

## Addressing Research Misconduct

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Council for Science, Technology and Innovation

### 1. Introduction

- In recent years, not a few cases of research misconduct have occurred in the field of science and technology in Japan. As some cases cast doubt on the research results, actions against research misconduct are required.
- The Council for Science, Technology and Innovation (CSTI) summed up the background of misconduct, as well as basic thinking and viewpoints for taking actions against misconduct, as shown in the Annex. It is based on reviews and discussions with experts on related trends in Japan and overseas, including actions taken by universities and funding agencies and international discussions at science academies. From the standpoint of overseeing the whole picture, the CSTI, which fulfills headquarter function regarding STI policy, requires researchers, research community such as academic societies, research institutions such as universities (hereafter “research institutions”), funding agencies and relevant ministries, to take further actions against research misconduct, taking into account the points mentioned in the Annex and in accordance with their respective positions, situations and the diversities of the research fields and research institutions. It is important to ensure that the actions taken by relevant actors will not be a case-by-case response, rather in line with internationally adopted approach ensuring research integrity.

### 2. Requirement for actors in scientific and technological research

#### (1) Researchers and Research Communities

- Researchers should reconfirm their responsibility to maintain research integrity; improve continuously research ethics through coursework and daily research activities; and on this basis, make research integrity as an integral part of their research activities.
- Researchers and research communities should work on fostering a culture, where research integrity is highly respected, for example, by transmitting value of research ethics that have been acquired to juniors through daily research activities.

#### (2) Research Institutions

##### [Prevention]

- Research institutions should continuously carry out effective research ethics education and training and endeavor to improve its effectiveness taking account of the diversity of research context, e.g. research fields, and researchers’ status, such as ranks, titles and responsibilities.
- Research institutions should establish a mechanism to make research integrity as an integral part of their functioning, and continuously assess and improve this mechanism in order to enhance its effectiveness.

##### [Post-incident measures]

- Research institutions should always be prepared to be able to quickly and accurately respond to any allegations of research misconduct.
- When research misconduct is identified, the research institution should thoroughly investigate the cause and the background of the misconduct in order to prevent the recurrence of a similar case, and devise effective measures against the case.

- (3) Funding Agencies
    - Funding agencies should endeavor to implement measures to enhance research integrity by, for example, requiring researchers to have taken research ethics courses when receiving their grant applications.
  - (4) Relevant Ministries
    - Relevant ministries should check the activities against research misconduct and assess them continuously in order to ensure research integrity at the research institutions under their jurisdiction.
  - (5) Council for Science, Technology and Innovation (CSTI)
    - The CSTI should oversee the overall situation of activities by research institutions and relevant ministries and appropriately interact with them when needed.
    - The CSTI should provide an open platform to collect and share information including that on research ethics education and good practices common in various research fields in order to ensure that activities taken by individual actors will function integrally.
3. Toward Establishing a Nation founded on Science, Technology and Innovation
- While being aware of changes in the environment surrounding the scientific and technological research, each actor needs to contribute to the construction of “the world’s most innovation-friendly country.”
  - In this perspective, careful consideration needs to be given regarding the impact of measures against research misconduct so as not to put pressure unnecessarily on research activities by taking excessive measures. At the same time, it is important to prevent the occurrence of research misconduct, through research ethics education, and to take firm actions against research misconduct based on evidences. Each actor is required to act, fully recognizing that continuous efforts against research misconduct will help to comply with a mandate of social trust in scientific and technological research and will eventually reinforce the strength of scientific and technological research.

[Annex]

1. Basic Understanding on Research Misconduct

- Scientific and technological research is the product of cumulated activities of human being, founded on the accumulation of the past research results and exploiting new frontier of knowledge in the future. As these are carried out based on the creativity and curiosity of individual researchers, their independence and autonomy should be respected. However, research misconduct means the transmission of false results, which can destroy the functioning of this chain of knowledge production.
- On the other hand, scientific and technological research must be established on the basis of a great deal of trust from the society and the people: the research is expected to challenge the unknown, accumulate and transmit knowledge to be shared, solve social issues, and contribute to the improvement of the quality of the peoples' lives. For that reason, researchers need to respond to trust expressed explicitly and implicitly and mandate from the society and the people, and they have the responsibility to fulfill these roles. Research misconduct goes against such social contracts and could lead to the loss of social trust and mandate, which are the very foundation of the scientific and technological research.
- Research misconduct needs to be handled strictly for the above reasons, and for this purpose it is necessary to clarify the definition of research misconduct and where the responsibility lies.
- Research misconduct is intentional falsification, fabrication and plagiarism in research results published in the form of academic papers, presentations and reports at academic meetings and also in research proposals to obtain research funds. Other inappropriate and irresponsible behaviors which weaken research enterprises, as pointed internationally, include losing research data due to inadequate management, adopting dangerous research methods, improper authorship, inappropriately increasing the number of papers or division of theses, and other inappropriate conducts in the reviewing process of theses and research proposals (such as intentional delay of reviewing, excessive revision demands deviating from the research viewpoint). In order to ensure that the research is carried out based on the high standards of research ethics, that is, to maintain research integrity, attention should be paid to these behaviors.
- Researchers bear primary responsibility for maintaining research integrity. Regardless of their relationship with research institutions, researchers are responsible for acquiring high standards of research ethics to maintain research integrity.
- It is required to re-recognize that research institutions to which researchers belong, research communities including academic societies, funding agencies and relevant ministries also have key roles in maintaining research integrity as critical constituencies of research environment.

2. Activities in Japan and Overseas

- In Japan, then Council for Science and Technology Policy formulated a document called "the Actions against Research Misconduct" in 2006 and recommended research communities, relevant ministries and research institutions to take actions such as formulating guidelines and regulations.
- In response to this document, research communities, relevant ministries and research institutions took relevant actions and have autonomously endeavored to establish a mechanism to maintain research integrity including the development of guidelines, regulations and ethical norms.
- Research misconduct has been internationally regarded as an important issue, too. The global guidelines have been developed including the Singapore Statement on Research

Integrity adopted at the World Conference on Research Integrity in 2010. Individual countries have been carrying out respective activities in accordance with their situation.

### 3. Changes in the Environment Surrounding Scientific and Technological Research

- Despite the various activities carried out against research misconduct, not a few cases of research misconduct are still occurring in Japan and overseas. It has been said that at the background of the misconduct are the significant changes in the environment surrounding scientific and technological research. Specifically, the main changes are (1) intensified competition for acquiring research funds and taking academic posts, (2) segmentation and specialization of research fields, and (3) increasingly diversified members of research teams.
- (1) Researchers are exposed to global competition for acquiring research funds and taking research posts. Under such an environment, researchers are under pressure to produce a number of socially and academically impactful results in a short period of time and disseminate these results widely. As a result, it is pointed out that those pressures are weakening their cautious attitude to repeatedly confirm the validity of research methods and results, after carefully examining validity of data, verifying data reproducibility, having discussions among peers and getting their feedback. These pressures can also cause researchers to over-qualify research results beyond the acceptable level in science or to give broader interpretations, as they are acutely aware of obtaining clear approbation immediately from various stakeholders when they publish their research results.
- (2) As research fields have been segmented and specialized in accordance with the development of science, it is becoming more difficult for individual researchers to fully understand the research carried out by other researchers and ascertain the validity of research results from the scientific viewpoints. In such a situation, some say that it is difficult even for researchers in the same research institution or the same research team to discuss the areas of other researchers in depth, and as a result of this, the checking function by the peers is weakening.
- (3) With the progress of multidisciplinary collaborations, globalization of research projects, brain circulation across industry, academia and government in Japan, and more globally, there are increasing opportunities where research institutions and research teams in Japan have researchers trained in different fields, culture or education systems. Under such an environment, rules and practices for conducting research are highly likely to be different from one researcher to another. As a result of these, researchers today are required to consciously and systematically acquire the norms and rules ensuring research integrity, which, in the past, used to be shared unconsciously and informally over time.
- On the other hand, while we see above changes in the research environment, new activities to address the above issues have been initiated by some funding agencies and academic journals. The new activities include disclosure of detailed experimental protocols to surely verify reproducibility, post-publication peer-review, and implementation of open data policy. Their future trend needs to be watched.
- Toward the realization of “the world’s most innovation-friendly country,” Japan is promoting new initiatives such as the promotion of young researchers and multidisciplinary research, and implementation of cross-appointment systems. Therefore the above issues should be addressed urgently through effective actions.

### 4. Fundamentals on Actions against Research Misconduct

- Research ethics as a basis of all researchers is a universally recognized value in all places and at all times. However, on the basis of the recent changes in the environment surrounding research in science and technology as mentioned in Section 3, researchers and research communities are required to be reminded of the importance of research ethics,

anytime they conduct their research activities. Also, other stakeholders of scientific and technological research, such as research institutions, are required to have a stronger awareness of maintaining research integrity. This section lists items to take note of when individual actors deal with research misconduct based on the recent international common understanding of research misconduct.

- As actions against research misconduct, researchers are required to make self-improvement while research institutions are required to establish an environment to maintain research integrity by providing opportunities for researchers' self-improvement and taking appropriate post-incident measures. Furthermore, it is important for other stakeholders to develop preventive measures and responsive actions against research misconduct, in accordance with the diversity of research fields and research institutions, as well as their norms and responsibilities, as it leads to the improvement of integrity in research activities as a whole.
- In promoting these activities, impacts on research activities need to be considered carefully so that excessive measures will not put pressure unnecessarily on research activities.

#### (1) Researchers and Research Communities

- Researchers should take responsibility to maintain research integrity by acquiring research ethics by themselves and to conduct their research on its basis. Research communities are required to re-examine and formulate explicitly codes and rules of research ethics, and ensure their strict respect by researchers.
- It is vital that researchers not only acquire research ethics through daily research activities but also through structured knowledge.
- Researchers need not only to acquire research ethics at an early stage of their research careers, but they also need to be reminded of research ethics continuously through daily research activities and by taking courses.
- Researchers should play a leading role in maintaining the high standard of research integrity by transmitting research ethics that they acquired to their juniors through their daily research activities.
- Research communities should take the lead in improving and revising the codes and rules on the basis of the research misconduct that actually happened and in accordance with the actual situations of different research fields. Researchers also need to take the lead in incorporating these in their research activities.

#### (2) Research Institutions

- Research institutions to which researchers belong need to create a mechanism to maintain research integrity, and develop it so that they can respond quickly and appropriately if a suspicious case of research misconduct arises. If the mechanism has obvious flaws or its operation has become a mere formality, there is certain institutional responsibility. If research institutions simply respond to each occurrence of research misconduct, it is difficult to solve the issues radically and it cannot improve the effectiveness. With these in mind, research institutions need to continue to assess and improve the mechanism in order to ensure its effective operation.
- In developing and operating the mechanism to maintain research integrity, sufficient consideration need to be paid how the mechanism is to be applied to researchers with different backgrounds (customs in conducting research, perception of research integrity), based on Japan's current situation to have increasing foreign researchers.

[Preventive measures]

- In order to prevent research misconduct, education on research ethics is the base for all actions. Concrete programs and instruction methods should be relevant to the research field and the characteristics of the institution, with reference to previously-developed materials.
- It is important that different versions of educational materials on research ethics are prepared according to the level of the researchers' position and responsibility, considering the differences among young, senior researchers and principal investigators in laboratories. When a researcher is hired at an institution or assumes a new post by promotion, it is recommended to provide training courses on research ethics relevant to the responsibility.
- It is advisable to nurture a culture of respect for research integrity as an integral part of research activities. For this purpose, appropriate recognition by research institutions for activities such as the verification of reproducibility and the research data management, will greatly contribute to the improvement of the situation.

[Post-incident measures]

- Even if a training program on research ethics is thoroughly provided and a clear penalty structure is in place, in reality it cannot be denied that it is difficult to eradicate research misconduct since research is a human activity. Therefore, it is important to prepare and develop a mechanism in advance in order to take quick and appropriate actions so as not to lose trust in research activities as a whole when a suspicious case of research misconduct actually occurs.
- The following three points are fundamental to set up the rules for investigation of suspicious case of research misconduct: (1) terminology and scope of investigation are clearly defined in order to prevent misunderstandings and flaws during the investigation, (2) the investigation procedure is not excessively complicated, and (3) the rules are well-communicated.
- In order to take appropriate actions at the right timing when a suspicion of research misconduct occurs, it is needed to be prepared by, for example, conducting simulations and drills.
- In order to deal with a suspicious case, professional and structured knowledge and experiences are required to fully understand the characteristics of the research misconduct. As it is beneficial to learn lessons from the past cases, the development of a mechanism to accumulate and share such information needs to be considered not only by research institutions, but also by actors engaging in scientific and technological research, including research communities, funding agencies and relevant ministries as a whole. It is also important to provide counselling services for research misconduct from professional viewpoints. This also needs to be considered.
- When a case of research misconduct is confirmed, it is important to take effective measures after thoroughly verifying the cause and background of the incident so that a similar case will not occur again.
- When a penalty is imposed, it is important to have objectivity, fairness and consistency in accordance with the content of the case of research misconduct.
- In the laboratory to which the researcher who committed research misconduct belongs, it is important to prepare in advance protection measures for other researchers and students who were not involved in the misconduct to avoid any disadvantages to their research.
- Within the framework of international collaborative research, acknowledging that there is a difference among countries in understanding of the range of research misconduct and rules, and customs in conducting research, it is necessary to integrate as a part of Memorandum of Understanding (MOU) between research institutions, the description of the response when the research misconduct occurs and perspectives of ensuring research integrity.

### (3) Funding Agencies and Relevant ministries

- Funding agencies also play a large part as an actor to enhance research integrity. Concrete measures include, for example, increasing opportunities of ensuring the research ethics by obliging applicants of research grants to get research ethics training or checking the records of research ethics education program with research institutions on the occasion of contract signing or final inspection; when research plans are submitted, by checking if they contain an objective description of intrinsic constraints or limitations of the research.
- It is important that funding agencies accumulate information on research misconduct which has occurred in research projects they funded, and organize and systematize the information in such a manner as other research institutions can refer to. Also, it is necessary to ensure that such activities are promoted under the international network of funding agencies.
- Relevant ministries are responsible for ensuring that activities carried out by research institutions under their jurisdiction are effective in maintaining research integrity. Therefore, it is necessary to continuously check and assess the effectiveness of the activities implemented by research institutions.
- The CSTI needs to grasp an overall picture of the current situation of actions taken against research misconduct at research institutions and of the maintenance of research integrity as well as activities carried out by relevant ministries. The CSTI also needs to have appropriate interactions when needed in accordance with the international trends.
- The CSTI needs to ensure consistency by providing a cross-sectional and disciplinary forum which enables the collection and sharing of various information, including that on research ethics education common in various research fields together with good practices rather than merely overview the individual activities in order to ensure that activities taken by different actors will function integrally.
- It is important that academic journals need to take actions against research misconduct as a repository of reviewed research results and foundation of the future research. While many point out that conventional peer-review system has its limitation, our attention is drawn to the investigation of new initiatives to check research misconduct in the process before and after the publication by for example, introducing a tool to mechanically check plagiarism and falsification, releasing the detailed experimental protocols, conducting post-publication peer review, and applying open data policy to research activities.

### 5. Toward Establishing a Nation Founded on Science, Technology and Innovation (STI)

- While the changes of environment surrounding research in science and technology, as mentioned in Sec. 3, continue to progress, each actor engaging in research in science and technology needs to promote activities toward the realization of “the world’s most innovation-friendly country”, while taking account of these changes from their respective perspectives.
- In promoting STI activities, careful consideration needs to be given regarding the impact of measures against research misconduct on the research itself, so as not to put pressure unnecessarily on research activities. At the same time, it is important to prevent the occurrence of research misconduct, through self-improvement and education in research ethics, and to take firm actions against research misconduct based on evidences. Each actor is expected to struggle with research misconduct, fully acknowledging that continuous efforts against the research misconduct will help comply with a mandate of social trust in research activities in science and technology and will eventually reinforce their strength.

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## **[Sample materials for research ethics education]**

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<http://www.jusmec.org/defaultjapan.asp?language=japanese>

\* The Japan Society for the Promotion of Science and the Science Council of Japan are jointly working on the creation of standard programs to provide education on research ethics which are common to various research fields.