

Scientific Cooperation
Between
Japan to Brazil

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Between
Japan to Brazil

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Forward

Under the invitation program of eminent persons in the field of international development, Institute for International Cooperation (IFIC) of Japan International Cooperation Agency (JICA) invited Prof. Flavio Fava de Moress, Scientific Director of Foundation for Funding Reserach, to exchange views with Japanese officials. During his stay in Japan from October 22 to 30, 1986, he accepted to give a lecture to JICA officials and other people concerned and the lecture was held on October 24 at IFIC.

This paper is a report on the lecture meeting on "Cooperation in Science and Technology between Japan and Brazil."

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Program

Date : October 24, 1986

14:00 -

Time : International Conference Room,
International Cooperation center, 9F.

Theme : "Scientific Cooperation Between Japan
to Brazil."

Cheirman : Ken Fujimura
Head of Institute for International
Cooperation,
Japan International Cooperation Agency.

Lecturer's Curriculum Vitae in Brief

Name: FLAVIO FAVA DE MORAES

Year of Birth: 1938

Nationality: Brazilian

Present Designation: Chairman-Department of Histology and
Embryology, Institute of Biomedical
Sciences, University of S.Paulo-Brazil.

Professional Career

1. Educational Career:

PhD-1965, Associate Professor-1973, Full

Professor-1980, Chairman-1981

2. Visiting Scholar: The University of Michigan-1971,
National Institute of Health-USA, 1977.

3. W.G.Gies Award: The young foreign scientist of the
year-1972-USA.

4. Research field: Control mechanisms on cell
secretion.

5. Dean: Institute of Biomedical Sciences 1982-1986.

6. Scientific Director: FAPESP: Foundation for the
Promotion of Science of the State of Sao
Paulo-Brazil:1986-1988.

"Scientific Cooperation Between Japan and Brazil"

24 October, 1986

Fravio Fava de Moraes
Foundation for the Promotion
of Science of the State of
Sao Paulo, Brazil

Scientific Cooperation Between Japan and Brazil

Specifically, the intention of this brief address, besides touching upon topics on science and technology under the care of competent scientists of both countries, is to find an eventual short or medium range definition for a proposition to implement adequate science policies.

I would, however like to make some comments:

- 1) Brazilian economy today ranks 8th in the world and second among the third world countries in terms of scientific production. Nevertheless, much remains to be done towards the development of human resources for science and technology. Be it sufficient to say that we totalize 130 million people and 1,300,000 university students (1% of the population).

Of these university students, I would like to call your attention, 70% are in private schools

(where apart from rare exceptions research is rarely found) and only 30% are in public schools (where research is concentrated, although not in all of them).

There is evidence, even if the figure is not absolutely precise, that in 1985, Brazil had little over 2600 undergraduated students who had been granted a Scientific Initiation fellowship (0.27% of the overall university students). Which we consider ridiculous.

Indeed today we reckon with less than

100,000 graduate students, that represent 10% of the university world. It is still very little:

- 2) In this direction, mainly two federal agencies like the

Coordination for the Improvement of College Personnel (CAPES); the National Research Council (CNPq) as well as the Foundation for the Promotion of Science of the State of Sao Paulo (FAPESP) have strongly supported the development of Brazilian expertise.

Particularly those that are being sent abroad, in 1985, there were approximately 2,000 and in terms of the host country, more emphasis should be dedicated to Japan, as it does not yet rank among the 4 preferred countries.

Language, perhaps is for us the most serious barrier.

This State of Sao Paulo foundation was endowed, this year with a 26 million dollars budget, to support research solely within the Sao Paulo state.

Its essential feature is that FAPESP which means our toradation is included in the State's constitution, where it is stipulated that the budget should amount to a minimum of 0.5% of the taxes collected in this same state. That is the budget is constitutional, therefore not undergoes the political fluctuations of Government officials.

A second important aspect, is that of in relation to the South American Countries. This last point is very important point, its budget the foundation cannot spend more than 5% on management and personnel. So, at least 95% of the total sum are available for research grants and fellowships. I call your attention again. That is a very important point in relation to South American Countries.

It was founded 25 years ago and has made a major contribution to the advancement of science and technology in the State of Sao Paulo.

A detailed report would be tiresome, so we can mail all yearly reports, for those interested.

However, I would like to quote at least one example:

Sixteen years ago, around 1970's a FAO (Food and Agriculture Organization) report stated that Brazil' citrus crops, especially of oranges, were seriously threatened by many pathologies and that the outlook was bleak.

FAPESP (The Foundation) supported a large scale survey of the situation and intense research was pursued to solve the issue.

Today, Brazil reckons with a total of 150 millions citrus trees, mainly concentrated in the State of Sao Paulo, that rank it practically as the largest "orchard" of the world.

Furthermore, considering biotechnology's modern significance, it is noteworthy that this year it was a Brazilian from Sao Paulo the scientist who received the first international NADR-86 award, sponsored by the United States of America, in recognition of his meritorious works in the field of biotechnology and agriculture.

But, going back a little, I remind you that FAPESP is a Foundation of the State of Sao Paulo, located in the city of Sao Paulo, the largest Brazilian metropolis, situated in the South East of Brazil.

This Region, especially the State of Sao Paulo, numbers in terms of inhabitants the world's second Japan, if

one considers immigrants and their offsprings, adding to a population of more than 1,200,000 (1% of the our total population) equal to the number of current university students.

In the South East, we have University courses where 30% of the Brazilian students are of Japanese descendance.

At the best and largest Brazilian university (the University of Sao Paulo), founded in 1934 (merely 52 years ago), among it teaching staff of 5,000 members 10% are of Japanese origin, including nowadays chairmen and Deans of their entities.

The city of Sao Paulo, now among the sixth largest of the world (over 12 million dwellers) encompasses an urban area that constitutes a real medium sized Japanese town, luckily called "Liberty" or shall we say Freedom, for there anything is available in its uniquely typical form and, even more important, blends harmoniously into the Brazilian environment (schools, clubs, restaurants, hotels, shops, craftsmen, banks, clothes, etc...etc...)

On the other hand, it is needless to reassert once more all that the Japanese have done for Brazil in various fields, mainly their pioneer efforts in agriculture.

Obviously, all this information can be obtained precisely at any embassy or consulate but, at this meeting I want to emphasize the following conclusion: we have all the requisites to guarantee, in the shortest possible time, the adjustment of Japanese scientists willing to go to Brazil, especially to the south east, given the existing habits,

language and sociability conditions. As an example, in any university department it is easy to find a Japanese native or descendant fluent in both languages that for some time would act as catalizer of the new-comer's activities, eliminating the risk of enstrangement of his cultural identity.

This way, regardless of the various agreements already celebrated by the two countries on science and technology (initiated only in 1970), the current proposition entails a more defined claim towards Japan, that being:

- 1st) Promote the visit of recently graduated Phds to our research centers for at least two years.
- 2nd) Foster the visit of retired or retiring, but still productive professors.

These two options encompass and favor the aggregative spirit and ability to work in groups exhibited by The Japanese scientists.

In both situations, besides the routine bilateral operational understandings, we shall also be responsible for the visitor's functional integration at the chosen centre, and JICA will in charge of the "grant" (in goods and / or equipment, as required) that will ensure the continuity of the invited scientists' research. This approach is not novel, as it has been successfully used by Japan, since the end of the last century.

On our side, the National Research Council, competently headed by Prof. Pavan, and the Foundation for

the Promotion of Science of the State of Sao Paulo, where currently, I am the Scientific Director, both have the capability to pave the way for these propositions linked to scientific and technological advances, when duly approved by their merit. Of course, there would be a preference for areas where we are wanting and need to form qualified manpower. I stress that we mention preference not exclusiveness: The feasibility of these transactions is clearly warranted by the comprehensiveness of the scientific co-operation agreement signed by the two countries, in this very city, in May 1984.

This is the proposition submitted to Japan for a brief study, we hope that it will not remain on an intention basis, for as I have stated before, we are sure to deserve a priority treatment among Japan's many international obligations and eminent social nationalism because, and I stress it again, Brazil today is proud of having the "world's second Japan, out of Japan".

DISCUSSIONS

Chairman;

First of all, I would like to explain the background of today's lecture just briefly. Looking back upon the change in the development aid policy toward the developing countries for the past 30 years, we can roughly say that it changed in the following ways. In the 1950's many developing countries became independent and therefore it was thought that capital was lacking and therefore capital aid was emphasized. In the 1960's it was found that the capital aid only was not sufficient. It's because many projects implemented did not work properly. And therefore it was stressed that technology is the key for development and transfer of technology was very much emphasized for it. In the 1970's income distribution was not good. It was said by many economists, because in accordance with development of the developing countries, it was found that there were lots of poorest poor who were not benefitted out of the development project. Therefore the aid had to be directed or reoriented for the poorest poor. It was emphasized by many development administrators and people also in the developing countries. Income distribution was the main topic in the 1970's. In 1980's it was further said that the basis for the development has to be strengthened, namely the two aspects for development; one is science and technology and the other is human resources development. These two subjects are the most emphasized areas in the present development.

Today we have a guest speaker from Brazil. I am very much pleased to introduce to you Prof. Fravio Fava de Moraes who is the Scientific Director of the Foundation of the Promotion of Science of the State of Sao Paulo, Brazil. Just called FAPESP in short. It is therefore very timely that he is with us today to speak on scientific cooperation between Japan and Brazil. Brazil is certainly leading the scientific activities of the developing countries today. The future cooperation between Brazil and Japan in the scientific field is very much anticipated. Prof. Fava, please.

Prof. Fava:

Good afternoon. First of all, I would like to thank Mr. Ken Fujimura for his attention during the last two days. And I would like to give my thanks to the audience, for these distinguished audience we have here today.

It's a difficult mission to talk in Tokyo, because we came from a big country in terms of area. In population we are similar to Japan, but in development we know that we are underdeveloped in relation to Japan. We must make good linkage with Japan, because we can say "We need your help." in terms of science and technology. So I will give a brief address in relation to Brazil and especially in relation to the Sao Paulo State which means a small state in relation

to the are of Brazil, but it is the most developed state of our country.

Dr. Fujimura prepared document. I hopt it was distributed. We can follow the paper and I will make some comments during the lecture, reading of this paper. So we can start right away in the first page.

Summary of Discussions

Thank you for your attention in this first part of my address. Thank you very much. So Mr. Fujimura, now I would like to say that myself and Dr. Waranabe that's here with me, we are at disposal of you and the distinguished plenary to questions for addtional comments in relation to our Foundation and to the Brazil and Japan cooperation.

Chairman:

Thank you very much indeed Prof. Fava. It was very interesting to know that the state of Sao Paulo has the second Japan, emphasizing the importance of science and technology and many descendants of the Japanese are working in this field, particularly in the university field. Well, ladies and gentlemen, we would like to invite your questions and any sort of comments to Prof. Fava are just welcomed. Also as Prof. Fava has introduced to you, we have also Prof. Watanabe on your right. He is also from the University of the State of Sao Paulo. He is a friend of

Prof. Fava. They are working together and he is also kind enough to answer any question in case Prof. Fava wants him to comment further. Your any questions and comments are welcomed.

Question (1):

I would like to know about the distribution of the funds by sector. I understand that your Foundation is giving grants and scholarship. How is the distribution policy of the grants and scholarship by sector? For example such as in the case of health sector, do you have any pre-established quota for health sector in the case of grants and scholarship? Another question is that do you have any criteria or quota for each racial group? I understand that in the case of Brazil, Sao Paulo it is a multiracial society.

Answer (Prof. Fava):

Thank you for the questions. First of all in relation to the priorities, if I understand you quite well, our Foundation is only 25 years old and we don't have real priority for application of our money. In other words, every field of science and technology can apply with their projects and the system to select the projects is the preview system. So if the projects is a good one.

So if the project is a good one, we are going to put our money on it. It can be human social science or can be

physics, astronomy, health science and so on. Another one is that we don't use any priority in terms of, to say that this field has the money and the other field does not have the money. It's a kind of competition by merit. Only this way we are using until now. In relation to the second question, let me come back a little bit. I have some figures for you. For instance last year health and biology received 35% of our budget, chemistry - 16%, social science - 20%, physics - 15%, geo-science, geology - 8%. That's the main figures I can give to you. But I stress again these numbers represent the demand of the projects and does not represent our intension into put more money into one field than in another field. I apologize for my broken English, but I guess I was able to transfer you the first question.

The second one, the answer is easier. No. There is no relationship between scholarship, fellowship, money for projects and the racial problems. It's absolutely equal for any application.

Question (2):

If I'm not mistaken, I think you said that you are majoring the development of human resources for science and technology in terms of university students and graduates. I would like to know how you connect the development in the university level with the rather low or the practical levels

of technical development in terms of industry or so. Could you explain a little bit about this?

Answer (Prof. Fava):

That's a hard question for me. There is a phrase that says you cannot have a good university, if you don't have good industrial park around the university. And others say exactly the opposite. You are not going to have good industry, if you don't have a good university. So which way? It's the first one. I am not secure to tell you, but in our country, especially in the University of Sao Paulo, the best university in Brazil, the relationship between the university and the industries outside of the university is a good one, but it's not well defined. We cannot realize quite well which is the mechanism between the interaction in both fields. We know they exist, but officially, it's a weak system. We must try to visualize more clearly how those things are working on. But until now, we know that there is a good relationship. But it's more dependent on the relationship between persons - between institutions. So the relationship is a quite weak one until now. We don't have a good relationship between both systems. I don't know if Prof. Watanabe would like to add some comments in relation to university and outside institutions of the university. I am asking Dr. Watanabe, because I am from the biology field and he is from the physics field. So probably he has more information than I. He is my defender here.

Answer (Prof. Watanabe):

Well, this is a very difficult question. We were discussing about the relation between university and industry for a long time, but I think the final conclusion we came to is that the direct connection between the university and the industry is not easy in any way. Because an university is a place where everything is moving slowly and the industry requires very rapid return of the money. I think the best way to make the connection between the university and the industry is to have some kinds of research institutes that can develop what was found in the university into some possible forms so that the industry can use them directly. In that sense we have a very small number of institutes in Brazil. That's a point we are recommending our government to create more research institutes, not directly connected to the university, but can connect the university to the industry through the research institutes. We have for example in Sao Paulo the Institute of Technological Research which is associated with the university, but not a part of the university. In this institute, several development programs are carried out so that the industry can pick up the result from that institute, not directly from the university. As far as human resources are concerned, I think our main problem that we have a very small number of researchers in Brazil, compared with Japan for example. We have altogether about 25,000 people working in research in Brazil, while in Japan you have 300,000. So in that sense

we need much more people going into research and the development in order to help progress of science and technology.

Answer (Prof. Fava):

There is misleadership for that still. That's why we are interested to invite people from outside.

Question (3):

To my last question you showed us very interesting figures, the distribution of the funds by areas. You told us that distribution reflects the demand - demand distribution. My question is that in these 25 years was there any change of distribution? And at the same time, I would like to ask you about your preference. In the last page of your paper, you said that there would be preference for the areas where you are wanting and need to have qualified manpower. So if you can clarify your preference and if you can clarify where there is any interrelation between your preference and the demand distribution, it will be very useful for us.

Answer (Prof. Fava):

During the last 25 years, the application of our budget has been very similar. It's related to the demand, but has not changed significantly during these 25 years. For instance, engineering, we applied last year only 10% and some years ago, it was 18%. You can ask me why we have decreased it

from 18% to 10%. I reaffirm to you that the Foundation is the state foundation. There are some national foundations. And sometimes people from engineering field that are related to expending more money are asking for the national foundations and not for the state foundation. So these figures do not represent the overall application of the money of our country. It's just the application in the state of Sao Paulo. For instance, health and biology is the first place since the Foundation was founded. In 25 years it has been always the first field in relation to our budget. In relation to the last page of our address, when we say "preference", it means advanced materials, chemistry, pharmaceutical drugs, medicine drugs, data base, micro-electronics. Shigeo, another one? It's mainly advanced materials, pure chemistry, drugs for medical use and electronics. Those are fields that we have some preference. But for instance I brought with me a program, a project related to the music which means that we are working in all senses. Because even in music we have interest to know how Japan is working on music, for instance electronic music. We are open for everything.

Question (4)-1:

My question is very very simple. At the very beginning you mentioned that the Brazilian economy today ranks the 8th in the world. Is this among the world - all the developing and developed countries?

Answer (Prof. Fava):

Among the world.

Question (4)-2:

Is this including USA, Soviet Union and others?

Answer (Prof. Fava):

That's correct. We are not proud to say that, because between this economical reference and the social conditions or our social environment - if you can say that, we can be ashamed to say - there is not direct correlation between our economical field and our social field. But it's true. We are the 8th economy in the world now.

Question (4)-3:

But Brazil is still considered as a developing country.....

Answer (Prof. Fava):

Yes.

Question (4)-4:

The population is 120 something million.....

Answer (Prof. Fava):

Correct.

Question (4)-5:

GNP per capita is still considerably high. How much is it?
GNP per capita may be more than 5,000 US\$.....

Answer (Prof. Fava):

I really don't know.

Question (4)-6:

But if that is the case, Brazil should not be classified as
developing country. That's my question.

Chairman:

GNP by capita according to the world development report, it
says that in 1984 it's about 1,720 US\$.

Question (4)-7:

If that's the case, if multiplied by 120 million population,
becomes some figure. That size may not be big. Ranking
world's 8th in economy.....?

Answer (Prof. Fava):

Probably you are right. But anyway I can tell you that we
have so many rich people and we have a lot of poor people.
So the reference per capita is just for a parameter, because
does not represent the real social condition of the country
sometimes.

Question (5)-1:

May I inquire two things? One is whether or not your research fund is provided to a individual researcher or to a corporate - a private company? Is there any proportion or you are giving the research fund to both an individual and a private company?

Answer (Prof. Fava):

We are giving to both. But it's quite different. It's something like 98% to the individual and 2% to the organizations. In other words as we call in Brazil, we are working "body to body" which means the Foundation and the research men, not with the insitutions. The scientist makes the application of his project and we give the money after the preview has been made.

Question (5)-2:

So you are giving most of the fund to the individual researchers.

Answer (Prof. Fava):

Right. Because the budget is not so high.

Question (6):

In your page 1, you have, the federal government's owned foundation named the National Research Council (CNPq). Do you have any particular division of activities in providing research funds between your state foundation and this

National Research Council? For example, the State of Sao Paulo Foundation is giving some sort of money for the applied research, while the National Research Council is giving the fund for the basic research.

Ansewr (Prof. Fava):

They are doing the same work. It's not quite different in the application between the both systems. But there are some differences. For instance, in relation to - fellowship, our priority is to give fellowship outside of Brazil, mainly after the student has completed his Ph. D. degree. And the National Research Council sometimes is giving fellowship for students to go outside of Brazil to take the Ph. D. outside of Brazil. So it's difference in policy. We prefer to give the fellowship after the Ph. D. degree has been obtained. And the National Research Council sometimes is giving fellowship after the student has compelted the undergraduate course. They have more applications in relation to insitutions than we have. As I told you before, we give more application to individuals and they can give it to institutions. And of course the budget for the National Research Council is something like 7 times more than ours. But they must attend our country and we are attending just one state - just the Sao Paulo state.

Answer (Prof. Watanabe):

Actually the real name of CNPq is the National Council for the Development of Science and Technology. The short form is CNPq, because the previous name was really the National Reserach Council which was changed some time ago. There is one big difference in one point. Namely CNPq is responsible for the 5 big institutes like the Amazon Research Institute, the Pure and Applied Mathematics Institute in Rio de Janeiro - the whole institute is sponsored by CNPq. There is the Space Research Center in the south of Sao Paulo city, S. Jose dos Campos. It's the national institute of space and science technology also supported by CNPq. There is a zoology institue and in Rio de Janeiro there is the Brazilian Center of Research in Physics, also completely supported by CNPq. So that's some difference between the State Foundation and the National Foundation. Those 5 need much more money than the State Foundation.

Answer (Prof. Fava):

There is another one - the meteorology institute.

Answer (Prof. Watanabe):

Yes, there is another meteorology institute, also completely supported by CNPq, not by the university. It's directly connected with CNPq.

Answer (Prof, Fava):

Another big difference is that we are limited by law. We cannot spend more than 5% in personnel and in administration. And the National Council can expend until 50, 60, 70%. That's a big difference, too. Our Foundation since from the president to the cleaners - the men cleaning the institution, we have only 50 persons. The National Council can have three or four thousand persons including the scientists, administration, personnel and so on. Probably I am exaggerating not so big, but we are able to manage our budget of 26 million dollars with just 50 persons.

Question (7):

You indicated only two thousand students are abroad now with foundations. And it is very sorry that Japan is not ranked among those 4 preferred countries. And you pointed out that only the language is the main reason for them to hate it to coming to Japan. But I think some governmental organizations in Japan provide chances to learn the Japanese language in universities and institutes. This is just my ideas, but I think there is another reason, not only the language difficulties of the Japanese. Do you have any opinions on it?

Answer (Prof. Fava):

Let me ask you first. Do you have any feeling, trying to help me? Which is your feeling about the problem? This

phrase is under my responsibility when I put that the language problem is the barrier. But the same happens in relation to German for us. Germany gives fellowship to our students for six months to one year in Goethe Institutes to learn first the language and after to be linked to some departments or research projects. But even after that, the number of students looking for universities or industries in Germany has not been increased too much. The responsibility to say that the language is the barrier - it's mine. There is other reasons. Let me ask who are a 2-sei (Ni-sei). What he thinks about it, Dr. Watanabe? Besides the language, there is another

Answer (Prof. Watanabe):

Probably distance is another reason beside the area. If you think twice before the candidate..... Because of the distance, of course, you always think twice before you apply for the fellowship to Japan, for example. Of course the language is the big barrier anyway.

Answer (Prof. Fava):

Another reason is that the government has limit to send the money outside. And the fellowship cannot be over 1,500 US\$ a month. That's our fellowship. Of course, they can keep their salary that they have at our university, but normally they cannot send the salary outside. Probably the cost of

living in this country is high for us. It's very expensive. Probably that's another reason.

Answer (Prof. Watanabe):

Yes, maybe. But anyway there is just Monbusho (the Ministry of Education) fellowship and many people apply for that one. I had one student that applied for that one and spent 2 years here in Japan and went back to Brazil. He is not of the Japanese origin. He is a real Brazilian. Several other students that I know of applied for the Monbusho fellowship and stayed for two or three years in Japan. But I think the distance and the language are the two main barriers for that anyway.

Answer (Prof. Fava):

I have a student here in the University of Occupational and Environmental Health, department of physiology, school of medicine. She is here in this school through JICA but she is from the Japanese origin, a sansei (a third generation).

Question (8):

What are the four preferred countries?

Answer (Prof. Fava):

U.S., U.K., the third one is France and the fourth one is Germany. Very close to Japan and other countries. France is now ranks the third position just because of human social

science. There is a very close linkage between the University of Sao Paulo and France in relation to sociology and so on. If you do not consider human social science, France goes down to the 7th or the 8th place.

Question (9)-1:

Can you give the proportion of these two thousand students studying abroad in these countries? U.S. for example 50% or 40%. Can you give such a figure? In proportion?

Answer (Prof. Fava):

It's 2,000 students in 1985. Probably we have more than that outside, because some students went in 1984 and will stay until 1987, so in 1985, 2,000 were receiving the fellowship. Probably outside we have a little more. And the figure is about 50% in U.S.

Question (9)-2:

And U.K.?

Answer (Prof. Fava):

Probably 25% - 23%.

Question (9)-3:

And France will be less?

Answer (Prof. Fava):

15%.

Question (9)-4:

So that Germany could be very small.

Answer (Prof. Fava):

I don't think we have more than 10% in Germany. It's interesting, because in Germany more in relation to chemistry, health, literature and music. I don't know why. But a lot of Brazilian students interested in music are going to Germany. Now as I told you before, there is a lot of interest in relation to Japan in this field.

Chairman:

I think the Japanese are going to France to study music or something, not to Germany much.

Question (10)-1:

You gave the proportion, but in the future with Japan do you have any particular subject area that you would like to have?

Answer (Prof. Fava):

Yes, for instance, advanced materials. It's a good field for us. If we can work on that, it will be good for us. But sometimes, I would not want to do the mistake to say

just only advanced materials. Another point is not going to be referred for me. They are very important for us. For instance, condensed advanced materials. But chemistry is a very important field.

Question (10)-2:

Because we have similar interest expressed by some ASEAN countries. They are also interested in the frontier subject of material development, biotechnology or etc. So that I just wonder

Answer (Prof. Fava):

Biotechnology is a good field, too. But I would like to say you that according to my paper in relation to agriculture and biotechnology, we have some people doing very good job. But this does not mean that we are not waiting for more help. Everything is good for us, but in some fields we can have few people doing good work. In other field probably we have none doing enough.

Answer (Prof. Watanabe):

The state government does not spend much in biotechnology. Very recently they created the state program for biotechnology and therefore any help in that are would be appreciated. Even the federal government, our MITI created the special secretary of biotechnology. That means they are giving much importance to biotechnology. Certainly that's a

very important area. Fine chemistry is important, of course, microelectronics - computer is another very important area that we are considering.

Question (11):

In your address you spoke only about the technology transfer from Japan to Brazil. But I think in some areas the Brazilian scientists and engineers have very advanced technology such as the production of alcohol from sugar canes, etc. Could you tell me in which area Brazil can give your advanced technology to the world community? I think in some manner, the relation is mutual.

Answer (Prof. Fava):

Agriculture. I guess in terms of biotechnology, we have good things. I am not sure in relation to Japan itself, how many investigators in Japan would like to have connection with our research-men in Brazil? But it's a good field. There are two other ones that Brazil is well recognized internationally. One is the aircraft construction, manufacturing and the other is armaments, weapons. Our country is selling a lot of armaments nowadays. I am not happy with that, but it's a technology that has been well accepted abroad or in our country. So aircraft production and armaments are good fields, good examples for you.

Answer (Prof. Watanabe):

How about the alcohol production? I think there is no problem, if someone here is interested to get that technology. We can cooperate with others, but there is not much difficulty.

Question (12):

JICA is maybe interested in transferring the Brazilian technology to other countries.

Answer (Prof. Watanabe):

In this Japan-Brazil Symposium on Science and Technology, in the second and the third ones, we discussed about alcohol production. We had some Japanese working on fermentation, giving some talk and on our side we presented alcohol fermentation technology and so on. I think that can be done without much difficulty.

Question (13):

Does Brazil have lots of activities of scientific exchange and scientific cooperation with other developing countries?

Answer (Prof. Watanabe):

Not much. I know very recently Brazil and Argentina signed the agreement on biotechnology - cooperation agreement on biotechnology. I think that Argentina has some work done already, not few and Brazil has, too. So they signed the agreement for exchange of cooperation in biotechnology.

Answer (Prof. Fava):

Nuclear physics, too.

Answer (Prof. Watanabe):

In physics, too. But that's mainly basic physics and not applied physics. Otherwise just cooperation between small groups.

Answer (Prof. Fava):

With some - one or two African countries, we have cooperation in relation to the transportation roads. In terms of tropical pavement. It's not my field, but there is a know-how in terms of how to pave in the tropical countries.

Answer (Prof. Watanabe):

With Nigeria, Ghana, Angola and maybe some other countries.

Question (14):

I learned that you are training so many people for the research field. Are there any problems of the so-called brain drain, those trained researchers who will remain in such as U.S. or other countries and never come back to Brazil? Do you have this kind of brain drain problem?

Answer (Prof. Fava):

Too worse, in some years ago. But now it's a little better. But it's still the problem. That's my impression of that. I don't know if Prof. Watanabe does agree with me.

Answer (Prof. Watanabe):

Probably now it's less than before, but still there is people, student going abroad, getting Ph.D., and some of them will stay abroad and will not come back. That's true. Still that happens. Particularly in U.S., I know some of them that get the better salary in U.S. than in Brazil. So he just does not come back to Brazil.

Answer (Prof. Fava):

The secret is not to send single guys outside. You must send married guys, so he can come back.

Chairman:

Today we have a visitor from CEDA. They are saying that they have training programs for medical doctors in Canada or U.S. But those trained people from Africa do not want to go back to their own countries. So they stopped training of these medical people, because it's no use for the particular countries of developing countries. Because they always go brain drain to U.S. or others. It's waste of money, they say.

Answer (Prof. Watanabe):

I think that's not only a problem of under-developed countries. But it's a problem of U.S., probably because I know for example in the University of Washington, Seattle, in the engineering department, particularly the whole staff are foreigners, not Americans. There are two Brazilians, two or three Japanese, some Arabian people and something like that. No American is staying in the university, because the industry pays better. So many foreign students that go to U.S. and after getting Ph.D., easily get jobs in the university and the salary is very much better than in their own country. That's why most of them stay in U.S. So it's also a problem of U.S. That's what I was told. I have a friend in the University of Washington, Seattle. He is a Brazilian, but he stays in U.S. and never came back.

Answer (Prof. Fava):

On the other hand, they have a lot of Ph.D. unemployed.

Chairman:

Unemployed? In Brazil?

Answer (Prof. Fava):

No, I mean in U.S. For instance in biochemistry they have overproduction of Ph.D. in biochemistry. A lot of people doing biochemistry are looking for jobs outside of U.S.

Chairman:

In the case of Korea, they established the Korean Institute of Science and Technology, the so-called KIST. They are very successful and famous for it, because it was established by the strong order and enthusiasm of the president. And they established this and gave a lot of incentives to the researchers. Therefore those brain-drained people working abroad in U.S. or Europe have returned for the sake of working in the KIST. The president tries to image up, to level up the position of the researchers by frequently visiting this KIST and talking to them very friendly and individually. And these scenes are televised to all the country. So everybody watching TV thinks that KIST must be something different from the ordinary institution, because the president frequently visits and talks with them. This really can be a common phenomenon that researchers' position in the society, their social status became much better. It was said that this was one of the success stories. Though this was a Korean case, there might be some major necessary

Answer (Prof. Watanabe):

Yes, I agree with you. Because something like that must be done to bring back the students that get the high degree outside. We have three state universities in Sao Paulo city. The University of Sao Paulo is the first one and the oldest one. The second one was created in the Campinas state. There is the third state university in the state of

Sao Paulo. When the second one was created in Campinas - one hundred kilometers north of Sao Paulo, the president of that university said " I'm going to bring back all those, many of the Brazilians that stay in the U.S. or some other part of France or England and so on. So that I can have good staff in our university." So he paid, gave very good condition for them. And he was able to bring back about 50 or 70 Brazilians. But that was only one program we had. So something like that must be done so that we can bring back students going abroad.

Answer (Prof. Fava):

That's correct. But sometimes we can make some mistakes for this. In that program that Prof. Watanabe just talked about from the case of the university in Campinas, I remember that the president was bringing back from outside a lot of different Brazilian scientists and one of them that has been employed by that university was my friend in U.S. It took 11 years for him to take the Ph.D. degree over there, because he was a very good soccer player. He was playing soccer over there. After 11 years he was brought back to Brazil like a scientist, very well paid. Sometimes in under-developed countries, the fact that you have been outside of the country even mainly in U.S. means that you are a genius now.

Question (15)-1:

According to the world development report, it says that the industry is taking nearly the share of 35% out of the total GDP in Brazil in 1984. In this sense perhaps we can envisage that the research work related to industries even including private companies, the research work about them will be increased very much in the future - prospect. Do you have any particular tendencies of those industries undertaking such research activities these days?

Answer (Prof. Fava):

Dr. Watanabe, help me. I don't know.

Answer (Prof. Watanabe):

Unfortunately not. Our industry is still in very oily stage. They are much more concerned about getting money back very soon. Anything that takes long time to produce any return is not considered very much. We have only 10 or 15 industries that have research program. Most of them don't. I think that's very unfortunate.

Question (15)-2:

Because in Japan, the research activities are undertaken by the private companies very very much these days. Especially since we are in the stage of the high competition with other countries like U.S. or Germany in producing products of better quality. So that so far we are heavily dependent on the outputs of the research activities of those countries.

But they say "No, you must develop your own." I think we are in a position that we have to do ourselves. But at the moment many developing countries tend to rely on external institutions and they just get the outputs and use them for their own. So that I think in the case of Brazil, you will be gradually coming to the stage that you have to do yourself to some extent.

Answer (Prof. Watanabe):

Our scientific community in Brazil is trying hard to convince the industrialists to help the research in Brazil. But it's very difficult to convince.

Question (15)-3:

Because do they think that Brazil's science and technology are still behind the international level?

Answer (Prof. Fava):

Yes:

Answer (Prof. Watanabe):

They know that we are behind the technology in the whole world. Yet, they have not enough and they do not decide to help any research yet. I think our industry should help much more the research, because that's the only way to develop the technology in Brazil.

Question (16):

In your document, it says that the size of the budget of your Foundation has very little fluctuations, because it is included in the constitution of the Sao Paulo state. So the political change will not affect the size of the budget of your Foundation. In the case of the National Research Council (CNPq), the situation is similar or is it affected?

Answer (Prof. Fava):

Quite different. It depends how much money the government wants to give them. In our case, it's quite different, because it is constitutional. If the consumer buys more products, the tax is going to increase. And every increase in the tax means that 0.5% comes to our Foundation. That depends on the demand, the economy itself.

Chairman:

Thank you very much indeed for your provoking lecture, Prof. Fava and also interesting comment, Prof. Watanabe.

Thank you very much for everyone for coming to the lecture and paying attention.

THE LIST OF PARTICIPANTS

NAME	POSITION	ADDRESS
1. ARAKI, Mitsuo	Assistant Manager, Industry-Government Relations Dept., Hitachi Ltd.	6 Kanda-Surugadai, 4-chome Chiyoda-ku, Tokyo, Japan
2. ENDO, Masayoshi	Advisor to General Manager, International Transport Div., Nippon Express Co., Ltd.	12-9, 3-chome, Sotokanda, Chiyoda-ku, Tokyo, Japan
3. ISHIDA, Masahisa	Staff Specialist, Corporate Planning Dept, Nippon Kokan K.K.	1-1-2 Marunouchi, Chiyoda-ku, Tokyo, Japan
4. ISOOKA, Naoki	The Manager of Operation Division, Tokyo Business Service Corporation	14-1, 6-chome, Nishishinjuku, Shinjuku-ku, Tokyo, Japan
5. MASUNOUCHI, Saburo	Executive Director, Industry Development Co., Ltd.	3-11-20, Naka-Katsushika, Edogawa-ku, Tokyo, Japan
6. MATSUBARA, Shin-ichi	International Division, The Long Term Credit Bank of Japan, Ltd.	2-4, Otemachi 1-chome, Chiyoda-ku, Tokyo, Japan
7. MORINAGA, Junji	Mining Manager, Resources Research & Development Dept., Marubeni Corporation	4-2, Otemachi 1-chome, Chiyoda-ku, Tokyo, Japan
8. NAGATA, Tak	Senior Specialist, International Division Kajima Corporation	17-22, Akasaka 2-chome, Minato-ku, Tokyo, Japan
9. NISHIMURA, Hidehiko	Technical Advisor, Foreign Department, Hokko Chemical Industry Co., Ltd.	Mitsui Bldg. No. 2, 4-2 Nihonbashi Hongoku, Chiyoda, Tokyo, JPN
10. SEKIYA, Mitsushige	Manager, Technology Team 1, Information & New Venture Div., Nissho Iwai Corporation	4-5 Akasaka 2-chome, Minato-ku, Tokyo, Japan
11. SHIMIZU, Kunimitsu	Director, Tokyo Public Service Dept., Tokai Bank	1-1-21 Toranomon, Minato-ku, Tokyo, Japan
12. SHIRAIISHI, Kenji	Advisor, Pacific Consultant International	8-2, Jingumae 2-chome, Shibuya-ku, Tokyo, Japan
13. TAKAHASHI, Masato	Acting General Manager, Overseas Operation Division, JEOL Ltd.	1418 Nakagami, Akishima-shi, Tokyo, Japan

14. TAKASE, Kunio	Executive Director, International Development Center	1-21-19, Toranomom, Minato-ku Tokyo, Japan
15. TANAKA, Yuichi	International Operations, Aoki Corporation	2-17-3 Shibuya, Shibuya-ku, Tokyo, Japan
16. THOMPSON, Peter	Development Dept., Bank of Tokyo	1-6-3, Nihonbashi Hongoku-cho Chuo-ku, Tokyo, Japan
17. UI, Yasuo	Senior Mining Engineer, Resources Research & Development Div., Marubeni Corporation	4-2, Otemachi 1-chome, Chiyoda-ku, Tokyo, Japan
18. KATO,	Technical Cooperation Division, Ministry of Foreign Affairs	2-2-1, Kasumigaseki, Chiyoda-ku, Tokyo, Japan
19. MIZUNO, Takashi	Livestock Development Division, JICA	Mitsui Bldg, P.O.Box 216, 2-1 Nishishinjuku, Shinjuku-ku, Tokyo, Japan
20. KUZUNA, Hiroyuki	Second Development Survey Division, JICA	- ditto -
21. TSUKADA, Koza	Research & Development Division, Institute for International Cooperation(IFIC), JICA	42 Ichigaya Hommura-cho, Shinjuku-ku, Tokyo, Japan
22. TAKAMA, Hidotoshi	- ditto -	- ditto -
23. TODOROKI, Masaru	Training Division, IFIC, JICA	- ditto -
24. GOTO, Koichi	- ditto -	- ditto -
25. FUJIMURA, Tateo	Director, Training Division, IFIC, JICA	- ditto -

