

FROM
MIYAKAWA
OUR HOME
10/19/90

Five-Year Plan for Promotion of the Human Genome Program
at Universities (Report)

July 11, 1190

Bioscience Sectional Meeting, Subcommittee for
Regional Promotion of Studies Specified by the
Academic Deliberative Council

The Academic Deliberative Council has made proposals regarding the necessity and significance of promoting the human genome program and procedures for advancing it immediately. (July 19, 1990) In response to this, the Bioscience Sectional Meeting of the Subcommittee for Regional Promotion of Studies Specified by the Academic Deliberative Council has made assessments regarding definite policies for advancing procedures for promoting an analytical study of the human genome to be performed at universities for the next 5 years, establishment of objectives, creation of the required academic environment, training of talents, etc. by setting up a subcommittee for promoting human genome program.

This report summarized the results.

1. Circumstances related to the analytical study of the human genome

The analytical study of the human genome has begun to show steady progress in a wide field, including the development of DNA analytical technique, study for laying the foundation of a biological information science, etc., with the preparation of a gene map and physical map for each human chromosome (analysis of genome structure) as the central subjects. This study is to decipher the human blueprint directly, and the development of a new academic field, centering on an epoch-making revolution in bioscience and development of a new biological information science, etc. along with the above progress is expected. And it is believed that the result will make a major contribution to the development of medicine and also have an impact not only on various sciences such as physics pharmacology, engineering and agriculture but also on the industrial world and the world at large. Therefore, some Western countries are promoting the systematization required for this trend, showing great interest in studies related to the analysis of the human genome. Various countries are about to proceed, activating their own characteristics, with the development of a way of thinking and methodology which emphasiss the analytical study of a whole field decisive type structure,

analytical study of a field-expanding type structure, centering on the identification of morbid genes and analysis of important gene systems, and analysis of small type genomes, such as the roundworm and yeast. In any event, the common point among the countries is that their prime object is set at coping with the revolution in bioscience expected it to occur with the development of DNA analytical techniques accompanied by a qualitative improvement and a large-scale accumulation of biological information.

2. Analytical study of the human genome at universities

Under these circumstances, our country has to take measures necessary for its interests and to contribute internationally to the development of the study within its means. For this purpose, a synthesized study (A) "Study Regarding the Promotion of the Human Genome Program" (Coordinator of the study; Prof. Kenichi Matsubara, Osaka University) by the Scientific Research Fund was established in 1990, and an assessment was made regarding policies for promoting the analytical study of the human genome, in addition to a preparatory study made concurrently. As a result of making a judgement synthetically of the situation at this time, including the result of this assessment, it is judged to be necessary for the analytical study of the human

genome to take the following activities into consideration:

- ① Contributions are to be made by developing our country's own study system concurrently in cooperation with the preparations being made of gene map and physical map of the human genome being developed internationally.
- ② Efforts are to be made for a study and systematization aimed at an epochal development of DNA analytical technique.
- ③ Establishment and systematization are to be made of studies regarding processing and analyzing massive information including genome databases, whose introduction is expected within several years.
- ④ Cooperative activities with an analytical study on the human genome are to be aimed at by promoting the analytical study of genomes by selecting some models among creatures other than Man.

Occurrence of problem is expected, in the future, which must be taken into consideration from the ethical, legal and social aspects, such as intellectual property rights on the method for handling gene information and results discovered in the process of study, for which it is necessary to make preliminary assessments.

Against this background, it would be appropriate for universities to aim at promoting their studies, centering particularly on the basic studies, while paying regard to independent research, as it is judged that

the role played by universities is particularly important in creating an environment for study, establishing an international cooperative system and training of researchers.

To achieve the above purposes, the strongest emphasis should be placed on efforts for the realization of the following 5 items as the analytical study of the human genome at universities for the next 5 years:

- o Promotion of group study
- o Arrangement and expansion of the organization for analytical study of human genome
- o Establishment of a center for human genome analysis
- o International exchange (opening of international symposia)
- o Training of researchers (such as special researchers of Japan Academic Promotional Association)

In promoting this study as a 5-year plan, it is necessary to deliberate adequately on some matters, such as establishment of a committee for planning and evaluation, taking into consideration the nature of the study.

The contents of all the above items in greater detail are as follows:

(1) Promotion of group study

It is necessary for the analytical study of the human

genome to aim at making great strides in the development of a new way of thinking and methodology and promote cooperation among researchers with efforts such as promoting development of systems for processing mass information and its analysis. Meanwhile, it is essential also to establish a group study to promote interdisciplinary studies and international cooperation. It would be reasonable to intend synthetic promotion of studies by organizing the following 5 groups.

① Group for analyzing structure of the human genome

Preparation of a gene map and physical map of the human genome is promoted, centering on each chromosome or specific functional field, to make an identification of the gene distributed in various functional units and determination of the base sequence for individual genes. Further, efforts are to be made for the development of overall principles and methodologies for genome analysis.

② Group for analyzing functional unit of human genome (cDNA project)

Paying attention only to the functional unit which codes protein among human genome DNAs, the structure will be clarified, and the position on the genome is determined to make a study for elucidating the overall image of the emerging genic information. For this purpose, preparation

is to be made of a library of the complementary DNA (cDNA) of the gene acting in the cells with different organization, organs or differentiating stages, and mapping of each component genome (or cloned genome DNA fragment) is to be made to promote the analysis of the gene and product corresponding to individual clones.

③ Group for developing DNA analytical technique

It is difficult to approach the entire structure of the giant genome only with the existing DNA analytical technique. Studies leading to the development of an epoch-making technique are to be made regarding the subjects of disjunction of chromosome and giant DNA, fragmentation of optional position of DNA, cloning of long-chained DNA, stabilized maintenance of the clone and determination of long-distant base sequence, and a basic study indispensable for activating the system of works efficiently for determining the base sequence is to be made concurrently. Analysis of the genomes of creatures other than Man is to be made to promote of research by exchanges of new technologies, ways of thinking and findings in light of the fact that a close relation exists between analysis of the human genome and those of other creatures.

④ Group for developing a system for processing mass information

Once the analysis of giant genome is put on the right track on the DNA level, it becomes necessary to process biological information in large amounts, such as base sequences, physical maps, functional maps and correlation among various creatures. Concentrated joint studies are to be made aiming at the development of a system which can cope with the above necessities, an attempt at unification of the method for processing a gene map, physical map and base sequence data, preparation of a data base which establishes a connection among different species, decoding of new information and processing of knowledge and information. This study is to create a new field of study at a point, where bioscience and computer science are in contact with each other by augmenting them.

⑥ Study group regarding the contact point between analytical study of the human genome and society

Studies of ethical, legal and social aspects are to be made regarding the ethical issues involved in the gene information which is elucidated by analytical studies of the human genome and the intellectual property rights on genic information which has a economic value.

(2) Arrangement and expansion of system for analytical study of the human genome

The analytical study of the genome is a basic and

fundamental subject for studies in the fields of biology and medicine. At present, studies handling DNA are being made by many groups, but analysis in a wide field or studies which makes the genome itself subject are not made by many. For DNA analytical technique and biological information science to make progress, it is necessary to aim at participating with researchers from other fields, particularly increased participation of genome researchers from the fields of computer science and molecular biology. To cope with such a rapid expansion of the analytical study on the genome, it is necessary to set up an organization which becomes the core of a study which propagates it to peripheral researchers, utilizing the technologies by the study group positively, as seen in the last example by which the experiment on DNA recombination was propagated.

For this purpose, the fields for analytical study of the human genome are to be increased at the typical organizations being engaged in gene analysis to make them strategic points for developing synthetic studies and also centers for exchange among researchers. At such organizations, activities of education and training, such as lecture classes for technology are to be made concurrently with the studies.

Further, if some divisions which become study centers

are established nation-wide and a network can be organized with each of these divisions as strategic points for the analytical study of the human genome, a considerable effect would result in the entire promotion of the analytical study of the human genome including the group study.

(3) Establishment of analytical center for the human genome

As the analysis in a wide field attains development, along with the analytical studies of the human genome now in progress, a sharp increase is expected to occur in the requirements for data (YAC library, cosmic library and cellular strain), modern data and highest technology in many fields including medicine. To cope with this situation, activities for supporting the study which arranges and offers a large amount of study materials and information become necessary. Organizations to which the task of these activities for supporting the study is assigned specifically are to be established at the above strategic points for the analytical study of the human genome and named the Human Genome Analytical Center.

The Human Genome Analytical Center is intended to undertake studies and activities with the following functions to promote the analytical study of the human genome.

- ① Genome data base division

This division is to be in charge of the preparation, assortment and offering of data making and data bases which will increase sharply as the analytical study of human genome progresses. While maintaining international cooperation in preparation of data bases centering on those (gene map, physical map, STS map and aligned clone library) associated with the genome mapping with the human genome as the center, this division is to offer data to researchers and make relevant studies.

② Division for analyzing the human genome structure

This division is to undertake the activities of collection, assortment, storage and distribution of study materials and related information required for this study, such as standard on marker DNA and various libraries and to perform studies related to these activities.

This division is also to take charge of the duties of the cDNA analytical division partially until it is established and make preparations and to offer a catalogue of cDNA specific to tissues, such as brain, bone marrow, liver and embryo.

③ DNA analytical division

This division is to offer information to the respective researchers nation-wide through workshops, by incorporating the topmost technology, which progresses form

moment to moment, in addition to making studies leading to epochal technological developments.

Appendices: Form and structure of the Center to be established

This Center should be established as a research institute for nationwide joint utilization and have it participate in postgraduate education for the training of new talents. This Center is to be established with the concept of undertaking the activities in mind, for which it should be understood that the study is an indispensable undertaking in realizing these activities. Since international cooperation is sought for the analytical study of the human genome, countermeasures on an international level will be an essential function of this Center, in addition to the above activities for supporting the study.

(4) Promotion of international exchange (opening of international symposia)

The analytical study of the human genome is in progress in some Western countries, and there is no doubt that an exchange the results of the study with researchers overseas and evaluating them together are an essential side for the promotion of the analytical study of the human genome. Therefore, it is necessary to hold seminars and symposia for

each study subject for an exchange of information.

(5) Training of researchers (special research members of the Japan Academic Promotional Association, etc.)

It is necessary to give encouragement for participation particularly by special researchers in Japan and abroad when we think about the importance of the intended inflow of researchers from other fields of study, the necessity of training young and new researchers, as the analytical study of the human genome is a new field which is expected to expand rapidly in the future and the necessity for accomplishing the study by maintaining international cooperation.