

第9章 文のつなぎ方 Connecting Sentences

§9-1 関係代名詞

[1] 関係代名詞の限定用法と非限定用法

限定用法（カンマ無し）： その関係詞節が無いと、先行する名詞がどの物や人を指すのかわからなくなる場合.

非限定用法（カンマ有り）： 先行詞に対して付加的な説明を加える場合.

An experiment which uses a magnetic analyzer is not very reliable.
Brown's experiment, which uses a magnetic analyzer, is not very reliable.
関係詞節を取り除いても意味が変わらないか?

次の文を比べてみよう：

- (a) We find the solution of eqs. (8-10) which remains finite as $x \rightarrow 0$.
(b) We find the solution of eqs. (8-10), which remains finite as $x \rightarrow 0$.

文(a) は $x \rightarrow 0$ のときも有限でない他の複数個の解があること（少なくともあり得ること）をほのめかしている。この関係詞節は我々が見つけるべき解がどんな解であるかを示している。他方、文(b)は、解はただ一つ（さもなければ“the”は“a”で置き換えられる）で、さらにそれは有限であると述べている。したがって、文(b)は下のようにも書き換えられる。

We find the solution of eqs. (8-10); this remains finite as $x \rightarrow 0$.
(セミコロンの使い方は §9-3 参照のこと.)

[2] 限定用法に用いる関係代名詞 “which”

これは多くの場合不要である。

英語 native speaker の文には関係代名詞はあまり使われない。分詞を使う。

The I-V characteristics which were obtained by this method are shown in Fig. 3.

⇒ The I-V characteristics obtained by this method are shown in Fig. 3.

The method which was described in Section 1 will be used here.

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The equation which describes this behavior is given in Appendix A.

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[3] 関係代名詞 “that”（限定用法のみ）

先行詞が最上級の形容詞を伴っていたり、all, every, any, no, the same, the only, the very, the last, the first など限定の意味が強い修飾語を伴っている場合は、that が好まれる。（非限定 ..., that ... は誤用。）

ただし、先行詞が人を指すときは、その場合でも who でよい。

一般に、先行詞が人と物の両方を含む場合は that を用いる。

Table 1 summarizes **all** the previous specific-heat data **that** have been published on this compound.

Gravitational waves 発見の論文：Phys. Rev. Lett. **116**, 061102 (2016).

本文 8 ページの中に、

[2] の限定“which”は何回出てくるか？ **0回**！→[3]の that が 14回

[1] の非限定“which”は？ 8回

[5] の“前置詞+which”は？ 3回

to which, the rate at which, some of which

§9-3 のセミコロン (semicolons ;): 10回、コロン (colons :): 19回

[4] 関係代名詞の先行詞

関係代名詞がどの名詞（先行詞）を指すか直ちにわかるようになっていること。

(1) 関係代名詞を先行詞の直後に置くのが原則。

One then obtains periodic solutions to the dynamical equations, *which* agree with those found by Jones.

Jones は方程式を見つけたのか、あるいは解を見つけたのか？

⇒ ...equations; **these equations** agree ...

⇒ ...equations; **these solutions** agree ...

(2) 節全体を先行詞とする *which* の使い方は避ける。

Pauling assumed two kinds of constituent atoms to be set as nearest neighbors, *which* is supported by the fact that ...

⇒ Pauling assumed two kinds of constituent atoms to be set as nearest neighbors.

His assumption is supported by the fact that ...

[5] 前置詞の目的語としての関係代名詞

However, the extent **to which** Ca influences these properties is still a controversial issue.

(Exercise 9-1) カッコ内に最適な関係代名詞を（必要ならカンマや前置詞加えて）書け。

1. The phase diagrams, () these applications are based, are reviewed in one paper.
2. It appears to be one of the few places in physics () there is a rule () can be stated very simply, but () no one has found a simple and easy explanation.
3. Composite objects, in circumstances () they can be considered as a single object, behave like a Bose particle if they contain an even number of Fermi particles.

§ 9-2 連結詞

文を論理的につなぐための「連結詞」には、**接続詞** (if, and, because など) や **接続副詞** (however, furthermore など) がある。

[1] 連結詞の重要性

次の文はファインマンのある教科書からの引用である。前後の文を論理的に、そして有機的につなぐための語句（太文字）が、頻繁に用いられている。これらの語句が切れ味よい、説得力のある文章を作る上での決め手ともなる。

More surprising is the Meissner effect. If a solid (simply connected) piece of superconducting material is placed in a magnetic field **and then** cooled below the critical temperature, the magnetic field is pushed out of the superconductor. Technically, some lines might be trapped in the object, **because** some parts reach the superconducting state before others. **Furthermore**, if the magnetic field is strong enough, it might not be pushed at all. In such a case, the material does not become superconducting. Its resistance and specific heat are normal. **Because** of its magnetic domains, iron cannot be cooled into superconductivity.

R.P. Feynman: *Statistical Mechanics: A Set of Lectures* (Benjamin, Reading, Massachusetts, 1972) Chap. 10.

Truman's law: If you cannot convince them, confuse them.

Bumper Sticker: If all else fails, lower your standards.

Cole's law: Thinly sliced cabbage.

Cole's Axiom: (axiom: an established rule or principle 公理)

The sum of the intelligence on the planet is constant;
the population is growing.

[2] よく使う連結詞

原因・理由や条件・仮定とその結果を結ぶもの

- (接続詞) because, since, if, provided (that)
(副詞) therefore, thus, hence, consequently, accordingly,
naturally, obviously, clearly
(副詞句他) as a result, as a consequence, in this way, as long as

同列の内容を結ぶもの

- (接続詞) and, or
(副詞) furthermore, moreover, besides, also
first, second, third
(副詞句他) in addition, in particular, as mentioned earlier
not only ... but also ..., at the same time, for example

反対の内容を結ぶもの

- (接続詞) but, while, whereas, though, although, even though
(副詞) however, nevertheless, otherwise, conversely
(副詞句他) on the contrary, in contrast, on the other hand,
in spite of, despite (“*despite of* ...” は誤用！)

注意を要する語句：

1. because, since

“because” は理由をはっきり述べ、因果関係を明らかにする。

“since” は少し軽い感じ。特に読者も知っているような理由を述べるときに
適当。

理由を表す接続詞の “as”, “so”, “for” は用いない方がよい。

2. And, But：文頭には用いないこと。

文を “and”, “but”, “so” で始めないようにしなさい。

“And” の代わりに “moreover” あるいは “further” を使い、

“But” の代わりに “however” あるいは “nevertheless” を使いなさい。

“So” の代わりに “therefore” あるいは “hence” を使いなさい。(A.J. Leggett)

3. then：文頭で「それゆえ」、「だから」の意味に用いるのは誤り。

“Then” は時間的順番を表すのに用いる。あるいは条件節を受けて用いる。

“Then” で文を始めることには注意してください。これを “therefore” の意味
で使うことは正しくありません。従って例えばつぎのようには書けません。

W: ** “*f(z)* is clearly analytic in the upper half-plane. **Then** we can replace ...” **
一方つぎのような文は書いてもよろしい。

“Let us suppose the series converges. Then we can replace ...”

この場合の “then” は “therefore” を意味しません。その意味は

“When (or If) we have supposed the series to converge, then we can ...”

ということです。(A.J. Leggett)

4. First(ly), ... Second(ly), ... Third(ly), ...

§5-2 (p. 21) でも述べたが “At first” を間違って使う日本人が多い。

“At first”: 時間的順序。しかも後に最初と異なる展開があることを暗示する。
(最初は. . . であったが、後で. . . となった。)

At first, most of the scientific community believed that his discovery was real.

“First”: 思考や記述の順番。

「まず第一に(First,)」>「次に(Next,)」>「最後に (Last,)」

5. however (接続副詞) §5-2 でも既に取りあげた。

however, hence, thus, therefore, furthermore, accordingly, otherwise などは
あくまで副詞である。二つの文を一つに結合するのには使えない。
接続詞 (because, although, if など) と用法を混同しないように。

W: ** “The results are interesting, however, their interpretation is rather

misleading.”**

R: The results are interesting. However, their interpretation is rather misleading.

R: The results are interesting; however, their interpretation is rather misleading.

セミコロンの用法はすぐ下で解説する.

R: Although the results are interesting, their interpretation is rather misleading.
(接続詞としての“however”は意味が異なる: You can act however you wish.)

6. **on the other hand** は同じ対象物に関する異なる事象説明に使う。同じ人物の右手を説明した後、それと異なる左手を説明するような場合に使う。

W: ** *The solution ψ_1 is unstable. On the other hand, the solution ψ_2 is stable.*

“In contrast,”を使うべき

R: This finding can be interpreted as implying the non-physical nature of the solution ϕ_1 . On the other hand, it could simply be interpreted as demonstrating the limitations of our method. (Glenn Paquette より引用)

(Exercise 9-2) カッコ内に最適な語句を下の語句群から選んで書きいれよ。

If an atom is exposed to radiation of a frequency much higher than the resonance frequency of (1) its K electrons, the dominant processes are Compton effect and photo-ionization. (2), for some purposes one is interested in the coherent scattering, (3) the atom remains in its ground state, (4) the cross section for this is rather small.

語句群: however, although, in which, even,

§ 9-3 セミicolonとcolon

セミcolonを使おう!

1. セミcolon (semicolon ;) は、ピリオドとカンマの中間程度の区切り。二つの文が密接に関係していて別々の文にはしたくないが、一つの文にすると長すぎたり焦点がぼけたりする場合に用いる。

The conference hall was too far to reach on foot; most of us went by bus.

接続副詞と組み合わせて使うのも有効:

A; however B. または A. However B.

セミcolonのあとは小文字で続ける。

2. colon (:) は、説明・列挙に用いる。

There were two problems in the measurements: the first one was the degradation of the sample crystal at high temperatures and the second one was the distortion of the output signal at high frequencies.

colonの続きは大文字・小文字いずれでもよい。

The actual behavior of a metal is very complicated: The metal electrons interact with the lattice, with the lattice vibrations, and with one another.

colonのあとには完結した文章がこなくてもよい。

“the following” や “as follows” の後には必ずcolon。

(Exercise 9-3) Fill in the parentheses with appropriate colons and semicolons.

1. Despite its remarkable success, the quark model presents us with a great puzzle () it has so far proved impossible to break up any hadron into its constituent quarks.
2. There were two problems in the measurements () we managed to solve both of them.
3. The uncertainty principle is expressed in the following form () $\Delta x \Delta p \geq \hbar$.
4. The results are interesting () however, the interpretation is rather misleading.

5. This brings up an interesting question () Why is it that particles with half-integral spin are Fermi particles whose amplitudes add with the minus sign?
6. The answer is a result of two effects () first, the exclusion principle () and second, the fact that the nuclear forces are somewhat sensitive to the direction of spin.

Law of selective gravity:

An object will fall so as to do the most damage.

Jenning's corollary:

The chance of bread falling with buttered side down
is directly proportional to the cost of the carpet.

The Murphy philosophy:

Smile ... tomorrow will be worse.

明日に備えて今日は笑顔で行きましょう。