Research and Higher Education in China

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### Key Numbers and Figures on Education

**China**

<table>
<thead>
<tr>
<th># Universities</th>
<th>1'145(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td># HEI Students (2013)</td>
<td>25.66m.(^3), 23.91m. Undergraduates, 1.47m. Master, 283'810 PHD</td>
</tr>
<tr>
<td># HEI Foreign Students (2013)</td>
<td>157'845(^5)</td>
</tr>
<tr>
<td># Domestic Students in CH / CN (2013/14)</td>
<td>1335(^6), 1152 at University and 183 at UAS</td>
</tr>
<tr>
<td># Domestic Students in CH / CN on Scholarship (2012-14)</td>
<td>316(^7), 53 on Swiss Federal Scholarship, 263 on CSC Scholarship</td>
</tr>
<tr>
<td># Scholarship Offer to CH / CN Students (2006-14)</td>
<td>18 Governmental Full-Scholarships and 30 Tuition-Free-Scholarships</td>
</tr>
<tr>
<td># Number of SSSTC projects funded(^8) (2008-14)</td>
<td>42 Joint Research Projects, 42 Institutional Partnerships, 129 Exchange Grants</td>
</tr>
</tbody>
</table>

**Switzerland**

<table>
<thead>
<tr>
<th># Universities</th>
<th>12(^2), 10 Universities, 2 Federal Institutes of Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td># HEI Students (2013)</td>
<td>229'461(^4), 143'260 Undergraduates, 47'980 Master, 23'237 PhD., 15'197 Other</td>
</tr>
<tr>
<td># HEI Foreign Students (2013)</td>
<td>56'266(^4), 41'514 UNI, 14'752 UAS</td>
</tr>
<tr>
<td># Domestic Students in CH / CN</td>
<td>764 (2013)</td>
</tr>
<tr>
<td># Domestic Students in CH / CN on Scholarship (2012-14)</td>
<td>111(^7), 94 on Chinese Government Scholarship, 17 Other Scholarship</td>
</tr>
<tr>
<td># Scholarship Offer to CH / CN Students (2006-14)</td>
<td>Up to 25 Federal and Cantonal Scholarships</td>
</tr>
<tr>
<td># Number of SSSTC projects funded(^8) (2008-14)</td>
<td>42 Joint Research Projects, 42 Institutional Partnerships, 129 Exchange Grants</td>
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<table>
<thead>
<tr>
<th>GERD</th>
<th>$191b. (2013)(^9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GERD/GPD</td>
<td>2.08%</td>
</tr>
</tbody>
</table>

### Footnotes:

1. Number of Higher Education Institutions, MoE
2. Secrétariat d’Etat à la Formation à la Recherche et à l’Innovation, SEFRI
3. Rectors’ Conference of the Swiss Universities, CRUS
4. Etudiants au Semestre d'Automne 2013/14, OFS
5. First Chinese-Swiss Financial Round Table, FDFA
6. Number of Students in Higher Education Institutions, MoE
7. China Scholarship Council
8. Awarded Project 2008-2016, Sino-Swiss Bilateral Programmes
9. China’s R&D Expenditure Highest Ever, Detenna
10. Research landscape in Switzerland, SNSF

HEI = Higher Education Institutes Offering Degree Programs
GERD = Gross Expenditure on R&D
1. Institutions

Figure 1 - All government and government-affiliated institutions in the fields of research and education in China. Illustration by the DAAD (the German Academic Exchange Service)  

1.1. Chinese State Council

The Chinese State Council, the Cabinet of the Central Government, is the supervisory body of education, science and innovation in China. State Councilor and Vice Premier Mrs. LIU Yandong is in charge of the STE dossiers. She heads the highest science and education policy body, the State Council Steering Group for Science, Technology and Education, which approves Five-Year Plans and long term strategy papers.

The following institutions, all on the same level, are all directly overseen by the State Council.

1.2. Ministry of Science and Technology (MoST)

The Ministry of Science and Technology (MoST) draws up Science and Technology policies, laws and regulations. It steers national research programs ranging from basic research to technological R&D and innovation, with the strongest focus being on the latter two. MoST also directly administers research funding instruments, some of them in cooperation with international partners. MoST’s budget for 2013 was RMB 29.7 billion (CHF 4.5 billion), an increase of 4% over the previous year’s budget.

11 DAAD, Forschungslandschaft in China
MoST, like most Chinese ministries, has strong and partly autonomous branches on provincial, municipal and county level, who implement the national programs.

MoST is headed by its Minister Mr. WAN Gang, who is assisted by seven Vice Ministers, each of whom is in charge of one department within the Ministry. (Appendix 1)

1.3. Ministry of Education (MoE)

The Ministry of Education (MoE) is responsible for all aspects of education, including elementary education, professional education and higher education. MoE funds and supervises the universities. As with MoST, a large part of MoE’s mandate is fulfilled through local branches of MoE. MoE also evaluates academic programs and degrees offered by the universities, through the State Council Academic Degree Committee, affiliated to MoE, and through its subordinate local academic degree committees.

MoE is headed by Mr. YUAN Guiren, who is assisted by six Vice Ministers. Each of whom is in charge of one department within the Ministry. There are two Assistant Ministers are of the same rank, who assist the Minister directly, without being in charge of an organizational department. (Appendix 2)

1.4. Natural Science Foundation of China (NSFC)

The NSFC 12 is the largest Chinese research funding agency for basic research and application-oriented research in the natural sciences. It is modeled after Western research funding agencies, with one annual call for proposals, a peer review system and seven disciplinary evaluation panels. It is financed directly by the State Council and thus largely independent of other government institutions. Historically, it is close to the Chinese Academy of Sciences CAS (see below), and most panel members of the NSFC are also members of the CAS (“academicians”). NSFC does not fund research in the social sciences and the humanities (there is little public competitive funding for these disciplines in China).

NSFC’s budget (2014) was RMB 19 billion13 (CHF 3 billion), an annual growth of 24% for the last five years14. The success rate for proposals was 22%. The average funding for a three-year project was RMB 738’900 (CHF 110’000). For priority areas the project duration is longer and funding higher, but lower than the spending levels of the large-scale priority programs of MoST. NSFC grants, like all competitive grants in China, are not spent on researcher salaries (which are paid by the university or research institute), but fund infrastructure, equipment and other costs like travel.

The current president of NSFC is Mr. Yang WEI, a former professor of solid mechanics and former president of Zhejiang University.

Further reading:
Fact Sheet on NSFC, STE section, January 2014

1.5. The Chinese Academy of Sciences (CAS)

The Chinese Academy of Sciences (CAS) 15 is a network of research institutes, a learned society with merit-based membership of “academicians”, and a higher education system, all in one.

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12 NSFC
13 Natural Science Foundation of China 2014 Budget
14 National Science Foundation Beijing Office, April 2012
15 CAS
CAS comprises over 100 research institutes; each one specialized in a research field in the sciences and engineering. The two CAS universities offer postgraduate courses, where students are mostly embedded in one of the CAS institutes – a higher education system parallel to the universities of the Ministry of Education. Most large-scale research infrastructures in China (e.g. the Shanghai synchrotron, the Beijing electron positron collider) are part of CAS. Also, CAS has launched hundreds of technology spin-offs, Lenovo being the most prominent.

In total, CAS has a research staff of almost 50'000, 19'000 in professor or associate professor positions. The budget of CAS for 2013 was RMB 46 billion (CHF 7 billion), an annual increase of 9.5%.

1.5.1. CAS reform

Currently, CAS is embarking on a reform plan to be completed by 2030. The goal is to de-bureaucratize CAS, to reduce overlap among different CAS institutes and synchronize their efforts. CAS research institutes will be sorted into four functional categories to give each one a clearer mandate and a clearer position in the innovation chain:

1. **Centers of Excellence** focused on basic research in long-term strategic priority areas.
2. **The Innovation Academy** will target areas with underdeveloped commercial potential and aim to streamline the value chain "from research lab to market".
3. **Big Science Research Centers** will host large-scale research infrastructures.
4. **Specialized Research Institutes**, whose role is not yet completely clear, focus on development with trans- and interdisciplinary perspectives and policy advice.

Further reading:

*Chinese Academy of Sciences*, bulletins-electroniques, December 2013

1.6. Other key academies and associations

The *Chinese Academy of Social Sciences* (CASS) is the largest academic research organization in the humanities and social sciences in China. In a structure similar to CAS, it comprises around 30 number of specialized and partly independent research institutes, around 50 research centers and a graduate school. CASS was established in May 1977, growing out of the Department of Philosophy and Social Sciences of the Chinese Academy of Science. It covers the fields Philosophy, Literature, History, Economics, Political Science, Law, International Studies and Marxist Studies. It is at the same time close to the Chinese central government – with an advisory role on policy and reform plans – and politically exposed and sometimes under pressure of the government or the communist party (see 3.5) CASS has 31 research institutes, more than 50 research centers, and one graduate school. The CASS budget for 2013 stood at RMB 2.47 billion (CHF 370 million).

The *Chinese Academy of Engineering* (CAE), originally a spin-off of CAS, is a learned society for engineering sciences, directly under the Chinese State Council. CAE provides consulting services to the government regarding the development of engineering and technical projects. Its current president, Mr. ZHOU Ji, is the former Education Minister.

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17 [CASS](#)
18 [CASS Publishes 2013 Budget](#)
19 [CAE](#)
The Chinese Academy of Agricultural Sciences (CAAS)\textsuperscript{20}, again similar in its structure to CAS, oversees 42 research institutes in both basic and applied agricultural sciences as well as a graduate school. It has assumed an important role in the development of China’s rural areas.

The China Academy of Chinese Medical Sciences (CACMS)\textsuperscript{21} is the largest national comprehensive institution for research and education on traditional Chinese medicine (TCM). Moreover CACMS provides medical service for patients at affiliated hospitals.

The main function of the China Association for Science and Technology (CAST)\textsuperscript{22} is the dissemination and popularization of scientific knowledge. It also represents the interests of scientists as professionals and advises the government in science policy. CAST has a highly decentralized structure: It consists of 180 member societies (in specific scientific disciplines) and has strong local branches on provincial and county level.
2. Education

2.1. Education System: Overview

Figure 2 - Education System in China
2.2. Elementary education

The education system provides compulsory education for 9 years: six years of free primary education starting at the age of six or seven, followed by three years of secondary education. Secondary school education is divided into two separate tracks: the vocational track and the academic/general track. The choice is mostly left to the parents, but vocational schools have a lower tuition fee and many remote areas lack academic schools. Therefore some students are forced to follow the vocational track due to financial reason or to the great distance to commute.

After the secondary education, students who continue must take an examination test; based on the test and partly on their choice, they continue studying for three years either in a vocational high school or in the general track (or academic) one. In the general track, students choose either humanities or science as their major.

2.2.1. PISA results 2012

In December 2013, the OECD Program for International Student Assessment (PISA) released the results of its 2012 tests. Students in East Asian nations achieved the best results worldwide, students from Shanghai ranked first\(^{23}\). There are a number of different factors that try to explain this fact:

In China itself, its success in PISA is often attributed to an excessive focus on rote memorization, due to the traditional importance of tests in China.\(^{24}\) The OECD itself explains the success of the Shanghai children with China’s century-old cultural emphasis on education as the only way of social advancement, grounded in the imperial examination (keju) of old times. In addition to the emphasis on education, China’s Confucian cultural background is said to foster the student’s reverence for their teacher through rituals and stern discipline, providing “a culture that prizes education and respects teachers”\(^{25}\) while the Western education model is deplored as being too soft on the students.\(^{26}\)

Besides these cultural explanations, some experts and pundits cite Chinese education policy as the cause of success, citing peculiarities of Chinese teacher education, teaching methods, the incentive structure for teachers, the composition of the curricula and other smart policies.

A third group of explanations considers the PISA results to be biased. For one, “Shanghai is not China” and rural students might perform less well in school. There has been a controversy about unofficial PISA tests being taken in nine poorer provinces of China.\(^{27}\) The OECD has alluded that results in these provinces were surprisingly good.\(^{28}\) However neither the Chinese government nor OECD has published the actual data\(^{27}\). PISA 2015 is planned to include rural provinces and will thus hopefully settle this debate.

Another, more subtle bias is described by the “missing children hypothesis”\(^{29}\) many migrant families living in Shanghai send their children back to rural villages as they approach gaokao age; others have left their children with relatives in their home village in the first place. All over the world, migrant children tend to be less successful in tests at school. Therefore the average performance in Shanghai is boosted by the absence of migrant children. The results are thus “biased”, not because of sampling errors, but because of a bias in Shanghai’s population, caused by the very particular socioeconomic policy of hukou registration. However, other East Asian participants, which do not know a hukou system, also perform much better than the rest of the world, namely Hong Kong, Taiwan and South Korea. There remains something to be explained about that East Asian success.

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\(^{23}\) PISA 2012 Ranking, Wikipedia
\(^{24}\) Why China’s Not Gloating About Topping Global Test Results, WSJ, December 2013
\(^{25}\) Thomas L. Friedman, The Shanghai Secret, October 2013
\(^{26}\) Chris Baumann, Das konfuzianische Vermächtnis, NZZ of April 29 2014 (not available online)
\(^{27}\) Tom Loveless, PISA’s China Problem Continues, January 2014
\(^{28}\) China: The world’s cleverest country?, BBC, May 2012
\(^{29}\) Tom Loveless, Lessons from the PISA-Shanghai Controversy, March 2014
2.2.2. Impact of the Hukou System on Education

The Hukou is the Chinese household registration. It was designed to control government welfare and limits the number of migrants coming to big cities from poorer regions. In cities like Beijing, for example, you need a Beijing Hukou to possess a car, place your child in school or buy an apartment. The standard education system as described above is sometimes hindered by the Hukou system: Children have to go to school to the province where their Hukou is issued but the level of education differs significantly among regions and the schools. When children of migrant workers move to the city with their parents, it is very complicated and expensive for them to have access to education, as they still have a Hukou from their hometown. Some children do not have a Hukou at all, e.g. when they were born "illegally" under the One Child Policy. Being out of the system, children with the wrong Hukou or none at all suffer from reduced access to education.

Further reading:
Down and out in rural China, The Economist, April 2014

2.3. Entrance Examination to Higher Education (Gaokao)

After the high school graduation, most students, from both high school institutions, take the college entrance examination (高考, Gaokao) according to their designated track. Vocational high school students do not pursue any particular track during the 3 years of their education, therefore, making it difficult for them to enter the university based on their Gaokao score as they compete with student of the academic track. The test is taken over two days in June each year and is based on three core courses – Chinese, Mathematics, English – and three elective courses depending on the track chosen in high school: Humanities or Sciences track (Figure 2). The outcome of the test determines at which university and for which major a student can apply according to the track pursued. Therefore, the Gaokao is the “one and only” opportunity for high school students to enter university, infamous for putting pressure on the students, and extensively covered and discussed in Chinese media.

One of the most controversial aspects of the Gaokao is its regional inequalities on admission: Every university in China has separate quota for students of its own province as well as for students of every other province. The candidates are ranked based on their Gaokao score and admitted by their respective provincial unit. Thus, students from a province with many distinguished universities, such as Beijing, Jiangsu or Shanghai, have a higher chance of being admitted to a good university than students from densely populated provinces, such as Shandong or Henan, even with the exact same score in the Gaokao. In addition, students can only sit for the Gaokao in the province of their Hukou registration, i.e. in most cases the province from where their parents are. Thus children of migrant workers in Beijing or Shanghai for instance, need to go back to their home province to take the Gaokao. This situation raises two issues. Firstly the Gaokao exam formality and content vary from region to region, therefore putting students who have received high school education in one region but
take tests in another in a highly disadvantaged situation. Secondly the provincial quota for the outsider students is lower than for the local ones and they need to do much better compare to their classmates in Beijing and Shanghai in order to be accepted in a university there. There is an ongoing public debate about these issues and a reform of the Gaokao is currently being undertaken (see below).

2.3.1. Gaokao Reform

A reform of the entire Gaokao system has been announced in September 2014. It will first be implemented in Zhejiang and Shanghai by 2017, nationally in 2020 (Figure 3). Many aspects of the reform are still under debate; Figure 3 provides an overview. At High School level, the different Humanities and Sciences tracks will be merged into one general education track.

To graduate from high school, the students need to finish the required curriculum and pass an academic proficiency test (APT) which covers the three core courses, all elective courses and the additional courses pursued. The test can be taken at any time during high school and separately for each subject, twice.

The APT will allow access to vocational higher education and to university of applied sciences (UAS) (see 2.4.1) – these students no longer need to the Gaokao. Students in secondary vocational education will be able to qualify for tertiary vocational college by taking a provincial level general knowledge test and a standardized skill test—which could be understood as “vocational Gaokao”. The process to enter a UAS is likely to follow the same path. After the general knowledge and skill test, candidates will need to pass an additional admission test. The detailed assessment and admission system for UAS is still being implemented. Students who wish to switch from the academic track after high school, aiming for tertiary vocational education shall submit their APT records and take a professional aptitude test organized by the prospect school – they do not need to take the Gaokao either.

The new Gaokao will thus be confined to the academic track, where it remains an important admission test for academic universities. University admission will be based on the total score of the three core courses of the Gaokao and on the total score of APT of three elective ones, and the university enrollment requirements. The choice of elective courses depends on personal interest, academic performance as well as the requirement of the anticipated university program. Universities will publish application criteria for zero to three elective courses for each program 3 years in advance. An applicant’s portfolio needs to include the APT score of at least one of them in order to be accepted at the university.
Figure 3 - Education System after Gaokao Reform (2017)
2.4. Vocational Education Training (VET)

Chinese students have the option of a dual track system, an academic and a vocational track. However, there is a well-established consensus across the nation that the VET track is inferior, both in quality of education and in career prospects. The vocational track is therefore mostly only considered when access to the general education track is impossible. Once enrolled in the vocational track, permeability to the academic track is very low.

The vocational education sector has thus been object to a number of reforms, with the goal of making the vocational track more attractive. One of them is the Gaokao reform (see 2.3.1), another one the introduction of a new type of school, Universities of Applied Sciences.

2.4.1. VET Reform: University of Applied Science (UAS)

China has more than 1100 universities, of which about 640 used to be higher vocational colleges that only recently “upgraded” themselves to academic universities. Since 2014, MoE recommends/advises/pushes those 640 universities to shift their focus back on applied sciences and reshape themselves into Universities of Applied Sciences, offering Bachelor and Professional Master degree programs. Up to now there are 45 members of the Association of the Universities of Applied Sciences AUAS in China. 30

Further reading:
China Moving Towards Dual Track Education, STE section, April 2014

2.5. University Education

2.5.1. “211” and “985” universities

“Project 211” was established in 1995 by the Central Government with the goal of raising the education and research standards at 100 key universities. The name of the program results from an abbreviation of “100 Key Universities in the 21st century”. At present Project 211 encompasses 112 universities, both on the state and on the local level; 3 of them are military academies.

The “211” universities were provided with additional funding to improve the quality of their infrastructure, education and research facilities. The third phase of Project 211 started in 2008, when RMB 10 billion (CHF 1.5 billion) were allocated to it from the central budget. The fourth phase of Project 211 started in late 2013 / beginning of 2014.

“Project 985”, established in May 1998 (hence its name), focuses even more on elite universities by selecting 39 institutions to become “world-class universities”. (Figure 4)
Both the “211” and the “985” universities are concentrated in the provinces of Beijing, Jiangsu and Shanghai (see the full list of “985” and “211”). This is a major reason for student migration from remote provinces to more developed regions in East China.

After the launch of the two projects, it was the major ambition of any Chinese university to be included in the programs in order to receive more funding and visibility, resulting in irrational and excessive expansion of many universities. To address the issue, the Ministry of Education has increased funding support for non-211 and non-986 universities and has stopped further expansion of the programs to include new universities.  

As a consequence of the 211 and 985 projects, China’s education landscape is split between well-financed “top-level universities” and mostly underfunded second-tier universities. This imbalance remains the biggest challenge in China’s education sector until today. The Ministry of Education has tried to address this issue by improving the education quality of the provincial institutes. However, the quality of the education in these local institutes is regarded as inferior. This results in a situation where prestigious universities are overcrowded with applicants and mediocre institutes struggle to find enough students – and their graduates struggle to find a job.

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31 Yuan: The Door for “211” and “985” Closed Forever
2.5.2. International University Rankings

The number of Chinese universities that are present in the Top 500 in various rankings has been increasing. Chinese universities generally rank high in terms of the number of articles published, the quality of infrastructure and the number of faculties and students. Regarding the impact of academic papers and publications in key science journals, Chinese universities are generally ranked low. Chinese universities also face a disadvantage due to some methodological issues, e.g. the tendency to favor old institutions by counting the total number of past Nobel prices. On the other hand, they might benefit from the focus of most rankings on natural sciences and engineering.

Probably the most well-known ranking in China is the “Academic Ranking of World Universities” (ARWU), created and updated by Shanghai Jiaotong University. The best ranked Chinese universities in ARWU 2014 are:

- Peking University (101-150)
- Shanghai Jiao Tong University (101-150)
- Tsinghua University (101-150)
- Fudan University (151-200)
- University of Science and Technology of China (151-200) [Hefei, Anhui Province]
- Zhejiang University (151-200)

The ARWU is a very important indicator for Chinese students when they decide about their study destination abroad. Jiaotong’s ranking for 2014 listed ETHZ 19th, the highest ranked institution from a non-Anglophone country, and generally lists Swiss universities quite favorably. The ranking from the Times magazine comes to a similar conclusion for the Chinese institutes.

2.5.3. Tuition fees, Scholarships, Loans

As requested by the Chinese state council, tuition fee for Chinese universities remained the same between 2000 and 2013. The average tuition fees at all Chinese Universities are ranged between RMB 4000 to RMB 6000 (CHF 640 - 950) per academic year for bachelor’s degrees, depending on the region and the major. For certain majors, namely medical sciences, engineering, foreign language, art and music, the tuition fees are higher (RMB 8’000 – 15’000). The fees for all master’s degrees (except MBA-type programs) also vary, ranging from free education (legacy of the planned economy) to RMB 15’000 per academic year. In late 2013 the Ministry of Education has authorized universities to raise tuition fees for both bachelor level and master/phd level education but has vowed to provide more scholarship opportunities. Under the new regulation, graduate programs should be charged between RMB 8’000 – 10’000 and free education opportunities are no longer provided.

On the central government level, the Ministry of Education offers around 50'000 national scholarships a year at RMB 8’000 each (equivalent of the tuition fee). In addition to the national scholarship, other opportunities are available via municipal government, universities and various foundations. The scholarships can be linked with conditions other than academic merits such as the choice of major (e.g. agriculture, forestry, education), willingness to work in remote regions or specific industries (mining, primary education) after graduation.

Alternatively, eligible students can apply for low-interest study loans through their schools and the four national banks of China (China Agriculture Bank, China Construction Bank, China Industry and Commerce Bank, Bank of China). During four years of study the interest rate on the loan is covered by the government. A low interest rate is added once the student graduates, and he/she is expected to pay off the loan within 6 years. Her employer can also choose to pay off the loan first and claim the payment through monthly payroll deductions.

32 ARWU 2014 for Chinese Universities
33 Times University Rankings 2014-2015 for Asian Universities
34 Postgraduate Studies Shunned As Free Tuition Scrapped, University World News, May 2014
2.5.4. Studying Abroad

A large number of Chinese students study abroad. By 2012, a total of 2.64 million students had received overseas education (Figure 5), among which more than 90% are self-supporting\(^3\). Chinese students have become the largest source of international students for major education markets such as in the US (235,597 students between academic year 2012/13, 28.7% of the total international student group)\(^3\), Australia (94'901 students between 2012/13 academic year, 38.7% of the total international student group)\(^3\) and UK (83'790 students between 2012/13 academic year, 19.8% of the total international student group)\(^3\).

![Chinese Students Abroad](image)

Figure 5 - Number of Chinese Students Studying Abroad from 2000 to 2012

Chinese government scholarships are administrated by the China Scholarship Council (CSC). In 2014, CSC financed ca. 21'350\(^3\) students and researchers to study abroad in a variety of programs, ranging from the bachelor and master programs to PhD and visiting scholars programs. Holders of CSC scholarships are required to return home immediately after completing their studies, and should work in China for at least 2 years before going abroad again.

A research done by *China Study Abroad Report 2012* found that as the number of Chinese students studying abroad is increasing, their age of departing China lowering\(^4\). A growing number of Chinese high school students prepare for the U.S. American SAT test and apply directly for American universities instead of taking the Chinese college entrance examination (*Gaokao*). The number of mainland Chinese students taking SAT tests in Hong Kong more than tripled in the past decade, rising from 7'000 in 2007 to more than 30'000 in 2013\(^5\). In the meantime, in order to attract prospective Chinese students, foreign universities start to accept Gaokao score in application as well. In Australia

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\(^3\) China Education Online, Study Abroad Report 2013
\(^3\) Number of Chinese Students Studying in the United States, Homeland Security
\(^3\) Institute Of International Education
\(^3\) Invitation To Britain, Estates Gazette, May 2014
\(^3\) China Scholarship Council Application Guideline 2014
\(^4\) China Study Abroad Report, Social Sciences Academic Press (China), 2012,
up to 60 percent of colleges and universities now accept Gaokao as an application credential after the University of Sydney led the way in 2012.\textsuperscript{41}

The Chinese government has made substantial efforts in recent years to attract overseas students to go back and work in China. Well known incentives include “Thousand Talent Program”\textsuperscript{42}, among other talent programs. The initiative offers high-achieving Chinese scholars abroad generous research funding if they return to a Chinese university. According to official numbers, more than 4'000 high profile returnees have been recruited under the initiative since the beginning of the program. State media reports that by 2013, 3 million people have left the country for reasons connected to education, and 1.44 million have returned. However, a study has suggested that the majority of the high-quality Chinese graduates still choose to stay abroad. A study for the American National Science Foundation in 2009 found that 92% of Chinese who graduated with a PhD in America in 2004 were still living in the US, five years after graduation\textsuperscript{43}.

Further reading:

- Returning students: Plight of the sea turtles, The Economist, July 2013
- Better Grad Programs Keep Students At Home, China Daily, November 2014

2.5.5. Foreign students in China

China is also attracting more and more foreign students. According to the Ministry of Education, a total of 328,330 foreign students were studying in China by the end of 2012, among them about 28'768 were sponsored by the Chinese government. The majority group of the international students is from Asia (66.32%, down from 81.93% in 2009). South Korea, the United States, Japan, Thailand and Russia are the top five countries. In 2012, the number of students from Africa increased by 30%. The most favored majors include Chinese language, traditional Chinese medicine, agriculture and Chinese culture and history. Economics, management and natural sciences have also become popular in recent years. The number of degree students reached 133'509 in 2012, up from 7'406 students in 2008, the rest of the students are enrolled in short study programs, exchange programs and language courses. Recently international MBA programs offered by Chinese business schools have gained popularity among international students due to the rising economic importance of China and the increasing value of China expertise among companies.

To consolidate China’s image as an international study destination, the Chinese Ministry of Education launched a “Coming to China” plan aiming at having 500’000 foreign students studying in China by 2020. To reach this goal China plans to actively enter bi-/multilateral agreements on education exchange, increase scholarship opportunities as well as offer more quality programs taught in English.

Some foreign universities have established branches in China and confer a joint degree:

- University of Nottingham Ningbo, Zhejiang (2004);
- Xi’an Jiaotong-Liverpool University, Jiangsu (2006);
- New York University Shanghai (2013);
- Duke Kunshan University, Jiangsu (2014)
- Chinese University of Hong Kong, Shenzhen (2014)

Further reading:

- Chinese MBA Programs Becoming More Competitive and Attractive, China Smack, January 2013
2.5.6. Job prospects for University graduates

Until 1986 university graduates were assigned to job posts based on state quota. The employers were subject to a yearly quota for hiring university graduates but had no opportunity to interview their prospective employees before they were hired. The reform started in 1987 and was completed in 2007, when the University of Tibet was the last university to put an end to the half-century long history of this job-assigning mechanism.

Chinese universities are now producing 7 – 8 million graduates each year, and recent global economic crisis have created increasing difficulties for graduates to find a job. According to China Household Finance Survey 2012, unemployment rate for the 21-25 age group holding a bachelor or higher degree is 16.4%44.

2.5.7. Massive Open Online Courses (MOOCs)

In 2013, Cousera and edX, two major MOOCs platforms launched by Stanford, and MIT and Harvard respectively, partnered up with Chinese universities to offer their free and high quality courses online. Responding to the challenges such as the ban of YouTube on which most lectures are uploaded as well as language barriers, both platforms are working closely with local portal websites. Cousera has even started to provide Chinese versions of a few courses to raise their profiles in China.

Local platforms adjusted to Chinese student’s needs in term of language, internet speed to load videos and course materials appeared within the same timeframe. They respond to the challenges faced by foreign platform. With MOOCs, Chinese universities get the chance to raise their international profiles and share its culture and knowledge to students all over the world.

With this new way of education a number of questions and issues have emerged such as cheating, copyright in course material, fake certificates or endanger academic jobs. Course certificates can indeed be earned (against a fee) but it is still not clear to which extend it would be recognized.

Moreover the Chinese government has not given a limpid statement on its strategy towards MOOCs yet. In addition to the problems caused by a technical and legal perspective, some academics are concerned that foreign doctrine might be imported via MOOCs and will affect the Chinese ideology.

Further reading:

Massive Open Online Courses, STE Section, February 2014

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44 Youth Unemployment in China: A Crisis in the Making, CNBC, February 2014
3. Research

3.1. Priority areas

China’s science and technology sector features a strong top-down approach in terms of policy-making and research funding. Research funds are distributed according to politically defined priority areas. Funding is also program-driven, i.e. most funding comes with clear administrative and academic conditions. A recent policy focus is on “technology parks”, with the goal of transferring technology and facilitating high-tech university spin-offs.

The current priority areas are defined in the “Medium- to Long-term Strategic Plan for the Development of Science and Technology 2006-2020”. The strategy is heavily oriented towards applicability, industry and focused on priority areas.

- Core electronic devices,
- High-end generic chips and basic software,
- Super large-scale integrated circuit manufacturing technology and associated techniques,
- Next generation broadband mobile telecommunication,
- High-end numerically controlled machine tools and basic manufacturing technology,
- Development of large oil-gas fields and coal-bed methane,
- Large advanced pressurized water reactors and high temperature gas-coolant reactor nuclear power stations,
- Water body contamination control and treatment,
- New genetically modified varieties,
- Major new drugs,
- Prevention and treatment of major infectious diseases such as HIV/ADIS and viral hepatitis,
- Large passenger aircrafts,
- High resolution earth observation systems,
- Manned space flights,
- Moon probes

Further reading:
China Is Investing More Than Ever In Science, But It’s Not Paying Off, Quartz, October 2013
China Goes Back To Basics On Research Funding, Nature, March 2014

3.2. Major Research Programs

Several big research programs have been initiated by the central government, with hundreds of individual research projects running and thousands of researchers being involved in each program. They provide infrastructure as well as competitive funding in strategic priority fields. Globally, they constitute about 20% of government R&D spending. The research programs are designed in opaque consultation mechanisms, and their stated goals and covered fields sometimes overlap. As a result, the landscape of research programs is difficult to grasp. The following programs are the largest programs still running:

The 973 Program (National Basic Research Program) administered by MoST funds projects in basic research, is China’s largest basic research funding. In 2013, RMB 3 billion in 2013 has been allocated to support 184 projects. On average, every single project enjoys a strong support of up to 20-30

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45 973 Program
46 973 Program, OpenChina-ICT, January 2013
million RMB over a span of 2+3 years with a mid-term review after 2 years. The large funding that benefits each project may lead to corruption scandals when the grant falls in the hands of few persons with inadequate auditing efforts.\(^{47}\)

The **863 Program (National High Technology Program)**, named after the date of its establishment in March 1986, funds R&D projects in advanced technologies such as spaceflight, information science, laser, automation, energy, new materials and oceanography. It is strongly application-oriented and administered by the Ministry of Science and Technology (MoST).

Launched in 1988, the **Torch Program** is China’s most important high-tech industry program. It funds development projects for high-tech products in advanced industries. Under the Torch program, high-tech industrial development zones have been established throughout the country.

**Further reading:**

[China plans super collider](http://www.nature.com/nature/journal/v512/n7513/full/5120730a.html), Nature, July 2014

#### 3.3. Technology Transfer

Research findings and patent at Chinese universities and research institutes have been technically “state-owned” before 2014—thus incentives for researchers to commercialize technologies are low. Various reforms have been enacted by the Chinese government in 2014 to encourage technology transfer and technology commercialization, aiming to bring technologies faster to market. Since January 2014, universities and research institutes in Beijing are fully authorized to license their technologies without having to report to authorities. They are also allowed to keep the income of technology transfer as incentives to the research team—with no less than 70% of income going directly to the researchers that contributed to the research finding, a great leap from the previous reward of no more than 20%. The new policy encourages university-based researchers or students to take “unpaid entrepreneurial leave” or to take a side job at a Zhongguancun-based technology company, the “China’s Silicon Valley”. It also calls for universities and research institutes to hire professional talents, or “technology transfer managers” to help speed-up the process.

Although the policy offers greater autonomy and mobility for researchers and provides more generous incentives for commercializing technologies, the research institutes and universities are still “state-owned” by nature and therefore still bound by bureaucratic regulations, especially in terms of HR management. De-bureaucratization remains a challenge and an ongoing effort for universities and research institutes in China.

**Further reading:**

[Beijing Universities Technology Transfer](http://www.ste-section.org/), STE Section, February 2014

#### 3.4. Controversy on funding system

In 2010, Professor RAO Yi from Peking University and Professor SHI Yigong from Tsinghua University co-authored an editorial in the journal *Science*, titled “China’s Research Culture”.\(^{48}\) The article created a huge discussion in China regarding widespread corruption in the distribution of funding. The two professors argued that the current top-down approach of funding distribution has forced scientists to spend too much time on building connections with decision-makers, rather than doing actual research. Also, young researchers are deprived of funding due to lack of connections. PU Muming, an eminent neuroscientist, defended the science policy in an interview, claiming that the problem lies within the

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\(^{47}\) [Chinese Academician Snagged In Corruption Dragnet](http://www.sciencenews.org/view/generic/id/8515/), Science News, August 2014

\(^{48}\) [Chinese Animal Cloner Charged With Misuse Of Funds](http://www.sciencenews.org/view/generic/id/8515/), Science News, October 2014

[China’s Research Culture](http://www.sciencenews.org/view/generic/id/8515/), Science, 3 September 2010
“Chinese culture” rather than the scientific system. As Pu Muming himself is one of the main beneficiaries of the 973 basic research programs, his reply only spurred an even more intensive debate. The highest authority in the field, State Councilor LIU Yandong has since promised to put “reform on funding distribution” on top of the agenda for the Ministry of Science.

Further reading:
Pillars of Reform, Nature, 29 October 2014

3.5. Academic freedom

In summer 2014 a discipline inspector of the Communist Party accused the Chinese Academy of Social Sciences of having four major “ideological problems: (a) using academic research as a disguise for other purposes, (b) fabricating false theories using the Internet, (c) conducting "illegal collusion" during politically sensitive times, (d) receiving peer-to-peer infiltration from foreign forces. This widely published accusation is generally seen as a warning to social scientists to conform politically and to be cautious when taking funds from Western foundations with possible political motives, e.g. the Ford Foundation.

In a similar spirit, three prestigious mainland universities, Peking University, Fudan University and Sun Yat-sen University, have vowed in 2014 to strengthen ideological control over students and teachers. This includes controlling comments of students and faculty on the internet, training faculty (aged under 45) to have a “correct understandings” of the problems that China is facing. Some universities, e.g. Peking University, have “students cadre” designated to report any anti-party behaviors among other students. Several teachers have been barred from teaching for their critical point of view: Legal scholar Zhang Xuezhong, who was teaching at the East China University of Political Science and Law in Shanghai, and of Xia Yeliang, reported on Weibo that professors at the university had been asked to avoid seven topics in their teaching, including universal values, press freedom and civil rights, judicial independence, and the Communist Party’s past errors. His post had a big success among the public and his Weibo account has been closed.

Another prominent case has been the dismissal of Xia Yeliang, former economics professor at Peking University. Many western media attributed his dismissal to his outspoken political views, while Peking University claims it is due to academic underperformance.

Further reading:
Peking University Expels Liberal Economist Xia Yeliang, South China Morning Post, October 2013
GW Abandons Potential Plan to Build Campus In China, GW University, February 2014
Inspector Questions Cass Ideology, Global Times, June 2014
3 Universities Pledge To Uphold Party Ideals On Campus, New York Times, September 2014
Three China Universities Vow To Strengthen Ideological Control Over Students, Teachers, South China Morning Post, September 2014
Even in China, Dissidents Sometimes Get Fired Just For Being Bad At Their Jobs, Peking University, October 2014

49 PU Muming, China’s Science and Technology: Where are the problems?, December 2012
3.6. Intellectual Property Rights (IPR)

Since 2001 and its accession to the WTO, China has undertaken major revision of its IPR regulations and laws. However, in practice, the effective enforcement of these reforms remains a significant challenge. China confirmed the need to strengthen the IP regime in its 12th Five-Year-Plan (2011-2015)\(^50\). In November 2014, a special court for intellectual property rights (IPR) cases opens in Beijing and two similar courts in Shanghai and Guangzhou will follow by the end of the year.\(^51\)

3.6.1. Patent System

With international companies such as Apple, Samsung or Sony being brought to court for patent infringement, intellectual property has become a burning topic in China. In 2009, Schneider Electric was found guilty in a patent infringement trial and was to pay $23 million. It remains the China’s largest patent verdict to this date and helped raise awareness, locally and internationally, of the potential value of Chinese patents.

Three types of patents are available in China\(^52\):

- **Invention patents** protect inventions with new technical solution and represent a notable progress. They provide 20-year protection.
- **Utility patents** protect new technical solution relating to the shape, the structure of a product and represent a progress. They provide a 10-year protection.
- **Design patents** protect any new design of the shape, pattern or color, or their combination. They provide 10-year protection.

China has been the world leader in annual patent application since 2010 and is partly due to the nation’s emphasis on R&D. China spends almost $300 billion on R&D in 2012, second behind the US. “The growth in patent applications\(^53\) shows that both individuals and enterprises are paying more attention to intellectual property protection by patenting their inventions,” said Gan Shaoning\(^54\), the deputy director of the China’s State Intellectual Property Office. The government incentives such as financial remuneration, tax breaks and other benefits offered by the government in exchange for the filing of patents may contribute to the number of patent applications. They cause the researcher to focus on patent quantity rather than patent quality. There is also abundant criticism of the Utility Model (UM) patents. They carry the same protection as invention patents such as the necessary legal tools to induce substantial fines (e.g. $23 million for Schneider Electric). However, they are quicker (3-6 months) and cheaper to obtain. As a result, they are often of low quality since the UM do not require the substantive examination of an invention application. Many of them are merely held to sue foreign companies and collect the fine\(^55\). The majority of all UM patents in China are granted to domestic applicants. Foreign entities appear to overlook completely their practicality. In 2013, 55.7% (885'226) of the domestic applications were for UM patents and 44.3% (704'936) for invention patents while only 5.6% (7'136) of foreign application were for UM and 94.4% (120'200) for invention\(^53\)\(^56\).

State Intellectual Property Office (SIPO) reported 2510 cases of patent disputes and 6512 cases of counterfeit patent cases in 2012, more than twice the caseload of 2011. In comparison, in 2012, the

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\(^{50}\) China’s 12th Five-Year Plan, APCO, December 2010

\(^{51}\) Beijing IPR Court to Open This Month, Xinhua, November 2014

\(^{52}\) Chinese Utility Models – A Lesser-Known IP Strategy, Thomson Reuters, July/August 2010

\(^{53}\) 111% and 118% increase from 2010 to 2013 for the invention and utility patents respectively. Facts And Figures – China, European Patent Office

\(^{54}\) Statistical Country Profiles, World Intellectual Property Organization

\(^{55}\) Nation Lacks Innovation Despite Patents, Experts Say, China Daily, November 2014

\(^{56}\) China’s Utility Model Patent System: A Perfect Storm for Patent Trolls, SIIA, September 2012

The design patent is not included in those statistics.
lawsuit in the US reached 5420 cases\textsuperscript{57}. In addition to the abundant in patent lawsuit in China, they are as well fast, often taking less than a year. Hence, more than 70% of all Chinese patent lawsuits are settled in court, compared to only 10% in the US.

**Further reading:**

- *China’s Great Leap Forward In Patents*, IPWatchdog, April 2013
- *Guide To Protection Of IPR In China*, 2014

\textsuperscript{57} *Big Increase In Administrative Patent Infringement Cases in 2012*, China IPR, January 2013
4. Sino-Swiss Cooperation

Sino-Swiss Science and Technology Cooperation (SSSTC)

In 2003, the Sino-Swiss Science and Technology Cooperation (SSSTC) program was established, with the signing of a memorandum of understanding (MoU) between the State Secretariat for Education and Research (SER) and the Chinese Ministry of Science and Technology (MoST). After a pilot phase 2004-2007, the program was fully initiated in 2008. Between 2008 and 2012, the Swiss government contributed CHF 12.3 Mio for Swiss researchers entering cooperation with Chinese counterparts. The Swiss funding was matched with funding by MOST for the Chinese researchers in the cooperation. In this period, 36 Joint Research Projects have been funded, along with 42 Institutional Partnerships and 119 faculty exchanges. The SSSTC has now entered its third phase (2013-2016); the most recent call for proposals, in the area of translational science, had been launched in early 2014.

Government Scholarships

In 1961, the first scholarships were exchanged between Switzerland and China. Between 1961 and the academic year 2013/14, Switzerland unilaterally offered 301 scholarships to Chinese students and researchers. China, on the other side, offered 419 scholarships to Swiss students between 1961 and 1999. A decade ago, the two parties have established a bilateral scholarship exchange program. A MoU was signed in 2006, stipulating that Switzerland offer 10 federal and 8 cantonal scholarships to young Chinese researchers, while China offers 18 governmental full-scholarships and 30 tuition-free-scholarships. In September 2012, during the Chinese Vice Minister of Education Mr. DU Zhanyuan’s official visit to Switzerland, a new Memorandum on Higher Education Cooperation was signed, which raises the number of scholarships offered by both countries. The Swiss side offers up to 25 scholarships to researchers; China matches the funding with scholarships for Swiss students. Implementing agency of both scholarship programs on the Chinese side is the China Scholarship Council (CSC).

Chinese Presence in Switzerland

China has established two Confucius Institutes in Switzerland. One is in Geneva, based on a partnership between University of Geneva and Renmin University. The University of Basel has signed an agreement with Eastern China Normal University in May 2013 to open the 2nd Confucius Institute. A third Confucius Institute in Zurich has been discussed for several years now.

In March 2013 the New Huadu Business School in Zurich was inaugurated. It is a purely private Chinese Business school, but has been accredited by the Ministry of Education.

Bottom-up Cooperation and Exchange

Notwithstanding the importance of government-initiated funding and scholarship programs, cooperation and exchange at an individual level (students, researchers) and institutional basis remain the core of bilateral relations between Switzerland and China.

Between 2008 and 2013, the Swiss National Science Foundation has funded a total of 122 Swiss research projects that indicated a cooperation with a Chinese researcher.

Figure 5 shows the constant increase in the number of Chinese students attending a public Swiss higher education institute. In the academic year 2013/14, 1335 Chinese students studied at a public Swiss higher education institute, 183 of them at a UAS. This is the larger group of international students besides those from Switzerland’s neighboring states.

The number of Swiss students in China has reached 764 in 2013, according to information from MoE.
Swiss Diplomatic Presence in China

Swissnex, officially inaugurated on August 7, 2008, serves as a platform to connect the dots in the science and research communities of Switzerland and China. In close cooperation with swissnex, the Education, Science and Technology Section of the Embassy of Switzerland in Beijing supports the Swiss research community in its collaboration with China.

List of Bilateral Agreements in Science and Education (see Appendix 4 & Appendix 5)
Appendix

Appendix 1 - Organization of MOST

Mr. Wang Gang
Minister

Mr. WANG Zhigang
Vice-Minister
Policy & Regulation
Personnel

Mr. ZHANG Laiwu
Vice-Minister
Rural Areas
General Administration

Ms. CHEN Xiaoya
Vice-Minister
Basic Research
MoST CPC Committee

Mr. WANG Weizhong
Vice-Minister
Finance
Social Development

Mr. GUO Xiangyuan
Vice-Minister
Compliance

Mr. WANG Zhixue
Vice-Minister
Science & Technology Daily

Mr. CAO Jianlin
International Cooperation
High-Tech Development

Appendix 2 - Organization of MOE

Mr. YUAN Guiren
Minister

Mr. CHEN Shun
Assistant Minister

Ms. LIN Huiqing
Assistant Minister

Mr. DU Zhandian
Vice-Minister
Degree Appraisal
Graduate Students

Ms. LI Weihong
Vice-Minister
Chinese Language
Social Sciences

Mr. LIU Limin
Vice-Minister
Compulsory Education
Teacher Education

Ms. LU Xin
Vice-Minister
Vocational Education
Continued Education

Mr. DU Yubo
Vice-Minister
Higher Education

Mr. HAO Ping
Vice-Minister
Education Policy
International Cooperation
Appendix 4 - List of Bilateral Agreements in Science and Education between Switzerland and China

- Accord de coopération Fonds National Suisse et National Natural Science Foundation, expired.
- Joint Statement on Sino-Swiss Science and Technology Cooperation between the Ministry of Science and Technology of China and the Federal Department of Home Affairs of Switzerland, signed in April 25, 2011
- Joint Statement on Sino-Swiss Science and Technology Cooperation between the State Secretariat for Education and Research of the Federal Department of Home Affairs and the Ministry of Science and Technology of the People’s Republic of China, signed in March 21, 2012.

Appendix 5 - List of Recent High-level Visits in China and Switzerland Regarding Science and Education

- August 7, 2008: Visit of StS Mauro Dell’Ambrogio to China. Official opening of swissnex Shanghai.
- November 17-19, 2008: Visit of CAS Vice-President Prof. Li Jinghai to Switzerland. SSSTC Joint Working Group meeting with CAS in Berne, followed by a scientific workshop with ETHZ.
- November 21, 2008: Visit of State Councilor LIU Yandong, Minister of Education ZHOU Ji to Switzerland. Meeting with President Pascal Couchepin and signing of a Joint Statement on Sino-Swiss Science and Technology Cooperation. Working Group meeting with MOST in Berne.
- May 12 to 16, 2009: Visit of ETHZ President Ralph Eichler to China. Meetings with MOE, CAS, MOST in Beijing, CAS Shanghai, as well as several universities in Beijing and Shanghai.
- June 23 to 25, 2009: Visit of the Minister of Science and Technology Prof. WAN Gang to Switzerland.
- October 2009, Visit of LU Yongxiang, President of Chinese Academy of Sciences to Switzerland.
- November 2009, Visit StS Mauro Dell’Ambrogio to China. Meetings with the Ministers of Education and S&T as well as with the Vice-President of the Chinese Academy of Social Sciences CASS.
- September 9-13, 2010, Visit of Deputy Director of State Secretariat for Education and Research Mr. Jürg Burri to China. SSSTC Joint Working Group meeting with CAS and MoST in Beijing, followed by a scientific workshop with CAS and meeting with CASS.


- May 3, 2012, Visit of StS Mauro Dell’Ambrogio to China, signing of bilateral cooperation agreement with Chinese National Space Administration.


- September 11-13, 2012, Participation of StS Mauro Dell’Ambrogio in the WEF’s Annual Meeting of the New Champions, Tianjin.

- September 14-15, 2012, Visit of Vice Minister of Education Mr. DU Zhanyuan to Switzerland. Meeting with Federal Councillor Alain Berset and signing the Memorandum on Higher Education Cooperation.

- May 23-25, 2013, Visit of Vice Premier LI Keqiang to Switzerland, meeting with President of the Swiss Confederation, Mr. Ueli Maurer, Federal Councillor Johann Schneider-Ammann and Federal Councillor Didier Burkhalter. The concluding of bilateral Free Trade Agreement on technical level was announced during Premier LI’s visit.

- July 10-13, 2013, Visit of Federal Councillor Johann Schneider-Ammann in Beijing, meeting with Yuan Guiren, Minister of Education

Beijing, 27.01.2015
Science, Technology and Education Section
Embassy of Switzerland in China