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Complex Noun Phrases and Complex Nominals: Some Practical Considerations

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This article will address the use in English of complex noun phrases in general and complex nominals in particular. These structures are frequently found in scientific and technical texts. Extremely compact, they combine several ideas into just a few words by adding a variety of premodifiers to a noun. An example is "excess water weight remover," suggesting some kind of device that gets rid of surplus weight consisting of water. Complex noun phrases are found especially in technical English and journalism, language areas where compression is highly valued.

In spite of their frequent use, no explicit rules for the formation or analysis of these combinations exist. This worsens the confusion of many EFL readers, especially Spanish speakers, because the position of nouns and adjectives in English and Spanish is almost always different. In English, the adjective precedes the noun it modifies almost without exception. In Spanish, however, although limiting adjectives usually precede nouns (e.g., *dos ecuaciones*, two equations; *el tercer capítulo*, the third chapter; *el mismo resultado*, the same result; *tanto dinero*, so much money), descriptive adjectives generally follow them (e.g., *un envase frío*, a cold container; *un ácido órganico*, an organic acid). An additional problem arises from the fact that often several nouns are strung together in English, while parallel nominal structures in Spanish use prepositions to make their relationships and meanings more explicit (compare "radio signals" and *"señales de radio"*).

In this article, attention will first be called to adjective+noun combinations as compared to parallel noun+noun expressions (such as *industrial output* vs. *industry output*). EFL readers seem to cope well with the former type but experience difficulty with the latter. Some classroom exercises featuring samples of multicombinations drawn from general science readings will next be presented, along with some typical problems they have posed students. Finally, some conclusions will be offered.

Complex Nominals: Noun+Noun Versus Adjective+Noun

Different authors have used different terms to refer to the structures herein considered. Noun+noun combinations (e.g., lemon pie and deficiency disease) have been named nominal compounds (Gay and Croft, 1990; Limaye and Pompian, 1991), noun adjuncts (Celce-Murcia and Larsen-Freeman, 1983), attributive nouns (Johansson, 1980), and adjectival constructions (Lees, 1960). Certain adjective+noun combinations (e.g., molecular chain and electric shock) have been called noun phrases with nominal or nonpredicating adjectives (Lees, 1960). The overarching term *complex nominal*, which subsumes the two types of combinations, means a syntactic construction composed, in its simplest form, of a head noun preceded by a modifier (Levi, 1978: 58). This modifier can be either another noun or a "pseudoadjective," (i.e., an adjective which cannot appear in its predicative function because it would make no sense). To illustrate, consider that although "an efficient generator" is a generator which is efficient, "an electrical engineer' is *not* an engineer who is electrical (although "an electrical problem" is a problem that is electrical).

Another feature of these "pseudoadjectives" is that their meaning appears to vary depending on the head noun that they modify. For example, a musical clock is a clock that produces music. Musical criticism, on the other hand, while it may produce many things from an informed public to an infuriated concert artist, cannot produce even one note of music, of whatever quality. These kinds of adjectives also appear in positions where we would expect a noun, and they form structures strikingly parallel, semantically and syntactically, to noun+noun combinations. (These combinations should not be confused with compound nouns such as "greenhouse" or "screwdriver" since these words make reference to a specific object or concept. Levi in fact considers the following to constitute semantically parallel expressions:

a)	electrical shock	b)	future shock
	sanitary engineer		mining engineer
	molecular chains		daisy chains

The lists which follow, on the other hand, exemplify fully synonymous pairs:

a)	manual signal	b)	hand signal
	oceanic currents		ocean currents
	atomic bomb		atom bomb
	acoustic system		sound system
	urban problems		city problems

It has been pointed out that complex nominals incorporate an idiosyncratic dimension which makes it impossible to learn each one individually: native speakers are always creating new forms spontaneously (Lees, 1960; Levi, 1978). EFL and ESL students can never, therefore, catch up completely. Another difficulty is that any complex nominal can be extended without theoretical limit (e.g., apple pie, apple pie plate, apple pie plate crack, apple pie plate crack pattern), etc. However, because native speakers don't have to stop to define these spontaneous linguistic creations, a certain uniformity in their construction must render most of them instantly understandable, even when they are quite original and not expanded existing forms. It is precisely this comprehensibility which accounts for the extensive use of complex nominals in English. A head noun and related information can be reduced to just two or three words, as in a "blood sugar regulation formula" and the "top corporate research jobs." In fact, such forms are so widely used that their "overuse" has been called *nounspeak* by Price (1974), who condemns this practice. He points out that three nouns seemed to be the limit in the past, and that not many examples of *nounspeak* are encountered at all before the 1950s. He claims that *nounspeak*, though not grammatically incorrect, nevertheless may lead to misunderstandings as well as hide blunt realities behind euphemisms. "U.S. Air Force aircraft fuel systems equipment mechanics course" is an example of the former, he says, while the military's "target neutralization requirement," which really means "the desired dead," illustrates the latter.

Does the compression found in complex noun phrases in fact sacrifice clarity? Limaye and Pompian (1991) tested whether the juxtaposition of three or more nouns retains sufficient semantic information to justify such compression. They found that native respondents often misidentified at least one out of five head nouns. They therefore recommend that students be reminded of head nouns' importance, and that complex nominals be presented to them only after they have seen fuller, clearer forms expressing the same meanings

In Spanish, the head noun in a nominal structure is readily identified. This is then modified by following words, and the structure as a whole functions in the same way as the noun by itself (Revilla de Cos, 1984). In English, by contrast, "the *semantic* relationship of modification is preserved by the *syntactic* configuration of prenominal elements plus head noun" (Levi, 1978: 58). Despite the extensive variety of prenominal elements in English, they all modify the last noun, which is the main element in the nominal phrase. Students of English, whether native Spanish speakers or not, must be made aware of this.

In addition to head noun placement, complex nominals avoid critical loss of information due to the fact that their elements can always be "rehydrated", as it were,

into full meaning. Thus, "senatorial industrial investigation" expands to "senators investigating such and such industries," and "drug deaths" clearly means "deaths cau by drugs."

When an element is deleted in order to achieve the concision of a complex nomi this does not, as we have seen, cause irrecoverable loss of semantic information. It c however, result in ambiguity. Although all complex nominals are potentia ambiguous, those which are commonly employed have what can be considere commonly recognized meaning, institutionalized referent or most probable read which virtually eliminates ambiguity in regular discourse (Levi, 1978).

Analysis of Multicombinations Found in General Science Readin

The exercises that appear in the Appendix have been used several times with U.S students in the First Year EST reading program. This program is based on development of reading strategies but provides no systematic instruction in Engl grammar, vocabulary, pronunciation, or writing. It is divided into three courses reading comprehension that students take as part of their requirement to enter (in th second year) their various major fields in engineering, science and technology.

The objective of the exercises on complex noun phrases is first to help stude recognize them, and second, to interpret them correctly. The term "complex no phrase" is used because many of the examples are not simple noun+noun combinatic nor complex nominals, but rather a mixture of nouns, adjectives and sometimes ev adverbs. These examples come from authentic texts comprising our students' readi materials, and most of the combinations therein were included in order to offer t students a chance to see a variety of structures. These exercises are always present after the students have already worked with the reading materials and have discuss the main ideas, the organization of the text, the rhetorical functions employed, and oth matters.

The first exercise introduces students to these structures. Fourteen examples a presented. The students must identify the head noun and the differences in meaning the paired samples. This simple exercise calls their attention to details of language a to how changes in word position cause changes of meaning. The first and thi examples include noun+noun and synonymous combinations. These do not typical cause students problems. Some, however, have difficulty understanding exampl five and six (political campaign/campaign politics; the Dutch patient/the patie Dutch), confusing adjectives and nouns. Once they concentrate on identifying th head noun, the comprehension problem disappears.

The second exercise in the Appendix has been used with first trimester students following eight hours of instruction. The students receive an introduction to this type of structure in class, and then are assigned the exercise as homework. During the next session, the students, in pairs or groups of three, compare their answers. Although almost all students identify the head noun correctly, certain structures elicit the same kind of misinterpretations. When groups disagree but then reread, paying special attention to structure, they usually resolve their difficulties. Among the complex noun phrases included, "technical design problems" and "a high-speed flash photograph" usually cause the most controversy—not only among students but EFL teachers as well. "Technical design problems" would seem to indicate problems of technical design with "technical" referring to *design*, not *problems*. However, taken in context, it becomes clear that *design problems* are of a technical nature because the reading *as a whole* discusses how some computer systems can help engineers and drawing assistants solve their design problems. When some actual architects and engineers were shown this complex noun phrase, they selected the second rendering: "technical problems of design" instead of "problems of technical design."

Students seem, however, to have no problem analyzing the phrase "traditional industrial design engineering" since the words "industrial design" go together well. Other words that they "feel" belong together are "numerical control" in the phrase "numerical control manufacturing plant" and "data base" from "advanced data base handling system." A few students usually point out another combination in the reading not included in the exercise. The phrase is "an integrated computer assisted design and manufacturing system," but has posed no comprehension problem.

With regard to the phrase "a high-speed flash photograph" in a reading about collisions taken from a physics textbook, every trimester features the same disagreement about "high-speed." *What* is high-speed, the flash or the photograph? In the end, most agree that the head noun is *photograph*, one taken by a camera using a flash and especially sensitive film.

Even though the exercise may seem confusing, most students enjoy it quite a lot. They approach it with the same attitude they take to solving riddles and puzzles. Meanwhile, they develop a sense of how words are grouped, and ask questions about the use of hyphens in other combinations, even pointing out that some words are hyphenated in some texts and not in others. Throughout the trimester, they are asked to find examples of complex noun phrases and to bring to class those they consider interesting or confusing.

The third exercise in the Appendix comes from the second trimester of the reading program. After discussion of main ideas and rhetorical functions (such as chronology),

students are asked once again to find as many examples as they can of complex noun phrases (and also compound nouns). From their response, we see the variety of phrases one particular reading provided. Again in groups, students usually realize in the end that they have sometimes picked out "groups" of words which on analysis make no sense because they are not true noun phrases (e.g., *the mechanical linkage capable*). Incomplete combinations (e.g., *a fast-acting precision*) also are scrutinized; usually the students themselves realize that something is missing (corrected: *a fast-acting precision machine*). In addition, students have proven sensitive to the number of hyphenated words in this particular reading as compared to other combinations we have discussed. Another activity that has been used with this reading is organizing the newly discovered word combinations according to type (e.g., noun+adj+noun: computer-based robot, servo-controlled motors, spring-powered automata, etc).

Sometimes, upon student request, we have discussed the ordering of adjectives in noun phrases and in English generally. In this case, the authors have always resorted to Celce-Murcia and Larsen-Freeman (1983). The latter give "an ugly big round chipped old blue French stone vase" as an example to show correct adjective order by type: determiner, opinion, size, shape, condition, age, color, origin, noun adjunct, and finally head noun.

These types of exercises have helped students become more aware of correct usage by analyzing how words are combined in English. Students have brought to class such examples as "multiple neutronically coupled fissioning cores," "rayon-nylon composite yarn dyeing," and "horizontal bed rest simulated microgravity." They come to realize that these complex phrases are found in most scientific readings, abstracts, text titles, and newspaper headlines—in short, wherever brevity is of the essence.

Summary and Conclusions

This article has examined complex noun phrases (and in particular complex nominals) in technical and scientific texts. EFL and ESL students often have problems understanding these structures, particularly when they consist of several nouns instead of adjective+noun combinations. Even combinations of multiple parts of speech arise, and students must be able to cope with these as well.

First, consideration was given to the differences between adjective+noun combinations and their parallel noun+noun forms. Some pairs are fully synonymous, such as *hand work* and *manual work*. Nevertheless, one may dominate, depending on the formality of the occasion. *Renal disease* and *ocular infection*, for example, appear more frequently in medical contexts than *kidney disease* and *eye infection*. In other cases, terms in use originate in advertising campaigns, such as *nose drops* (instead of

nasal drops) and, ironically, *nasal decongestant* (instead of *nose decongestant*). Through frequent repetition, such forms may filter into everyday speech.

Do adjective+noun combinations, then, differ in register from their noun+noun counterparts? It seems not. We favor *father figure* over *paternal figure*, but prefer *maternal instinct* to *mother instinct* for no particular reason. One may conclude that the differences between noun+noun and adjective+noun combinations are not completely clear, and that writers must rely on usage or, for new coinages, on their intuition and ear for the language.

As to pedagogical implications, ESL/EFL reading teachers can always be on the lookout for examples of complex nominals and complex noun phrases (both of which are sometimes unclear even to native speakers of the target language) for their classes. Students, meanwhile, should be reading authentic materials where these structures are commonly found, keeping in mind that because language changes according to its users' needs, new combinations will arise continually. ESL/EFL teachers can design exercises similar to those given in this article in which students work first individually and next collectively in their major fields of study or interest to spot and decode *nounspeak*.

In the scientific community, the use of complex noun phrases is widespread and likely to increase. Our students can better cope with the succinctness of technical and scientific English by developing strategies for rapid comprehension. Identifying the head noun and analyzing the relationship between all the elements in complex noun phrase is one such strategy on our students' road to becoming more competent and efficient readers of English.

APPENDIX

Complex Noun Phrases: Exercise 1

When two or more nouns appear in a phrase, the last noun is the main noun or HEAD NOUN, and all the others give us additional information about that head noun.

Analyze the following examples. First work individually trying to identify the head noun and figuring out the meaning of the combinations. Then, work in groups of two or three people to compare your answers. Some combinations look very similar but refer to different ideas. You may use your dictionary if necessary.

1a. an ocular infection	1b. an eye infection
2a. a traditional society	2b. a society tradition
3a. manual work	3b. hand work
4a. education standards	4b. standard education
5a. the political campaign	5b. the campaign politics
6a the Dutch patient	6b. the patient Dutch
7a. a process investigation	7b. an investigation process

8a. some representative chemical industries

8b. some chemical industry representatives

Complex Noun Phrases: Exercise 2

The English language makes frequent use of expressions in which many ideas are condensed into a few words. These combinations produce an extremely compact structure in which a main noun or HEAD NOUN is preceded by one, two or three words that give us more information about that HEAD NOUN (e.g., high precision instruments). Every day we find more examples of these forms in technical and scientific writing probably because of the rapid advances in modern technology. These require the condensation of many ideas into a few words.

It is important to know that the HEAD NOUN is the main element of these combinations and that we can solve problems of confusion or ambiguity by analyzing the order of the words.

You are probably familiar with combinations such as these:

a) a new <u>car</u> ===» a <u>car</u> that is new
2 1 1 2

b) a plastic orange <u>ball</u> ===» a <u>ball</u> that is orange and is made of plastic
3 2 1 1 2 3

c) a Central University engineering <u>student</u> ===» a <u>student</u> of engineering from
3 2 1 1 2

Central U.
3

The following is an example from your reading materials:

"Hemorrhagic fever viruses are among the most dangerous biological agents." If we analyze this combination, we can say that it has two combinations:

"hemorrhagic fever viruses" and "most dangerous biological agents."

We could re-write it as: ===» The viruses that cause a kind of fever that is characterized by hemorrhages are among the agents [of animal or plant origin (biological)] that are extremely dangerous.

Now let's look at the following combinations from your "Guía de Lecturas." CIRCLE the HEAD NOUN of each combination and try to rewrite the phrase, as is shown in the following example.

- a blood sugar regulation formula ===» a formula to regulate the sugar in the blood.

(page 20, Reading: "Computer Aided Design")

1) specialized interactive computer systems ===»
2) technical design problems ===»
3) traditional industrial design engineering ====»
4) numerical control manufacturing plants ====»
5) advanced data base handling system ====»

(page 23, Reading: "Viruses")

6) filterable animal viruses ===»

(page 28, Reading: "Average Velocity")

7) the total elapsed time ===»

(page 29, Reading: "Collisions")

8) a high-speed flash photograph ===»
9) a relatively strong force ===»
10) the well-known repulsive electrostatic force ===»

ID1-112 Complex Noun Phrases: Exercise 3

Guía de Lecturas: Reading "Robotics" (page 7)

Find as many compound words (e.g., interface) and complex noun phrases (more than n+n or adj+n; e.g., high-level language programming) as you can in this reading. Circle the head noun in multiple combinations and be prepared to discuss them in class.

Students' Answers:

Compound Words: minicomputer, microelectronics, radioactive, teleoperator, wristwatch

Multiple Combinations:

paint spray guns
steam-activated mechanisms
water-powered clocks
spring-powered automata
fast-acting precision machine
computer-based robot
two golden working female statues
radioactive nuclear materials
master-slave telecherics
high-level computer languages
magnetic process controller
end-of-arm tooling
first programmable industrial robot
die-casting machine
high-speed mass calculations
heavy-duty hydraulic-powered robot
servo-controlled motors
numerical control
motion programming
programmable industrial machine

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