

Prevention of Research Misconduct

Basic RCR Program for Graduate Students

Issued March. 2019

Research Ethics and Integrity Promotion Office ,
Hiroshima University

(in cooperation with Writing Center , Hiroshima University)



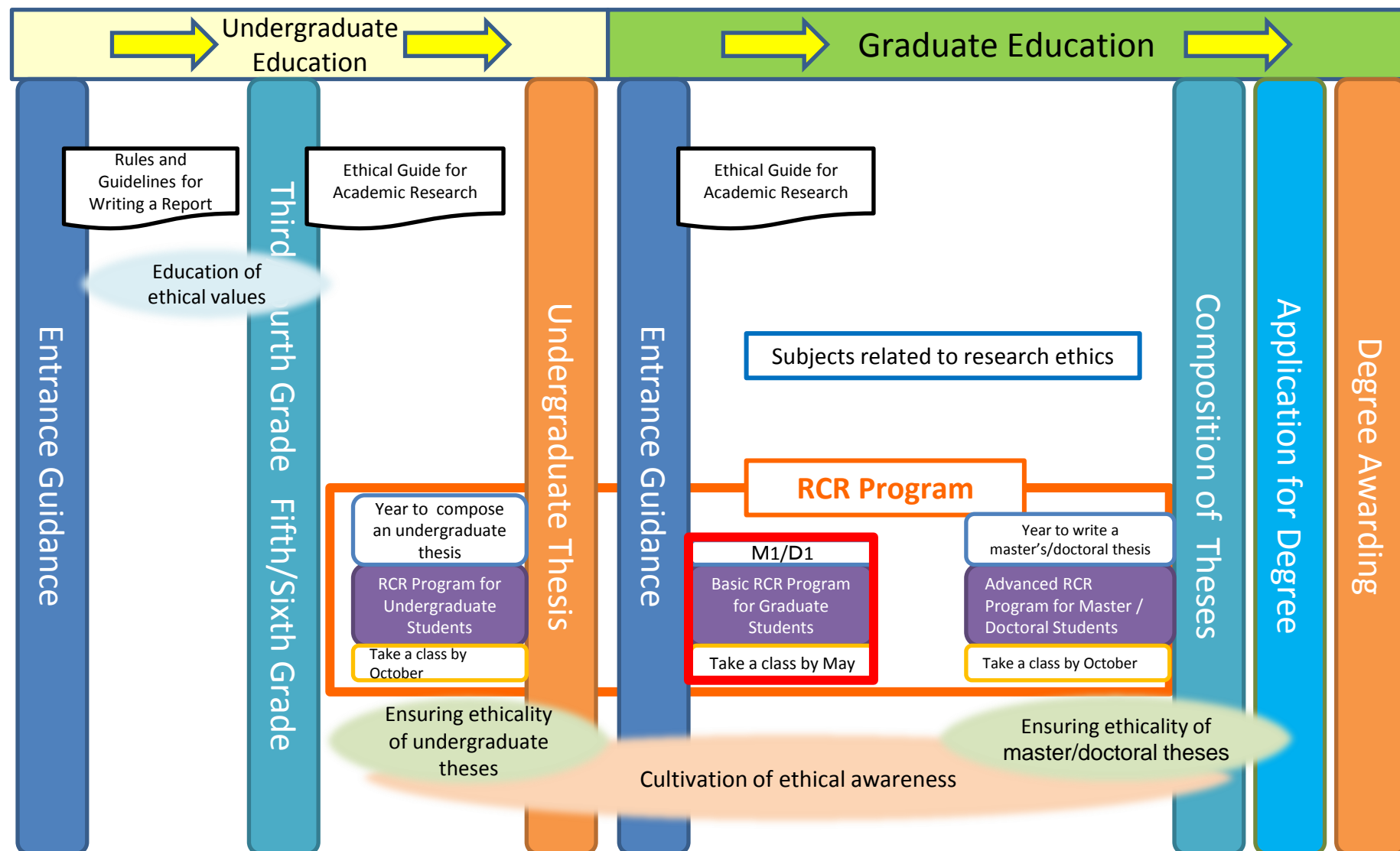
HIROSHIMA UNIVERSITY

As long as they conduct research such as undergraduate theses or master/doctoral theses, students are considered **researchers (scientists)**, just like faculty members. Hence, students are responsible as researchers.



Research Ethics Education at Hiroshima University

To be launched in April, 2017



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Norms and Rules of

Scientists at Hiroshima University

① Today's Textbook

For the Sound Development of Science -The Attitude of a Conscientious Scientist-

Section I What Is a Responsible Research Activity ?

Section II Planning Research

Section III Conducting Research

Section IV Presentation of Research Results

Section V How to Conduct Joint Research

Section VI Appropriate Use of Research Funds

Section VII Contributing to Quality Improvement in Scientific Research

Section VIII For the Progress of Society



Commonly known
as Green Book

Full texts are available online

http://www.mext.go.jp/a_menu/jinzai/fusei/1353972.htm

② Booklets and Subjects

- **Distribution of Ethical Guide for Academic Research**
(in Japanese, English and Chinese)

A booklet that briefly overviews research ethics (**Revised 2016.3**)

Momiji→Academic Support → Graduate Education →Ethical Guide for Academic Research

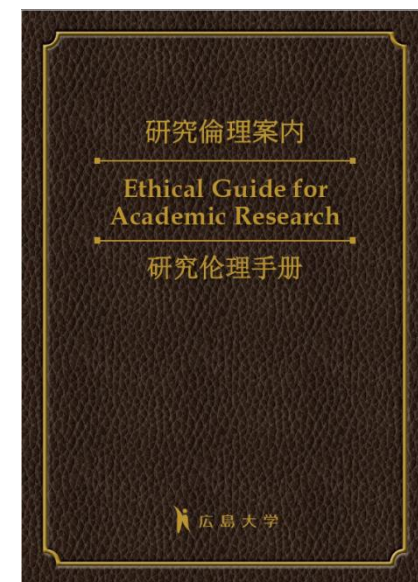
- **Distribution of “Rules and Guidelines for Writing a Report”**
(in Japanese, English and Chinese)

A booklet briefly overviews rules and guidelines (plagiarism, copyright, quotation, etc.) (**Revised 2016.3**)

Momiji→Academic Support →Undergraduate Education→ Rules and Guidelines for Writing a Report

- **Research Ethics Cultivating Field (Courses to cultivate the ethics that are required in relation to the society) in the Common Subjects of Graduate School**

In order to develop human resources that can serve as leaders in society, that can see things from comprehensive perspectives, that can express their thoughts, that have time management ability and ethical sense, and that can solve problems, a subject, Research Ethics Cultivating Field (Courses to cultivate the ethics that are required in relation to society), is included in courses that all graduate students can take as common subjects.



Major Classes	Graduate School
Research Ethics *	Graduate School of Science
Advanced course of Biomedical Ethics	Graduate School of Biomedical and Health Science
Science and Engineering Ethics	Graduate School of Biosphere Science

*subjects where lessons take place in English

③ e-learning

APRIN e-learning

<https://www.aprin.or.jp/e-learning>

Responsible Conduct of Research: Fundamentals (Humanities)

Misconduct in Research, Plagiarism, collaborative Research, Peer Reviews, Managing Public Research Funds

Responsible Conduct of Research: Fundamentals (RCR-S) (Science & Technology)

Research Misconduct, Ethical Issues in the Management of Data in Engineering Research, Responsible Authorship, Ethical Issues in the Peer Review and Publication of Engineering Research, Collaborative Research in Engineering Fields, Whistleblowing and the Obligation to Protect the Public, Managing Public Research Funds

Responsible Conduct of Research: Fundamentals (RCR) (Medicine)

Responsible Conduct of Research, Research Misconduct, Data Handling, Rules for Collaborative Research, Conflicts of Interest, Authorship, Plagiarism, Communicating Information to the Public, Peer Review, Mentoring, Managing Public Research Funds, 〈Digest Version〉 Responsible Conduct of Research

Units other than those listed above are offered.

JSPS e-learning(eL CoRE)

<https://www.netlearning.co.jp/clients/jsp/top.aspx>

This is animated teaching material created based on JSPS“For the Sound Development of Science -The Attitude of a Conscientious Scientist-”(Green Book) This material enables learners to learn and think. Learners undertake tests for each sections. Operation started April, 2016.

For the Sound Development of Science -The Attitude of a Conscientious Scientist-
Section I What Is a Responsible Research Activity ?

Responsible Conduct of Research

Activity ? (Green Book Text P3)

- What are the responsibilities of scientists to society? Scientists are expected to use their knowledge and intelligence to make new discoveries and to solve various problems encountered by society.
- To respond to such expectations is one of scientists' responsibilities. In this process, scientists often use public research funds, so they must be aware of society's expectations reflected in such funding.

Activity ? (Green Book Text P3)

- It is necessary for scientists to always apply **honesty and integrity in their decision-making and behavior**, to make effort to maintain and improve their expert knowledge, abilities, and techniques, and **to do whatever they can to scientifically verify the validity and accuracy of the knowledge** obtained through their research.
- Scientific research is built upon the assumption that **scientists can trust one another's research**. Scientists must, therefore, exercise integrity in proposing ideas, making plans, submitting applications, conducting research, and reporting results.

Behaviors that are not permitted for researchers

- Misconduct in Research Activities

① Fabrication

③ Plagiarism

② Falsification

- Inappropriate Use of Research Funds

① Use of funds for private purposes

② False claims

- Multiple university hospitals participated in clinical research on “Diovan,” a drug for treating high-blood pressure. It was alleged that, when each hospital conducted its own research, **numerical data such as the subjects’ blood pressure and statistics were manipulated** in such a way that the conclusion would be advantageous to a certain pharmaceutical company.
- After the misconduct was exposed and made public, their research paper was retracted.
- The former hospital employee involved in the data fabrication and falsification and an employee of the pharmaceutical company which used that invalid paper to advertise the medicine were prosecuted for exaggerated advertisement prohibited by the Pharmaceutical Affairs Law.



European Heart Journal (2009) 30, 2461–2469
doi:10.1093/eurheartj/ehp363

FASTTRACK
ESC HOT LINE

Effects of valsartan on morbidity and mortality in uncontrolled hypertensive patients with high cardiovascular risks: KYOTO HEART Study

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See page 2427 for the commentary on this article (doi:10.1093/eurheartj/ehp364)

Aims	The objective was to assess the add-on effect of valsartan on top of the conventional treatment for high-risk hypertension in terms of the morbidity and mortality.
Methods and results	The KYOTO HEART Study was of a multicentre, Prospective Randomised Open Blind, Endpoint (PROBE) design, and the primary endpoint was a composite of fatal and non-fatal cardiovascular events (clinical.gov NCT00149227). A total of 3031 Japanese patients (43% female, mean 66 years) with uncontrolled hypertension were randomized to either valsartan add-on or non-ARB treatment. Median follow-up period was 2.7 years. In both groups, blood pressure at baseline was 157/88 and 133/76 mmHg at the end of study. Compared with non-ARB arm, valsartan add-on arm had fewer primary endpoints (83 vs. 155; HR 0.55, 95% CI 0.42–0.72, $P=0.00001$).
Conclusion	Valsartan add-on treatment to improve blood pressure control prevented more cardiovascular events than conventional non-ARB treatment in high-risk hypertensive patients in Japan. These benefits cannot be entirely explained by a difference in blood pressure control.
Keywords	High-risk hypertension • Angiotensin receptor blockers • Cardiovascular mortality-morbidity • Valsartan

Introduction

Cardiovascular disease is the leading cause of mortality worldwide.¹ Hypertension is the most common cause of coronary heart disease and heart failure in Japan; however, cerebrovascular disease is still more prevalent in Japan than in Western societies.² The percentage of cerebral bleeding is two or three times greater than in white people, and cerebral infarction is mostly caused by lacunar-type ischaemic stroke due to hypertensive small vessel disease.³

The renin-angiotensin system (RAS) plays a major role in the homeostasis of blood pressure, electrolytes, and fluid balance.⁴ However, chronic activation of RAS contributes to the development of hypertensive and cardiovascular organ damage.⁵ Numerous trials have investigated the benefits of ACEi, e.g. The Heart Outcomes Prevention Evaluation (HOPE) Study reported that

ACE inhibitors significantly reduced mortality, myocardial infarction, and stroke in high-risk patients.⁶ Another important study, in this case with ARB, was the Losartan Intervention For Endpoint (LIFE) reduction in hypertension study, where losartan-based therapy prevented more cardiovascular morbidity and death, in particular stroke, than atenolol-based regimen despite similar blood pressure control.⁷ There are now numerous studies showing beneficial effects of RAS blockers on cardiovascular outcomes, in particular with ARBs, in various stages of the CV continuum.⁸ However, these studies have included as maximum a few percent of Asian patients in general and very few Japanese in particular.

Cardiovascular disease incidence in Japan differs from those in Western countries. CAD mortality is one-third of that in the USA, and cerebrovascular disease mortality is ~1.5 times higher than in the USA.⁹ The dietary habits in Japan differ from

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Source: European Heart Journal Website
<http://eurheartj.oxfordjournals.org/content/ehj/30/20/2461.full.pdf>

STAP Cell Scandal in 2014

- In January 2014, the RIKEN center made an announcement about the creation of STAP cells. Two articles related to the cells appeared in Nature.
- Soon after the announcement, various questions were raised, including about the data supporting the claim. RIKEN's investigative committee confirmed the fabrication of images in the first article and, for the second paper, manipulation of DNA fragment images. The two articles were withdrawn.
- After that, misconduct was also found in the scientist's doctoral thesis, a university that awarded the degree revoked the doctorate after recognizing 11 points of misconduct, such as plagiarism, etc.

STAP retracted

Two retractions highlight long-standing issues of trust and sloppiness that must be addressed.

This week, *Nature* publishes retractions of two high-profile papers that claimed a major advance in the field of stem cells (see page 112). Between them, the two papers seemed to demonstrate that a physical perturbation could do what had previously been achieved only by genetic manipulation: transform adult cells into pluripotent stem cells able to differentiate into almost any other cell type. The acronym STAP (stimulus-triggered acquisition of pluripotency) became instantly famous.

Soon after the papers were published on 30 January, cracks appeared

Source: *Nature*, 511, 3 JULY, 5 (2014)



Substantial Coverage of Those Cases

- Those media reactions show society's high expectations to science technologies and scientists.
- Scientists are responsible for responding to such expectations.
- Scientists always are required to apply honesty and integrity in their decision-making and behavior, to make efforts to maintain and improve their expert knowledge, abilities, and techniques, and to do whatever they can to scientifically verify the validity and accuracy of the knowledge obtained through their research.

For the Sound Development of Science -The Attitude of a Conscientious Scientist-

Section III Conducting Research

5. What is Research Misconduct?

Research Misconduct

Research misconduct

● Behaviors that violate research ethics, distort the nature of research or findings of research when presented to the public, and disturb good communication among researchers

① Fabrication

② Falsification

③ Plagiarism

Specific research misconduct

④ Duplicate posting

⑤ Inappropriate writing of authors of academic papers

⑥ Not properly citing existing papers



① Fabrication

- Making up data or research results, etc.

② Falsification

- Manipulating research materials, equipment, or processes to change data or results obtained from research activities.

③ Plagiarism

- Appropriating the ideas, analyses, analytical methods, data, research results, research paper(s), or words of other researchers without obtaining the permission of the researchers or giving appropriate credit.

Research Misconduct by Academic Fields

Table 9 : Distribution by majors

Major	Fabrication	Falsification (Manipulation)	Plagiarism (Piracy)	Others	Total [aggregate]
Medicine (Medicine, dentistry and pharmacology)	15	7	6	7	30 [35]
Science and engineering	8	3	7	2	18 [20]
Humanities and Social Sciences	2	—	36	1	39 [39]
Education	1	1	5	—	6 [7]
Agriculture	1	—	—	—	1 [1]
Others (Including three unidentified cases)	—	—	4	—	4 [4]
Total	27	11	58	10	98 [106]
Biology and Biotechnology	21	7	6	7	36 [41]

Numbers are based on newspaper and other materials that the author has
(Since Oct.1997)

In the past, Hiroshima University experienced cases such as data manipulation and plagiarism, which damaged trust of both society and the research field.

Note : There are no clear differences in the definitions of plagiarism and piracy

Reference : Kikuchi, Shigeaki.,IL SAGGIATORE, 40, 63-86 (2013)

[authors & referees](#) > [Policies](#) > Image integrity

Image integrity and standards

Images submitted with a manuscript for review should be minimally processed (for instance, to add arrows to a micrograph). Authors should retain their unprocessed data and metadata files, as editors may request them to aid in manuscript evaluation. If unprocessed data are unavailable, manuscript evaluation may be stalled until the issue is resolved. All digitized images submitted with the final revision of the manuscript must be of high quality and have resolutions of at least 300 d.p.i. for colour, 600 d.p.i. for greyscale and 1,200 d.p.i. for line art.

A certain degree of image processing is acceptable for publication (and for some experiments, fields and techniques is unavoidable), but the final image must correctly represent the original data and conform to community standards. The guidelines below will aid in accurate data presentation at the image processing level; authors must also take care to exercise prudence during data acquisition, where misrepresentation must equally be avoided.

- Authors should list all image acquisition tools and image processing software packages used. Authors should document key image-gathering settings and processing manipulations in the Methods.
- Images gathered at different times or from different locations should not be combined into a single image, unless it is stated that the resultant image is a product of time-averaged data or a time-lapse sequence. If juxtaposing images is essential, the borders should be clearly demarcated in the figure and described in the legend.
- The use of touch-up tools, such as cloning and healing tools in Photoshop, or any feature that deliberately obscures manipulations, is to be avoided.
- Processing (such as changing brightness and contrast) is appropriate only when it is applied equally across the entire image and is applied equally to controls. Contrast should not be adjusted so that data disappear. Excessive manipulations, such as processing to emphasize one region in the image at the expense of others (for example, through the use of a biased choice of threshold settings), is inappropriate, as is emphasizing experimental data relative to the control.

When submitting revised final figures upon conditional acceptance, authors may be asked to submit original, unprocessed images.

Electrophoretic gels and blots

<http://www.nature.com/authors/policies/image.html>

Editing Images of Gels with Photoshop

- Things you should never do with Photoshop:
 - ① Copy & paste (needless to say)
←however, most of fabrication in the past was this
 - ② Touch-up (a tool to edit and clean up images) using
 - ③ Retouching part of images such as changing lightning or contrast
 - ④ Manipulating the research results to look as if those are obtained from one datum, while actually the results are obtained at a different times or from different locations (for instance, if two separate gel electrophoresis lanes are brought closer to each other, a boundary line should be drawn)

Examples of Fabrications

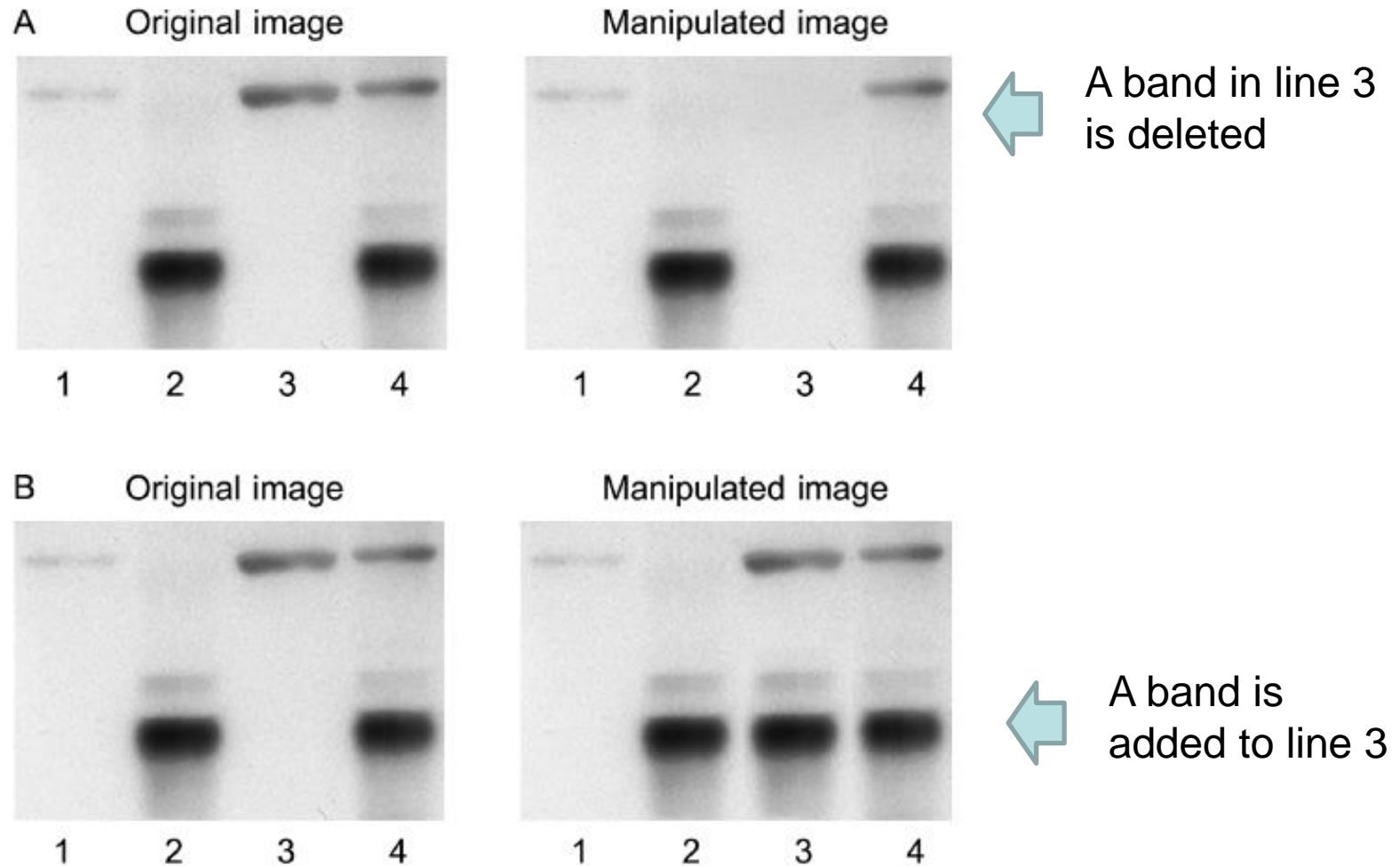


Figure 1. **Gross manipulation of blots.** (A) Example of a band deleted from the original data (lane 3). (B) Example of a band added to the original data (lane 3).

Examples of Fabrications

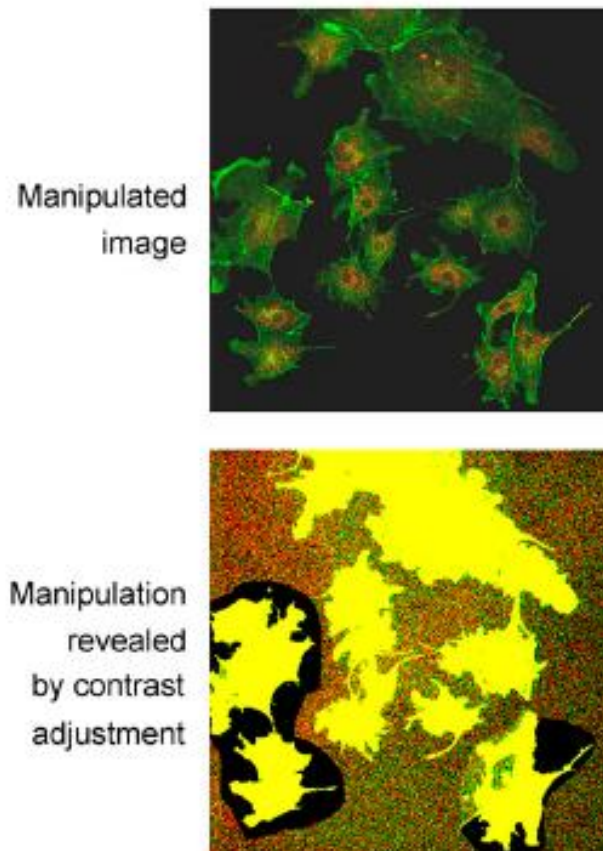


Figure 6. Misrepresentation of image data. Cells from various fields have been juxta-posed in a single image, giving the impression that they were present in the same microscope field. A manipulated panel is shown at the top. The same panel, with the contrast adjusted by us to reveal the manipulation, is shown at the bottom.



Two cells in the left and one in the right bottom were added after the fact

Source: Rossner et al., J Cell Biol, 166, 11-15 (2004)



『正しい知識が捏造を防ぐ データを正確に解釈するための6つのポイント』
(*Correct Knowledge Prevents Fabrication: 6 Points to Interpret Data Appropriately*)
The Molecular Biology Society of Japan

- 「連載にあたって」
(On Serializing)

No.1「Photoshopによるゲル画像の調整」 「Q & A」
(No.1 Editing images of gels with Photoshop, Q&A)

No.2「蛍光顕微鏡データの誤った解釈」 「Q & A」
(No.2 Misinterpreting of Data Obtained with Fluorescence Microscopes, Q&A)

No.3「客観的な判断のむずかしい事例をどう扱うか？ 定量化の方法と代表例の選び方を主題として」 「Q & A」
(No.3 How to Deal with Cases that are Difficult to Objectively Judge: Qualification Methods and Ways to Select Representative Examples, Q&A)

No.4「微妙なデータをどう表現するか 骨研究分野での実験データ解釈を例として」 「Q & A」
(No.4 How to Describe Obscure Data: Examples from Interpretation of Experimental Data of Bone Research, Q&A)

No.5「大規模データの解析における問題点 DNAマイクロアレイによる遺伝子発現量の測定を例として」 「Q & A」
(No.5 Problems of Massive Data Analysis: Examples from DNA Microarray Analysis, Q&A)

No.6「分子生物学, 生化学, 細胞生物学における統計のポイント 医療統計学の専門家を交えた鼎談」
(No.6 Key Points to Analyzing Statistical Data in Molecular Biology, Biochemistry, and Cell Biology: Tripartite Talk with A Medial Statistic Expert)

Available in PDF
(in Japanese only)



Plagiarism (Green Book Text P37)

- Using large parts of someone else's paper, without properly citing it, as if writing them as one's own work is obvious plagiarism.
- A university professor looking at an unpublished paper of his graduate student and publishing an idea found in the preprint as his own idea is also considered plagiarism.
- In the humanities and social sciences, while research misconduct involving fabrication and falsification has not been so common, it is becoming a significant problem.
- In experimental research, a different type of problem exists: not citing sources of published papers when documenting materials and methods used in one's own experiments. Furthermore, original sources should be cited not only when using someone else's original description but also when adding changes and modifications to original descriptions.



Examples of Plagiarism (in the humanities)

- Professor A (Department of English and Contemporary Society: An academic paper posted in the 8th issue of the department journal (March 2013) was found to be plagiarized from an academic paper written by professor Z. (16 pages out of 35 pages, including from the 14th to 54th notes out of a total of 54 notes listed in the end.)
- Associate professor B (Faculty of Commerce): The professor used sentences, graphs and charts from three master's theses without permission, as well as failing to cite sources. The professor posted two articles in 日本経営学会誌 (*Journal of Japan Academy of Business Administration*) and two more articles in *Waseda Bulletin of International Management*.
- University student C: Student's undergraduate thesis (2012) appeared in *Annual Reports of the Cultural Documents Research Institute* but was found to have plagiarized nearly 20 parts from works by a professor of Ochanomizu University and others.
- Graduate student D (Graduate School of Public Management): At least 64 parts in student's doctoral thesis were cited inappropriately and 12 parts among 64, which the student claimed as his observation, were verified as plagiarism. The student's degree was revoked. (2013)

Article Withdrawal

- Investigation on 2,047 biomedical and life science articles, which appeared but withdrew from the Journals between the 1940s-2012 (Fang et al., 2013 PNAS)
- 67.4% were due to misconduct
 - Fabrication/suspicion of fabrication 43.4%
 - Duplicate posting 14.2%
 - Plagiarism 9.8%

- iThenticate (Plagiarism detector)
 - Participants: More than 500 publishers including Elsevier, Nature Publishing, Springer, Taylor & Francis, etc.
 - Database: Nearly 80,000 scientific, technological and medical journals
- Six-month test was conducted in three magazines of Taylor & Francis
Approximately 10%, 6%, 23% of articles were rejected because of plagiarism (Nature 466, 167 (2010))

Plagiarism Detection Software (iThenticate)



- Students cannot use by themselves, but faculty members have access to this software at our university.
- Recently, it has become easier to detect plagiarism.

01-Dec-2015 05:55PM 4147 words • 47 matches • 24 sources

iThenticate Spatial and temporal distribution of Secchi depth in Suo

Quotes Excluded Bibliography Excluded 11% SIMILAR

primary production.

Internet
aura.abdn.ac.uk

Full Source View

le reasons (Munkes 2005, HELCOM 2007c, Nyqvist et al. 2009, Baden et al. 2012), despite promising examples elsewhere (e.g., Bryars and Neverauskas 2004, Tomasko et al. 2005, Orth et al. 2006, Cardoso et al. 2010, Vaudrey et al. 2010, Dolch et al. 2013). Seagrass recovery is generally a slow process, which can last for decades, and it is questionable whether the ecosystem can ever be returned to its original state. These examples of delayed ecosystem responses to measur

have long been observation records in many estuarine, coastal and open ocean systems (e.g., Hayami et al., 2013). Secchi depth is used as an indicator of eutrophication because of relationship to phytoplankton biomass and have an ecological importance because of relationship to the euphotic depth (HELCOM, 2009). Maximal depth of submersed plants is also known to be related to Secchi depth (Dunstan et al., 1993). Therefore, Secchi depth is recognized as one of important indicators to evaluate eutrophication in enclosed sea (HELCOM, 2006, Williams et al., 2009). On the other hand, Secchi depth and light attenuation in coastal area is strongly affected by not only phytoplankton biomass but suspended particulate matters and chromophoric dissolved organic matter (Drechsel et al., 2009). Therefore, the improvement of eutrophication based on nutrients reduction and consequently reduction of phytoplankton biomass in coastal area does not always induce increase in Secchi depth in a shallow and coastal area.

The major enclosed seas in Japan were subject to severe eutrophication and pollution by industrialization and urbanization of the surrounding areas during the high economic growth period of the 1970s. The Seto Inland Sea is a wide (25,200 km²) and shallow (mean depth of 38 m) semi-enclosed sea and has been also heavily polluted (Takahara, 2002; Iwataki et al., 2011). To improve water quality in these enclosed sea, the Total Pollutant Load Control System (TPLCS) has been implemented since 1979. The total phosphorus and total phosphorus loads into the Seto Inland Sea was reduced from 27.7 kgP km⁻² a⁻¹ to 16.7 kgP km⁻² a⁻¹ (40% reduction) and from 2.60 kgP km⁻² a⁻¹ to 1.03 kgP km⁻² a⁻¹ (61% reduction), respectively, for 30 years.

In this paper, spatial and temporal distributions of Secchi depth in Suo Bay were clarified based on long term monitoring data for 30 years and were evaluated how chlorophyll a concentration and nutrient load reduction have affected spatial and temporal distributions of Secchi depth. Suo Bay located in west part of Seto Inland Sea (Fig.1) was selected as the study. Suo Bay has gently sloping seabed and no remarkable point sources of nutrients load such as large cities and rivers.

Match Overview

Match 1 of 1

Match	Source	Words	Similarity
1	CrossCheck 83 words Tetsuo Yanagi, "Open Ocean Originated Phosphorus and Nitrogen in the Seto Inland Sea, Japan", Journal of Oceanography	83	2%
2	CrossCheck 42 words Fleming-Lehtinen, V., "Long-term changes in Secchi depth and the role of phytoplankton in explaining light attenuation in the Baltic Sea", Journal of Great Lakes Research	42	1%
3	Internet 36 words crawled on 24-Sep-2008 www.iwaponline.com	36	1%
4	CrossCheck 35 words Iizuka, T., "The influences of various anthropogenic sources of deterioration on meiobenthos (Ostracoda) over 10 years in the Seto Inland Sea, Japan", Estuarine, Coastal and Shelf Science	35	1%
5	Internet 29 words crawled on 01-Dec-2015 www.env.go.jp	29	1%
6	CrossCheck 28 words Blenfong, P.K., "Phytoplankton dynamics in the subtropical Pacific Ocean off Hawaii", Deep Sea Research Part A	28	1%
7	CrossCheck 27 words YOSHIMURA, Chihiro, and Kuniyoshi TAKEUCHI, "Estimation of Nutrient Runoff Processes in the Mekong River Basin", Journal of Environmental Management	27	1%
8	CrossCheck 19 words Estuaries of the World, 2015.	19	<1%
9	CrossCheck 19 words Yamaguchi, H., "Dynamics of microphytobenthic biomass in a coastal area of western Seto Inland Sea, Japan", Estuarine, Coastal and Shelf Science	19	<1%
10	CrossCheck 17 words Tomita, Akio, Yoshio Nakura, and Takuya Ishikawa, "Review of coastal management policy in Japan", Journal of Coastal Research	17	<1%
11	Internet 15 words	15	<1%

For the Sound Development of Science -The Attitude of a Conscientious Scientist-

Section VI Appropriate Use of Research Funds

Improper Use of Research Funds

Inappropriate use of research expense

Research expense is a fund to be used for activities at Hiroshima University, including education and research. It's a precious financial source provided by Japanese people and companies etc.

→ **You always have to keep in mind that research expenses etc. are not “your own money” but “money provided by people in Japan etc.”**

When you incur the research expense etc., following behaviors are considered to be inappropriate use of research expense.

① Misappropriation

② False charging

③ Personal accounting

→ **In recent years, many cases of inappropriate use of research expenses have been identified through investigations performed by “the Board of Audit of Japan” and “Taxation Bureau” etc.**

① Example of false charging



【Deposit in vendor】

Several teachers were found to get involved in the so-called “deposit” practice. Despite that there was no actual delivery of goods, they asked the vendor to prepare the false delivery slip/invoice. Then, the money (about 36 mil. yen), which had been paid by the university according to such false documents, was kept by the vendor so that they can manage it as they want. [Example of Hiroshima University]

From FY2004 to 2009, “deposit” and “intentionally change of purchase goods name recorded on the accounting book” practices were performed (by 31 faculty members/staff) for payment of about 190 mil.

In one of such cases, which was judged to be misappropriation, was malicious because the dummy goods were prepared on purpose to repeatedly change the name of purchase goods by using such goods. [National University A]

➡ **Hiroshima University has adopted a receiving inspection system at the time of goods delivery to prevent inappropriate use of expense related to delivery of goods, including “deposit”.**

Your cooperation for receiving inspection work by person in charge at the goods delivery management center etc. would be appreciated.



【Pooled fund at laboratory etc.】

Money was wrongly pooled in the laboratory's bankbook through "a fake business trip" which made the university pay the trip expense without having the actual business trip, and a kickback paid by the part-time researchers from their salary. Part of such money was spent for private use.

[Example of National University B]

➡ **Hiroshima University implements efforts such as asking for submission of documents which objectively prove the fact of a trip and interviewing a person who receives honorarium when an internal audit is conducted.**

When a faculty member received a donation or subsidy for official education and research activities, he/she failed to go through the procedure to donate such money to the university, and handled it as personal accounting, resulting in payment of back tax. 【Hiroshima University etc.】

➡ **When you receive the above type of money, don't make a decision on your own but inform a person in charge of finance at your faculty/graduate school, etc.**

Impacts of inappropriate use

【Impact to a person】

- Criminal accusation (If it's recognized as misappropriation etc.)
- Disciplinary action (If it's recognized as misappropriation, punitive dismissal is included.)
- Restriction to application for competitive research funds (for 10 years if misappropriation is recognized.)
- Reimbursement of money which was inappropriately used. (If it cannot be paid back with the research expense etc., it could be repaid by private money.)

【Impact to the university and other researchers】

- Downgrading of operation performance evaluation rating by National University Corporation Evaluation Committee by one level
- Restriction to application for competitive research funds (for 2 years at maximum if it's recognized as violation of good manager's duty of care.)
- Suspension of grants to the whole university
- Reduction of indirect expenses

➡ **As inappropriate use of expense has a significant impact to both a person and the university etc., please be sure to confirm the accounting rule first, and go through the appropriate paperwork based on the fact.**

For the Sound Development of Science -The Attitude of a
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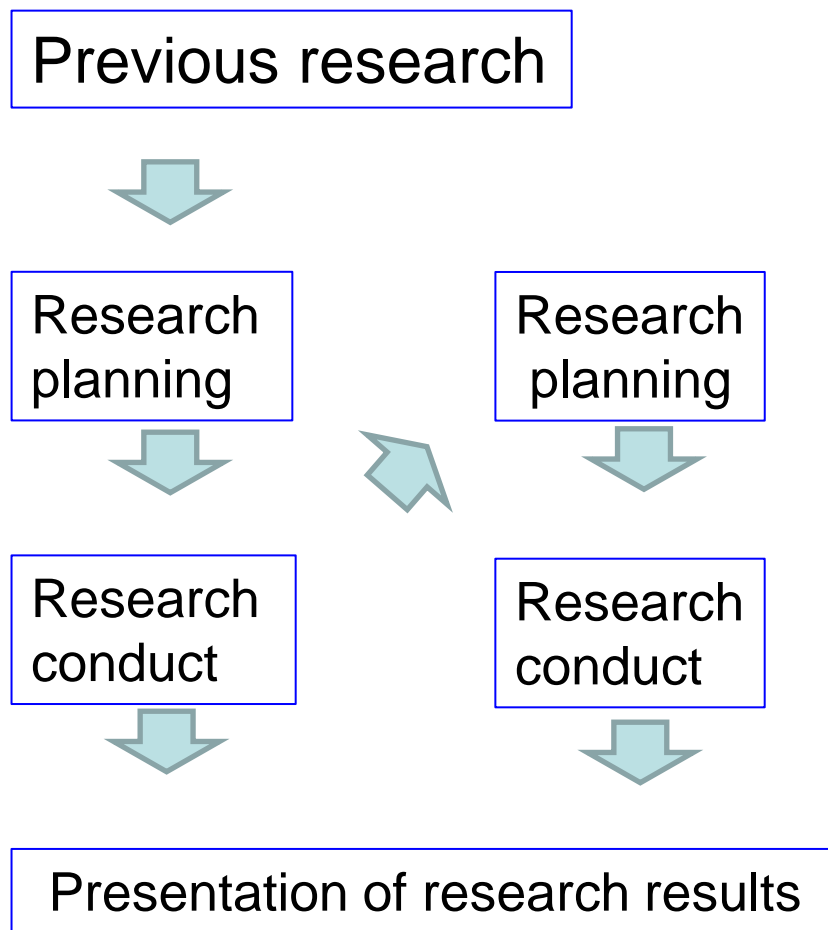
Section II Planning Research

Section III Conducting Research

2. Informed Consent
3. Protecting Personal Information
4. Collecting, Managing, and Processing Data

Data Handling

Research process



【Citation/credit】 Credit for previous research and clear distinction between one's research and others' should be made.

For further improvement of one's own study, storing the primary information that you obtained (raw data including the experiment conditions and advanced questionnaires) is essential.

In order to verify the research results, it is required to keep correct primary information.

In order to ensure the reliability of published research results, it is required to keep not only the published contents but also the process that proves how the result was obtained from data.

Undergraduate theses • master theses • doctoral theses
Presentations at conferences • submitted papers

Importance of data

- Research data ensures the reliability of research results not only at the time of publication but also after publication (including master's theses.)
- If there are doubts about a paper, it is necessary to prove the correctness with research data.

[authors & referees](#) > [Policies](#) > Image integrity

Image integrity and standards

Images submitted with a manuscript for review should be minimally processed (for instance, to add arrows to a micrograph). Authors should retain their unprocessed data and metadata files, as editors may request them to aid in manuscript evaluation. If unprocessed data are unavailable, manuscript evaluation may be stalled until the issue is resolved. All digitized images submitted with the final revision of the manuscript must be of high quality and have resolutions of at least 300 d.p.i. for colour, 600 d.p.i. for greyscale and 1,200 d.p.i. for line art.

<http://www.nature.com/authors/policies/image.html>

- ① Data are obtained based on appropriate methods.
- ② Data collection does not involve intentional wrong-doing or mistakes due to negligence.
- ③ Data obtained are properly stored and their originality is maintained.

- ① Storing unrevised raw data.
- ② Are the research results replicated?
The explanation of the details such as experiment material, process, conditions, experiment tools, measurement tools, etc.
- ③ Is the process which leads to the conclusion explained?
The detailed description of purpose, data processing, interpretation, development, etc.
- ④ Originality is maintained and shared.
Along with the clear notification of experiment date, researchers (contribution, intellectual property), sharing the information with supervisors and joint researchers

- ① Lab notes do not belong to an individual; they belong to the institution

Lab notes should be maintained on a group basis such as a research group.

As a general rule, Hiroshima University has a responsibility to maintain lab notes for 10 years after the academic paper was published.

- ② Data containing personal information.

Close attention should be given in order to avoid personal information leakage by taking measures such as setting access authorization, etc.

- ③ Storing data on electronic media

Storing in ways where correction or editing are easily made should be avoided.

Example of a lab note (Green Book Text P33)

[Entry Example]

Date, month, and year of the entry should be clearly recorded.

Only when the entry goes on for two or more pages.

Correction of an error (be sure the date is clear)

Page number, to be recorded when the page is used.

10年2月7日	続き	45
ポリプロピレン、10年2月7日、鈴木次郎 ポリエチレンを		
佐藤太郎 10年2月7日		
10年2月8日	プロジェクト: △ △ △ △ △ △	
(データ引用文献名: □ □ □ □、P12)		
10年2月8日	以前に行った記載を下記の通り訂正する。 (訂正箇所) P40、10年1月17日 (訂正内容) (訂正理由)	
10年2月9日	プロジェクト: ○ ○ ○ ○ ○ ○	佐藤太郎 10年2月8日
以下空白		
記入者	確認者	日付
鈴木次郎	佐藤太郎	2010年 2 月 9 日

Signature of the person writing the entry (full name)

Signature of the reviewer (full name)

Date reviewed

Full name of the reviewer

Date of review

Main title: research project title

Reference work cited

Later revision

Tally impression

Transparent film tape

Separate sheet attached

Only if a blank space is left below before going on to the next page



Example of "Research Lab Notebook" developed jointly by Prof. Yoichiro Sada of Yamaguchi University and Kokuyo S & T Co. Ltd.,

Guidelines for storage of research material, etc. at Hiroshima University

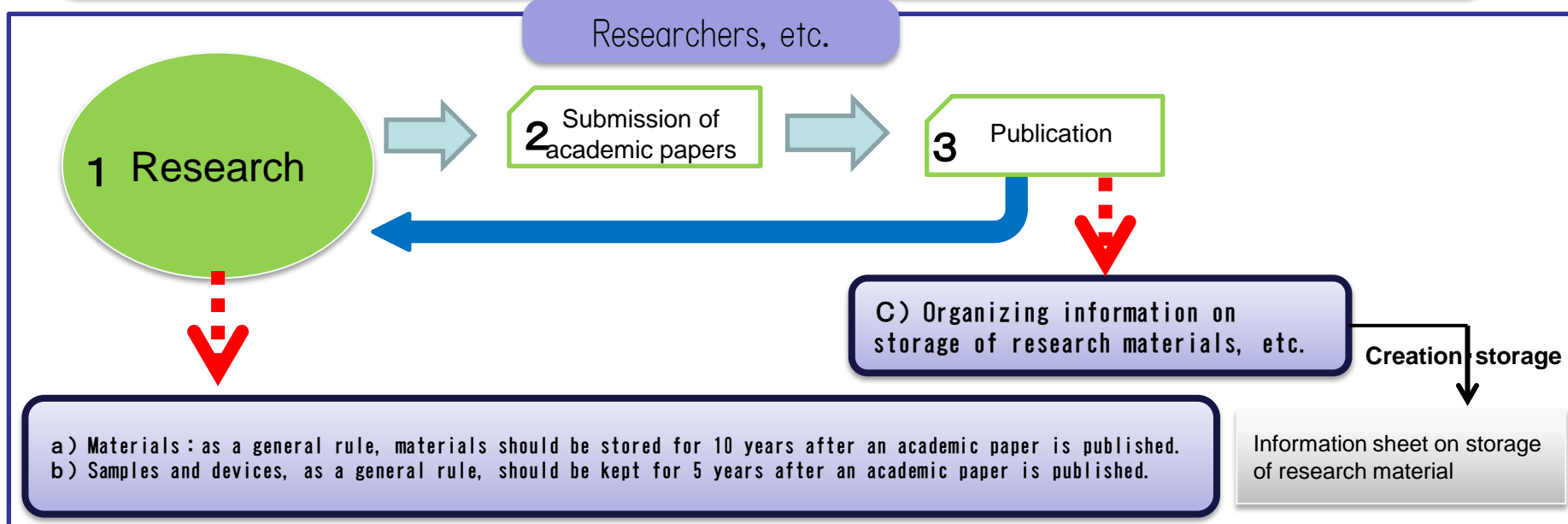
Responsibilities of researchers, etc. [Regulation Paragraph3 Article 4]

- Securing ways to verify legitimacy of research.
- Making it possible for a third party to verify the research.



The guidelines which stipulate items required for storage of research materials

- Appropriate management and storage of research materials.
⇒ implementation of a), b) and c).
- Disclosure [of materials] as needed





Information sheet

Information sheet

To decide a format



In accordance with the uniqueness of each research field, the sheet can be revised.

○Basic information:

The title of a paper, storage period and the person in charge of storage

○Information of researchers, etc:

Author of the paper, where the paper is submitted and relevance to dissertation

○Author information: authorship

○Research material information: material (documents and statistical data) and samples

○Research conduct information: LMO (Living Modified Organism), approval for animal experiment.

※By organizing information, prevent loss of information and conduct proper information management.

研究資料保存に関する情報整理票

研究資料保存責任者		No.	
-----------	--	-----	--

基本情報	学術研究成果の論文題名・題目											
	学術研究成果の発表日	資料(文書、数値データ、画像など)は原則として発表の後10年間				試料、装置試料(実験試料、標本)、装置などは原則として発表の後5年間						
研究者等の情報	学術研究成果の発表先等	投稿論文筆頭著者 (First Author)					科研費研究者番号					
		連絡先となる代表著者 (Corresponding Author)					科研費研究者番号					
		投稿した学術誌名										
	学位論文との関係	<input type="checkbox"/> 関係なし	<input type="checkbox"/> 関係あり									
		博士・修士・学士の区分										
		学生の氏名										
		学位論文名										
	剽窃ソフトによる検証の有無	<input type="checkbox"/> 検証の結果、問題なし <input type="checkbox"/> 検証をしていない										
著作者等に関する情報	1. Authorship 投稿論文に関する著者及び責任分担	氏名 (科研費研究者番号)	a)企画・構想	b)実験遂行	c)データ解析	d)理論解釈	e)草稿作成	f)重要な箇所への意見	g)その他			
	2. Acknowledgement 投稿論文における研究遂行に寄与した者	氏名 (科研費研究者番号)	h)執筆の補佐	i)技術面の協力	j)周知の理論の教示・示唆	k)施設の提供	l)資金提供	m)その他				
	3. Acknowledgementに 記載した研究資金											
研究資料の情報	資料(文書、数値データ、画像など)	資料の種類・態様	作成時期	媒体の種類	作成者	管理者	保存場所	秘密情報の有無	学術誌への投稿	その他		
	試料(実験試料、標本、装置など)	資料の種類・態様	作成時期	媒体の種類	作成者	管理者	保存場所	秘密情報の有無	学術誌への投稿	その他		
実験計画等	実験計画の承認	実験計画の該当	計画名(課題名)				実験責任者	承認番号	承認年月日	承認期間		
		<input type="checkbox"/> 遺伝子組換え生物等使用実験計画 <input type="checkbox"/> 動物実験計画 <input type="checkbox"/> 放射性同位元素使用実験計画 <input type="checkbox"/> 医の倫理に関する実験計画										
その他	その他特記事項											

Protection of Human Rights and Compliance with Laws and Regulations (Green Book Text P10)



- It is not correct to say that anything should be allowed in the name of scientific research.
- One should never forget that freedom in research is to be guaranteed only so far as the research fulfills its responsibility of protecting those things that are to be protected.

Protection of human rights

Confidentiality of personal
information

Informed consent

Compliance with laws and regulations related to human life ethics

Compliance with laws and regulations related to safety

Approval of an ethics review committee

Important points of Research involving Human Subjects (Green Book Text P22)



- Informed consent
 - means the consent that a person who is a candidate for inclusion as a subject of a clinical study, after having been fully informed of the design of the study by researchers or equivalent persons and having fully understood the significance, objective(s), method(s), etc. of the study, gives at his/her own discretion consent to participate in the study and approval of the procedures for handling the human specimens and equivalent materials.”
(Ethical Guidelines for Clinical Studies established by the Ministry of Health, Labor and Welfare)



Protection of personal information

- The same sort of consideration should be given in interviews and other research in the humanities and social sciences



Personal information (Green Book Text P28)

- “personal information” is defined as “information on a living individual, which can identify the specific individual by name, date of birth or other description contained in such information (including information that can be compared with other information and thereby identify the specific individual.)” (Act on the Protection of Personal Information)
- Specifically, this includes not just information such as name, gender, date of birth, and other descriptions that can identify the specific individual but also “any information expressing facts, judgment, or evaluation concerning the individual’s physical body, assets, occupation, position, or other attributes.”

It is expected that personal information such as base sequence, which comprises of DNA, is stipulated in a cabinet order.

Ethical Guidelines for Clinical Studies

※To be revised in spring, 2017

- ① When presenting research results, the subjects shall not be identifiable.
- ② Personal information shall not be used beyond the scope necessary to accomplish the purpose of its use specifically explained to the subject when obtaining informed consent.
- ③ Personal information shall not be obtained using an improper method.
- ④ Effort shall be made to maintain personal information accurately and currently within the scope necessary to accomplish the purpose of its use.
- ⑤ Safety management shall be implemented to ensure that personal information is not leaked, lost, or damaged.

(Green Book Text P29)

Humanities and social sciences

In the situation where one presents results while quoting unpublished documents or interview records

- ① In the original interview, to obtain consent from the interviewee concerning the objectives of the research, scope and format of disclosure, and whether or not his/her approval will be obtained before presentation.
- ② When quoting an interview record, to mention the interviewee's name, position and occupation, date, time, and location of the interview within the scope agreed upon by the interviewee.



(Green Book Text P29)

- ③ When quoting a historical source or document publicly displayed in an archive or a historical library, to cite the name of the archive or library, title of the source/document, document number, and other details. When using a deposited document and the deposition agreement requires that the depositor be shown a rough draft of your presentation in advance, to be sure to comply with that requirement.
- ④ If you have received special permission from an individual or a corporation to browse historical sources or documents, to obtain prior agreement and clarify the disclosure conditions, including to what extent you may disclose the actual resources/documents, their existence, and items containing personal information.
- ⑤ When quoting historical resources or documents, to pay especially close attention to information such as an individual's birth, lineage, economic status, death (including history of illnesses), and criminal history, because, while the individual may have lived in the past, such information may violate the privacy of his/her heirs or successors.

For the Sound Development of Science -The Attitude of a Conscientious Scientist-
Section **IV** Presentation of Research Results

Presenting Research Results



- Recognition of a scientist's contribution to research is called "credit."
 - Authorship , indicating who has written a given paper
 - "Citations" of research conducted by other authors
 - Listing scientists who contribute to a research study in the "acknowledgements".
 - Inappropriate listing as authors
 - Not citing previous researches
- Misconduct**

Who Should Be Listed as Authors (Green Book Text P50)

- Four criteria for one to be listed as a paper author.
 1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work;
 2. Drafting the work or revising it critically for important intellectual content;
 3. Final approval of the version to be published;
 4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- These are the conditions that must be satisfied to be eligible for authorship; conversely, people who satisfy all of these conditions must be listed as authors.

Improper Authorship (Green Book Text P51)

- Gift Authorship

- In a case in which a true author, out of kindness, gives authorship to someone not deserving it.
- Other cases where persons in a more powerful position than a true author add their names as authors of a paper, taking advantage of their superior position. Conversely, there are cases where a true author adds to the list of authors someone close to him/herself or someone who can give the true author an advantage if listed as an author.

- Ghost Authorship

- A truly deserving author is not given credit as an author.
- Even when the graduate student's experiments, data collection, and analyses were carried out under the guidance of the professor, the graduate student should be named as an author when s/he has made a substantial contribution to the research.
- The Diovan Scandal can be one of the examples where an employee of a pharmaceutical company carrying out clinical research and analysis of data but only university-affiliated researchers are listed as authors of the paper.
(See P12)

Duplicate posting and duplicate publication ①



(Green Book Text P52)

- Duplicate posting and duplicate publication are not acts of an author disclosing information already made available to the public.
- When submitting a research paper, if an important part of the paper has already been presented elsewhere, that fact needs to be made clear.
- In particular, Japan's regulations on academic degrees were revised in 2013, replacing dissertations printed on paper with dissertations presented over the Internet. With this, it will be normal for a doctoral dissertation to appear on the Web within one year following the awarding of a degree. When one submits a paper based on a doctoral dissertation, this fact must be reported to the academic journal.



Duplicate posting and duplicate publication ②

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FAQ on Research Ethics (Excerpt of parts related to dissertation)

No.	Q	A
1	I would like to publish my doctoral thesis from a publisher. Would it be considered duplicate publication?	In accordance with the revision of regulations on academic degrees made in 2013, doctoral theses are disclosed on WEB (Hiroshima University Institutional Repository). Whether this case applies to duplicate publication or not varies and depends on the practice of your major and policies of the publisher. Please consult with supervisors and the publisher.
2	(snip) The explanation was given that because of the revision of regulation on academic degrees made in 2013, it will become a regular practice that doctoral theses will be disclosed within 1 year on the web. If there are contents related to patents in a doctoral thesis, how should we deal with the new practice? Will it lead to loss of novelty because of disclosure?	In compliance with Hiroshima University Degree regulations, doctoral theses shall be disclosed with all their contents within one year from when the dissertation is accepted. However, in unavoidable circumstances where the disclosure possibly leads to the loss of novelty, the summary of the doctoral thesis would be replaced with the entire thesis after receiving approval of the president. Such special circumstances include planning for an application for patent and application and you will file a claim by submitting a Doctoral Dissertation Submission and Publication Confirmation (Application Form)". Please contact the Student Support Office of your graduate school if your dissertation has other reasons.
3	(snip) The explanation was given that because of the revision of regulation on academic degrees made in 2013, it will become a regular practice that doctoral theses will be disclosed within 1 year on the web. How can we post our doctoral theses in books?	Please ask the publisher after taking a closer look at your contract with the publisher. In cases where your dissertation cannot be disclosed, with the president's approval, it is possible to publish a summary of your dissertation content instead of the entire dissertation, after acknowledging the circumstance and undertaking the appropriate procedure.
4	How can a person, who already obtains a (doctoral) degree, register one's dissertation on Repository?	A person, who acquired a degree before 2012, is needed to submit Agreement to Allow the Deposit of My Doctoral Thesis in "Hiroshima University Institutional Repository (HiR) when the person register one's dissertation. Please contact Library Information Planning Group. For who obtained a degree after 2013, please contact Management Support Office.



- The act of publishing one research as multiple smaller studies (slices cut out from the main study) is referred to as “salami publishing” or “bologna publishing.”
- This practice not only artificially exaggerates one’s accomplishment, but it is also problematic because it makes it difficult to grasp the overall significance of the research and unnecessarily wastes other scientists’ time.

- To give proper credit to research conducted in the past, it is essential to carefully investigate prior research and appropriately reference it when writing a paper.
- There are cases when a research group intentionally omits reference to prior research done by a competing research group.

- When preparing and using a secondary work that copies or modifies someone else's work, generally one must first obtain permission from the owner of the copyright of that work.
- The copyright of a work published in a journal or other publications normally belongs to the publisher, so an author may need to obtain permission from the publisher to use that article even if it was written by the author him/herself.
- When a scientist's research results are reported in a newspaper or other media, s/he may want to share the report or coverage by including it on a website.



- In the following cases for example, no permission is needed unless transfer is expressly prohibited: Use of a work excluded from the protection of the Copyright Act by a national law or a local ordinance, duplication for a personal use, and use of a work whose copyright-protection period has expired.
- When “quoting” someone else’s work or using part of someone’s work for educational or examination purposes, no permission is necessary as long as proper procedures are observed.
- According to the Copyright Act, it is permissible to quote from a work “already made public” provided that it is “compatible with fair practice” and “to the extent justified by the purpose of the quotation such as news reporting or research critiquing.”

Requirement of quotation

Direct quotation

- (1) Use materials for quotation that have already been published.
- (2) Quote within an “appropriate range” for criticism and study.
- (3) Clearly express the master-subordinate relationship for your sentences and quotation.
- (4) Use quotation marks, etc. to make the quotation clear.
- (5) Demonstrate the necessity of quotation.
- (6) Indicate the written sources clearly.

Indirect quotation

- (1) Do not use the sentences as they are, but paraphrase in your own words.
- (2) Do not modify the gist of the original sentences.

Regulations and code of conduct for scientists at Hiroshima University

A code of conduct for scientist at Hiroshima University 61

Hiroshima University Five Guiding Principles

① The Pursuit of Peace

② The Creation of New Forms of Knowledge

③ The Nurturing of Well-Rounded Human Beings

④ Collaboration with the Local, Regional, and International Community

⑤ Continuous Self-Development

○ Following Hiroshima University's vision (five principles), scientists take responsibilities for contributing to human society with pride.

○ Those who get involved in scientific research should make utmost efforts to contribute to world peace and to exclude acts that threaten the peace.

○ With the awareness of social responsibility, scientists conduct research appropriately and use research funds ethically.

❌ Hiroshima University established a code of conduct of research and use of research funds

Regulations at Hiroshima University

Regulations concerning improper use of research funds

広島大学における研究費等の不正使用の防止に関する規則

- Prevention of improper use of research funds → Conducting compliance
Mandatory confirmation of compliance with regulations
- Measures against improper use → Roles of organizations such as the Investigation Committee for Improper Use

Regulations concerning research misconduct

広島大学における研究活動の不正行為の防止及び対応に関する規則

- Prevention of research misconduct → Conducting research ethics training
Storing and managing research materials, etc.
- Measures against misconduct → Roles of Investigation Committee for Research Misconduct

Regulations concerning application for research

Examples: Animal experiments, Recombinant DNA experiments, Conflicts of interest

Definition of research misconduct

- fabrication (making up data or research results, etc.), which is lead by gross neglect in the basic duty of care expected to be exercised by researchers.
- falsification (manipulating research materials, equipment, or processes to change data or results obtained from research activities).
- plagiarism
(appropriating the ideas, analyses, analytical methods, data, research results, research paper(s), or words of other researchers without obtaining the permission of the researchers or giving appropriate credit).
- Destruction of evidence of fabrication, falsification and plagiarism or interference of verification (including hiding, disposal and ill-management of experimental records which are required to reproduce and replicate the experiment)



Internal hotline for misconduct at Hiroshima University

○ Internal-reporting hotline concerning research misconduct

Research misconduct: violating codes of conduct for researchers at Hiroshima University and fabricating, falsifying or plagiarizing data or other research results in the process of research, or hiding such misconduct.

**Chief Manager of Academic Support Group, Department of Academic Affairs,
Hiroshima University**

1-3-2 Kagamiyama, Higashi-Hiroshima City Hiroshima, 739-8511
(1F, Administration Bureau Building)

Direct phone number: (082)424-5679

Fax: (082)424-5890

Email: kokuhatsu@office.hiroshima-u.ac.jp

○ Internal-reporting hotline concerning improper use of research funds

Improper use of research funds: with regards to all expenses managed by Hiroshima University, to spend research funds on purpose other than their intended use, to demand research funds based on false claims or to demand research funds in violation of regulations.

Hiroshima University Audit Office

1-3-2 Kagamiyama, Higashi-Hiroshima City Hiroshima, 739-8511
(6F, Administration Bureau Building)

Direct phone number: (082)424-6068

Fax: (082)424-4251

Email: kansa-situchou@office.hiroshima-u.ac.jp

- ① 科学への期待と社会との関係
- ② 研究活動の本質
- ③ 研究成果の発表とは？
- ④ 研究活動における不正行為への対応等に関するガイドライン
(文部科学大臣決定)
- ⑤ 不正行為に対する基本姿勢
- ⑥ 研究不正行為に対する取組み
- ⑦ 不正行為が大学に与える影響
- ⑧ 研究倫理教育の受講を公募要件化
- ⑨ 研究倫理教育教材 CITI Japan等
- ⑩ 広島大学における学生に対する研究倫理教育の実施
- ⑪ 広島大学における研究倫理向上のための取組み
- ⑫ 研究機関における公的研究費の管理・監査のガイドライン(文部
科学大臣決定)の改正
- ⑬ 第3次大学院教育振興施策要綱

(The detailed information is provided on "Momiji". This slide shows only table on contents)

- ① 広島大学における科学者の行動規範
- ② 広島大学における研究活動に係る研究倫理教育推進体制
- ③ 広島大学における研究倫理教育の対象者
- ④ 広島大学における研究資料等の保存ガイドライン
- ⑤ 広島大学における研究活動に係る不正行為の防止及び対応に関する規則
- ⑥ 広島大学における研究費等の不正使用の防止に係る体制
- ⑦ 広島大学における研究費等の不正使用の防止等に関する規則
- ⑧ 広島大学の不正使用等の通報窓口
- ⑨ 研究費等の事務処理手続きの情報提供
- ⑩ 海外における研究活動に関する注意事項
- ⑪ 広島大学研究倫理教育FDの受講証の取扱い
- ⑫ 研究倫理教育に関連する主な変更点等

【規則】

広島大学における研究活動に係る不正行為の防止及び対応に関する規則
広島大学における研究費等の不正使用の防止等に関する規則

【 Books 】

1. 『科学者をめざす君たちへ：科学者の責任ある行動とは』 池内了訳, 化学同人, 1995年.
(On Being a Scientist: Responsible Conduct in Research, by the Committee on Science, Engineering, and Public Policy of the National Academy of Sciences of the United States. 1995)
2. 『科学者の不正行為：捏造・偽造・盗用』 山崎茂明著, 丸善, 2002年.
3. 『ORI研究倫理入門：責任ある研究者になるために』 山崎茂明訳, 丸善, 2005年. (ORI Introduction to the Responsible Conduct of Research, by Nicholas H. Steneck, Office of Research Integrity.2003.)
4. 『背信の科学者たち：論文捏造、データ改ざんはなぜ繰り返されるのか』 牧野賢治訳、講談社（ブルーバックス）, 2006年. (Betrayers of the Truth: Fraud and Deceit in the Halls of Science, by William Broad and Nicholas Wade, Simon & Schulster. 1982.)
5. 『パブリッシュ・オア・ペリッシュ：科学者の発表倫理』 山崎茂明著, みすず書房, 2007年.
6. 『科学を志す人びとへ：不正を起こさないために』 科学者倫理検討委員会編, 化学同人, 2007年.
7. 『科学の健全な発展のために：誠実な科学者の心得』 日本学術振興会「科学者の健全な発展のために」編集委員会編, 丸善, 2015年. (英語版: For the Sound Development of Science: The Attitude of a Conscientious Scientist, Japan Society for Promotion of Science Editing Committee “For the Sound Development of Science”)
8. 『研究不正 科学者の捏造、改竄、盗用』黒木登志夫著, 中公新書, 2016年
9. Hiroshima University, *An Introduction to Research Ethics*, (2016, March) (in Japanese, English and Chinese)
10. Hiroshima University, *Rules and Guidelines for Writing a Report*, (2016, March) (in Japanese, English and Chinese)

This slide concludes the lecture designed for Basic RCR Program for Graduate Students.

After the lecture, please provide detailed information such as explanations about practice or the unique features of each major.