning ‘a posterior part’. In addition, *koobu* comes rightward, while its English counterpart *post-* behaves like a prefix. Turning to (5c-e), instead of *koobu*, the expression *koohoo* is adopted as a translation of *post-*. *Hoo* in *koohoo* is a lexeme whose original meaning is ‘orientation’. *Koohoo* is also a compound resulting from the Merge of the morpheme *koo-* ‘posterior’ and *hoo* ‘orientation’, and has almost the same meaning that *koobu* does. *Koohoo* comes to the right position again. Note that the final particle *no*, which is in brackets, is a functional category guaranteeing a prenominal use. Like *postsynaptic*, its Japanese counterpart, \textit{sinapusu koobu no}, functions as a prenominal modifier.

Japanese is a head-final language, and thus the Japanese translations in (5) all conform to the headedness property of Japanese. However, *post-* is often translated in such a way that its Japanese counterpart occurs leftward like a prefix, keeping the original head/complement order unchanged. Consider, for example, (6):
(6) a. **postcapillary** → *koo*-moosaikan (no)  
posterior capillary (NO)

b. **postpalatine** → *koo*-koogai (no)  
posterior palate (NO)

*(English-Japanese Dictionary of Medical Science)*

(6) shows that the Japanese counterparts of **postcapillary** and **postpalatine** are *koo*-moosaikan and *koo*-koogai, respectively. In these cases, *koo-*, meaning ‘posterior’ and occurring without *bu* ‘part’ or *hoo* ‘orientation’, is used as a prefix-like bound morpheme.

In the dictionary, some English medical words are found to be translated in both (5) and (6) forms. For example, the free form *koobu* or *koohoo* and the bound prefix-like form *koo-* are both possible translations of **post**- in **postbrachial**, **postglenoid** and **postglomerular**.

(7) **postbrachial**

a. zyoowan **koobu** (no)  
upper arm posterior (NO)

b. **koo**-wan (no)  
posterior arm (NO)

(8) **postglenoid**

a. kansetuka **koohoo** (no)  
glenoid posterior (NO)

b. **koo**-kansetuka (no)  
posterior glenoid (NO)

(9) **postglomerular**

a. sikyuutai **koohoo** (no)  
glomerular posterior (NO)

b. **koo**-sikyuutai (no)  
posterior glomerular (NO)

*Post-* in **postbrachial** is translated into Japanese in two ways, with *koobu* or *koo-* utilized. In translating **postglenoid** and **postglomerular**, on the other hand, *koohoo* as well as *koo-* is a candidate.

Summarizing, there are two translation patterns for **post**-. It can be translated by the postpositional use of the free words *koobu* or *koohoo*, or the prefix-like morpheme *koo-*. This formula is illustrated in (10):
Let us call the translation pattern in (10i) the *X-Koohoo* pattern, and that in (10ii) the *Koo-X* pattern. Assuming that the two-way translation is a fundamental property of spatio-temporal prefixes in medical English, we attempt to explain why the two forms are found in Japanese translations, paying attention to the prefix *post-*. Specifically, we address the following questions:

(11) a. How are the two translation patterns in (10) derived?

b. What is the difference between them?

We show that Nagano’s (2013) analysis of spatio-temporal prefixes provides us with a possible explanation of why there are two translation patterns illustrated in (10). In the next section, based on Nagano’s analysis, we answer the question (11a).

3. NAGANO’S (2013) COMPLEX PP ANALYSIS AND ITS APPLICATION TO JAPANESE

In the preceding section, we observed that medical terms with spatio-temporal prefixes can be paraphrased into expressions of PP structures in English. As shown in (2b), the expression *postoperative* can be paraphrased into an expression such as *after surgery*, for example. In this section, we first introduce Nagano’s (2013) analysis of the relationship between spatio-temporal prefixes and PP structures, and then attempt to answer the question (11a).

3.1. NAGANO’S ANALYSIS

As Nagano (2013) observes, the correspondence between spatio-temporal prefixes and PPs are not limited to medical language. This is generally the case, as illustrated as follows:
(12) a. preadverbial expression  a’. expression in front of an adverb
  b. pre-Chaucerian literature  b’. literature before Chaucer
  c. postnominal adjective  c’. adjective after a noun
  d. intra-organismal and  d’. within and between struggle
       interorganismal struggle
  e. sub-Saharan Africa  e’. Africa below the Sahara
  f. suprasegmental phonemes  f’. phonemes above segments
  g. a trans-global expedition  g’. expedition across the globe

(Nagano 2013: 123)

The adjective with a spatio-temporal prefix in (12a), preadverbial, for example, can be paraphrased into the PP in front of an adverb as shown in (12a’). The other pairs in (12) also show a similar correspondence between prefixed adjectives and PPs. The adjective postnominal is equivalent to the PP after a noun (12b/b’), the expression intra-organismal and interorganismal can be paraphrased as within and between organisms (12d/d’), trans-global means across the globe (12g/g’), and so forth. In addition, the adjectival pattern and the PP pattern have the same function. They are both nominal modifiers.

The surface form of the PP in front of suggests that spatial Ps corresponding to spatio-temporal prefixes have complex structures. Nagano adopts decomposition analysis of spatial PPs developed in Beard (1995), Svenonius (2010), Cinque and Rizzi (2006), among others, and assumes the following structure for the PPs headed by in front of and under, for instance:

(13) Decomposition of spatial PPs

```
PP
   P
   AxPartP
   AxPart
   NP
   in
   front
   (of)
   the car
   (a kangaroo) in front of the car,
   AT
   under
   (of)
   the tree
   (a cat) under the tree
```

AxPart is a category related to the meaning of axial or positional properties of something which can be described by an expression such as top, front, back, bottom, side, and so. It is also called the relational noun (RN).
Spatial Ps like *under, after, behind, above, across*, and so forth are complex in nature in the sense that they are conflated forms consisting of a simple preposition, corresponding to *in* or *at*, and an AxPart, like *front*. Based on this idea, Nagano makes the following proposal.

(14) Spatio-temporal prefixes like *pre-* are bound realizations of AxParts or RNs.

The following definitions in a medical dictionary support this view:

(15) a. **preauricular** = situated *in front of* the auricle of the ear  
    b. **postoral** = situated *behind* or *in the back part* of the mouth  

As shown in (15a), *pre-* is paraphrased with the RN *front*. The prefix *post-*, on the other hand, is defined with the expression *back part* in (15b). Spatio-temporal prefixes are derived from a morphosyntactically structure such as (13).

Considering that spatio-temporal PPs function as nominal modifiers like adjectives, Nagano also adopts the following assumption in Baker (2003):

(16) P is an NP-to-AP transpositional functional category.

(16) states that P is a functional category which changes the category N to the category A. In other words, P is a category-shifter. This is the case for P in the structure (13). The simple P thus gives AxPartP, equivalent to the phrase projected from an RN, an adjectival function, behaving as a category-shifter. This is why the PPs *in front of the car* and *under the tree* can be nominal modifiers. The category-shifter P is involved in *in front* and *under*.

Extending this idea to the adjective involving spatio-temporal prefixes like *preadverbial* or *sub-Saharan*, Nagano further proposes that an adjectivizer such as *-al* or *-an* is a bound realization of P. The adjective *preadverbial* is derived from the structure (13) through head movement:

(17) [[AxPart+N]+P]: **preadverbial** (expression)

The prefix *pre-* , which is a realization of AxPart or RN, and the adjectivizer *-al*, which is a realization of the category-shifter P, are realized independently.
We can summarize Nagano’s complex PP analysis as follows:

(18) Word forms of complex prepositions like *under*, *behind*, *before* result from conflated of the category-shifter P and axial parts, or relational nouns, like *front*.

(19) Spatio-temporal prefixes are bound realizations of relational nouns, and adjectival suffixes like *-al* are realizations of the category-shifter P.

In Nagano’s analysis, the morphosyntactic structure in (13) can be realized in two ways. AxPart or RN is realized as a free form like *front* or as a bound prefix form like *pre-*.

3.2. JAPANESE TRANSLATIONS OF MEDICAL TERMS IN ENGLISH

Remember that spatio-temporal prefixes in English medical terms can be translated into Japanese in two ways. Consider again (10), repeated here:

(10) *post*-

(i) free compounds

- *koo-bu* (lit.) posterior-part,
- *koo-hoo* (lit.) posterior-orientation

(ii) bound prefix-like morphemes

- *koo-* (lit.) posterior

The translation of the prefix *post* can be a free form like *koobu* or *koohoo*, or a bound form, *koo*-. According to Nagano, AxPart is realized as a free morpheme like *front*, or as a bound morpheme like *pre*-. Our idea is that *koobu* or *koohoo* is a free realization of AxPart, and *koo-* is a bound realization of AxPart.

Consider (8), for example, repeated below:

(8) *post*glenoid

a. kansetuka *koohoo* (no)

   glenoid posterior (NO)

b. *koo*-kansetuka (no)

   posterior glenoid (NO)
The medical term *postglenoid* can be translated as *kansetuka koohoo (no)* or *koo-kansetuka (no)*. Both *koohoo* and *koo-* are realizational forms for Ax-Part. The Japanese translations (8a) and (8b) share the morphosyntactic structure in (20)

(20) 

\[
\text{PP} \\
\text{AxPartP} \quad \text{P} \\
\text{NP} \quad \text{AxPart} \\
\text{kansetuka koohoo no} \quad \text{‘postglenoid’} \\
\text{kansetuka koo no} \quad \text{‘postglenoid’}
\]

Japanese is a head-final language. So assume that PP and AxPartP have right-headed structures. In Japanese, there are two realizational forms for the structure (20). One involves a free form for AxPart (*koohoo*) and the other a bound form (*koo-*). In the case of bound realization, AxPart is morphophonologically left-headed. Still, it is right-headed morphosyntactically.

In this way, applying Nagano’s analysis to Japanese, we can answer the question (11a), concluding that the two Japanese translation patterns are realizational variants in the same way that spatial PPs and adjectives with spatio-temporal prefixes are. Form Nagano’s perspective, it is quite natural that medical terms with spatio-temporal prefixes have two types of Japanese counterpart.

4. LICENSING A TECHNICAL TERM

Let us turn to the question (11b), which asks how the *X-koohoo* pattern and the *koo-X* pattern are different. In section 3, it is shown that the *X-Koohoo* pattern and the *Koo-X* pattern are derived from the same morphosyntactic structure in (20). In spite of shared morphosyntactic structures, however, they sound different in nuance to native speakers of Japanese. Expressions in the *Koo-X* pattern sound more like technical terms than those in the *X-Koohoo* pattern.

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1 We assume that the particle *no* is a category-shifter P. See details about this matter in Nagano and Shimada (2013).
Consider (8), for example:

(8) postglenoid
   a. kansetuka koohoo (no)
      glenoid posterior (NO)
   b. koo-kansetuka (no)
      posterior glenoid (NO)

(8a) and (8b), which involve koohoo and koo- as AxParts, respectively, are equally Japanese counterparts of postglenoid. Interestingly, (8b) sounds more like a technical expression than (8a). Where does this difference between the two patterns come from?

In addition to the subtle semantic difference just mentioned, the two patterns also have phonological differences. We would like to explore the possibility that the semantic difference and the phonological one are interrelated. First let us observe how the X-koohoo pattern and the koo-X pattern are different in phonology.

Consider the pronunciation of the following expression of the X-koohoo pattern:

(21) sinapusu koobu (no) (=5a))
   synapsis posterior (NO)
   ‘situated after a synapse’

The expression sinapusu koobu is a compound consisting of the word sinapusu and the word koobu, and is never a phrase. This is evidenced by the fact that such a modifier koko-no ‘single’ cannot modify the word sinapusu in sinapusu koobu, showing the lexical atomicity of the expression sinapusu koobu:

(22) *koko-no sinapusu koobu (no)
    Single-Gen synapsis posterior (NO)
    ‘situated after a single synapse’

In contrast, in the phrasal counterpart of (21), with the genitive marker no attached to sinapusu, koko-no can modify sinapusu, as in (24):

(23) sinapusu-no koobu (no)
    Synapsis-Gen posterior (NO)
    ‘a posterior part of a synapse’
(24) koko-no sinapusu-no koobu (no)
    Single-Gen  synapsis-Gen posterior (NO)
    ‘a posterior part of a single synapse’

Note that in Japanese, a word and a phrase are distinguished according to an intonation pattern. Since sinapusu koobu in (21) is a word, it is predicted that it has an intonation pattern of words. However, it has the same intonation pattern that the phrase sinapusu-no koobu has:

(25) a. sinapusu  koobu
    b. Sinapusu KOObu (phrasal intonation)
    c. *siNAPUSU KOObu (word intonation)

(26) a. sinapusu-no  koobu
    synapsis Gen posterior
    b. Sinapusu-no KOObu (phrasal intonation)
    c. *siNAPUSU-NO KOObu (word intonation)

In (25) and (26), the capital letters represent a pronunciation with high-pitched accents. The intonation pattern of the compound sinapusu koobu and that of the phrase sinapusu-no koobu are the same, as shown in (25b) and (26b). The expressions sinapusu and koobu keep their original accents unchanged. We cannot pronounce (25a) and (26a) as one unit of words. This is indicated in (25c) and (26c). Therefore, the compound sinapusu koobu, which is classified as the X-koohoo pattern, has a phrasal character in the sense that it has the same intonation pattern that syntactic phrases have, though it is a word. This is reminiscent of what Shibatani and Kageyama (1988) call a post-syntactic compound. The post-syntactic compound bears a phrasal intonation and is characterized as a kind of word with phrasal properties. So we can refer to it as a phrasal compound.

The expression of the *koo–X pattern, on the other hand, is characterized as a morphological word or a genuine word, but not a phrasal word, since it shows intonation patterns for words, not phrases. Consider (6b) again, for example:

(6) b. postpalatine → koo-koogai (no)
    posterior palate (NO)

As illustrated in (27), the expression koo-koogai ‘postpalatine’ is pronounced with a word intonation, but not with a phrasal intonation:
In (27b), each of the morphemes *koo- and *koogai is pronounced as an independent word, which is not allowed. In (27c), on the other hand, *koo-koogai is pronounced as one word. Judging from these facts about pronunciation, it can be said that the *koo-X pattern is not a phrasal word but a morphological word. The sequence of *koo-X is counted as a word as a whole. In sum, the expression of the *koo-X pattern is a morphological or genuine word, while the expression of the X-koohoo pattern is a phrasal word.

Other examples showing a similar contrast are given below:

(28) **post**glomerular
   a. sikyuutai koohoo (no) (phrasal word)
      glomerulus posterior (NO)
   b. *koo-sikyuutai (no) (morphological word)
      posterior glomerulus (NO)

(29) **para**oral
   a. kookuu shuui (no) (phrasal word)
      mouth around (NO)
   b. *boo-kookuu (no) (morphological word)
      around mouth (NO)

In (28), the X-koohoo pattern, sikyuutai koohoo (no), has a phrasal intonation, while the koo-X pattern, koo-sikyuutai, has a word intonation. Japanese translations of English spatio–temporal prefixes other than post- show the same thing. For example, the prefix para- can be translated as the free form shuui or the bound form *boo-, as illustrated in (29). In this case again, the X-koohoo pattern, kookuu shuui in (29a), has a phrasal intonation, while the koo-X pattern, *boo-kookuu in (29b), has a word intonation.

It should be noted that the phonological distinction just mentioned is not a matter of phonology in essence. It is just a surface manifestation of the fundamental difference in wordness property between the X-koohoo pattern and the koo-X pattern. The phrasal intonation of the X-koohoo pattern indicates that this form is not a complete word and has some relation to syntax. In contrast, the koo-X pattern is a genuine word.
We would like to suggest here that the distinction in wordness between the X-koohoo pattern and the koo-X pattern is the source of the subtle semantic difference between them. Generally speaking, phrases are generated in syntax, and the semantic information of phrases is interpreted when they are built in syntax through the process of Merge. In minimalist theory, for example, when the unit of a phase is completed as a result of Merge, the structure is interpreted and spelled out. It is not until after the application of the syntactic process that the interpretation of phrases is determined. In contrast, words are listed in lexicons and are stable in meaning. Their interpretation is determined in advance. Remember that the koo-X pattern, which is a genuine word, sounds more like a technical expression. The technical expression is a word which is assigned a specialized meaning. Its meaning is defined, invariable, and shared among users. Comparing the koo-X pattern and the X-koohoo pattern, the former is superior in the wordness property. For this reason, the koo-X pattern is a more suitable form for technical terms than the X-koohoo pattern, which is not a genuine word.

5. CONCLUDING REMARKS

In this paper, we have been concerned with the following questions:

(30) a. How are the X-koohoo pattern and the koo-X pattern derived in the Japanese translation of English medical terminologies with spatio-temporal prefixes?
    b. What is the difference between the X-koohoo translation and the koo-X translation?

We argued that both patterns are derived from the same morphosyntactic structure, and their formal difference is attributed to how the AxPart is realized. A free form like koohoo and a bound form like koo- are two options for a phonological realization, which is a source of the variation of translation patterns. We also suggested that the koo-X pattern guarantees the technical-word status. It is a genuine word, while the X-koohoo pattern is a phrasal word.

Before finishing the paper, we take a brief look at spatio-temporal prefixes other than post-. First consider the morpheme kee-, the Japanese counterpart of the prefix trans-:
(31) **trans- → kee-**
**trans**synaptic → *kee-sinapusu (no) / sinapusu-keebu*
across synapse (NO)

It seems that *trans-* lacks the X-koohoo pattern as a Japanese translation. However, according to a dictionary, *trans-* is paraphrased with a verb phrase:

(32) **sinkee sinapusu-o yokit-te okoru**
neuronal synapsis-Acc crossing occurring
‘occurring through synaptic connection’
(cited from *An English-Japanese Dictionary of Medical Science*, published by Kenkyusha Co., Ltd. in Tokyo.)

In (32), the verb phrase *sinapusu-o yokit-te* ‘(lit.) synapsis crossing’ is used as a translated expression of *trans-. A phrasal word could not be used as a phrasal pattern for the Japanese translation of *trans- for some unknown reason. We have to resort to genuine phrases like VPs to translate *trans-* into phrasal expressions. So the X-koohoo pattern would not be found as a translation of *kee-.*

Next consider (33) to (35):

(33) **infra- → -ka**
   a. **infracostal** → *rokkotsu-ka (no)*
      rib beneath (NO)
   b. **infracardiac** → *sinzoo-ka (no)*
      heart beneath (NO)
   c. **infraglottic** → *seemon-ka (no)*
      glottis beneath

(34) **inter- → -kan**
   a. **intercostal** → *rok-kan (no)*
      rib between (NO)
   b. **interdental** → *si-kan (no)*
      teeth between (NO)
   c. **intercapillary** → *moosaikekkan-kan (no)*
      capillary between (NO)

(35) **intra- → -nai**
   a. **intraoral** → *koo-nai (no)*
      mouth within (no)
b. intranasal $\rightarrow$ bikuu-*nai* (no)
nose within (NO)
c. intracellular $\rightarrow$ saiboo-*nai* (no)
cell within (NO)

The prefixes *infra-*-, *inter-*, and *intra-* are translated as *-ka*, *-kan* and *-nai*, respectively. These Japanese translations are all bound forms and thus genuine words, but not phrasal words, result. Moreover, these Japanese bound morphemes come rightward, conforming to the right-headedness of Japanese words. It is not clear at present why the morphemes *-ka*, *-kan* and *-nai* are different from the morpheme *koo-* in headedness. The issue of minor variations among spatio-temporal morphemes in Japanese is left open for future research.

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spatio-temporal prefixes, like *post*- , *trans*- and so forth, functioning as semantic heads, appear leftward or rightward in words

(1) a. postsynaptic → sinapusu koobu lit. synapsis post
b. postcapillary → koo-moosaikan lit. post capillary

Based on Nagano’s (2013) idea that spatio-temporal prefixes in English are bound realizations of axial parts in the sense of Svenonius (2010), it is argued that Japanese translations like *koobu* and *koo*- are also axial parts. It also follows that Japanese has two options for the translation of spatio-temporal prefixes. Moreover, their subtle semantic difference is attributed to the difference in the wordness property between them. The translation of (1b) type sounds more like a technical term because it is a genuine word.

**Key words:** Medical English, translation, spatio-temporal prefixes, adpositions

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**TŁUMACZENIE NA JAPÓŃSKI**

**PREFIKSÓW PRZESTRZENNO-CZASOWYCH Z MEDYCZNEGO ANGIELSKIEGO**

**Streszczenie**

Istnieją trudności przy tłumaczeniu medycznej angielszczyzny na języki niespokrewnione typologicznie, takie jak japoński. Na przykład japońskie odpowiedniki prefiksów przestrzenno-czasowych, takich jak ‘post-’, ‘trans-’, itd., funkcjonujących jako semantyczne człony główne, występują z lewej bądź z prawej strony wyrazów

(1) a. postsynaptic → sinapusu koobu dosł. ‘synapsa post’
b. postcapillary → koo-moosaikan dosł. ‘post naczynie włosowate’

W oparciu o propozycję Nagano (2013), która twierdzi, że prefiksy przestrzenno-czasowe w języku angielskim są realizacjami związanymi osiowych części mowy (‘bound realizations of axial parts’) w ujęciu Svenoniusa (2010), postuluje się, że japońskie ekwiwalenty przekładowe, takie jak koobu oraz koo-, również należy zaklasyfikować jako osiowe części mowy. Stąd też wniosek, że język japoński daje wybór pomiędzy dwoma wariantami przekładu prefiksów przestrzenno-czasowych. Co więcej, przyczyny subtelnej różnicy w ich znaczeniu upatruje się w różnicy ich „słowności” (‘wordness property’). Przekład typu (1b) bardziej przypomina termin specjalistyczny, gdyż jest to pełnoprawne słowo.

**Słowa kluczowe:** medyczna angielszczyzna, tłumaczenie, prefiksy przestrzenno-czasowych, przyimki