

日本スイス
技術者・科
学者協会

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Editorial

Though Switzerland and Japan differ in numerous aspects (history, geography, size), they face at the same time many common challenges and share common values. Every year, Swiss trainees and scholarship holders have the opportunity to realise a professional stay in Japan. They acquire a concrete working experience within companies or universities, develop their knowledge of the Japanese language, culture and society. Similarly, a growing number of Japanese spend part of their graduate or post-doctoral studies in Switzerland.

Created in November 1995, the *Swiss-Japan Association for Engineers and Scientists* gathers engineers and scientists who have worked in Japan. The main goal of the association is to facilitate information exchange and build strong ties between its (as of now more than) 70 members, the Swiss and the Japanese scientific, technical and industrial world. The association is presented on page 7.

This bulletin is a way towards the realisation of this goal. It is addressed to all members of the association, as an additional link between them, but also to all interested companies, universities, and public offices, which will find comparative data on technological or scientific issues interesting for both countries. It may also become a place where engineer's and scientist's view on the society is put forward.

We would like to use the opportunity by this editorial to thank all persons who encouraged us in our task, the Swiss Federal Institute of Technology in Lausanne for its financial support, Prof A. Funakubo from Tokyo University, Dr. Branco Weiss, and last but not least each of our members supporting a committee which chronically suffers from a modern illness: the lack of time.

Dr. A. Zryd
Vice-Chairman

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The educational system in Switzerland and Japan : a comparative overview

Education is the basis of a country. It is the soil on which culture and science may grow. In every society, the task of preparing the children, the young men and women for their future, has priority. Ensuring the continuous education of adults in order to let them evolve in pace with the surrounding world is a vital.

Both Switzerland and Japan are industrialised and well developed countries. They both have a high level of literacy. As such, they have a well organised educational system with a strong effort on the undergraduate stage. They have, however, provided different answers to the same problem: how to optimise the education in order to fit the needs of an evolving society? And the answer they found reflects the history and the culture of each country.

When a Swiss arrives in Japan, he encounters in his everyday life many aspects of the Japanese educational system. If he has children going to

pre-school or elementary school, he may be surprised by the apparent physical rudeness of the system, by the uniforms, by the importance given to song; all small details marking the difference between the systems. In the street, he crosses cohorts of high-school students, listens to stories of stressed children preparing themselves for the entrance examination in the hope of entering one of the top Universities, such as Tokyo University.

On the contrary, a Japanese coming to Switzerland may be lost in a decentralised elementary and secondary system different from one "canton"¹ to another, or in a high education system refusing up to now the « numerus clausus ». A survey of the stages of both countries does not reveal profound disparities (fig. 1 and 2). But the two systems differ certainly in their philosophy and means. This article presents an overview of these differences, without the pretension of being exhaustive. It rather proposes some axis of reflection.

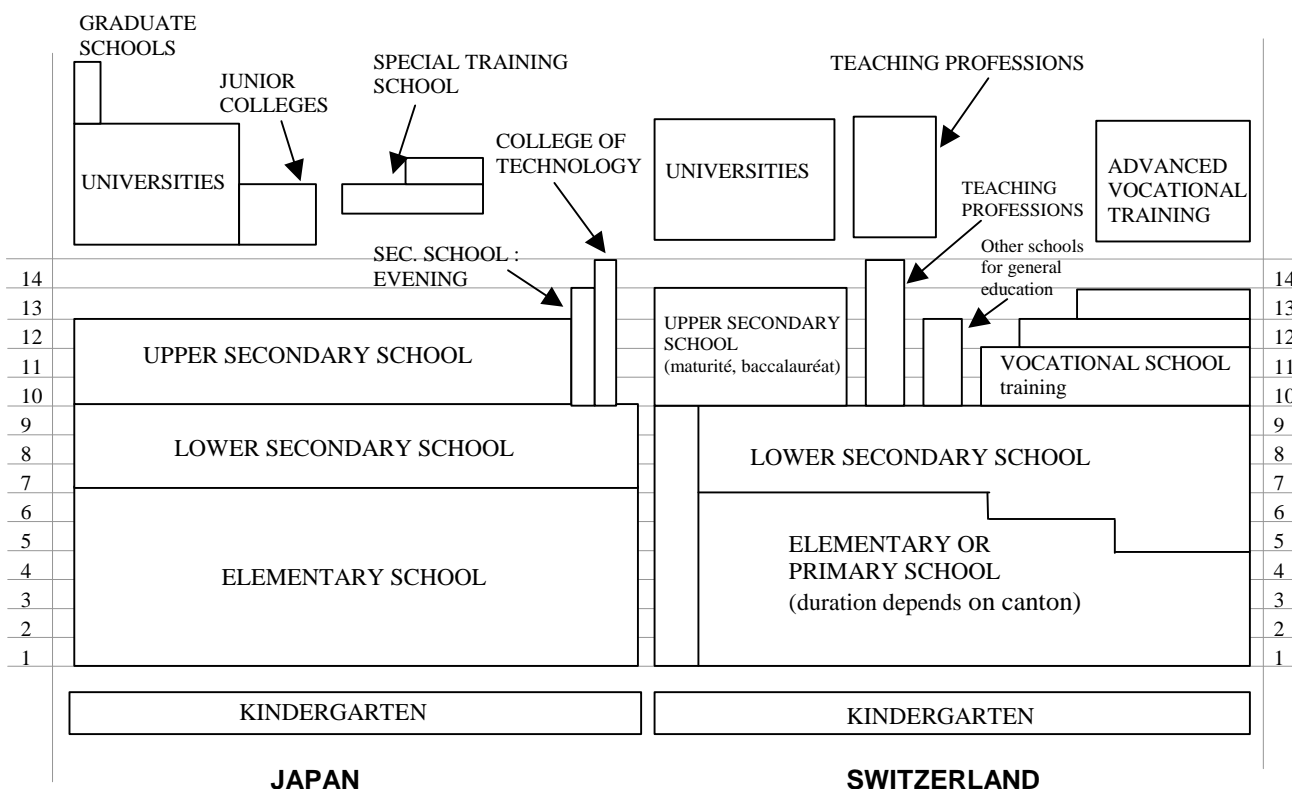


Fig. 1. The Japanese educational system (left) compared to the Swiss system (right), is a highly centralised system. The « juku » and the « yobiko », private schools attended in parallel to the normal elementary and secondary stage and dedicated to prepare the students for the difficult entrance examinations in good colleges or universities, are not represented here, though their role is very important. The total number of « juku » throughout Japan is estimated to 45 000.

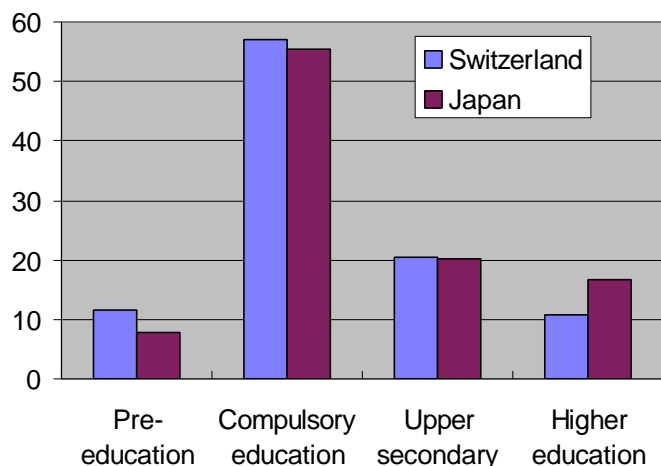


Fig.2. Comparative percentage of students by educational level in 1995.

Though differences are difficult to assess because the exact population structure is not known, it can be seen that Japan tends to have a slightly higher level of students in universities than Switzerland.

	Number of students, Japan (x1000)	In % of the total population	Number of students, Switzerland (x1000)	In % of the total population
Elementary school	8370	6.7	453	6.4
Lower secondary school	4570	3.7	281	4.0
Upper secondary school	4725	3.8	280	4.0
Universities	2547	2.0	88	1.2
Universities + colleges of technology	2602	2.1	105	1.5

Fig. 3. Total number of students and percentage with respect to the total population of Japan and Switzerland. The similar ratios reflect a similar structure of the population. However the proportion of university students is lower in Switzerland, which is partially due to the smaller percentage of population receiving a « baccalauréat ».

The bachel or and the university

It is certainly impossible to present complex educational systems in a few paragraphs. An interesting insight into the Japanese elementary and secondary levels has been given by Swiss teachers after a study trip to Japan². If to a certain extent their observations comfort the general ideas (education based on memory, heavy discipline, strong competition), it also points out the widely recognised high quality of this education.

Though different in conception, the means offered by both countries for primary and lower secondary education are quite similar. In 1995, the average number of students per class was 20 for primary education and 19 for lower secondary level in Switzerland, whereas it was respectively 19 and 17 in Japan. These statistics do not, however, always reflect the daily reality. In specific classes, the number of students may rise in Japan up to 40 for upper secondary education.

Therefore, in his article D. Dumoulin attributes the high quality of secondary education in Japan not really to material means, but to many other factors, among them: a harmonious mixture of tradition, art and modern fields; the stimulation of the students by competition; the motivation of the teachers by a good formation; a high level of social and political recognition, and a good continuous formation including study trips abroad.

The final examination of the higher secondary education stage and its role also differ considerably between the two countries. In Switzerland, the Maturité or Baccalauréat, passed when the student is 18 or 19 years old, still offers entrance in every faculty of each Swiss university. The selection of candidates is made by the filter of the Baccalauréat. In Japan, on the opposite, a higher proportion of young people receive a

degree. More than 95% of the students finishing the lower secondary education level enter into higher education. This is reflected in the higher percentage of the population attending University lectures (Fig. 3). But the most prestigious universities (Tokyo, Osaka) select the students by an entrance examination. The failure percentage at the entrance examination of Tokyo University may be as high as 35%.

The Swiss approach is the opposite of such a selective system. The recent controversy about the

introduction of a “*numerus clausus*” for medical studies is a good example of the attachment of Switzerland to its egalitarian approach. The proposition of a new *Maturité* has also been the subject of hefty discussions. The role of higher education is to prepare students for their future by helping them to acquire maturity and as a corollary a solid general culture. This should not be omitted while discussing about secondary education.

Postgraduate education and the industry

As an association grouping engineers and scientists, the AJ is interested in the education of this population group. There has been a recent effort in Switzerland to promote graduate and postgraduate (doctoral studies) in the technical and scientific fields. The motto is to prepare highly educated people with a good understanding of research for a career in industry. It has been asserted that having people with a good knowledge of research was the way to increase the competitiveness of the Swiss industry. This promotion of the PhD had two side effects: the increase in the number of students enrolled in PhD and the decrease of the length of the PhD.

This is certainly very profitable for the industry. It must be said, however, that R&D in industrial environment and constraints have little to do with research in academic environment. In Japan however, few students continue to the doctorate in major technical fields. And most of them do so because they want to pursue an academic career. On the opposite, industries have developed large R&D sectors, draining the good students and offering them a valuable scientific training and an interesting working environment.

Conclusion

This rough sketch gives a basic idea of the Swiss and Japanese educational systems. Times are coming of a change in the Swiss conception of the « *baccalauréat* » or « *maturité* ». There are eventually some lessons to draw from Japan in order to find a median way between this highly elitist and competitive system and a lower level but more « democratic » teaching.

This may be so, because the financing of R&D in Japan is slightly different from the Swiss system. Though both countries have a structure where the governmental funding is rather small, in the case of Japan a large part of this funding goes directly to the private sector through an institution as the MITI (Ministry of Trade and Industry). In 1993, for example, 31 Swiss francs per capita was given to the private industry by the MITI, whereas in Switzerland this amount of public funding to private industries was only of 16 Swiss Francs (Fig. 4).

The ratio of foreign students in universities is at the same time a measure of the quality of the teaching and of the research (a measure of its attractiveness), and a factor enhancing this quality by favouring the exchange of ideas. If the level is high in Switzerland (approx. 20 %, see fig. 5), it is considerably lower in Japan (around 2%) in spite of the attractiveness of its R&D sector. It is, therefore, very important that associations, foundations, universities, develop their network with this country and continue to encourage Swiss students to spend some time in Japan. That is the goal, which the Swiss-Japan Association for Scientists and Engineers tries to reach with its modest means.

The highly competitive industry needs highly educated people; it needs skilful engineers in Switzerland as well as in Japan. The attractiveness of such careers should therefore be increased. Switzerland is trying to promote engineering by the creation of the HES (*Hautes Ecoles Spécialisées*, former Technical High Schools). At

the same time, Universities and Institutes of Technology may have to focus on high technology fields, and on an entrepreneurial-wise formation or post-formation of their students.

Moreover, an increased government participation in private research through the channel of already existing institutions may help brilliant students to enter industry with high-level research capacities.

This could co-exist with the creation of more bridges between private and public sectors (under the form of grants, loans,...), offering the possibility to skip from industry back to academy. Thus both sides would benefit under the form of an increased knowledge exchange.

Dr. A. Zryd

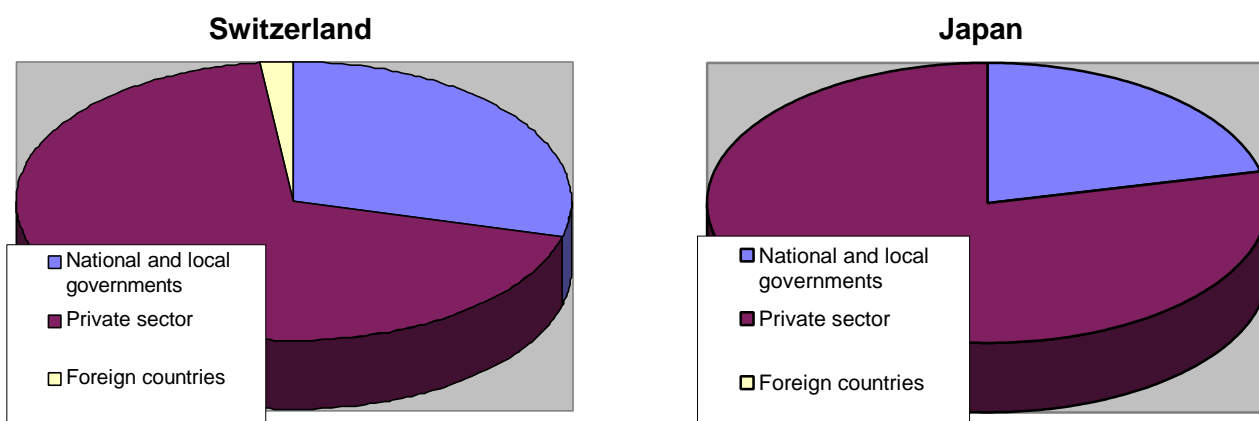


Fig. 4. Financing of R&D (1992 for Switzerland, 1994 for Japan). The relative amount of private sector funding is slightly more important in Switzerland than in Japan.

These private funds, in both countries, are spent mostly within the industry itself (more than 97 % in the case of Japan). But proportionally more public funds are spent in Japan directly in the industry (through the MITI), or in development, than in Switzerland. For example, in 1993, 52 % of public expenses for research were for basic research, whereas in Japan only 30% of the expenses of universities and research institutes are spent for basic research.

University or Federal institute	Percentage of foreigners
University of Basel	13 %
University of Bern	5 %
University of Fribourg	16 %
University of Geneva	33 %
University of Lausanne	21 %
University college of Lucerne	17 %
University of Neuchâtel	20 %
University of St Gallen	25 %
University of Zürich	12 %
Federal Inst. of Technology, Lausanne	24 %
Federal Inst. of Technology, Zürich	10 %

Fig. 5. Percentage of non-Swiss students in the different Swiss Universities. (Source : "Higher Education in Switzerland, Vision, special issue of December 1997).

Notes :

¹ A "canton" is a political entity forming the Federal State of Switzerland. The cantons have a large political autonomy and are among others tasks responsible for compulsory education.

² D. Dumoulin, Du Japon à la Suisse, Gymnasium Helveticum, 6, 1992.

Sending foreigners' children to schools in Japan

In Japan, children are often considered as little kings to whom everything is permitted. When they are low-aged especially, they have a lot of freedom, which is gradually restricted as they grow up. This particular affection is also valid for the children of the foreigners who work and live in Japan. Anyone who has ever gone out for a walk in a Japanese park, taken a subway or just been in a public place with his/her children, has certainly noticed how much the people from Japan appreciate the children and are kind with them.

In addition to that pleasant positive attitude, the foreigner's children are a real factor of integration for the whole foreigner's family where this family lives, as well as when it travels inside Japan. Many contacts are made with the Japanese people, neighbours or friends thanks to the children and their daily needs.

In everyday life, however, when the parents are either at work or occupied at home, it could be a real benefit for the children and also for the parents (especially for the mother if the father works in a company) if the children are sent to school. The consequence is that these children are in contact with other children of the same age and will be more integrated in the culture where they are going to live for a period of their life, which is not negligible. One-year stay in Japan, for example is a large period for a three-year old child. This also leaves some free time for the mother who can then do other activities rather than only taking care for her children.

If the decision to send children to school is taken, the next step is the choice of the language spoken in that school. If it is relatively easy now to find an English, German or French school in Tokyo or Osaka, it is neither the case in other smaller cities nor for other foreign languages. However, if no school is available, where the mother tongue of the child is spoken, is it then useful to send him to another one, for example to send a French speaking child in an English speaking school? He/she will then have English speaking friends in the school and Japanese speaking friends at home if he lives in a Japanese environment, resulting in having many languages to learn and speak simultaneously, which will lead to confusion. Wouldn't it be wiser to send him to a Japanese

school where the child will learn some Japanese words that will allow him to communicate with many children on the playground? The answers to these questions are very personal and it belongs to each parent to find the appropriate solution, depending on their own situation, priorities and views of education. The parents should nevertheless bear in mind that a little child is naturally in a very intense language learning process, and that he/she is then very sensitive and receptive to any source of linguistic communication, no matter in what language it is. That is why a simultaneous exposure of a young child to too many foreign languages often leads to chaotic mixture of words which can even be problematic for his/her future linguistic development if that exposure is too long.

Once the kind of school is chosen, the research of such a school is not an easy task. The company of the foreign worker can help him/her to find it, but not always successfully. Another interesting possibility is to address directly to the resident's City Hall. This help can be very useful in the case of a Japanese school (also called "yoochien"), as it is not so common for them to accept foreign children.

I was in Japan with my family in 1992/93, working for Mitsubishi Electric in Amagasaki, and living in Itami-Shi. My children were aged two and three and my wife and I thought that our children needed to have contact with more children rather than staying the whole day at home. We asked for assistance from my company to find a school for the children but they unfortunately could not find any. We were then advised by one of our neighbours to contact the City Hall of Itami-Shi. There, in the *Department of International Section Office*, a very friendly person helped us and found a school named *Shirayuri Yoochien* in Itami-Shi itself. Our children were accepted and placed there three days per week. This school was 100% Japanese speaking and, as it was the first time they had foreign children, they worried a little bit on how they would handle in the daily activities, starting with the language problems. In fact, no problems arose; our children were well accepted and made many little friends at school as well as at home. They quickly learned some elementary Japanese

words, which were enough for children's communication. They also learned some very nice songs in Japanese and it was a real pleasure for the parents to hear them. The days children were at school, my wife took advantage to discover Osaka, Kyoto, to take Japanese lessons and to give lessons in English to some of our neighbours

who became friends. Finally, I can say that it was a really fruitful and wonderful experience for the children to go to that school and that all of us keep very good memories from this period.

Dr. E. Tasev
AJ General Secretary

A few words about the Swiss - Japan Association for Engineers and Scientists

The *Swiss-Japan Association for Engineers and Scientists* (abbreviated as "AJ") has been founded in November 1995 and since then around 70 engineers have become members. They live not only in Switzerland, but of course in Japan, the United States, and even in Australia. The members have generally spent at least 6 months in Japan as a trainee in an industrial company, as a scientist in a national Japanese laboratory, or as a visiting researcher in a university or in a company. They have generally received a grant from the *EPFL*, the *Swiss National Science Foundation* or the *Swiss Academy of Engineering Sciences*. After their return from Japan, they would like to keep a close contact with this country, its culture, language and society.

The main objective of the association is to create a network between Swiss engineers and scientists with a Japanese background. The exchange of information between the members and other interested parties is rendered possible by means of Web links, this bulletin, the organisation of conferences with Swiss or Japanese speakers in Switzerland, and by giving practical pieces of advice to Swiss engineers who are preparing a professional or an academic stay in Japan.

Different projects have been planned and managed by AJ volunteer members: J.-M. Henchoz prepares a presentation document about the AJ. N. Piguet collects CV information of the members in order to combine them into a booklet. The Web site has been started by A. Zryd in 1995, and now S. Stijve together with P. Allenbach are in charge of the WWW pages, carrying out the updates of the pages and proposing new ones. A.

Zryd is the editor of the bulletin, whilst its realisation is due to S. Stijve.

AJ members have been participating for more than three years in student meetings organised by the *Service d'Orientation et Conseil* of the *EPFL*. It is an occasion for future *EPFL* grantees to get direct information and ask questions about an industrial stay in Japan. Help is also offered in personal meetings in order to prepare their experience in Japan. Mentoring is also another activity, and several members are presently in Japan for a professional stay. A close contact is kept via e-mail and help from Switzerland can be always provided. A reciprocity exists: information about Japan is being gathered and added to our Web pages.

The first AJ conferences were held last year, and the following topics have been presented: "*Marketing in Japan*" by Dr. Roya Bafandi, and "*The Activities of the JETRO*" (Japan External Trade Organization) by Mr. Kiyoshi Imai. It was an opportunity for everybody to hear about commercial subjects, and to discover other non-technical fields. This year, three different conferences were given: Dr. Raphaël Holzer presented his Ph.D about Biomicro machines (Univ. Tokyo), Dr Marcel Sonderegger explained how his company manages to sell medical goods in Japan, and Mr. Yoichi Miyahara compared his Swiss and Japanese academic experiences (see page 9).

We hope that the next years will be more and more interesting, that the AJ activities will expand, and that more members will join us.

Ms. N. Nibbio
AJ Chairman

Presently the committee of the AJ Association is composed of the following persons:

Ms. Nadia Nibbio, Electrical Engineer, Chairman
Dr. Amedee Zryd, Engineer- Physicist, Vice-chairman
Dr. Emile Tasev, Engineer- Physicist, General Secretary

Mr. Jean-Michel Henchoz, Civil Engineer
Ms. Nathalie Piguet, Electrical Engineer

The culture corner: Integral Calligraphy

Klein's integral blue John Lock's white paper

The process of integral calligraphy should be able to stand upstream of the dynamic, colourful, brute forces in the relationship between latent surface and evinced space or downstream, having exploited all of the technical possibilities of the classical and abstract forms available to the artist.

If the classical calligraphy is drawing of characters such as poems or diverse texts signs forming a whole from a sacred sutra to some ideological slogan according to a criterion chosen from various traditional styles then the text composed or numerous characters can amount to only one which, being an ideogramme, can stand for a world on its own rights.

For instance the character

明

clarity

is made up of

日

the sun

and

月

the moon

Finally, in pushing the efforts to the end, the pictogramme can be reduced to a mere stroke

—

horizontal

vertical, sloping, curved or hooked and so on, as the case may be, At this stage, it is no more than a gesture, a unique expression which may finally be reduced to a dot.

•

It is nothing more than the manifestation of the artist's intention summing up his act of calligraphy to a single, essential and primordial fact, the dot. Not just any dot, but the only possible, amid the "ten thousand" as Chinese used to say.

*Here, the calligraphy must no longer be understood as the art of drawing characters with skill, elegance and *fēiling* according to the temperament, mood and imagination of the artist being in duet or echoing with the text.*

Rather, it is a microcosm—a latent microcosm within each individual.

The significance of his work lies every bit as much in what it allows to see beyond, or to foretell, as in what it actually is.

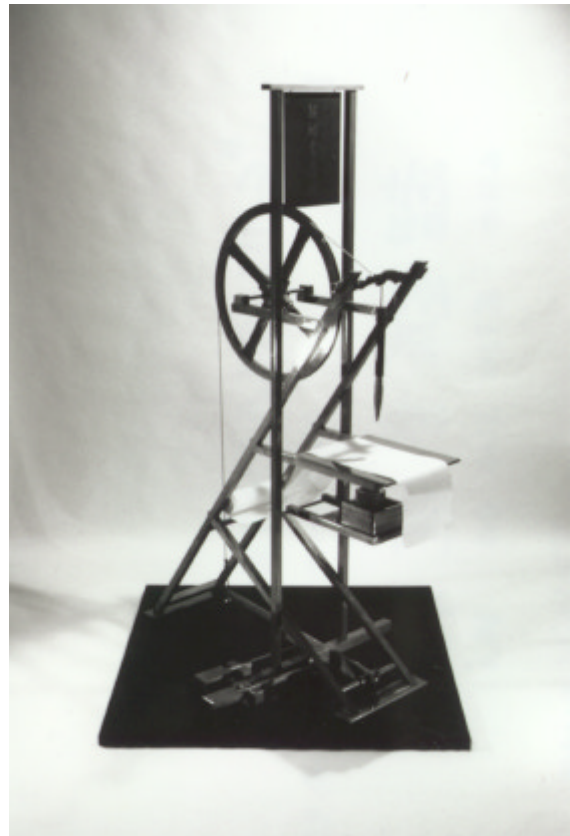
"Do not confuse the finger which points at the moon with the moon herself."

A Zen anecdote

The author, Mr. L. Takikawa, borrowed from different sources to compose this satire. John Locke, English philosopher of the 18th century, wrote on the creation concept taking the blank page as a starting point. "Bleu intégral" is the title of a painting made by a French contemporary artist and is presently exposed in the Basle Museum. It represents the opposite approach in the search of creation.

On the right is represented another work of L. Takikawa, the "Calligraphteuse".

"CALLIGRAPHTEUSE"
1998 H. 2.000 L. 1.250 .D. 950
超越書道機
CHO ETSU SHO DO KI
L. Takikawa



STUDYING IN SWITZERLAND: THE POINT OF VIEW OF A JAPANESE ENGINEER

This is the reproduction of the speech Mr. Miyahara gave on 26th November during the series of conferences organised by the AJ. The topic of his speech fits to the topic of this first part of the bulletin, since it refers to the differences between the educational systems of Japan and Switzerland.

Currently, I am an assistant in the department of microengineering. I have already been working in EPFL for one year and half. Before I came here, I have studied in Waseda University in Tokyo during my faculty and graduate school periods for a total of nine years.

First of all, I briefly introduce my former affiliation, Waseda University because I feel that unfortunately, Waseda University is not so well-known in EPFL and you might not know about Japanese private universities very well. In Japan, there are more than hundred national and public universities and more than four hundred private universities. In fact, about 80% of all the Japanese students are studying in private universities. Among them, Waseda University is one of the most traditional private universities and it was established in 1882. The main campus is located

at the north of Shinjuku district in Tokyo with nine faculties and ten graduate schools. The total number of the students exceeds fifty thousand, so it is also one of the largest universities in Japan. I studied in the faculty of science and engineering which was established in 1908. It has fifteen departments and the number of the students almost reaches ten thousand. Actually the late Mr. Masaru Ibuka, who is the founder of Sony corporation, graduated from the department of electrical engineering. After I finished my faculty period in the department of electrical engineering, I entered the master's course. Two years later, after finishing my master thesis, I entered the doctoral course in the same department. Then at the third year of the doctoral course, I was employed as a research associate. After finishing my doctor thesis, I started to work in EPFL in June 1997.

Since I came here in EPFL, many different aspects in research environment have surprised me. Firstly, the composition of research staff is very different. I was really surprised that one professor had more than ten employed assistants and most of them were Ph.D candidates. Secondly, the assistants often change their positions. Almost every month, some new staff members come and others leave. Thirdly, the research activity is not limited in one group and people communicate openly with each other. Moreover, I was surprised that many of the assistants had already had some professional experience elsewhere and their attitude towards their research subjects was also professional. In Japan, the graduate students, especially the master course students, are the ones mainly engaged in the actual research activities, not the assistants. The number of assistants is very limited - normally it is less than that of professors. Besides, in general, the number of the doctor course students is also very small in Japanese universities. In Japanese educational system, after four years of the faculty period, the students can continue to study in graduate schools. Nowadays, many of the students in science and engineering field enter the master's courses. Actually, more than fifty percent of the students do so. However, on the other hand, only a little portion of the students enter the doctoral course. It is even exceptional. Recently, because of the promotion by the government, the number of the doctoral students is rapidly growing up, but entering the doctoral course is still not a normal choice because of the big mental barrier.

Why don't the Japanese students like to enter the doctoral course? That is one of the most important problem in Japanese universities. I can point out two main reasons. Firstly, it is very difficult for the doctoral students to find jobs. It is mainly because Japanese companies generally do not estimate them so highly. Actually, it is said that personal affair divisions in the companies consider the doctoral students as the people who know only their majors and lack flexibility. Accordingly, not many companies employ the doctoral students, and even if they do, the salary offered is not so good. Secondly, there is another important reason. I think, it is the more important one. There are two ways to get a Ph.D degree in Japan. Surprisingly, you don't have to enter the doctoral course for getting a Ph.D. If you obtain

good research results in the company, you can apply for your Ph.D degree to any university of your choice. Furthermore, unlike Ph.D candidates in EPFL, the doctoral students in Japan have to pay their school expenses. In fact, I had to work as a private teacher to get money during all my university period. In such a situation, even if the students have good motivation, they don't bother to pay much money to enter the doctoral course. Such system disturbs considerably the motivation of the students. I have often heard that some professors persuade their students to enter the doctoral course but actually they don't have any means to support them. In order to change such a situation, the Japanese government started to support doctoral students financially. However, in my opinion, unless the system is totally changed, the students' minds will not change easily.

Next, I would like to point out the aspect of personnel changes in Japan. Here in EPFL, many people come from many institutions and on the other hand, the assistants can get positions in companies as well as in academic institutions after finishing their work. So many possibilities are good for training young researchers. In the case of Japan, it is exceptional that the graduates from doctoral course can get positions in companies. Furthermore, even in the academic institutions, there are only a few positions for young researchers like assistants in EPFL and they are not necessarily open for public applications. So it is very difficult for young researchers to find their positions. Actually, most of the Japanese researchers in EPFL keep their positions in Japan. Otherwise, they will have difficulties in getting jobs afterwards.

In the last few years, such problems are recognised by many people. So the government is trying to change the situation. For example, post-doctoral positions are being increased and the academic positions with limited term are being introduced. This kind of position has not been common yet in Japan. However, as the Japanese society itself is now changing globally, such attempts can change the research environment towards a better one. In the near future, you might see much more Japanese colleagues at EPFL.

Dr. Yoichi Miyahara
Assistant at EPFL's microengineering department