

先進理工学専攻 大学院技術英語

Academic Writing

電気通信大学

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## 1. はじめに

### The Scientific Method とは？

Observation + Background knowledge



*Big question:* Why do things fall?

*Research question:* Which falls faster, a heavy object or a light object?  
(testable)



“A heavy object will fall faster than a light object.”  
(expectation)



Hypothesis



(test a hypothesis)



Experiment

Independent variable (独立変数)



a parameter changed by the researcher



Weight of object

*Variables* (変数)

Dependent variable (従属変数)



a parameter which may change  
because of the independent variable



Speed of fall

- Controlled variables



The density, size, and material of the  
falling objects must be controlled or  
kept the same.

*General truths*

(例) The invention of the microscope has made it possible to directly observe the behavior of micro-organisms.

*Specific facts*

(例) There were over 128 million people living in Japan in 2010, as reported by the Japan Statistics Bureau.

*Claims*

(例) Based on our result showing that diseased lobsters avoid healthy lobsters, this paper argues that disease affects the social behavior of lobsters.

*Opinions*

(例) The population of Japan is too small.

出典：東京大学教養学部 ALESS プログラム・編『Active English for Science: 英語で科学する—レポート、論文、プレゼンテーション』東京大学出版会、2012 年

\*Peer review の重要性

## 2. アウトラインの作成

### Overview of the Research Paper

The overall rhetorical shape of a typical RP looks like this.

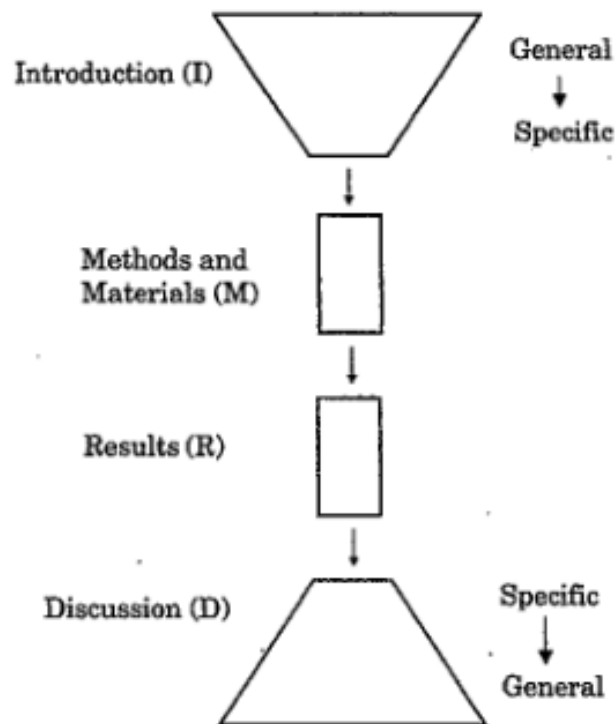


Fig. 10. Overall shape of a research paper

Source: John M. Swales and Christine B. Feak. 2004. *Academic Writing for Graduate Students: Essential Tasks and Skills* (2<sup>nd</sup> edition). Ann Arbor: The University of Michigan Press.

○以下の点に注意を払うこと。

1. どのような目的 (Purpose) で、どのような読み手 (Audience) を対象にし、どのような情報 (Information) を、どのような言語 (Language) で書くか。換言すれば、適切なジャンル\* (この場合は genres of writing) を選択できているか。

\*A genre is a socially defined type of text which has a particular *purpose* and intended *audience*.

2. 投稿規定 (Instructions to Authors) に沿った Writing になっているか

### 3. IMRAD 各セクションで使われる表現の例

#### Introduction で使われる表現の例

##### 研究の分野を特定する

\* 研究テーマの重要性、分野や用語の定義、問題の指摘、研究の歴史

1. ... is used worldwide
2. ... has been recognized as a characteristic feature of ...
3. Much attention has been directed to ...
4. Interest in ... has remained high over the last decade

##### 先行研究に触れた後、自分の研究の意義を強調する

\* これまでの研究で未解決の問題を特定

1. ~ has been of much interest and concern to ~ / has lately become a subject of special interest. Not enough attention, however, has been paid to ~
2. ~ has been widely discussed by ~[1]. However, there still remains a controversy over ~
3. A number of researchers / ~ et al. [2] have discussed / examined ~, but they have not yet reached a conclusion as to ~
4. There have been a considerable studies on this theme [3,4,5], but the previous studies have not answered the question of ~
5. The importance of ~ has been increasingly recognized in [6], but no detailed study has been published.
6. The previous work / experiments has / have demonstrated that ~. However, no complete interpretation has been formulated.
7. ~ [7] has reported on ... On the other hand, the detailed mechanism ... still remains to be elucidated.

##### この論文の目的は～

\* 未解決の問題点との絡みで研究目的（または内容）を提示

1. The purpose / aim of this paper is to show that ~
2. This article examines / discusses / concerns / describes / reports / deals with the problems regarding ~ \* 今書いている論文について言及するときは現在形
3. This report, therefore, begins by clarifying / examining / describing ~
4. In this study, we discuss / report / investigate / clarify ~
5. In this article, therefore, we will try to clarify / elucidate ~

##### 本論の構成は～

1. This paper first explains ~. Then it discusses ~. Lastly, it offers ~.
2. The first section / part of this paper explains ~. The second section / part discusses ~.
3. This paper begins by ~ and then discusses ~. Lastly, it proposes ~.

##### ～に焦点を当てる

1. This paper will focus on / present / suggest / deal with ~
2. Chapter 1 considers / concerns / involves ~
3. Each of ~ will be briefly considered in chapters 2 and 3.
4. We present herein a detailed account of ~

### 結果を報告する

1. We have obtained an interesting result and wish to report it herein.
2. We present an interesting conclusion reached by comparing ~ with ~

### Methods で使われる表現の例

#### どのような材料と方法 (Materials and Methods) で実験等を行ったか

1. *In order to collect* realistic representative data, we needed to know wh- ...  
\*「～するために・・・する必要があった」
2. *In order to investigate* the effect of environmental cues on 24-hour rhythmicity in humans, ten male human subjects lived for two weeks in a room containing no windows, clock, television, or computer. \*「～するために・・・した」
3. *To test* the effect of music on plants' growth, this study tested wheat plants in three different sound conditions. \*「～するために・・・した」
4. *Since* daily habits prior to the study could influence individual subjects' reactions, all subjects were polled about normal daily sleep/wake habits and had comparable habitual rhythms. \*「～だから・・・という方法をとった」
5. An experiment / interview *was conducted / performed* to find whether ~  
\*過去形・受動態が頻出
6. Various tests were devised to gauge ~
7. ~ volunteers / subjects\* were asked to ~ \*被験者
8. We tried the following experiment *using / with* ~  
\*「～を使って」という場合 by using~とせずに using~とすることが多い。
9. ... particles were observed using *the ... method / an* optical microscope.  
\*特定の手法には the をつける。特定されていない道具には a / an をつける。
10. In the present experiment we prepared / synthesized / added / placed / measured / removed / heated / cooled / dried / analyzed ~  
\*再実験するために必要な情報を提供
11. ~ was prepared
12. The experiment method / The procedure\* was as follows: \*手順
13. Clips were an average length of 4.4 seconds, *which*\* allowed enough time to make a judgment. \*関係代名詞の非継続的用法

## Results で使われる表現の例

### どのような結果が得られたか

\*生のデータ (raw data) を羅列するのではなく、仮説との絡み合いで最も顕著な傾向 (trends) を述べる。すなわち、Introduction で投げかけた research question(s)に答える trend(s)を Results セクションで簡潔にまとめるとよい。

1. We *observed* several significant differences in ....  
\*図や表で示されたデータから直接読みとれる事実や、その背後にある事象を提示→過去形
2. No significant differences in ... were found.
3. There was *a / no significant / considerable difference* in ... between A and B.  
\*顕著な差があった / なかった
4. There was *almost no correlation*\* between ... and .... \*相関関係
5. There was *a rapid / slight / drastic / sudden / gradual increase* in the reported number of cases of skin cancer between 2001 and 2005.  
\*以下のように表現することもできる。形容詞+名詞→動詞+副詞  
The number of reported cases of skin cancer *rapidly / slightly / drastically / suddenly / gradually increased* ....
6. Addition of milk to black tea *affected* the total catechin\* levels in blood (Figure 1). \*カテキン
7. The seeds that received the *greater* amount of light germinated more than those that received less light. \*比較級
8. Gorillas who heard sound were *less likely* to be aggressive than those who heard no sound stimulus. \*比較級 be likely to は hedging として。
9. Increased exposure to light resulted in *a larger number of* germinated seeds as compared to reduced exposure to light. \*比較級
10. *The largest number of* sleeping students was observed in the university group.  
\*最上級
11. The following results *were obtained*:
12. ~ was developed / achieved / accomplished / established / characterized as
13. In general, plants *attain* the highest biomass under intermediate light conditions. \*すでに事実として受け入れられていることを述べる時は→現在形  
\* in general, generally, usually, often などの副詞は hedging として使われている。
11. These results clearly *show / illustrate / indicate* that ...  
\*図表に言及するときは→現在形
12. The results *indicate / depict / display / exhibit / demonstrate / suggest / predict* ~  
\*suggest は控えめな感じ (hedging の一種)
13. The results summarized / presented in Table 1 *show that* ...
14. The results *are shown* in Table 1. \*論文中の図表に関する説明→現在形
15. Answers to questions about ~ thus *reflect* ~  
\*結果に関する短いコメント→現在形 詳しくは Discussion で論じる。
16. These data *seem to suggest* that the solubility of each drug coincides well with .... \*seem to, appear, tend to を使って断定を避ける (hedging の一種)。  
(例) These results show that people *tend to* rely on first language collocational patterns when processing a second language.
17. This *may* be due to diffusion of \*\*\* substances from the sediment.  
\*副次的コメント→助動詞を用いることもある (hedging)。
18. These results *possibly* lead to / result in ~



\*副詞の possibly, certainly, probably, likely, presumably, possibly, perhaps を使って断定を避ける (hedging の一種)。

19. ~ can / may / could / might be interpreted / described / justified  
\* 心態を表す助動詞＝断定を避ける (hedging)
20. This research *has found / revealed* that ... \* 現在完了形も使われる。
21. Thus far, it has been suggested that ...

#### Discussion で使われる表現の例

～に焦点を当てて・・・を明らかにした

\* この研究が何を目的にして、何を明らかにしたか (成果・重要性) を再確認する。  
Introduction で提示した仮説に基づいて論を進めるとよい。

1. This paper *discussed / focused on / explored / examined / analyzed and showed / revealed* ... \* 過去形・能動態が頻出
2. This paper *highlighted* the importance of ~
3. This study *was done* to purify ....
4. *Contrary to* the previous observations, we found that ...  
\* これまでの研究との対比
4. In this study, we *have shown / clarified* that .... \* 現在完了形も使われる。
5. The present study *has attempted* to explore ~. In particular, the focus has been on ~
6. This *is* the first demonstration that .... \* 現在形
7. Up to this point, these results *are consistent with* those of \*\* and \*\*(1982). / This result *contrasts with* [1] ....  
\* 本研究での結果が過去の研究データと合致している、あるいは異なっている点を明記。
8. *The present study shows* that consumption of green or black tea is followed by a rapid increase of the total catechin concentration in blood. *No significant effect was found* of the addition of milk to black tea on the catechin levels in blood.  
\* “hypothesis” (仮説) という語を使わず、仮説の内容を文章で表現するとともに、本研究の結果が仮説を裏付けるものであったか、あるいは、仮説とは矛盾したものであったかを記すとよい。
9. These results appear to *confirm* the hypothesis that music benefits gorillas.  
\* confirm の他に、support, uphold, demonstrate, show, give strength to などの表現が使われる。appear to (hedging)
10. These results appear to *contradict* the hypothesis that music benefits gorillas.  
\* contradict の他に、refute, do not support, run contrary to, make it unlikely (that) などの表現が使われる。

本論で述べた内容を要約する

p.8 を参照

1. To sum up, ...
2. In summary, ...
3. The results may be summarized as follows:
4. The summary of the results is ~

～について論じたい。次に～について論じたい

1. *The first point* we need to / must discuss is ~                      \* 能動態が頻出
2. *First*, we need to inquire into ~
3. Let us *first* consider ~
4. The point we must consider *next* is ~
5. What needs to be investigated *next* is ~
6. The above discussion leads us to consider *another* important factor.
- 7.

結論は・・・である

\* 結論を短く言い切って締めくくる。(注) Discussion の最後の部分で結論を述べず、Conclusion というセクションを独立して置くこともできる。  
→次のセクション参照

1. *In conclusion*, we *propose* the schematic model of ....
2. *In summary*, the present study *has shown* the considerably high frequency of ....
3. We *suggest* that attention should be paid to ....

Conclusion で使われる表現の例

結果から～のように結論づけることができる

\* 本研究から得られた結論と、その根拠を簡潔かつ明確に記す。  
このセクションは Discussion の最後に置かれることがある。

1. The results lead us to the conclusion that ...
2. These facts lead us to assume that ...
3. The most important point is that ...
4. It was found from the results that ...
5. *Thus*, we conclude that the degradation product of \*\*\*is the major carbon source for bacterial growth.                      \* Thus, は前までの文をうけて文頭で用いることが多い。
6. *Overall*, these results / findings confirm / indicate that ...
7. The results clearly show that ...
8. The results / Our data suggest that ...
9. In conclusion, ...
10. From the facts described above we can conclude that ...
11. Based on the facts that have been clarified so far, we reason that ...
12. Finally, the study presented here clearly demonstrated that ....

今回の研究の限界・問題点・課題を挙げたい

\* 説明できない点、矛盾点、不明確な点、あるいは適用できる範囲などを示し、それを解決するために将来どのような研究が必要であることを示唆する。

1. *Future* research is hence needed to determine ...

2. *Further* studies of ... may shed more light on / will need to investigate ....  
\*助動詞 (may, will) の使用 (hedging)
3. This paper has examined ~. To date, however, little is known about ~
4. It should be noted that ... / It must be borne in mind that ...
5. We should be cautious about ... because ....
6. A / One limitation of the present study was that ....
7. There are, however, *some other* ways ...
8. The following points are left as *future* problems.
9. This will be discussed in a *separate* paper.
10. ~ is the subject for a *future* study.
11. The results *suggest* that ....  
\*新たな仮説の提示。suggest は hedging (予防措置) のため。
12. These data indicate that ... *is likely to be* .... \*be likely to ...=hedging

#### 4. リサーチペーパーを書く際の留意点

図 (Figures) 表 (Tables) の説明 ・ ・ ・ Spoken English では、As you can see, ... / This table shows ... / Let's have a look at this graph. / I'm going to show you ... などの表現が使われるが、Written English の場合、以下のような表現が使われる。

1. Table 2 shows / indicates / reveals the number of immigrants from 1850 to 2000.  
\* 論文中に図や表を入れた場合、必ず本文で言及する→動詞は現在形
2. Table 6.3 shows / indicates that Spanish ranked fourth in terms of native speakers.  
\* 図や表のなかの傾向、変化、差異などで特筆すべき点を文章で表現する  
→動詞は現在形

3. The following graph shows / exemplifies / reveals / discloses:  
(1) ....  
(2) ....

\* column graph (棒グラフ) / line graph (折れ線グラフ) / pie (円グラフ) / subdivided bar graph (構成比グラフ) / scatter graph (散布図)

4. The table below, based on Fishman [3], portrays / presents ....
5. The dropout rate is shown / indicated / displayed / illustrated in Figure 7.1.
6. The dropout rate is summarized in Table 9.3.
7. The growth of ... is given in the table below:
8. The theory is represented / demonstrated in the diagram below:
9. As the diagram indicates / illustrates, ....
10. As shown / indicated / illustrated / can be seen in Table 4.1 / Figure 4.2, ....
11. Their performance was significantly below the average level (see Table 8 for details).

\* 表の場合、タイトルは表の上に :

(例) Table 3 Ratio of power energy resources in Japan (2010)

\* 図の場合、タイトルは図の下に :

(例) Fig. 1 / Figure 1: Fluctuations in the yen exchange rate to the U.S. dollar

\* 出典は図表の下に :

(例) Adapted from Kinder (2002) / Source: Kinder (2002)

出典表記 (Citation) の仕方・・・いくつかのスタイルがあるため、各自の専門分野に則したスタイルを探しておくこと。いずれにしても、plagiarism (盗用) を避けるため、先行文献に触れる場合は必ず引用したことを明記すること。

(例 1) *IEEE (Institute of Electrical and Electronics Engineers)* のスタイル  
＜情報系の研究者がよく使用する＞

1. The data are supported in [1, 3], but have been questioned in more recent studies [2, 4]. In [3], for example, pigs were reported to be able to fly; Old McDonald, however, noted that the pigs had been thrown into the air. [4]
2. Yamada et al. [5] reported / described that ....
3. Wilson [6] proposes / suggests that ....
4. According to Lucantonio [7], ....

\* 論文の末尾に引用文献[1][2]を記す→引用文献の項を参照 (12 ページ)

(例 2) *APA (American Psychological Association)* のスタイル  
＜社会科学の研究者がよく使用する＞

1. Fishman (1980) found that ... (p.14). *\*integrated citation*
2. It was found that ... (Fishman, 1980). *\*non-integrated citation*
3. Brown and Carter (2009:78) reported that ...
4. Carter (2010) holds / argues / contends / maintains / insists / asserts that...
5. Brown and Carter (2009) testify / confirm that ....
6. Several past studies (e.g., Fishman, 1980) indicate / point out that ....
7. As Spolsky (1988) points out / suggests / states / emphasizes, ...
8. According to Collins (2007:56), ....
9. Various authors (e.g., Freedman & Cline, 1996; Cook, 2002a) regard ... as ....
10. Kimura (2001a) defines / refers to .... as ....

(例 3) *MLA (Modern Language Association)* のスタイル  
＜人文科学の研究者がよく使用する＞

1. Scott states, "The fundamental difference between speaking and writing appears that writing is largely decontextualized"(18). \*18 はページ。  
\*直接引用 (原文の一部をそのまま引用) は文系の場合よく見受けられるが、理系の論文では少ない。
2. Scott argues that compared with speaking, writing lacks contextual information and thus more difficult to perform (18).  
\*パラフレーズ (原文の論旨を自分のことばで言い換える) しても、アイディアが自分のものではない場合、必ず原典を明確にする。さもないと盗用とみなされる。

Reporting verbs の例 :

- (1) that 節または目的語が後に来る動詞  
advise, suggest, recommend, advocate, argue, reason, consider, believe, hold the view, claim, allege, assert, affirm, contend, maintain, disagree, emphasize, stress, assess, hypothesize, speculate, postulate, propose, suggest, show, demonstrate, establish, uphold, state, comment, report など
- (2) 目的語が後に来る動詞 (that 節は来ない)  
Encourage, discuss, debate, reject, dismiss, contradict, refute, dispute, object to, underscore, evaluate, appraise, examine, discuss, explore, investigate, scrutinize,

advance, describe など

引用文献 (References) の書き方・・・いくつかのスタイルがあるため、各自の専門分野に則したスタイルを探しておくこと。  
ここでは例として、IEEE (Institute of Electrical and Electronics Engineers)のスタイルを記す。

○本の場合

著者が一人の場合

- [1] D.E. Knuth, *Fundamental Algorithms*, 2<sup>nd</sup> ed. Reading, MA: Addison-Wesley, 1973.

編者がいる場合

- [2] B.A. Osif, Ed., *Using the Engineering Literature*. London: Routledge, 2006.

○本の中の論文の場合

- [3] N. Clarke and K. Rowles, "Patent Information," in *Information Sources in Engineering*, 4<sup>th</sup> ed. R.A. MacLeod and J. Corlett, Ed., Munchen, Germany: K.G. Saur, 2005.

○学術雑誌に掲載された論文の場合

- [4] V. Bush, "As We May Think," *The Atlantic*, vol.176, no.1, July 1945, pp.101-108.  
[5] M.J.O'Mahony, C.Politi, D. Klonidis et al. "Future Optical Networks," *J. Lightwave Tech.*, vol.24, no.12, Dec.2006, pp.4684-4696.

○電子資料からの引用の場合

ウェブサイト

- [6] IEEE Computer Society, *IEEE Computer Society Style Guide*, IEEE Computer Society, Nov. 2008. [Online]. Available:  
<http://www.computer.org/author/style/cs-style.htm> [Accessed: 5 Apr. 2012].

電子書籍

- [7] A.V. Aho and J.D. Ullman, *The Theory of Parsing, Translation, and Compiling*, Englewood Cliffs, NJ: Prentice-Hall, 1972. [E-book]. Available: ACM Digital Library, <http://portal.acm.org/> [Accessed: 10 Dec.2011].

オンライン・ジャーナルの中の論文

- [8] "Rock Anchors Keep 'Boat' From Floating," *Civil Eng.*, vol.64, no.12, Dec. 1994, p.11. [Online]. Available: Academic search Premier, <http://web.ebscohost.com> [Accessed: 10 Feb. 2009].

\* 詳細は IEEE Citation Style Guide を参照。

[http://www.library.dal.ca/Files/How\\_do\\_l/pdf/IEEE\\_Citation\\_Style\\_Guide.pdf](http://www.library.dal.ca/Files/How_do_l/pdf/IEEE_Citation_Style_Guide.pdf)

言い換え (Paraphrasing) : 他人の論文の内容を自分の言葉で表現する

例えば、Wells が 2006 年に発表した論文の一部を引用する場合 :

Original: The value of music for the psychological well-being of humans is well documented.

↓

Paraphrase: (1) It is well known that music can have psychological benefits for humans (Wells, 2006).  
(2) Wells (2006) showed / asserted / suggested / hypothesized that Music have psychological benefits for humans.

要約 (Summarizing) : 他人の論文の要点を簡潔にまとめる

例えば、Behringer et al.(2006)を要約する場合 :

Original: During underwater surveys of lobsters, we observed that diseased lobsters rarely shared shelters with conspecifics (less than 7% shared dens and more than 93% were solitary), even though healthy lobsters generally preferred to live together (more than 56% shared dens and less than 44% were solitary).

↓

Summary: (1) Behringer et al.(2006) found that healthy lobsters avoided diseased lobsters.  
(2) Similar to the trend of healthy lobsters avoiding diseased lobsters (Behringer et al., 2006), our study indicates that ants tend to engage in fewer social behaviors when stressed.

出典 : 東京大学教養学部 ALESS プログラム ・ 編『Active English for Science: 英語で科学するーレポート、論文、プレゼンテーション』東京大学出版会、2012 年

- \* (1) の場合、オリジナルの要旨を本文の一部に取り入れている。  
このようなテキストは **synthesized text** と言う。(1) と比較して **Citation** の違いに注目。なお、詳細は出典表記・引用文献の項を参照。

以下のように箇条書きで要約することもある。

1. ~ can be briefly summarized / explained as follows:
  - (1) ...
  - (2) ...
2. ~ may be summarized in six parts:
  - (1) ...
  - (2) ...

例として～がある（例証）

1. One example will be briefly outlined.
2. The example illustrates that ...
3. An example is ... (see Chapter 3).
4. An example for schoolchildren is now presented (see Reuter, 2010 for an example).
5. Five examples of psychometric tests are given below:
- 6.

～と定義できる（定義）

1. We define ~ as ~
2. ~ is defined / seen as ...
- 3.

～と比較すると（比較: Comparison） / ～と対照的である（対比: Contrast）

1. Compared with ~ / Similar to ~ / Based on ~ / Following ~ / As ~ / This is analogous to ~  
\*類似点を基に比較するときの表現  
(例) Based on the well-known effect of color on human choice and behavior (e.g., Hill & Bartonm, 2002; Cuthill et al., 1997), this study investigated the effect of color on judgments by referees.
2. In contrast / In opposition to ~ / Challenging ~ / Though ~ / ... is contrasted to ~ / A distinction is made between ~ and ~  
\*相違点を強調して対比するときの表現  
(例) In opposition to the study of Harr (2006), our study showed no significant effect of color on referees' judgments.

強調される点は～

1. A particular emphasis is on ~
2. It should be noted / emphasized ~
3. In particular / Particularly / Notably



## 数字の表記法

1. Our staff consists of (six, 6) writers, (two, 2) editors, and one translator.  
\* 10 未満の数は算用数字でなく、スペルアウト
2. We now have (sixteen, 16) engineers on our staff.  
\* 10 以上の数は算用数字
3. The new air-condition system consists of (12, twelve) pumps, (6, six) fans, (7, seven) ducts, (5, five) valves, and (3, three) heat exchanges.  
\* 同一文内で複数の数を示すときは、すべて数字
4. See Fig. (Five, 5) for a detailed drawing of the engine.  
\* 頁、図式の番号は算用数字
5. The quality control (QC) meeting will be held at (three, 3) p.m.  
\* 計量単位、時間、日付は算用数字
6. The compass indicates (one-point-five-six, 1.56) degrees North.  
\* 小数・分数は算用数字
7. Families now spend less than (1/5, one-fifth) of their income on food.  
\* 計量単位を伴わない小数・分数はスペルアウト
8. (3,000, Three thousand) test samples were selected in the experiment.  
\* 文頭の数字はスペルアウト
9. We used (12, twelve) 75-ohm coaxial cables.  
\* 数が二つ続くときは、一方の数をスペルアウト
10. The maximum reaction temperature was \* \* ™ and the minimum one was (\* \* ™, \* \* °C).  
\* 一貫した計量単位
11. We process 0.6 (ton, tons) of raw cotton per day.  
\* 1 以下の数は単数扱い
12. The sales amount of the car has increased by 12 percent each year (see Fig.7.). / (see Fig.7).  
\* カッコ内のピリオドは省略。ただし、疑問詞、感嘆符は残す。

謝辞 (Acknowledgements) の書き方・・・“I” の使用も可。

1. First of all, I would like to thank ~ for his / her helpful advice / kind suggestion.
2. I am grateful to ~ for his / her assistance during the preparation of this paper.
3. I would like to acknowledge, first of all, the generous support of Professor ~.
  
4. I would also like to thank ~
5. I am also indebted to ~ for suggesting this problem.
6. My thanks go to ~ for providing me with helpful information about ~
7. My thanks, too, to ~ for ~
  
8. I have also gained a great deal from discussions of ~ with my friends, particularly ~.
9. Helpful discussions with ~ are greatly acknowledged.
10. And my most sincere and heartfelt thanks (go) to ~
11. Grateful acknowledgment is given to the following professors for data for table ~
  
12. Finally, I am extremely thankful to ~ for providing me with ~
13. Above all, I would like to note my profound gratitude to ~, who painstakingly commented on the original manuscript.
  
14. The authors wish to express their appreciation to ~ for his valuable comments.
15. The author wishes to thank ~ for their financial support.

## 5. Spoken English から Written English への橋渡し

科学論文に使われる語彙や表現 (the scientific register) の特徴

### 1. Formality

don't (informal) ---→ do not (formal)  
go up (informal)---→ increase (formal)  
So, (informal)---→Therefore, / Consequently

### 2. Objectivity

In my opinion (subjective)---→The evidence suggests that (objective)  
Iron is the *best* material for building bridges. (subjective, emotional)  
---→ Iron is the *most cost-effective* material .... (objective)

### 3. Specificity

*Some people* are more likely to develop early onset Alzheimer's disease.  
(general)  
---→*People with mutations\* on chromosomes\* 1, 14 or 21* are more likely  
develop early onset Alzheimer's disease.  
(specific) \*突然変異 \*染色体

アングロ・サクソン本来語とラテン借入語の関係

- \* アングロ・サクソン本来語は spoken English に、ラテン借入語は written English に使われることが多い。  
 \* やまとことば と 漢語の関係にあらためて注意を払うとよい。

アングロ・サクソン本来語			ラテン借入語	
<動詞>	get	える	obtain	取得する
	Do		perform, conduct, implement	
	keep (on)	つづける	maintain, continue	維持する 継続する
	try		attempt	
	need		require	
	build		construct	
	break	こわす	destroy	破壊する
	grow		increase	
	use		utilize, employ	
	give	あたえる	impart, provide	提供する
	hide	かくす	conceal	隠蔽する
<形容詞>	enough		sufficient	
	not enough		insufficient, limited	
	a lot of	たくさん	numerous, various, substantial	多数 多量
	old		previous	
	big, huge	おおきい	great, large, sufficient	巨大な
	popular		well-known, widely-used	
<名詞>	stuff, thing	もの	object	物体
	way	method		
	worry		concern	
<副詞>	more and more	どんどん	increasingly	次第に
	kind of		somewhat, partially	
	what is more		further, furthermore	
	really		quite	

句動詞 (phrasal verb) や名詞構文の多用に注意

\* 句動詞や名詞構文は **spoken English** に使われることが多いのに対し、**written English** にはラテン借入語の動詞 1 語でズバリと表現することが多い。

句動詞		ラテン起源語
go up	のぼる ふえる	ascend, increase 上昇する 増加する
go down		descend, decrease
find out		discover, identify
look into	しらべる	investigate, explore 調査する
come up with		offer
make up		constitute
get rid of	とりのぞく	eliminate 除去する
keep up		maintain
look over	みわたす	review 点検する
bring on		cause

\* 句動詞＝動詞に副詞や前置詞が付いて  
1 つのまとまった意味を表す。

名詞構文	ラテン起源語
be an illustration of	illustrate
be an explanation of	explain
have a tendency to	tend to
have a function	function
make an experiment	experiment
make an assumption	assume
do examinations	examine
give a description of	describe

\* 名詞構文＝基本動詞 (be, have, make, do, give, put など) + 名詞のパターン

## 6. タイトル(Title)・アブストラクト(Abstract)推敲の規準

### タイトル推敲の規準

- \* 無駄な言葉を省き、正確・簡潔に論文の内容を伝える。
- \* 同じ研究分野の読者に読む気を起こさせる。

#### (1) 漠然としすぎていないか。

##### × Role of liposomes

- \* 「～の役割」だけでは研究内容が明確に伝わらないため、もっと具体的な (more specific) 語を使う。

##### ○ Liposomal applications to cancer therapy

#### (2) 「～に関する(基礎的な)研究」や「～への一提案」など、英語のタイトルとして不必要な表現をしていないか。

##### <ロボットの二足歩行に関する基礎的研究>

##### × A fundamental study of a bipedal robot locomotion.

- \* Fundamental Research on ~ / Basic Study on ~などの表現は避け、「～」に焦点を当てる。
- \* 冠詞、前置詞、接続詞以外は、頭文字を大文字で表わすことが多いが、上記のタイトルのように小文字の場合もある。投稿規定に従うこと。
- \* タイトルにはピリオドを付けない。

##### ○ Toward the Practical Use of Bipedal Robots: Achieving Stable (Bipedal) Locomotion

- \* 副題を付ける場合には、コロン (:) を打つ。

#### (3) 無駄な冠詞を付けていないか。

##### <ロボットの二足歩行の安定性の説明>

##### × The Solution of Stability of Robot's Bipedal Locomotion

- \* タイトルの頭にある定冠詞(The)は省略することが多い。\* of の繰り返しを避ける。

##### ○ Mechanism of Stability in Robotic Bipedal Locomotion

##### ○ Mechanism of stability in robotic bipedal locomotion

- \* 大文字 (Capital letters) を使わない場合もある。投稿規定に合わせる。

##### <二足歩行型ロボットの実用化への一提案>

##### × A Proposal to Using the Bipedal Locomotion Type of Robots Practically

- \* 「～への一提案」→「～」の部分に焦点を置く。

##### ○ Practical Applications for Bipedal Robots

#### (4) 節を使ってタイトルを不必要に長くしていないか。

##### <ロボットの二足歩行に及ぼす重心の影響>

##### × Influence of Barycentric Position That Have an Effect on Robotic Bipedal Locomotion.

##### × The Effect of the Barycentric Position Which Exerts on the Robotic Bipedal Locomotion

- \* 関係代名詞(That/Which)の導く節は使わない。節→句

- Effect of the Barycentric Position on Robotic Bipedal Locomotion
- Barycentric Position Affects Robotic Bipedal Locomotion
  - \* 文 (S+V) のタイトルも受け入れられるようになっているが、投稿規定を確認すること。  
 The effect of wind speed on the rate of gas transfer in oceans and lakes (名詞句)  
 比較  
 Wind speed decreases the rate of gas transfer in oceans and lakes (文)  
 文形式のほうが、特筆すべき結果を強調できる。
- (5) キーワード以外の不明確な語句を使っていないか。  
 <二足歩行型ロボットの実用化に関する開発研究>  
 × A Development Research on the Practical Use for Robotic Bipedal Locomotion  
 \* 「～に関する開発研究」を直訳せず、「～の開発」のほうが簡潔・明瞭。
- Development of a Bipedal Robot for Practical Use

#### アブストラクト推敲

- (1) 研究の目的 (Objective)、方法 (Methodology)、結果 (Key Results)、結論 (Key Conclusions) の記述においてバランスが崩れていないか。  
 \* 余裕があれば研究の背景 (Background) を最初に 1 文 (ないしは 2 文) 入れる。
- (2) 制限語数を超えていないか。
- (3) 不必要な記述はないか。  
 \* 略語、図、式は使用しない。文献の引用も原則としてしない。  
 \* 本文中に書いていないことは絶対に書かない。
- (4) キーワードに対して異なる表現が使われていないか。  
 \* a multi-legged robot (多足型ロボット) を a robot with many legs や a robot which has multiple legs などと言い換える必要はない。言い換えによって読者を混乱させる可能性がある。
- (5) 専門用語の使い方を間違えていないか。
- (6) 時制の使い分けに関するルールを無視していないか。
  1. × This paper described a method to achieve a ### task in unknown environments utilizing \*\*\* .  
 ○ This paper describes a method ....  
 \* 「研究の目的」の部分で、論文が何を提示しているかを示す場合は現在形。例えば、In this work, we present ....
  2. × Experimental result indicates that as the barycentric position rises by 1.5 cm, walking stability decreases by 17.3%.  
 ○ Our experimental results indicated that if the barycentric position

was raised by 1.5 cm, the walking stability decreased by 17.5%.

- \*「結果」は、過去のある時点で起きたことであるから過去形で示す。  
「方法 (We used ...など)」や「結論 (We concluded ...など)」も過去形で示すことが多い。ただし、過去に起きたことがらを現在の絡みで述べたいときは現在完了形を用いる。
- \*「結論」の部分で、発見の正しさや意義を強調する場合には現在形が用いられる。例えば、These findings show that \*\* is synthesized using ....

3. × In this paper, we suggested a new method of maintaining the walking stability against dynamic change of the barycentric position.

<本論文では、以上の解析結果から重心位置の動的変化に対して歩行安定性を維持する新手法を提案することができた。>

- Based on these findings, we propose a new approach for maintaining walking stability with dynamic changes in the barycentric position.

- \*「結論」で新手法を提案するときは現在形。また、過去に行なわれた実験等に基づく説でも、一般に受け入れられていて定説になっている場合には現在形で示す。

#### (7) 助動詞の使い分けに関するルールを無視していないか。

- \*助動詞は modal verbs (心態をあらわす動詞) と言われ、断言を避けるための予防措置 (hedging) として使われる。Introduction や Discussion のセクションで使われることが多い。

<比較>

- ① The findings from this study show that captive gorillas, like humans and other primates, are influenced by their auditory environment.
- ② The findings from this study suggest that captive gorillas, like humans and other primates, may be influenced by their auditory environment, albeit to a moderate degree.

1. can (できる=現時点で可能である、能力がある)

Such a comparison can be made by examining the distribution of genes in the region.

2. could (かもしれない=可能性はあるが、may や might より低い)

No such relationship could be found between ... and ....

3. might (かもしれない=それほど可能性はないが時としてはある:  
could<might<may)

The exposure to solar radiation might result in a continuous bleaching of the chromophore-rich\* portion.      \*色素群・発色団に富んだ

4. may (かもしれない=可能性はある : could<might<may)

This may be due to diffusion of dissolved substances from the sediments\*.      \*堆積物

5. should (たぶんそうだ=可能性は高いが would より低い)

Our model should be tested by further investigations.

6. would (たぶんそうだ=可能性は高い : should<would)

*could<might<may<should<would*



The responses of flies to different stimuli\* would be controlled by different sets of genes. \*刺激因子

(8) 受動態の使用により、不必要に文を長くしていないか。

- × In our experiment, a statistically significant difference in the concentration of NO was observed between the group A and B.
- NO was higher in the group A than B ( $p < 0.05$ ).  
\* 主語が長すぎる。また、In our experiment は省略可。
- × In this study, the concentration dependent effects of ### on the ability of tubulin to polymerize into microtubules was examined.
- We examined the concentration-dependent effects of ### on ability of tubulin to polymerize into microtubules.  
\* 能動態にして主要動詞を文頭ちかくに置く。

(9) “I” や “We” を多用していないか。

- × Then, we manufactured the bipedal robot. We can consecutively change its barycentric position. And, we measured the influence.  
<そこで、重心位置を連続的に変化させることが可能な二足歩行型ロボットを試作し、その影響を定量的に計測した>
- This led us to construct a bipedal robot that could vary its barycentric position in a continuous manner to quantitatively determine the effect on walking stability.  
\* 主語 we と共起する動詞は mental verbs (think, know, propose など) が多い。参照→ (6 - 2) = we propose  
Cf. 図表の説明の際は We を主語にしない (アブストラクトでは図表の説明はしないが)。  
× We can understand from Figure 3 that ....  
○ Figure 3 shows ....

(10) 慣用句・冗長な表現・曖昧な表現を使っていないか。

1. × at this point in time  
○ now
2. × because of the fact that  
○ because
3. × very unique  
○ unique
4. × a considerable amount of  
○ much
5. × It was shown that the particle size and particle size distribution were strongly dependent on the cross-linker ratio.  
○ The particle size and its distribution were found to be strongly dependent on the cross-linker ratio.  
\* it 構文は遠回しになるため、文頭に keywords を置く表現のほうがよい。

(11) 不必要な “つなぎことば” を使っていないか。

1. × And, the barycentric position changes four levels, the more the barycentric position is taller, the more the barycentric acceleration is increased.  
 <さらに、パラメータとして重心位置を4段階に変化させた場合、その重心位置が高いほど、重心加速度は増加する傾向を示している。>
  - When the range of the barycentric position extended over four levels as parameters, the acceleration showed a tendency to increase as the height increased.  
 \* 「さらに (And/So/Then/Moreover)」 「ただし (But/Only)」 「以上のことから (From the above)」 など、話しの流れを示す表現の中には、省略しても文章の流れを損なわないものがある。

(12) 口語的表現を使っていないか。

1. × We think that walking stability of a bipedal locomotion robot are based on its barycentric position. So, this paper makes it clear theoretically and experimentally. <本論文は、二足歩行型ロボットの重心位置による歩行安定性に関して、理論的・実験的に解明したものである。>
  - The objective of this study was to theoretically and experimentally clarify the relationship between the barycentric position of a bipedal robot and its walking stability.  
 \* So (そこで)、By the way (ところで)、Well (そうですね)、Anyway (とにかく) などの会話体は用いない。
2. × You can see the result in Table 1.
  - The result is presented in Table 1.
3. × Actually, very little is known about the general nature and prevalence of scientific dishonesty.
  - Very little is actually known about ....  
 \* 文頭に副詞を用いると口語的になる (Also, ...など)。
4. × The new technology won't show much improvement.
  - △ The new technology will not show much improvement.
  - The new technology will show little improvement.  
 \* 短縮形 (won't, don't, didn't など) を避ける。また、not much は little, not many は few, not any は no にする。
5. × What can we draw from this result?
  - We need to discuss what we can draw from this result.  
 \* 直接疑問は避ける。
6. △ The new machine will cut down the cost.
  - The new machine will reduce the cost.  
 \* 学術論文では、句動詞の代わりにラテン語起源の動詞 (1 語) が使用される。
7. × The new discovery will get rid of the old faulty idea.
  - The new discovery will eliminate the old faulty idea.

8. × Scientists are looking into innovative ways to combat AIDS.  
○ Scientists are investigating innovative ways to combat AIDS.
9. × The member of mature female green turtles that return to their primary nesting beach has gone down 1,280 ten years ago to 145 today.  
○ The member of mature female green turtles that return to their primary nesting beach has decreased 1,280 ten years ago to 145 today.
10. × place a major emphasis on  
○ emphasize / stress  
\*いわゆる名詞構文（基本動詞＋（動詞の）名詞形：have a look at... など）を使うより、動詞そのものを使って簡潔に表現するほうがよい。

(13) 構文や表現が単調になっていないか。

\*参照→（9）主語 we の連続、（15-8-1）主語 it の連続

(14) 日本語からの直訳になっていないか。

1. × In this paper, we discuss bipedal walking robot stability, but to generalize this, it is necessary to discuss multi-legged robot stability.  
 <本論文では二足歩行型ロボットの安定性について検討してきたが、これを一般化するためには、多足歩行型ロボットにおける安定性を検討することが不可欠である。>  
 ○ In this study, we examined the walking stability of bipedal robots. In order to generalize the results, the stability of multi-legged robots needs to be studied.  
 \*「が」は必ずしも“逆接”の意味ではない。「が」≠ but
2. × 二足歩行型ロボットの駆け足状態で歩行安定性を向上させるためには、重心位置の変化に対する歩行安定性を解明することが不可欠である。  
 ○ 駆け足状態の二足歩行型ロボットの歩行安定性を向上させるために、さまざまに変わる重心位置がどのように歩行安定性に影響を与えるかを解明することが不可欠である。  
 <日本語を分析し、不必要な語句を削ったり欠けている情報を補ったりして、簡潔・明瞭・正確な英語で表現する。>

In order to improve the upright stability of a quickly moving bipedal robot, it is necessary to clarify how changes in the barycentric position affect walking stability.

(15) 情報のスムーズな伝達が損なわれていないか。

15-1 スペルミス

15-2 数の一致（主語と述語動詞）

- × One of the important factors are ....
- One of the important factors is ....
  
- × The number of female students have been increasing for the past several years.
- The number of female students has been increasing for the past several years.

15-3 名詞（可算名詞[C]と不可算名詞[U]）

- × a locomotion
- locomotion（歩行=[U]）
  - \* 「低速度で」
    1. at low speed 「低速という状態で[U]」
    2. at a low speed 「不特定・単数の低速度で[C]」
    3. at low speeds 「不特定・複数の低速度で[C]」
    4. at the low speeds 「特定・単数の低速度で[C]」
    5. at the low speeds 「特定・複数の低速度で[C]」

15-4 冠詞（不定冠詞と定冠詞の使い分け）

1. × We used 30 rats. Rats were grouped into ....  
○ We used 30 rats. The rats were grouped into ...  
\* 新情報（rats）から旧情報（the rats）へのスムーズな移行。
  
2. × Recently a new book about computer graphics was published.  
Too much space is taken for hardware by the book.  
○ Recently a new book about computer graphics was published.  
The book takes too much space for hardware.  
\* 第2文の先頭に旧情報（The book）を置くと、スムーズに情報が引き継がれる。
  
3. × This is a paper to solve walking stability influenced by the barycentric position of bipedal robots on theoretical and trial basis.  
○ ... a bipedal robot  
\* 「二足歩行型ロボットの任意の1体」。それに対し bipedal robots とすると、不特定多数の「二足歩行型ロボット全体」を指す。
  
4. × Results demonstrated that ....  
○ The results demonstrated that ....  
\* 「結果」で述べる results は、この研究で得られた特定のもの。
  
5. × stability of robotic bipedal locomotion  
○ the stability of robotic bipedal locomotion  
\* of で始まる句によって特定されているため、定冠詞の the を付ける。Cf. the center of a desk

#### 15-5 動詞の特性（自動詞と他動詞、状態動詞と動作動詞）

- × We discussed about the stability ....
- We discussed the stability .... <discuss は他動詞>  
\* discuss it/approach it/reach it という具合に記憶しておくといよい。
  
- × The material is belonging to Type B.
- The material belongs to Type B. <belong は状態動詞>  
\* 日本語の「～している」に惑わされないこと。

#### 15-6 指示代名詞（this）

- △ Our pilot study has shown that wind turbines used to generate electricity can pose a threat to flying birds. What the pilot study has found out suggests a need to further research on improving the safety of these mechanisms.
  
- Our pilot study has shown that wind turbines used to generate electricity can pose a threat to flying birds. This finding suggests a need to further research on improving the safety of these mechanisms.  
\* 直前で述べたことを、ひとまとめに「この～」と簡潔に表現できる。

#### 15-7 類義語

- × This essay is a paper which describes the stability ....
- This paper describes the stability ....  
\* essay は特定のテーマに関する短い散文。「学术论文」にあたる語ではない。  
\* chart と table  
chart : 詳細な情報を示すダイアグラムや表  
table : 情報を配列した列

#### 15-8 文の結合（sentence combining）

1. × Aluminum is a metal. It is abundant. It has many uses. It comes from bauxite. Bauxite is an ore. It looks like clay.  
○ Aluminum, an abundant metal with many uses, comes from bauxite, a clay-like ore.  
\* 単純な文の羅列を避ける（同格の使用）。
  
2. × We stayed at home. Because it was raining.  
○ We stayed at home because it was raining.  
\* “sentence fragment（文の断片化）”を避ける（従属接続詞の正しい用法）。
  
3. × She hadn't studied, still, she took the exam. <still は接続詞でなく副詞>  
○ She hadn't studied; still, she took the exam.  
\* “run-on sentence（ダラダラ文）”を避ける（セミコロンの使用）。
  
4. × This story is written in classical Japanese. The story is not easy to read.

- Since this story is written in classical Japanese, it is not easy to read.

- Written in classical Japanese, this story is not easy to read.  
\*細切れ情報を統合する（接続詞や分詞構文の使用）。

5. △ Wild animals are rapidly becoming rarer. The number of wolves and tigers has been decreasing in recent years.

- Wild animals are rapidly becoming rarer. The number of wolves and tigers, for example, has been decreasing in recent years.

\*文と文の論理関係を明確にする（「つなぎことば」の使用）。ただし、省略可能な場合は使用しない。参照→（11）

#### 15-9 句読法（セミコロンとコロンの用法）

1. × The accident was unfortunate. We enjoyed the trip.  
× The accident was unfortunate, however, we enjoyed the trip.  
○ The accident was unfortunate. However, we enjoyed the trip.  
○ The accident was unfortunate; however, we enjoyed the trip.  
\*対比関係・因果関係にある2文をセミコロンでつなぐ。

2. △ Shakespeare wrote thirty-seven plays. They are history plays, comedies and tragedies.

- Shakespeare wrote thirty-seven plays: history plays, comedies and tragedies.

\*前文の内容を詳しく説明するとき、コロンでつなぐ。

#### 15-10 パラレル構造（parallel structure; parallelism）

1. × This gas is colorless, insoluble and has no odor.  
○ This gas is colorless, insoluble and odorless.  
\*文法構造が同一であるため、論理展開が予測しやすい。

2. × The box is one meter long and the width is 70 centimeters.  
○ The box is one meter long and 70 centimeters wide.

3. × The teachers decided:  
1. to teach students how to write  
2. correcting students' papers  
3. answer students' questions.

- The teachers decided to:  
1. teach students how to write  
2. correct students' papers  
3. answer students' questions

\*リスト文には同一の文法構造を使う。

#### 15-11 シフト（shift：文構成上の不一致）

- × The flour and butter should be mixed into a paste, and add a little milk.
- Mix the flour and butter into a paste and add a little milk.

\*Mix ... add ...と両方に命令法を使ったほうが読みやすくなる。それに対し前者は、受動態と能動態が混在していて焦点が定まっていない。上述の平行構造を参照。

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タイトル  
(英語)  
(日本語)

学籍番号  
氏名

Abstract  
(英語)

1 3 0 ~ 1 5 0 語

< ... words (語数) >

Keywords: 4 ~ 5 語 (カンマで区切る)

要旨  
(日本語)

< ... 語 >

キーワード :



**Watson TF, Philips SG, Kawakami E, Ward DR, Scarlino P, Veldhorst M, Savage DE, Lagally MG, Friesen M, Coppersmith SN, Eriksson MA. (2018). A programmable two-qubit quantum processor in silicon. *Nature*, 555: 633–637.**

### **Abstract**

Now that it is possible to achieve measurement and control fidelities for individual quantum bits (qubits) above the threshold for fault tolerance, attention is moving towards the difficult task of scaling up the number of physical qubits to the large numbers that are needed for fault-tolerant quantum computing<sup>1,2</sup>. In this context, quantum-dot-based spin qubits could have substantial advantages over other types of qubit owing to their potential for all-electrical operation and ability to be integrated at high density onto an industrial platform<sup>3,4,5</sup>. Initialization, readout and single- and two-qubit gates have been demonstrated in various quantum-dot-based qubit representations<sup>6,7,8,9</sup>. However, as seen with small-scale demonstrations of quantum computers using other types of qubit<sup>10,11,12,13</sup>, combining these elements leads to challenges related to qubit crosstalk, state leakage, calibration and control hardware. Here we overcome these challenges by using carefully designed control techniques to demonstrate a programmable two-qubit quantum processor in a silicon device that can perform the Deutsch–Josza algorithm and the Grover search algorithm—canonical examples of quantum algorithms that outperform their classical analogues. We characterize the entanglement in our processor by using quantum-state tomography of Bell states, measuring state fidelities of 85–89 per cent and concurrences of 73–82 per cent. These results pave the way for larger-scale quantum computers that use spins confined to quantum dots. (220)

Keywords: Quantum dots, Quantum information, Qubits

## 学生アブストラクト例 (1) STUDENT ABSTRACT 1

### **Development of All-Fiber-Type Dual-Comb Spectrometer**

In recent years, the optical comb has attracted much attention as a useful broadband coherent light source. The optical comb, as a light source in spectroscopic research - such as dual-comb spectroscopy, has exhibited great performance in terms of high resolution, high frequency accuracy, and short acquisition time than traditional FTIR (Fourier transform infrared) spectroscopy. Dual-comb spectroscopy is an efficient way to separate the modes. In dual-comb spectroscopy, two optical combs with slightly different repetition frequencies are used. This configuration achieves such mode separation by multi-heterodyne detection and can extract the optical properties of the sample precisely and rapidly. Recently, we applied this method to characterize the complex refractive index of solid samples, such as Er:YAG - a kind of nonlinear optical materials, and were able to demonstrate the great potential of dual-comb spectroscopy as a useful characterization tool for solids. In this study, we aimed to realize a practical and simple dual-comb spectrometer with broad applicability to samples and measurement conditions by developing an all-fiber-type dual-comb spectrometer that is compact, stable, and easy to use. The stability of the spectrometer was evaluated by using two parameters, phase stability and coherence time. By introducing a thermal insulating box and a temperature feedback control system, we realized the high phase stability of up to 0.06 rad/h, which was stable enough to characterize the optical properties of various samples. The slow fluctuation that has coherence time more than 100 ms, can be corrected by the standard data processing called coherent integration. We also achieved long coherence time of 4 s, which is long enough for coherent integration. The developed system will have broad applications such as rapid and precise evaluation of laser media or fiber components. (284)

Keywords: all-fiber-type, a temperature feedback control system, dual-comb spectroscopy, high phase stability, optical comb

## 学生アブストラクト例 (2) STUDENT ABSTRACT 2

### **Frequency characteristic of protein-based photo sensor**

Bacteriorhodopsin (bR) is photo sensitive protein whose molecular construction and function is similar to rhodopsin. When it absorbs light, bR pumps protons from cytoplasmic side to extracellular side of biological membrane. This transmembrane movement of protons creates chemical gradient and charge displacement. Thus, bR has the function of converting light energy to electrochemical energy with large quantum efficiency. bR has been to applied to photo sensor. This photo cell consists of bR film and electrolyte sandwiched between two electrodes. As bR can generate electric energy from incident light like other solar batteries, this sensor can be used without power supply. When the intensity of incident light changes, it shows transient photocurrent as a result of charging and discharging of capacitor. This response is

called differential response, and retinal ganglion cell also shows this response. bR based photo sensor reacts strongly to movement of object, so it is applied to motion sensor without power supply. For implementing it in complex system designs, both temporal and frequency responses should be considered. We are therefore aiming to model the frequency characteristic of bR-based photo sensor. As a light source, LED light (wavelength is 525 nm) which was modulated sinusoidal was used. The amplitude of the output signal was measured at different frequency. Frequency characteristic was band pass type, and its peak frequency and band width depended on the electrode area. Besides, its characteristic was changed by the concentration of buffer in the electrolyte. Through this study, the possibility of controlling the frequency characteristic of bR-based photo sensor was indicated. In the future work, the optimization of this sensor condition (construction, electrolyte) is expected, according to applications, like motion sensor, robot visions. (278)

Keywords: Bacteriorhodopsin, Frequency response, Photo sensor, Protein

学生アブストラクト例 (3) STUDENT ABSTRACT 3

### **Properties of a red $Y_2O_2S$ -based afterglow phosphor**

Afterglow phosphors are materials which emits light for tens of hours in darkness after eliminating exciting light. Recently, blue and green afterglow phosphor have been widely studied and can be practically used, for example clock dials and luminous paint. However, red afterglow phosphor cannot be practically used, because duration of afterglow is shorter than that of blue and green ones. If we obtain red afterglow phosphor, full-color is realized with three primary colors afterglow. In this study, a new red long afterglow  $Y_2O_2S: Eu^{3+}, Ti^{4+}, Mg^{2+}$  phosphor was synthesized and its luminescent properties were measured. Samples were prepared by solid state reaction employed with  $Y_2O_3$ ,  $Eu_2O_3$ ,  $Ti_2O_3$  and  $MgCO_3 \cdot Mg(OH)_2 \cdot 5H_2O$  as raw materials. These materials were mixed homogenously and heated at 1250°C for 2.5h in pure  $N_2$ , 5% $H_2$ -95% $N_2$ , and air respectively with a flux of carbonate. Then, crystalline structure of each samples were analyzed by X-ray diffraction (XRD). In addition, its afterglow decay curve at room temperature is measured. XRD results indicated the crystalline structure of a sample sintered in pure  $N_2$  consisted with that of  $Y_2O_2S$ , and that the doping of Eu, Ti and Mg ions had little influence on the crystalline structure. Crystalline structure of samples sintered in pure 5% $H_2$ -95% $N_2$  and air were not that of high purity  $Y_2O_2S$ . Afterglow decay time of a sample sintered in pure  $N_2$  was 2.5h. It is the largest value of all samples. A new red afterglow phosphor  $Y_2O_2S: Eu^{3+}, Ti^{4+}, Mg^{2+}$  was prepared by solid state reaction in pure  $N_2$  atmosphere. The phosphor has afterglow property lasting for 2.5h. However, afterglow duration of the sample was shorter than that of existing blue and green afterglow phosphor, which lasting above 10 hours. Therefore, afterglow duration must be extended for practical application. (292)

Keywords: Afterglow phosphor, Photo-luminescence, Red phosphor,  $Y_2O_2S$

## その他のアブストラクトの例（１）

（医学雑誌 *Deutsche Medizinische Wochenschrift* に掲載された論文）

\*BACKGROUND AND OBJECTIVE, METHODS, RESULTS, CONCLUSIONS という語が明記されている。このようなスタイルは例外であるが、Abstract の構成を把握するうえで有用と判断し、ウェブからとった。

Effects of a mandatory guideline that prohibit hospital doctors from accepting any form of benefits in any form from the pharmaceutical industry

Gundemann, C; Meier-Hellmann, A; Bauer, M; Hartmann, M

Universitätsklinikum Jena

### Abstract

**BACKGROUND AND OBJECTIVE:** Several hospitals have issued their own guidelines that regulate the conduct of staff members toward the pharmaceutical industry. The effect of these guidelines on the attitude of the doctors toward the pharmaceutical industry in Germany has so far been unknown. This study investigated whether hospital doctors with guidelines and those without guidelines differ in their attitude toward the pharmaceutical industry. **METHODS:** A retrospective analysis was undertaken to determine the influence of hospital guidelines on the attitude of doctors toward the pharmaceutical industry. In May 2008, all doctors in intensive care of a hospital with and one without guidelines were asked anonymously by a questionnaire about their dealings with the pharmaceutical industry. The response rate was 64.9% (37/57) and 55.1% (59/107) respectively. The cooperation rate in both groups was 100%. **RESULTS:** In the hospital with guidelines every doctor was on average carrying 0.56 +/- 0.64 pharmaceutical advertising gifts with a company logo, while the average in the institution without guidelines was 1.2 +/- 0.61 advertising gifts. Whereas 49% of doctors with guidelines considered the acceptance of advertising gifts as not questionable, 81% without guidelines did. Furthermore, 70% of doctors in the institution with guidelines compared with 92% of those doctors in the hospital without guidelines believed that the advertising practices of the pharmaceutical industry had no influence on their prescribing behaviour. Both groups of doctors are convinced that other doctors are more influenced by the pharmaceutical industry than they are themselves (51% with and 37% without guidelines). 70% and 90%, respectively of all participants considered hospital guidelines setting standards of conduct toward the pharmaceutical industry and those not sponsored by the industry to have a positive effect. Every other doctor additionally stated the advice by the pharmaceutical industry was not helpful for his work. **CONCLUSIONS:** Hospital guidelines on relations with the pharmaceutical industry appear to further a critical attitude by physicians regarding the pharmaceutical industry.

\*このアブストラクトは 300 words を少し超えている。課題の目安としては、この半分くらいの長さ。

その他のアブストラクトの例（２）

Wells, Coleman, and Challis (2006). A note on the effect of auditory stimulation on the behaviour and welfare of zoo-housed gorillas.

Auditory stimulation has long been employed as a form of therapy for humans and animals housed institutions. Its effect on one of our closest-living relatives, the gorilla, however, is largely unknown. This study explored the effect of auditory stimulation on the behaviour and welfare of six gorillas housed in Belfast Zoo. All animals were exposed to three conditions of auditory stimulation: a control (no auditory stimulation), an ecologically relevant condition (rainforest sounds) and an ecologically non-relevant condition (classical music). The gorillas' behaviour was recorded in each condition using a scan-sampling technique. There was no significant effect of the auditory environment on the gorillas' behaviour, although animals tended to show more behaviours suggestive of relaxation (i.e., resting, sitting) and fewer behaviours typically associated with stress (i.e., aggression, abnormal behaviour) during the ecologically relevant and, in particular, the non-relevant, conditions than the control. Overall, findings suggest that certain types of auditory stimulation may hold some merit as a method of enrichment for zoo-housed gorillas, although more long-term work with a larger number of animals is needed before firm conclusions can be drawn.

(180words)

出典：東京大学教養学部 ALESS プログラム・編『Active English for Science: 英語で科学するーレポート、論文、プレゼンテーション』東京大学出版会、2012 年、pp.176-177