

Past, Present & Future of Graduate School of Mathematics, Kyushu University — A Case Study¹ —

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0. Introduction

A highly provocative but astonishingly well-organized Discussion Paper accompanies each ICMI Study. The present ICMI Study is no exception either. Its Discussion Paper³ underlines the fact that Teaching Mathematics at University Level is a task generally assumed by professional mathematicians, who at the same time are doing researches in Mathematics. We know that mathematicians all over the world socially behave quite similarly regardless of their nationalities and of their background civilizations and cultures⁴. A nation's future, on the other hand, is *grosso modo* believed to be profoundly related to Teaching in general and most likely to that of Mathematics⁵.

Realizing that many of the questions for this ICMI Study should thus be discussed and answered with this delicate balance of cosmopolitan generalities and national peculiarities, I feel very happy to be able to give some account of my own experiences on this occasion.

I earned my Ph D from the University of Tokyo almost thirty years ago, and then became a faculty member at Hokkaido University in Sapporo. In 1985, I moved to Kyushu University in Fukuoka. I took then a *chaired* professorship of Department of Applied Science, with duties of teaching mathematics to undergraduate and graduate Engineering students⁶.

I am now on the faculty of Graduate School of Mathematics, Kyushu University, created in 1994. In fact, I was deeply involved in its making, which, on the one hand, was our response to recent transformations of University System⁷ in

¹Prepared for ICMI Study Conference in Singapore, December 1998. Recall ICMI for *International Commission on Mathematics Instruction*.

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⁴Somewhat ironical but warm accounts are found in D. Ruelle, *Chance and chaos*, Princeton University Press, 1991.

⁵However, please check <http://www.monbu.go.jp/aramashi/1997eng/e201.html> for verifying a rather exceptional case of Japan.

⁶Some differences of the Japanese system from that of the US can be deduced by consulting John B. Conway: *On being a department head — A personal view*, Amer. Math. Soc. 1996.

⁷cf. <http://www.monbu.go.jp/aramashi/1997eng/e2046.html>.

Japan and, on the other hand, our proposal for ensuring a wider participation⁸ of mathematicians in affairs outside researches of traditional pure mathematics (of *connoisseurs*), from teaching general undergraduate students to advanced researches including various applied areas.

I will tell you why I hatched an idea of a big single school of mathematics within a university⁹, and how it crystalized as our Graduate School of Mathematics¹⁰. I will also talk about how things have passed within the Graduate School since its creation, adding a bit of my analysis and observations thereupon and, of course, its future prospect.

1. Mathematicians at Kyushu University before 1994

The Department of Applied Science where I used to be was a mixture of mathematicians and physicists¹¹ within the Faculty of Engineering. Its status had not totally been secure and stable¹² in spite of its history since the foundation of the university as an Imperial one in 1911/1912.

On the other hand, Kyushu University had a big and highly research-oriented Department of Mathematics¹³ in the Faculty of Science. The university also had a teaching institute for the first two year undergraduate students, called College of General Education¹⁴. There were quite a big group of mathematicians¹⁵ then.

Until five years ago, Kyushu University thus fostered three independent departments of mathematics with distinct responsibilities and of different recruiting habits. You see how complicated the situations of mathematicians were.

⁸cf. The Rochester case. See, e.g., SIAM News **29-1**, 1996

⁹A. Yoshikawa, Toward the Faculty of Mathematics!, Suugaku-Seminaa, **29** No.12, 52-53, 1990, in *Japanese*

¹⁰A. Yoshikawa, What the Graduate School of Mathematics, Kyushu University, is aiming, Ooyoo-Suuri, **3** No.4, 55-58, 1993, in *Japanese*

¹¹There were 11 mathematicians including 4 chaired professors, 12 physicists with 3 chaired professors and 3 chemists with 1 chaired professor. A chair, an administrative unity of teaching and research, generally consisted of 3 or 4 faculty members, i.e., a full professor (chaired one), an associate professor and assistant professors, presumably defined accordingly to the content of teaching subject trusted to them.

¹²An obvious reason was difference of formations: we were scientists while they were engineers. And of course a similar conflict between mathematicians and physicists.

¹³There were more than thirty faculty members including 9 chaired professors and 9 associate professors. The department, founded in 1942, was the youngest among the major mathematics departments in Japan, but had long been a leading institution in mathematical statistics and applied mathematics.

¹⁴It went back to the pre-war Fukuoka High School, a three-year liberal arts college of tertiary education for students completing a five year secondary education. It was annexed to Kyushu University, which used to be Kyushu Imperial University, a three year university of post tertiary education for the graduates of High Schools. This collapse of higher education seems to have strongly been recommended by the US occupation forces and was made in effect in 1948. Now universities are more numerous than pre-war institutions for secondary education.

¹⁵There were about 20 faculty members teaching mathematics. They were not chaired though generally associated to Department of Mathematics. But promotion was independent of Department of Mathematics. On the other hand, there were more than 70 classes (50 students/90 minutes) of mathematics for a couple of thousands students of the first two years. More than 20 half-time teachers were hired for covering a good number of classes.

You might guess that such a system would finally be degenerated to producing a discrimination among the faculty, and thus compromising their proper objectives. The situation was analogous in most universities¹⁶ of Japan and also in other disciplines than mathematics.

2. Formulating a graduate school of mathematics

The higher education in Japan faced to several challenges since some time. University Council thus was created associated to the Ministry of Education (and related affairs)¹⁷. One of the important issues was degeneration of teaching for the first two year students, as lack of morales on the side of teachers and loss of motivations on the side of students had become apparent more and more. The reasons must have been very complex. University Council studied them and judged that the university system itself was in a state of *fatigue*.

Another challenge to which University Council had to answer was to enhance graduate courses¹⁸. In particular, it was emphasized that the ratio of PhD's to the total population in Japan was extremely low compared to the countries in the North America or in Europe¹⁹.

In any event, University Council formulated a Recommendation of University Reform in 1991²⁰, a particular point of which was about the status of Colleges of General Education. As for enhancement of graduate schools, the situation was somewhat delicate. Some prestigious universities including ex-Imperial ones were considered qualified.

On the other hand, from the side of mathematicians at Kyushu University, other than the problem raised by various status within the university, a need to reorganize the mathematics faculty seemed to be obvious, for, in spite of rapidly growing chances of mathematics in recent industries and societies, Department of Mathematics, Faculty of Sciences, had some difficulties in coping with these situations, for it remained, or was stuck to, interpreting mathematics in quite a conservative way²¹.

¹⁶Most were created during these 50 years, but some were transformed from pre-war High Schools and Higher Technical Schools. However, some went to newly introduce discriminatory Faculties and Colleges of General Educations, following ex-Imperial Universities.

¹⁷Consult <http://www.monbu.go.jp/aramashi/1997eng/e2046.html>

¹⁸The prewar Imperial Universities were in effect corresponding to today's Master Courses of Graduate Schools. Even after the 1948 university reform, at ex-Imperial Universities, the last year education for the undergraduate students were done in common with that of Master Courses, at least for some time. E.g., even for my case, a senior undergraduate at the University of Tokyo around 1964. This should no longer be the case, due to modifications in secondary educations since 30 years. However, I will have a word to say about this.

¹⁹This is also a very complicated matter. There is a question of a social understanding about what the rôle of a PhD is and how essential being a title holder is.

²⁰We had been informed about the discussions at the Council since its creation in 1987, thus my paper of 1990 in the above footnote. I was then also in the Project Committee at the Faculty of Engineering and was able to know what the major Faculties of Engineering were preparing for their future.

²¹There were around 60 students majoring Mathematics graduating each year. About half

Situations of the mathematics faculty were of course similar in other universities. The Mathematical Society of Japan and the mathematics related subcommittees of the Science Council²² were also interested in the same area of questions²³. There were also several suggestions from Ministry of Education etc. In 1992, Graduate School of Mathematical Science²⁴ was created at the University of Tokyo, by reorganizing the mathematicians of Faculty of Science and College of General Education²⁵.

Mathematicians at Kyushu University had started in 1991 discussions for eventually creating a new mathematics department, but without very clear prospect. I think several points²⁶ finally contributed to our *success*:

0. clearly formulated ideas for the projected department
1. the above mentioned Recommendation of the University Council
2. Kyushu University's plan of creating a new campus
3. support from the Faculty of Engineering
4. the case of the University of Tokyo in 1992

Now let me explain our ideas for an eventual new department²⁷. There were several motivations based on our understanding of the rôle of mathematics in the world to come, and consequently of a need to reorganize teaching and research of mathematics. In other words, we wished to transform the then rather isolated, basically stationary looking mathematics departments to an open and non-stationary mathematics department by duely recognizing large and wide

of them went to industries, 20 became teachers in the secondary education, and the remaining 10 strove for academic posts. However, the Department's instructions mainly targeted the last group of students and encouraged only dozens of students to the Graduate Course. On the other hand, the number of teaching posts in the secondary education was getting smaller because of a rapid demographic change.

²²A government institution of academics formulating proposals of science policies.

²³I was once in one of such subcommittees around 1990. I then made a survey about the teaching situation of about one hundred mathematics departments inside Japan. One of the questions was to specify what ideals and goals each department adopted as they provided mathematical teaching and training to students majoring in mathematics. Some responses showed a categorical rejection of the idea of setting any goal in *educational* matters, alluding the etymological notion of *education*.

²⁴I vaguely guess its founding idea in the context of general circumstance. I personally believe that my 1990 paper had somewhat encouraged them.

²⁵However, this university chose to strengthen the College of General Education and to remove difference of status of the faculty of the College and those of the prestigious ex-Imperial Faculties. In fact, the College of General Education at the University of Tokyo had formally been the prestigious First High School, which, together with other Faculties of the University of Tokyo, might be considered as descended from the Confucian School for Officers of the Tokugawa Shogunate founded in the beginning of the 17th century.

²⁶The points 2, 3, 4 were of political nature within the university. However, without the point 0, these points would not have been aroused.

²⁷We formed a committee for its preparation; The principal charge was taken by three mathematicians, a topologist from the Department of Mathematics, Faculty of Science, a functional analyst from the College of General Education, and myself. We investigated future possibility of industrial mathematics, and responses from major industries then were very favorable, certainly enhanced by booming economy of Japan at the moment of enquête. cf. *Supplementary explanatory document for the proposal of creating Graduate School of Mathematics, Kyushu University*, presented to the Ministry of Education etc., 1993.

boundary areas encircling the traditional mathematics. In a more picturesque way of saying, we tried to create an image of a mathematics department like some creature vibrating lively around the heart of traditional mathematics. I call your attention that this was in fact an inevitable consequence of our realism²⁸ gained through observing contemporary mathematical environments.

To create a graduate school of mathematics appeared to solve all the problems we were faced to. It would contain almost 70 faculty members²⁹ covering a wide range of researches, and thus redistribution of teaching duties should let any discrimination among the faculty rapidly disappear. On the other hand, in principle we had to preserve the people already holding posts as this was just customary in this kind of transformation (and also for avoiding any legal conflict).

We proposed 8 major domains of teaching and researches : algebra, geometry, analysis, discrete mathematics³⁰, mathematical systems³¹, nonlinear mathematics, computational mathematics, and mathematical statistics. They might be reorganized into two groups: Core Mathematics and Applied Mathematics³². With somewhat terse arguments with the concerned agencies of the Ministry of Education etc, we finally arrived at the present Graduate School of Mathematics in 1994. With the above 8 domains, it was planned to receive annually 56 Master Course students majoring mathematics and 35 students seeking PhD degrees³³. We assumed that most students would seek positions in industries, for both academic positions and teaching posts in secondary education were expected to become very tight.

The Graduate School of Mathematics was also designed that its faculty members should assume all teaching of mathematics as service subjects, from linear algebra and calculus for the first two year undergraduate students, advanced calculus, statistics and some advanced topics of general mathematical nature for engineering students (including some graduate courses), and also teaching undergraduate students majoring in mathematics.

3. What happened since the start of our Graduate School.

The Graduate School started with choosing as the Head the topologist who was an executive member of the preparing committee³⁴. We knew that he

²⁸Romanticism still persists. See our *Annual Reports* 1995, 1996, 1997 published by the Graduate School.

²⁹Now there are more than 80 people on the faculty.

³⁰This domain started rather as algebraic combinatorics, thus ideas related to discretizations of continuous mathematical objects were not necessarily in its eyesight.

³¹By this, we understood some topics of essentially infinite dimensional nature, from functional equations such as stochastic ones to operator theory including C^* -algebra.

³²We had to solve a kind of political problems in assigning mathematicians already at Kyushu University to these domains. It was very fortunate that the varieties of our faculty allowed us the task without serious discrepancies.

³³The latter figure has been quite problematic.

³⁴His background was the Department of Mathematics, where faculty members were most

showed little interest in Analysis in general and still less in Applied Mathematics, but since other ex-executive members (for instance, myself) were supposed to assist him in these fields, we did not think of any inconvenience. But we immediately had to realize that we all had been too naive in the administrative affairs³⁵. Anyway, so far, we have been doing quite well where technicalities are in question, e.g., assuring service subjects with reasonable syllabi³⁶.

What we had proposed in creating Graduate School of Mathematics was not restricted to do mathematics of *established* nature which might be covered by a single genius, but rather to assure widening of its possibility. Thus, the proposed 8 domains were defined loosely, and designed to serve as a guideline for a large variety of mathematics teaching for the graduate students. It was also expected to organize some research groups accordingly. Thus, originally the Graduate School had been expected to be operated based on respecting these 8 domains. It should be said that this type of precisely preassigned operation is generally crucial in applied fields while certainly less relevant in pure mathematics.

Actually, even before the Graduate School's take-off, this kind of segmentation was harshly attacked by some groups of our colleagues. They pretended that there should be a unique mathematics and everybody should naturally tell a good mathematician doing a good mathematics from those who were not. In fact, most of our colleagues including myself were raised in this kind of naive atmosphere under a strong influence of Bourbakism, but rarely faced to a situation where such a principle was literally made effective³⁷. This attitude might be considered as a rather excessive reaction, often observed among fundamentalist mathematicians, against the *chaired* system as taken by them a typically segmented narrow one³⁸.

numerous and very proud. He also worked as an advisor to the Ministry of Education in the matter of refereeing newly proposed university departments related to mathematics though he had been waived for our case. His nomination as the Head seemed thus very reasonable. However, we soon had to face problems of how leadership should be.

³⁵But in the deepest place, I perceive a certain characteristic of social systems in the traditional Japanese civilization. Think of an orchestra. You have the conductor who determines its performance yet without ever joining it as an instrument player. This idea of orchestra and that of *conductorhood* in particular are the most alien to the Japanese social system, where only admitted are such groups that each of their members must have an instrument to play. A real, thus *influential*, head of a group should be a player, who is technically most dexterous (or something like). In other words, no head is expected to imagine any landscape from the view point other than that where most of the group members commonly stand. This renders naturally any organization apt to be put its constituents' well-being prior to its original purpose.

³⁶However, for Engineering students, I notice some draw-backs due to the fact that teachers no longer belonged to the Faculty of Engineering. But this is not really serious and to some extent was expected.

³⁷At some universities occurred appointments like a mathematical analyst assigned to a chair of Geometry and a geometer to that of Analysis.

³⁸I, however, suspect that this had come from a certain self-justification of incompetence of pure mathematicians some decades ago. In fact, in the 50's many mathematicians at ex-Imperial Universities left for the US, and these vacant posts or chairs were taken by mathematicians not really prepared for the posts' proper assignments. Instead of studying the assigned subjects, most of them gave up teaching and researches of these subjects in preference to their original branches, e.g., algebra, in which they had been trained. Mathematicians

Perhaps here I need to explain you how the general operation of a division or department of a Japanese university is carried out. The Head presides the Council of Professors consisting of the totality of full or chaired professors of the department. The Council is legally in charge of determining basically all affairs of the department, including election of the Head, nomination and promotion of a faculty member, syllabi and organization of courses, admission of students, acknowledgement of degrees and credits, discussion of fiscal and funding matters, and so on. In reality, most topics are prepared in advance by regular individual committees assisted by proper administrative staffs. Notice that responsibility of these regular committees is in principle quite administrative and rather neutral with respect to researches and teaching except those specialized to recruiting or to teaching. There generally is an executive committee, something in between the Head and the Council of Professors, which arranges daily matters and proposes any project of researches or affairs closely related to the operations of the department. Besides these operations within the department, there are matters related to the entire university, and some members of the department have to be involved therein.

In the case of our Graduate School, the Head formed the executive committee essentially from chair persons of specialized committees. In other words, the executive committee consists of members each representing a certain function in the administrative operation of the Graduate School. Although it had initially looked reasonable, it soon appeared that informations relevant to administrative operations stayed within a relatively small circle of faculty members who happened to belong to some of the specialized committees. Furthermore, even those who had some knowledge about how operations were being carried out found very difficult to formulate ambitious proposals of research projects, which would be indispensable for arousing a very positive participation of considerable numbers of colleagues to various activities within the Graduate School. As far as I judge, this was because we had misunderstood that operations of the Graduate School would be just routine and restricted to administrative matters, but actually they were a basic means of realizing wishes for researches and teaching of *all* of our colleagues.

As for the recruiting system, we had at the beginning installed a single specialized committee of several members, with the term of a year though renewable³⁹. This committee had also been given a full authority to determine the recruiting policy each time a vacancy was previewed⁴⁰. After some neces-

again reacted more or less similarly when, in the mid-60's, many posts were created, originally intended for applied mathematics, due, e.g., to the industrial innovation. As an extreme case, it happened at some ex-Imperial University that, 3 quarters of faculty members at Department of Mathematics being algebraists, training of students majoring in a wide range of mathematics other than algebra was no longer assured from around 1960 on.

³⁹ Actually, some antagonists had argued that such a recruiting system would be too near-sighted and would exercise an excessive influence beyond their responsibility over the future of the Graduate School thus in an arbitrary way.

⁴⁰ However, it goes more often like this. For a vacant post, the committee formulates an offer for a mathematician, of whatever field of mathematics, with strong research records. Applicants are thus of various fields. The committee tries to arrange them linearly by orders

sary procedures, the committee chose a candidate, and then performed a certain ritual seeking for a consent from most of the faculty of the Graduate School⁴¹ before proposing to the Council of Professors their choice as a single candidate for the post.

Since 1994, the recruiting committee worked hard to fill vacancies. As a result, however, we had fewer analysts and geometers while some applied fields such as computational mathematics were ignored in spite of their relevance in the present day mathematical activities⁴². Another consequence was a review of syllabi for the undergraduate and graduate students majoring in Mathematics from the point of view of competence of thus recruited faculty members, rather than what kind of mathematics would be considered for the future prospects of the students.

As these inconveniences becoming so obvious, we have since some time tried to amend our original system of operations. We have changed the recruiting system, and now we have two systems: one for the Core Mathematics and another for the Applied Mathematics. The former succeeded the previous system and there is a single committee⁴³ through an academic year while the latter is carried out by independent committees formed following respective vacancy's specialities⁴⁴. However, as for the executive committee, the problem is not yet resolved since we still continue fierce arguments about the ideas behind the composition.

4. Analysis and future prospect

So far I have described how things are proceeding around us. We are involved in several activities, teaching calculus, linear algebra or something like to freshmen students on the one hand and joint researches with PhD students on the other. We are numerous, and each of us has the same responsibility on teaching and researches related to mathematics. We find it not necessarily easy to maintain a high research standard in a wide variety of fields while assuring various levels of mathematics teaching inside a university⁴⁵. Some tasks are less sensible to research specialities of involved faculty members. We have, however, had to admit that a too strong determination of forming an excellent research group might even affect the quality of teaching for students of mathematics major.

or degrees of *goodness* of mathematical results obtained by these applicants.

⁴¹In fact, the committee members had been elected by the vote of all the faculty members.

⁴²The results of the recruiting naturally reflected taste of the committee members. Again some observed that a certain vicious cycle could be established since the composition of the committee members could be converging to a narrow area as they were elected by the vote of all the faculty members.

⁴³The members are now elected by the vote of the faculty members of the Core Mathematics.

⁴⁴The recruiting policy has been determined through discussions among the faculty of the Applied Mathematics before forming any committee.

⁴⁵It is, however, believed that a high standard of teaching is assured by strong activities of researches.

Here are some observations about our Graduate School⁴⁶ :

- a. Purist's attitude of grasping mathematics
- b. Strong motivation of promoting one's own specialities
- c. Excessive interest in technical details
- d. Relatively weak sympathy to the students' motivation
- e. Somewhat arbitrary interpretation of the sense of teaching mathematics

In short, what is not clear is that the faculty members of our Graduate School in fact understand that the Graduate School is a *public* institution within a university which has a well-defined objective of teaching and doing researches of a wide variety of mathematics. In other words, although the setting of teaching purpose and that of research activities are far from being private, my colleagues are apt to think them rather private and manipulable at their own taste.

Actually, we have observed serious difficulties in keeping standards of teaching mathematics to students of these days. We can count several reasons, but the reality is the reality. Moreover, in the mean time, we now have to observe visible transformations of the circumstance around us, particularly, how mathematics are now applied, not only in industrial matters, but also in financial affairs. Therefore, we have certainly to revise syllabi of mathematics teaching. Then how?

Recently a proposal of syllabi for the students majoring in mathematics has been made in a way that the curriculum is designed upon what most teachers are competent in teaching and not upon what kind of mathematical knowledge should be expected for students when graduated as majoring in mathematics⁴⁷. There are three characteristic short-comings in the above proposal. Firstly, there is no room for computer-assisted instruction of mathematics. Secondly, a lack of interest in showing the students a rough overview of modern mathematics, e.g., some reluctance of introducing the Lebesgue integration theory as a common ground. Thirdly, there were no discussions on how the proposed curriculum would finally be judged successful or not.

These are typical consequences of the items **a** through **e** mentioned above. We have not yet completed related discussions. However, I note that, while the students will have achieved their full culmination some twenty or thirty years from now, we the teachers will then no longer be as influential as now. The lives of the students obviously belong to them, and not to us. But we have to assist them to lead *mathematically* better lives. Thus, basic ingredients of mathematics teaching should not be altered, while some technicalities should

⁴⁶Recall the footnote about an orchestra. The Graduate School certainly consists of players of very high performance, who may, however, be interested in only some limited instruments.

⁴⁷Such a proposal of review was necessary because, according to the proponents, the levels of mathematical training of undergraduate students when admitted to the university were getting more and more insufficient. It thus became just impossible to provide them mathematics of the same standard as a decade ago. They did however not allude that the levels of faculties might also be getting worse though another point emphasized by these proponents was that undergraduate mathematical subjects should be so chosen that *any* faculty member, regardless of specialities, might be able to teach. On the other hand, it was difficult to invite them to enter into discussions about designing possibly promising menus for future chances of students.

be replaced by computer-assisted instructions. We have a good reason to keep the standard of mathematical knowledge of the students, even though they are less prepared than before when admitted to the university. To realize such a contradictory objective, a straight means is that we have to work harder⁴⁸, and also to rearrange the courses, employing the computer-aided instruction. Unfortunately, this is too demanding, and people wish to find out a third way.

The situation is basically the same in mathematics as a service subject. Here we are facing a more difficult problem. If mathematics professors are reluctant in changing their teaching styles, they will provide lesser materials in their service subjects and possibly arouse frustrations of teachers and students majoring in other disciplines than mathematics. So although it appears we could here make several choices, actually there is only one so that we should reasonably reorganize mathematics instructions as service subjects. However, as our colleagues are heavily inclined in original mathematical research works, only a few are willing to dedicate their time to pedagogical innovation. Some faculty members do not hide their strong distaste in mixing up in educational matters, and some people even go too far by discouraging those seriously endeavoring in such affairs. Here you see how the above items **a**, **d**, **e** converge.

Now let us turn to the *future* of our Graduate School. Honestly, it is not very certain. Some part of the difficulty, as you guess, comes from socio-cultural characteristics of the present day Japan. Some colleagues are not very much interested in promoting our original researches and teaching *inside* the Graduate School, but, instead, paying much effort to getting high evaluations from colleagues in some other places. If one speaks of *trends* and *fluctuations*, we are in fact much attracted by the latter. It is the *present* and just in front of us as, e.g., established mathematical themes. Minute technicalities lure us. In fact, a friend of mine, though also a mathematician, attributes such an attitude of Japanese scientists to unfamiliarity to, or a lack of training in, the way of literary or socio-philosophical thinking⁴⁹.

Anyway, a strong personal ambition serves as a genuine motif for carrying out often hard and solitary research works. To my own view, however, we could be blamed for not trying to see the world with our own eyes and thus far from creating our own mathematics, were we interested only in established themes. I said in the above that mathematical environment has drastically changed these days. This means that chances are getting larger. It should thus be recalled that our Graduate School was so founded to catch these widening chances of mathematics.

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⁴⁸For instance, to separate teaching of the final year undergraduate students and that of the Master Courses.

⁴⁹This may reflect a very serious dichotomy in the present day Japan between the scientific instruction and literary education. In this respect, a French case is noteworthy though elder French people might be complaining. See Pierre Bohr, An industrial vision of scientific computation for the 21st century, in: Computational Science for the 21st Century, pp. 761-773, ed. by Bristean, M.O., et al., John-Wiley & Sons, 1997.