

# Different contexts on which the scientific term appears: the case of “gene” in mass media and daily use

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**Abstract:** This paper focuses on the public understanding of genetics. The discourses in the newspapers and the discourses in the weblogs are compared. In both discourses we can find several contexts in which "gene" appears. They are partly overlapped with each other. But weblog discourses include specific contexts which can not be identified in newspaper discourses. It means that the public knowledge does not constitute the subset the experts' knowledge. Large part of current science/technology communication on genetics has been based on the idea of public acceptance. But the result of this investigation suggests that new model of science/technology communication (citizenship model) is required.

**Key words:** *Discourse, Genetics, Public Understanding of Science*

## 1. Introduction

This paper analyses Japanese mass media communication about genetics and proposes a new model of science/technology communication, indicating that it is more suitable than so-called "deficit model".

In its broadest meaning, science/technology communication is the exchange of information which has relation to science/technology. But communication of that sort among experts is not usually called as science/technology communication. Discussing in academic meetings, reading and writing technical papers, talking on her/his own research, and informing technical contents for specialist education belong to the communication among experts. Some of these have been the object of scientometrics studies, and some are the one of studies of anthropology of science. Communication among non-experts is not included in science/technology communication either, but has been the object of studies of PUS (Public Understanding of Science), as is shown in the following part of this paper. Therefore, the problem of science/technology communication was understood as one between experts and non-experts, that is, among people whose background, interest, and knowledge were very different.[1] This paper adopts such usage of the phrase of "science/technology communication". And most of science/technology communication does not have direct forms, but indirect forms through mass media.

The past type of science/technology communication

has been criticized as "deficit model". Deficit model considers non-experts as the people lacking of knowledge and science/technology communication as compensating the "deficit". There has been many and various criticism on this model of communication, which can not be mentioned here. But we show the difference between the "deficit model"(here we call it in another name) and the other model in the following table(**Table1.**) and indicate the relevance to the main issue of this paper.

At first glance, the "layperson model (model L)" is as like as the deficit model. It is the framework of traditional thought of public acceptance (PA). But critique against the deficit model has been around the expert-centricism and paternalism. But model L centered on the attitude of non-experts as well. The model L is the one which is reformulated to make clear some social aspects of the deficit model, that is, closedness in solving problem, aiming penetrating the existing value and intending prevention of arising problem rather than making problem apparent.

Recognizing the model L as above mentioned, the opposite model can be formulated. Here this is named the "citizenship model (model C)". Based on current criticism about the Model L, necessity and importance of the model C can be understood. The model C includes the idea of the communication which seeks social potentialities and leads to the creation of new values and the one of autonomy of non-expert citizens.

**Table1. Two Models of science/technology communication**

Layperson Model	Citizenship Model
to give knowledge to non-experts	to ensure the right of non-experts
experts explaining and non-experts learning	mutual studying of experts and non-experts
society consisting of "unenlightened" people	society consisting of people of different knowledge and values
experts are the host	non-experts are the host
non-experts' acceptance of information from experts	non-experts' rearrangement of information from experts
to get rid of anxieties of non-experts	to investigate anxieties of non-experts
having the aim of promoting research	promoting research is not always the aim
fixing of framework	unfixing of framework
sharing value	creating value
understandability	alterity

This paper intends to combine this proposition of new model of science/technology communication with empirical studies. According to the L model, the knowledge of the public must to be a subset of the mass media information, therefore to be a subset of expert knowledge. Non-experts must be the ones who only accept professional information and know fragments of professional information through mass media. So if the L model is realistic, there will be such inclusive relationship between information of mass media and knowledge of the public. On the contrary, the C model predicates the other relationship. This paper centers on knowledge of genetics, especially the usage of the word "gene" and tries to be certain whether model is more adequate to describe our society.

## 2. Method

The public usage of the word "gene" has been discussed on many sides. [2, 3] For example, the misuse and misapplication of "gene" in many fields have often been mentioned. The studies of public understanding of science(PUS) have dealt with general grasp of the concept of "gene". [4, 5] In the beginning, they centered on the genetic determinism as the implication of the concept of gene. But through many other types of studies such as the focus group interview, it is suggested that there are many ways of understanding of genetics. Many of these studies were part of the ELSI programs relating to the Human Genome Project. So "gene" is the well-known object in PUS studies. Based on existing research, this paper analyses Japanese public understanding of gene concept.

In the following section, as is mentioned above, mass media discourse and public discourse are compared. As mass media discourse, the newspaper articles were taken up. As public discourse, weblog writings in the internet were taken up. The comparison of this kind has not been tried in PUS studies.

Newspaper was taken because it is usually seen as the most reliable media informing scientific and technological news in Japan. [6] Some reports indicate that the reliability of newspaper, television and the internet is higher in this order. Several big Japanese newspaper companies have nationwide door-to-door delivery system. So newspaper has functioned to provide same level information around Japan. It holds the most important position through mass media. Nowadays as the internet develops, the position of newspaper as media is decreasing. But we can easily read the same news on the internet as on paper. So the influence of the information which newspapers convey can not be bypassed. All the news items in 2005 which include the word "gene"("idenshi" in Japanese) were picked up from the Asahi Newspaper, using the database "Kikuzo"(Digital News Archives for Library) by Asahi Shinbun Company. Here we call these items as "gene articles".

As public discourse, the weblog data were used. When getting information from many unspecified people, the method of questionnaires or interviews is usually used. But we need much unfixed and irregular form of information about what the word "gene" means and sounds. We realized that the weblog discourse is the best resource, because it occurs spontaneously and in unfixed form. It is said that many of the bloggers are twenties

or thirties and the ratio of female/male is almost one. Bloggers might have some specific tendencies, but it is not evident that bloggers could not be good examples of the public, because broadband internet access is now available and writing weblog is not so difficult work to do. The "entries" in January 2006 which include the word "gene" were picked up on the Japanese weblog site "Hatena diary". We also call these as "gene articles". Besides of its convenient search system, "Hatena diary" is thought to be one of the most suitable site for collecting public ideas on the subject, because it is one of the most popular weblog sites, has prohibition against links to the external sites and has request of many steps for registration.

KH-coder was used for textmining. [7] We got each 100 words(except postpositional particles and auxiliary verbs) of frequent appearance from both newspapers and weblogs and calculate context vector of each word based on cooccurrence, which were analyzed by cluster analysis using Ward method. The inclination of occurrence was also investigated, that is in which a word appears more often, in newspapers or in weblogs.

### 3. Results

The each 100 words are shown in Fig-1A, 1B. Among the words in the same box, there is high frequency in cooccurrence. The number following the word is the number of times of appearance, which reflects on the fontsize of the word.

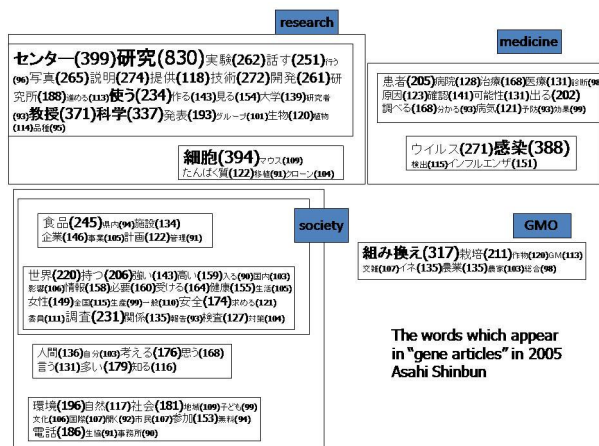
According to Fig-1A, four groups are to be distinguished from the viewpoint of cooccurrence. They are named as "research", "society", "medicine" and "GMO". Not apparent in these figures, the last one has independency of occurrence from other three. Each group of words can be regarded to be a "context" in which the word "gene" appears, or to be a framework in which the word "gene" appears. In gene articles from newspaper, there are to be four different contexts.

According to Fig-1B, the 100 words in the gene articles of weblog are divided into four contexts named as "personal relationship", "fiction", "research" and "technical knowledge". The first two groups are so close that they can be united. The name "research" is assigned to the group at the lower left in Fig-1B, because it has many common member words of the counterpart in Fig-1A. The other groups are distinguishably assigned names, which are not common to the group in Fig-1A. It

means that the contexts in newspaper and the ones in weblogs are considerably different.

To have such differences of contexts apparent, the frequency of appearance of each word(only noun in this case) were compared between in newspapers and in weblogs(Table 2). The words in the upper part are that which relatively often appear in the gene articles of weblogs but relatively rarely appear in the gene articles of newspapers. The words in the lower part are that which relatively rarely appear in the gene articles of weblogs but relatively often appear in the gene articles of newspapers. The words in the middle part are that similarly appear in both kinds of gene articles.

The Fig.1 indicates that in the gene articles there is a social context in case of newspapers and a personal relationship context in case of weblogs. The Table 1 tells



what bias each word of frequent appearance has.

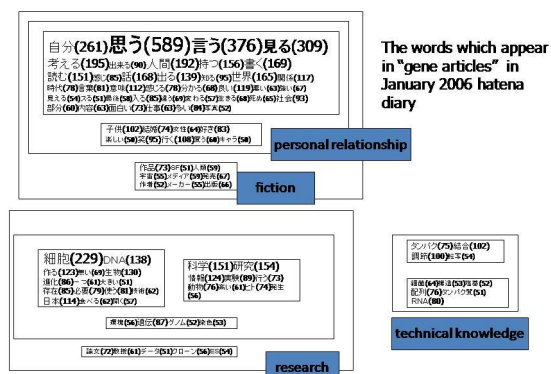


Fig-1A. Contexts in the newspaper.

Fig-1B. Contexts in the weblog.

### 4. Conclusions and Discussions

It has been said that newspaper articles are usually written in relation with social matter even if they are scientific. Some scientists complain that the essence of research is not reported in such articles. This situation is shown in Fig.1-A, because gene articles in newspapers are occupied by medical and GMO (that is agricultural) contexts as is shown above.

On the contrary, weblogs have vast range of statements. They have personal statements as its major contents. It can be seen that the word "gene" is adopted in personal statements. And "gene" is linked to not only the real but also the fictional or imaginary. On contrary that newspapers avoid using technical terms, weblogs have some technical words, but not many. Some weblog discourse is much more technical than newspaper discourse.

Medical and agricultural contexts do not stand out in weblog gene articles. The social usefulness of technology is not always thought to be unimportant but far from highly estimated.

Japanese newspapers perform or intend to perform their part as mass media informing the public of scientific research and its application easily to understand, as was indicated in the newspaper analysis of the former section. But weblog analysis shows that there are many discourses which are in greatly different context from contexts in newspaper. The difference partly stems from the traits of both media and the influence of other mass media is not investigated yet. But despite of that, it is not deniable that L model is inadequate. In other words, the knowledge of the public does not constitute a subset of the mass media information. These results are consistent with what current PUS studies mentioned before suggest. It is no more than idealistic thought that citizens just accept correct knowledge through mass media and the knowledge is part of the knowledge of experts. The science/technology communication based on such thought would not go well.

It is said that genetically modified organism (GMO) has been increasingly viewed with high concern. Many kinds of action for public acceptance (PA) has been called and realized. And risk recognition of the public has been studied. But according to the weblog analysis, this topic is not regarded important among the subjects concerning gene. It is possible that GMO has is not regarded as result of genetic engineering but in other

contexts. Without seeing public understanding of genetics as a whole, the strategy for public acceptance might be misled.

It is sometimes said that the scientific interest must be introduced through science/technology communication. But in fact many other interests exist around genetic research. Communication centered on scientific interest may be the one remaining among the people with specific interest.

In model L citizens are seen to be enlightened. But various kinds of discourse in the weblogs prevent us from supposing that homogeneous "citizens" exist. It is true that non-experts lack technical knowledge, but they can not be understood only from this one aspect. The citizens are to be supposed to have various kinds of knowledge from various sources of information and to arrange such information by their own way which is not the same as experts'. In model C such trait of citizens is recognized.

It is natural that scientific knowledge is linked to other knowledge, for example daily knowledge or practical knowledge, because one's knowledge can be consistent as a whole to a certain extent. The experts can center scientific knowledge of their major on their whole knowledge and arrange other type of knowledge around it. But for non-experts, scientific knowledge exists on the periphery of their whole knowledge at most. Thus technical knowledge can not be accepted as expected by experts. Sometimes one accepts scientific knowledge for one's own convenience. Sometimes scientific knowledge is linked to entirely different type of knowledge, as no experts can imagine. This study shows one example of such conditions. Current science/technology communication is not always based on such recognition. New model of science/technology communication which is based not on the idea of formatting "tabula rasa" but the idea of intervening knowledge network is required.

## **5. Acknowledgment**

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