Tips for Prospective International Students

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1 Introduction

In this note, I summarize some basic information for prospective students who are interested pursuing graduate studies under my supervision. I have years of research experience outside Japan, and have been enthusiastic about hosting international graduate students, and **applications from international students are very welcome**.

University of Tokyo has complicated admission processes for international students, which processes are often different from those of a typical university in the rest of the world. My case is even more involved since I am in a somewhat unconventional position inside the university. For this reason **I strongly recommend you to start looking into details well in advance**. In the past a large fraction of those interested simply missed the deadline due to various reasons.

I am not necessarily be familiar with all the intricacies of the admission process, and the information herein could contain some misunderstandings, so **I urge you to cross-check with the most updated information from the official websites of the university.**[1]

I am planning to update this file as time goes by.

I often receive e-mails inquiring if I am willing to take graduate students in a particular year. I have no restrictions on the number of students at this moment, so you should simply apply to the graduate school. Whether a particular case works or not depends on many factors, including application materials. Quite often I have very limited information about you, so please do try to put in as much information as possible in the application materials. When applying, it could be of use to send me a message introducing yourself, so that I am aware in advance who is applying to me.

[1]For Kavli IPMU-specific information, please check out `https://www.ipmu.jp/en/research-activities/PhD-programs`.

2 My Research

My research has been in theoretical physics, in particular high energy theory, quantum field theory and string theory. I have also worked in other areas of theoretical physics, such as particle phenomenology, cosmology, statistical mechanics. My research is often characterized fits into mathematical physics (broadly defined), and with motivations from high energy theory and string theory I have in the past worked in research topics in pure mathematics (e.g. in geometry, representation theory and integrable models). More recently I have been excited about interface between string theory and condensed matter, cosmology, particle physics, and quantum information. In reality my research topic changes from day to day depending on my research interest, and I would say that even I myself do not know my future research topic.

The graduate school is primarily a place for research. It is therefore important in selections of graduate schools and/or Ph.D. advisors to understand in advance what type of research you would wish to pursue, and where in the world your research topic can be studied.

In the following there is nothing concrete written concerning my research activities, but if you are interested in my research please do have a look at my homepage `http://member.ipmu.jp/masahito.yamazaki/index.shtml`, where you can download my scientific papers, lecture slides and videos.

3 Research Environment at Kavli IPMU

I belong to the **Kavli Institute for the Physics and Mathematics of the Universe (Kavli IPMU)**, a premier research institution located at the Kashiwa campus of the University of Tokyo.[2] Kavli IPMU is located in a suburb of the University of Tokyo, and can be easily reached from airports and central Tokyo via public transportation.

Our institution is very international, and all the daily research activities

[2]Kavli IPMU homepage `https://www.ipmu.jp` contains lots of useful information.

are in English. Many of our graduate students are Japanese, but we have an increasing number of graduate students from abroad. We also have excellent English-speaking staff, who will be able to help you with various practicalities as you go along.

The institute has a large fraction of faculties and postdoctoral fellows, who will be an invaluable source of guidance during your graduate studies.

Kavli IPMU is famous for tea time held every day from 3 pm. This is a great opportunity to chat, ask questions, and discuss with many researchers at Kavli IPMU from "other areas". I myself have written several papers, which grew out of casual conversations during the tea time.

4 Graduate School: Mathematics or Physics?

If you are interested in becoming my student at Kavli IPMU, you should apply to the graduate school of University of Tokyo.

Setting aside the details, there are basically two choices to have me as a Ph.D. advisor:[3]

- **Graduate school of mathematical sciences** (most courses at Komaba campus)
- **Graduate school of physics** (most courses at Hongo campus)

All my students will belong to Kavli IPMU, and are treated equally irrespective which graduate school they belong to. I also encourage my graduates students to interact with each other.

Having said that, there are some important differences between the two options, both scientifically and bureaucratically, and hence I would recommend you to seriously compare the two options. **As will be explained more fully below, the graduate-school admission process is simpler for the math department. Therefore if you are fine with either option then I would recommend the math department.**

[3]There is actually one more option with Oxford, please see section 7.

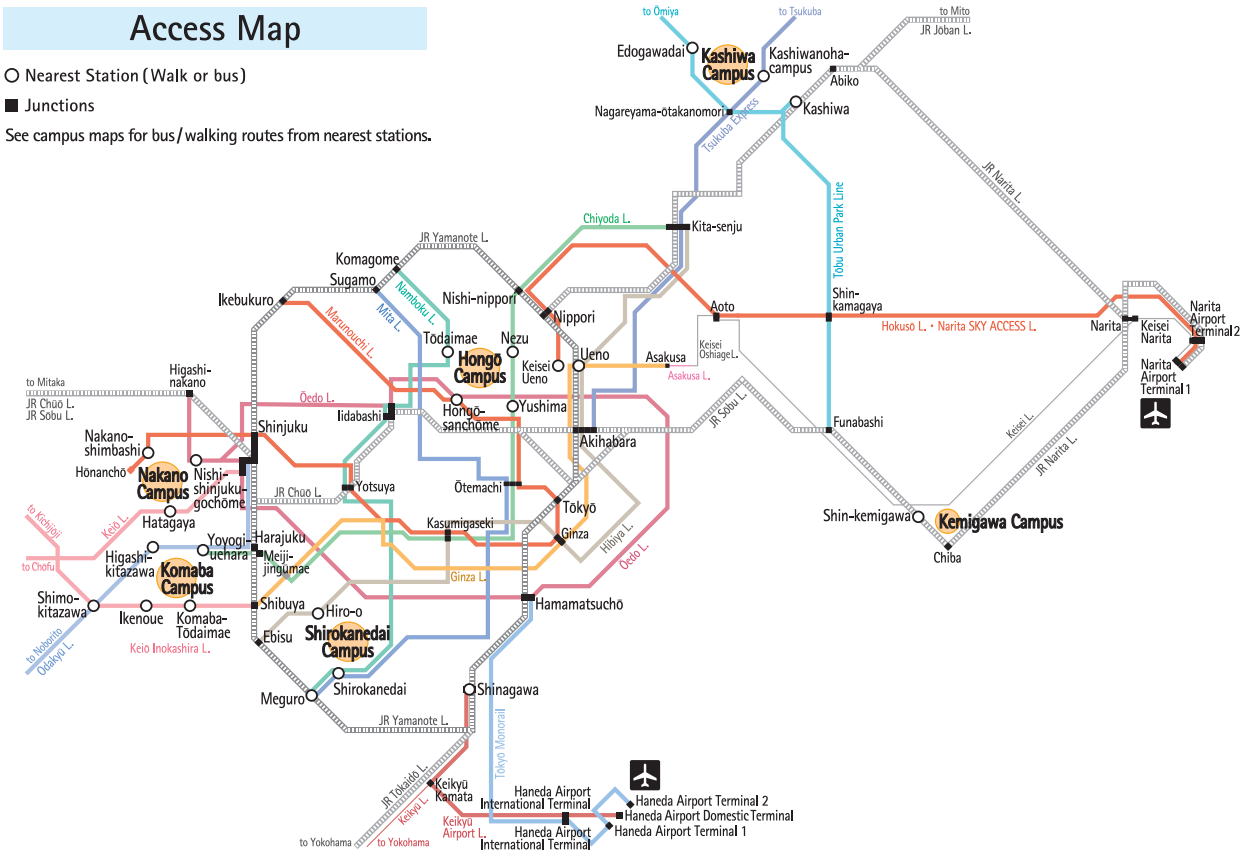

Figure 1: The locations of different campuses of University of Tokyo, as borrowed from https://www.u-tokyo.ac.jp/content/400020133.pdf. I myself and Kavli IPMU are located at the Kashiwa campus, whereas graduate school of mathematical sciences and physics are located in the Komaba campus and Hongo campus, respectively. You can easily move between different campuses by public transportation.

	mathematics	physics
MY as an official supervisor?	Yes	No
MY as a de facto supervisor?	Yes	Yes
most courses	Komaba campus	Hongo campus
Ph.D.	mathematical sciences	science

In order to get a Ph.D. in respective areas you need to have new results either in physics or mathematics. For example, a mathematics Ph.D. thesis should contain some novel results which are well-defined mathematically.[4] This has some important consequences for the graduate studies, especially in initial stages. Nevertheless my intention has been to let you explore your interest irrespective of the university department system, and it is perfect possible to work on very "physics" problems while you belong to the math department, and the other way around.

If you are an undergraduate in mathematics (respectively physics), then it is likely that you choose graduate school of mathematics (respectively physics). There can be, however, situations where e.g. a physics undergraduate students comes to the graduate school of mathematics, to study mathematics as motivated by string theory.

Below I provide some more details of the admission process.

[4]This does not necessarily mean, however, that the thesis should be written in the definition/theorem/proof format. For example, if you are working at the interface of mathematics with other areas (e.g. physics) it could make sense to have some materials which are not mathematically rigorous, as long as the thesis contains novel mathematical contents in other parts.

5 Graduate School of Mathematical Sciences

5.1 Admission Process

Please do check the official website[5] for details of the admission process in the graduate school of mathematical sciences.

The admission process is through submission of application materials, possibly combined with written exams and interviews.[6] Since the information available tends to be limited to application materials only, please do try to include as much information about yourself. In my impression the standard is set to be high: the official document notes that "only excellent students are eligible for this procedure," so please be prepared.

5.2 Graduate Studies

In UTokyo system, a graduates school consists of (1) approximately 2 years of "master course", after which you obtain a master's degree and (2) approximately 3 years of "doctor course," after which you obtain a Ph.D. degree, totaling 5 years by default. Note that everybody first goes through the master's course, contrary to what happens in some other countries where the master course and the Ph.D. courses are separated and only those who will not pursue Ph.D. gets a master's degree.

International students enter into the graduate school either as a master course student or a doctor course student, however those even with international students with master's degree (or equivalent) are often recommended to start from the master course. Since the 5 year graduate studies can be shortened to minimal 3 years depending on the performance,[7] it is considered to be safest option. It might still be possible to start from the "doctor course", depending on the situations.

[5] `https://www.ms.u-tokyo.ac.jp/kyoumu_e/liaison/guide_e.html`

[6] This is contrast with the case of long-term residents in Japan, who need to take written and oral exams.

[7] Obviously higher standards apply if you wish to shorten the 5-year Ph.D. program.

As written in the official website, the "quota" for the graduate school as of this writing is 53 for the master's course (which here means the first 2 years of the 5-year graduate studies), and 32 for the Ph.D. course (which here means the last 3 years (or more) of the 5-year graduate studies), and the typical number of international students are ~ 6 for master's course and ~ 3 for Ph.D course. (The exact number depends on the year, and for example sometimes the actual number can be smaller than the full quota.) This means that basically most of the fellow graduate students are Japanese, along with some international students. Let me add that the ratio of international mathematics students is much higher at Kavli IPMU, at least as of now.

5.3 Lectures

Most of the lectures in graduate school of mathematics are in Japanese. While some Japanese courses are provided by the university, this could be a hurdle for international students. I have been told, however, that in reality graduate-level lecturers write in English on the blackboard whenever an international student is present in the class (the exceptions are undergraduate-level courses, which however are elementary anyways[8]). It is also the case that you will be able to get necessary credits already in the first (or second) year of the graduate school, so in practice this is at least a small (and arguably minor) part of the ~ 5 year graduate period. Besides, there will be people in the math department who will help international students settling down and going through practicalities. If interested in further details, you can contact some IPMU mathematics graduate students.

We have had some international students in the math department in the past, and judging from the comments from various people, it is enough to invest a bit of time learning some basic Japanese characters (Hiragana and Katakana; these are Japanese counterparts of English alphabets and there are approximately 50 of them each).

[8]Some lectures are simultaneously for the graduate students and for the final-year undergraduate students.

Some lectures are on standard materials, but other lectures are on more advanced topics, where the topic is chosen flexibly depending on the lecturer' interest. There are also "intensive" lecture courses, each of which continues for a week and deals with more specitic/cutting-edge topics.

6 Graduate School of Physics

Since I have a Ph.D. in physics and have written many physics papers, it is natural to come to the graduate school of physics. Also, I do research in various areas of physics which goes beyond the framework of "mathematical physics." For this reason I would be very happy to take students from the physics department.

Unfortunately, due to bureaucratic reasons I am not entitled to be your (document-wise) primary supervisor in the graduate school of physics, and this makes the admission process more involved. Here are some more instructions.

In my understanding **all the lectures in the graduate school of physics are in English** as long as there is at least one non-native speaker of Japanese in the class.[9]

6.1 Options

For international students, there are in principle several different options in the graduate school of physics, including[10]

1. "regular" admission process, starting in April of the academic year

[9]The details seem to be left to each instructor, and I heard there can be a few exceptions in some rare cases.

[10]For more detailed information, please check out this page `https://member.ipmu.jp/taizan.watari/inf_guide.html` by Prof. Watari, which contains useful information regarding the application to the physics graduate school.

2. "regular" admission process, starting in September of the academic year

3. Global Science Graduate Course (GSGC). This is a graduate-school program for international students. From the official website: "The GSGC allows its students to obtain their degrees using English only, provides them with financial support in the form of a scholarship, and assists them under the framework of its industry-government-academia cooperation as they seek employment after obtaining their degrees." The GSGC Scholarship program provides a student 180,000 yen per month as a scholarship[11] while he/she is taking the course, two years for the master's program and three years for the doctor' s program. Repayment is not required.

4. Japanese Government (MEXT) Scholarship. There are basically two variations on this, one through the embassy and another through the university.

I would quickly add, however, that some options might not work in practice. For example, some professors take the "regular course" students only in September, since it might be too much to repeat the admission process both in April and September of the same year.

My current recommendation is to apply to both GSGC and "regular" applications process for starting in September[13]; the former comes with a guaranteed financial support but is more competitive, while

[11] According to the physics department webpage, in 2015 the graduate students of the University of Tokyo spent 128,900 yen for the monthly cost of living in average. The master's students spent 113,600 yen and doctor's students spent 142,500 yen. The average monthly housing cost is 58,500 yen.[12] I should add that the cost of living near Kashiwa campus is lower than the areas near the Hongo campus, where most of the UTokyo students study.

[13] The catch is that most of the professors at Kavli IPMU do not seem to take students through "regular" course. I myself do not need exactly how things work, at least you should look into the "regular" course as a possibility. I should also add that GSGC is competitive, and in my impression the number of accepted students is limited each year

the latter is less competitive but financial support not guaranteed as of admission. I should add that in my understanding most of the students do get financial support in the end, from a variety of sources, irrespective of whether or not you are accepted through GSGC—this is however not guaranteed in the admission process. The possible sources of financial support includes (a) JSPS fellowships for young scientists (DC1, DC2) [14], (b) Forefront Physics and Mathematics Program to Drive Transformation (FoPM) [15], (c) Leading Graduate Course for Frontiers of Mathematical Sciences and Physics [16]. I believe there are also TA's for some lectures. The details are time-dependent are subject to change, but the point is there are many schemes for financial support. Some of these programs asks you to pick up a "second supervisor" in addition to your primary advisor, and this can also be an opportunity to interact further with faculties.

6.2 Finding a Primary/Official Supervisor

As stated already, I would be happy to be the de facto Ph.D. advisor for an international student. However, **you still need to find an "official" supervisor for admission/practical purposes.** In other words, you should contact both me and one of the faculties in the list of "primary advisors", who could be your official advisor.

In the past, I have encouragd the applicants to contact high-energy theorist at Kavli IPMU as a candidate "official supervisor". In practice, though, it is difficult to get any commitment in advance before the admission process, and I would therefore suggest that (1) you apply to the graduate school standard admission process, with candidate "official supervisors" specified for admission purposes[17] and (2) you clearly indicate somewhere in the ap-

(again I do not know the exact number, but in my impression only very few GSGC students are admitted in the whole of the Kavli IPMU each year).

[14] `https://www.jsps.go.jp/english/e-pd/index.html`

[15] `https://www.s.u-tokyo.ac.jp/en/FoPM/`

[16] `http://fmsp.ms.u-tokyo.ac.jp/index_e.html`

[17] The "official supervisor" in principle be outside Kavli IPMU, and from different cam-

plication materials (e.g. in essays) that you are interested in working with me in practice.

For your information, here I listed some of the high-energy theory faculties at Kavli IPMU who have the privileges of becoming your official advisor in the graduate school of physics[18]:

- Kashiwa campus, Kavli IPMU: Simeon Hellerman, Kentaro Hori, Shigeki Matsumoto, Hitoshi Murayama, Taizan Watari

If you wish to choose one of them as an official advisor, you should simply apply to their pre-screening process, see their web site[19] for more information. The application materials should be uploaded there directly, and **this needs to be done separately from the department of physics admission process**. The deadline for the pre-screening is in late November in the case of 2020 academic year (this is subject to change in the future: in the past the deadline was earlier, in late October).

Whether a professor is willing to be your "official advisor" while letting me be your "de facto advisor" depends very much on many factors, and can be different from year to year. Some professors never do this these days. But in the end what matters most is how strong your application is, and if you make preference clear in your application materials (e.g. in essays) that will be taken into account in the selection process. The GSGC is highly competitive, and in my impression you need to be close to the top of all the applicants to be admitted this way.

Please be aware that in almost all the cases I cannot judge whether or not to be your (de facto) advisor even you send me a one-page CV; accepting

puses and from different research areas as long as the area is reasonably related to high energy theory. However, having an advisor at different campuses/institutes will make the situation complicated, and this could lead to misunderstanding. I would therefore recommend choosing Kavli IPMU professors, unless you are exceptionally talented and is willing to overcome extra hurdles.

[18]This data is subject to change, please do cross-check with updated information.

[19]See https://member.ipmu.jp/taizan.watari/joint-preselection-HHIW.html

graduate students is a highly non-trivial commitment, and I need to take into account all the information possibly available, which can include your CV but also many other things, e.g. your graduate school application materials, letters of recommendation from your advisors in your school or elsewhere, and sometimes results of in-person video interviews. This practically means that in almost all the cases all I can say that it is OK to apply to graduate school and list me refer to me as a candidate for the de facto advisor. The final decision of whether such an arrangement works or not will be deferred until the very last stage of the admission process (or in some cases in later stages of the graduate school in some exceptional cases).

Finally, while all the things written above are admittedly complicated, I hope you regard this as an opportunity to take initiative yourself and to be actively engage with many professors. Such experience will surely be of use during your graduate studies. Indeed, I have always been encouraging my graduate students to interact with other professors whenever possible, and having someone as an "official advisor" could provide an excellent excuse to interact with him/her on a regular basis.

7 Oxford Option

In addition to Departments of Mathematical Sciences and Physics, there is also a wild card: come to Kavli IPMU through Oxford-Kavli IPMU program.

Since none of my graduate students have used this program in the past, I have not been too familiar with the system, see however `https://www.ipmu.jp/en/research-activities/PhD-programs` for some minimal information. Let me here copy the description there:

"There is also an option to enroll in a PhD program at Oxford University and spend about three years of the time of the PhD program at Kavli IPMU; Kavli IPMU has such an agreement with Department of Physics of the Oxford University. The admission process and thesis defense are run by the Oxford University; class-room lectures are also provided by the Oxford University

in the first year of the program. A part of research activity is done at Kavli IPMU in this option. The student applies to Department of Physics at Oxford. During the interview, Kavli IPMU faculty picks applicants who would be eligible for this joint program. Together with an Oxford supervisor, a joint offer is issued to the applicant. Financial support is taken care of by the Kavli IPMU."

This is an interesting program and I hope some of you will take advantage of this opportunity in the near future.