UNIVERSITÄT BASEL

VirginiaTech

GLOBAL PERSPECTIVES

Comparative views of the Swiss and US Higher Education systems with a focus on doctoral education and global research.

GPP Global Perspectives Programme
Preparing Future Academic Leaders

Co-ordinated by International Affairs, University of Basel

2011

UNI BASEL

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INTRODUCTION

Global Perspectives Programme (GGP)

A US-Swiss Programme for future academic leaders

A partnership between Virginia Tech, in the US and the University of Basel, Switzerland, the Global Perspectives Programme is aimed at preparing future academic leaders for the challenges of an increasingly diverse and globally focused higher education (HE) sector. Through exchange and first hand experience, GPP offers doctoral students and post doctoral researchers the opportunity for reflective comparison of the two countries' HE sectors and the chance for individuals to develop global competencies and inter-cultural communications skills.

Global Perspectives Manual

Themes 2011: Doctoral Education & Global Research

Contributions in the form of written reports from both Swiss and US participants have been brought together in this Global Perspectives manual. The publication is a useful resource for those wishing to explore differences and commonalities in academic organisations and practices in these two countries. In 2011, the main themes explored within the programme were Doctoral Education and Global Research. Participants could elect to report on one of these two themes or select another topic that was of interest to them.

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FOREWORD

Prof. Dr. Edwin C. Constable

Vice Rector for Research at the University of Basel

The transcontinental Global Perspectives Programme (GPP) between the University of Basel and Virginia Tech is symptomatic of the wide-ranging changes that are taking place in the higher education system in general and in the training of graduates in particular. The theme of the 2011 program was exceptionally timely and centred on the reform of doctoral education. The various meetings allowed doctoral and early career post-doctorals from a range of cultural and educational systems to exchange experiences and consider the impact of procedural reforms on the day-to-day task of obtaining a doctorate.

Universities throughout the world are actively engaged in questioning and reforming the structures of their doctoral training methods and programs. On the one hand, there is political and social pressure on the Universities to supply trained and relevant scientists and technologists to address the urgent needs of society and the industrial base and on the other hand the wish of the Universities to pursue knowledge-driven and academically robust research programs. The doctoral student finds herself or himself between the of social relevance and the Charybdis academic freedom.

My colleague and friend Dr DePauw has provided a short bibliography of reports that serves to highlight the increasing importance of the problem outside the “Ivory Towers” of academia and the 2011 Global Perspectives Programme has given a voice to the target audience of the reforms. The papers collected in this publication summarise some of the activities of the GPP and within their sober academic titles, lie key questions such as “Why are am I doing a PhD?”, “How often do you see your adviser?” and “What next?”.

The 2011 GPP has been an unqualified success and has not only allowed exchange between students of the two institutions, but has also posed fundamental questions that are of relevance to all Universities in this time of change.

FOREWORD

Prof. Dr. Karen P. DePauw

Vice President and Dean for Graduate Education at Virginia Polytechnic Institute and State University (Virginia Tech)

For the second year of the collaborative Global Perspectives Programme (GPP) between University of Basel and Virginia Tech, we selected doctoral education reform as the major theme for the 2011 program. The theme became a focus of conversation for individuals within each group leading toward the seminar held in Riva San Vitale in early June and was highlighted through group presentations at the Global Perspectives Conference held at the Embassy of Switzerland on June 17, 2011.

Although higher education reform has been a topic of conversation throughout the 20th century, the dialogue has intensified in the last 10-15 years. The Bologna Accord stimulated higher education reform in Europe and focused attention in recent years on the doctoral degree. In the United States, several reports including *Rising Above the Gathering Storm* (2005) and the follow-up *Rising above the gathering storm revisited: Rapidly approaching category 5* (2010) articulated the need for research and education. The Commission on the Future of Graduate Education in the U.S. described the roles and responsibilities of three constituent groups (universities, employers, policy makers) in securing the future of graduate education in the report entitled *The Path Forward* (2010). The Royal Society called for global science and international collaborations in its report *Knowledge, networks & nations* (2011). But perhaps the most alarming challenge to doctoral education came from a series of articles in the April 20, 2011 issue of *Nature* on the future of the PhD. A brief overview can be found in the Global Research and doctoral education: Critical conversations presented at the Future Academic Leaders conference at the Swiss Embassy (put link in here).

These reports and additional materials from the European University Association (EUA) provided the foundation for the rich discussion among the Global Perspectives Programme participants about doctoral reform across national borders. The papers in this publication share some of the insights gained during the 2011 Global Perspectives programme.

FOREWORD

Erich Thaler

Head of International Affairs,
University of Basel

'Quo Vadis PhD' was the title of the Global Perspectives Programme's first alumni meeting held in Basel in December 2011. It gathered PhDs and postdoctoral researchers from Basel who have participated in the Swiss – US Global Perspectives Programme (GPP) in order to discuss questions of of postgraduate career paths and working conditions for doctoral students at Swiss & US universities as well as to share experiences made during the GPP 2011 tour that led students to various places of higher education and research in the US.

The manual at hand summarizes experiences with issues in higher education in Switzerland and the US made during a "GPP Year". A typical year, as we can say today, starts with an Input Seminar in spring to familiarize University of Basel students with topics in higher education chosen for a specific year. This is followed by the visit of and encounters with the participating US student group in Basel and Ticino. Followed in turn by the reciprocating visit of the Basel student group to the US. Finally, the GPP alumni meeting in early December closes this annual cycle with the sharing of insights and experiences made during this period with a larger academic public.
I wish all readers of this manual not only a good lecture but I would be specifically pleased to receive comments, critique and recommendations of articles published or relating to the programme itself at our GPP Facebook site: *Global Perspectives Programme, University of Basel*. Your contributions will help to further develop the programme and to foster dialogue in a complex and global Higher Education landscape.

GPP AT THE UNIVERSITY OF BASEL

Exchanging ideas about teaching at the Input Seminar

Virginia Tech students are hosted at the Department of Psychology

Group work session at the Joint Seminar in Riva San Vitale

At MIT, one of the institutions visited while in the US

The programme incorporates five components; an input seminar on the HE systems of Switzerland and the US, the hosting of the US delegation in Basel, a joint seminar in Riva San Vitale, Ticino, visits to HE institutions in the US and a conference held at the Swiss Embassy in Washington at the programme's close.

While in the US it is a goal of the programme to visit a broad range of HE institution types. US HE institutions visited by Swiss participants in 2011 included: Northeastern University, MIT, Harvard University, University of Virginia, New River Community College and our programme partners, Virginia Tech.

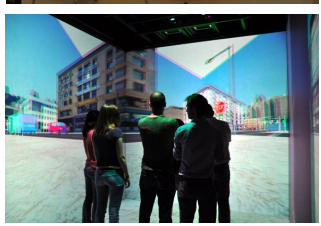
As an mixed-disciplinary programme, GPP enables a vibrant inter-faculty dialogue. In 2011, programme participants represented the Department of Biomedicine, the Faculty of Law, the English Department, the Faculty Philosophy and History and the Faculty of Business and Economics.

Further details can be found on the **International Affairs website: www.internationalaffairs.unibas.ch/gpp**

GPP AT VIRGINIA TECH

Visiting the Faculty of Engineering at the University of Freiberg, Germany

Joint seminar at the Center for European Studies and Architecture (CESA) in Riva San Vitale, Switzerland



University of Basel students sample the virtual reality CAVE while visiting Virginia Tech

Global Perspectives conference, Swiss embassy, Washington

The Virginia Tech Future Professoriate Global Perspectives Programme was developed to provide VT graduate students with an opportunity to gain knowledge and understanding of global higher education, especially in Europe. In order to be selected to participate in the summer program, graduate students must have completed two courses taught through the Graduate School: GRAD 5104 Preparing the Future Professoriate and GRAD 5114 Contemporary Pedagogy. After selection for the highly competitive program, participants meet monthly during the spring semester to increase their understanding of higher education in Europe, the Bologna process, and global graduate education and research with a focus on Switzerland and Italy.

The 2011 global experience included visits to selected universities in Switzerland, Germany and Italy . In addition to these visits, the trip included daily seminars, cultural visits in the region, and a joint seminar with UniBasel participants at VT's facility in Riva San Vitale,Ticino. The experience concluded with the Global Perspectives conference held at the Swiss Embassy in Washington DC in June.

Further details can be found on the Virginia Tech Graduate School website: http://graduateschool.vt.edu/graduate_school/gpp/

or follow the Global Perspectives Switzerland blog at: https://blogs.lt.vt.edu/pfpswitzerland/

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Rethinking the PhD: Global Perspective

Amanda Cronin Rumore
Virginia Tech

Global Perspectives Program

The issue of graduate education reform has become of recent interest both here in the U.S. and abroad. It has grown with large, multi-nation initiatives such as the Bologna Process in Europe, the explosion of interdisciplinary degree programs to meet needs of emerging fields, and even as the focus issue in the top scientific journal *Nature* (April 20, 2011). It appears academia is beginning to recognize that considerable changes must be made to graduate education in order to adequately prepare the next generation of scholars. The question of how to reform PhD scholarship was recently undertaken by a group of PhD students through the 2011 Global Perspectives Program developed between Virginia Tech (Blacksburg, VA) and Universität Basel (Basel, Switzerland). In its sixth year, the program is designed to give students from both institutions the chance to explore graduate education between the United States and Europe. This year the U.S. students visited multiple European universities and the Swiss students mirrored with a tour of U.S. institutions. The program culminated with the "Global Graduate Education Summit" held at the Swiss Embassy in Washington, DC where both groups presented their findings on *Rethinking the PhD* in terms of education and research.

The overall objective of the program was to provide the two groups of graduate students with an opportunity to explore trends and issues of global higher education, such as faculty roles and responsibilities, organization and structure of academic programs, and student demographics. The students hailed from varied graduate programs including rhetoric and writing, history, biology, linguistics, chemistry, classical studies, engineering (mechanical, civil, transportation), international affairs, psychology, computer science, nutrition, economics, bioinformatics, counseling, biochemistry, and law. This diversity allowed the students to better understand the landscape of different programs and

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encourage discussion on ways to improve graduate curriculum across the board regardless of research area. After two weeks of in-depth exploration, the group established what they see as the biggest problems with current graduate education and then determined how to reform graduate programs to absolve these issues. They concluded the greatest deficit in current PhD curriculums is that students are being trained as specialized researchers not academicians. This leads to a market saturated with PhDs lacking much more than the ability to research one niche area, limiting their ability to move up through standard academic channels. The students conveyed their ideas in terms of acquired skills they see as necessary for the future of preparing the PhD. Their findings are summarized below.

Rethinking the PhD: Acquired Skills

Since graduate degrees vary greatly in coursework, research obligations, and publication requirements, the group focused on which skills they believe should be acquired during any PhD program in order to facilitate a most successful and productive career in academia. The list makes note that a PhD scholar should have a round and complete set of skills necessary for leading a career of teaching and research. And although these skills may not be fully matured before graduation, it is absolutely necessary that PhD programs make known the importance of developing these skills early in one's career.

Communication Skills

The purpose of the PhD is to generate *and* disseminate knowledge. An academic must be prepared to share their research with the public, government and/or private funding agencies, and within their own discipline. This requires effective writing and oratory skills and the ability to have appropriate discourse with both nonprofessional and discipline specific stakeholders. Most importantly, the academic must be able to self-market research ideas. In a world where research funding is declining and competition is increasing, a researcher must be able to verbalize the importance of his/her research to various funding sources and administrators and produce well-read publications to increase visibility.

Graduate students should receive training and practice to improve their writing and communication skills. Suggestions include grant-writing workshops, encouragement from mentors to apply for small grants available to PhD students, write and publish review papers, and partaking in speaking engagements both at the home institution and national/international conferences. Furthermore, students should be required to teach (or assist) courses within their discipline since teaching will likely be a large part of any future faculty position. If students can build a strong foundation in effective communication skills during their graduate program, then their ability to succeed as a researcher, teacher, and public figure early in their career will be enhanced.

Research Skills

Every PhD should graduate with a set of research skills to successfully study within their field. Most of these skills are labeled as "technical." That is, the ability to use a specific machine or computer program or reaction to test a hypothesis and measure an outcome. But students should also have a set of "non-technical" research skills such as the ability to develop research questions, modify existing techniques to better test a hypothesis, understand real world implications of their research objectives, and an understanding and adherence to research ethics.

In order to develop these skills, mentors must encourage their students to broadly explore their research topic through literature reviews and

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promote "trial and error" in testing out self-developed techniques. Students should be able to develop their own research questions based on available information rather than the advisor providing them to the student. Furthermore, a graduate level course in research ethics should be an integrated component to every graduate program. At this time, the responsibility of teaching research ethics typically falls on the major advisor. However, many advisors do not make this a priority or are far too burdened by other obligations to explain research ethics in-depth to their students. A structured, for-credit course taught by qualified researchers and administrators is not only the best way to effectively deliver the topic of research ethics but also sends a message to students that ethics are a top priority at the institution.

Critical Thinking Skills

A PhD graduate should undeniably secure a set of skills and techniques to be competent in researching within their field, but it is also essential that they have the ability to use those skills to solve complex problems. Unfortunately many of today's students become "lab robots" within their mentor's research laboratories. There is less autonomy given to students and their own research projects. Instead principle investigators have groups of PhD students each trained in specific techniques so that data can be generated faster. Although this may be good for grant applications and research publications, it does not allow the student to learn how to formulate and carry out a research project independently.

Once a student has acquired a repertoire of research skills, then they should be required to use those skills to develop their critical thinking abilities. Although the student may be expected to carry out experiments for funded projects, they need to also have a project in which they define the research outcomes and how they should be met with minimal assistance from the major advisor. This also includes learning about information management and organization and troubleshooting experimental challenges. Once the student has demonstrated the ability to use their research skills to critically complete a research project, then the student is more adequately prepared to lead their own research program.

Leadership Skills

Ultimately a PhD will be leading their own research program, department, college, or university. Even students who end up taking a position in industry will likely have managerial duties similar to those in academia. Running a program or department can be an overwhelming task without a strong leadership foundation. Anticipated duties in both academic and industry positions include managing large projects, fostering teamwork/groupwork, and understanding how to integrate interdisciplinarity into their research program. Students should begin to equip themselves with the basic tenants of leadership during the PhD so they can begin to formulate their leadership style

The easiest way to establish basic leadership skills during graduate school is to become involved in university governance and/or graduate school sponsored programs outside of research. Many universities and departments have graduate student associations which work with administrators to handle graduate concerns and host activities for graduate students. Most importantly, these associations and resulting programs are completely student-run with the support of the graduate dept/school. The organizations elect their own members, fundraise for their programs, and manage all events and activities they sponsor. The "hands-off" approach by administrators allows graduate students to have an independent experiential learning experience. They learn about the tenants of leadership, the composition of university administration,

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and how to effectively handle their constituents concerns with assistance but not control from their superiors.

Students can also gain leadership experience in their research by taking on roles such as "lab manager" and supervising undergraduate research students. Both of these responsibilities teach students about task delegation, how to effectively train research assistants, and how to manage group dynamics. Overall it is imperative for graduate students to experience a preview of becoming a leader of their own research program by taking on small leadership roles during their graduate tenure.

Conclusions

The list of acquired skills above may seem overly ambitious for the already stressed graduate student. However, it can be argued that PhD's represent the pinnacle members of academic society. They should not be trained as glorified laboratory technicians with a small set of perfected research skills. This leads to a saturation of the market with ill-equipped degree holders and lowers the educational value of a PhD. Students should be expected to meet and exceed these acquired skill sets in order to lead the future of academia.

An oversight committee or structured assessment for these skills is not a proposed solution to these issues. It would be difficult to adequately test and would likely lead to bureaucracy by unqualified officials. Rather, PhD students should understand the importance of making these skills part of their PhD term and have the support of faculty, administrators, and academic mentors so students are successful in developing these skills. Further discussions and summits should be held between top graduate education leaders to generate guidelines to be disseminated to all academic areas. The ultimate goal in reforming graduate education is to advance PhD programs for the 21st century by strengthening communication, critical thinking, research, and leadership skills as cornerstones of future PhD programs.

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Cultural Challenges in Global Higher Education – Differences in Power Dynamics in the Advisor -Advisee Relationship

Akiko Nakamura
Virginia Tech

My topic is cultural differences in the power dynamics between faculty and graduate students, specifically how mentoring is recognized differently. With the growing global economy, the development of international outreach in academic programs needs to enrich educational experiences. Once students graduate and go out to the real world, they often work in multicultural teams in this global economy. Increased international student mobility could be challenging to both faculty and students in classrooms and in labs because culture plays important roles in communication and relationships. For successful advising relationships, cultural mentoring outside of the academic advisor-advisee could enrich global higher education and research. However, a Bologna Process for cultural differences in academia has not been developed yet. Just as the Bologna Process created uniformity for the academic curriculum, a Bologna Process for the multicultural and cross cultural side of academia would increase awareness of cultural differences and ease faculty and student challenges. Therefore, the additional multicultural/cross cultural side of a Bologna Process could lubricate the relationships between faculty and students and promote successful advising relationships in global higher education and research.

Global education adds complexity to advisor-advisee relationships because advisors and students have different backgrounds and thus different communication styles. A Bologna Process for cultural differences could be used as a tool to facilitate recognition of multicultural challenges and expansion of the integration of diverse populations. While informal cultural mentoring has been widely accepted, and there are many international organizations on/off campus, formal cultural mentoring similar to what the Bologna Process did for the academic curriculum has not been developed. The formal cultural mentoring could assist multicultural students in adjusting academically and

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socially. A cultural Bologna Process could also guide faculty members in advising students with different cultural backgrounds.

My experience in Global Perspective 2011 helped me to understand challenges in multicultural advising and cross cultural classroom and research. Table 1 displays my observations of cultural differences in the power dynamics between the advisor and advisee in doctoral education and research across countries.

During Global Perspective 2011, I learned faculty and students play different roles and have different expectations in different countries, depending on which system they are from. In general, advisors in the US expect students to be more independent and to take more initiative, whereas students receive more guidance from their advisors in Europe and Japan. These two academic models are different in expectations, and when faculty and students go from one to another, problems emerge.

During Global Perspective 2011, I asked questions about "power dynamics between professors and students" and also about "mentoring" at different institutions. At ETH, a postdoctoral researcher said that his research advisor communicates to his graduate students and gives them research advice. That postdoctoral researcher was German, and he said that he feels like the advisor-advisee relationship in Switzerland is more equalitarian, compared to the one in Germany. At SUPSI and University of Lugano, the students recognized the word "mentoring", but they were not aware of it occurring at their institutions. Thus, advising is in practice, but mentoring might be less accepted or explored in Switzerland, compared to the US.

In Italy and Germany, I got the impression that they do not consider mentoring as a part of being an advisor. The German postdoctoral researcher in ETH said that his doctoral advisor had approximately 30 graduate students and 5 assistant researchers, and when he had questions about his research, he went to talk to one of the researchers and did not have much chance to talk to his advisor about his research. Also, at Politecnico di Milano, I learned when students have any problem, most likely they have to deal with it by themselves at their institute. Thus, the adviser-advisee relationship in Italy and Germany was more hierarchical, compared to the one in the US. A friend of mine who did her BS and MS in Japan, Ph.D. in Germany, and postdoctoral research in the US said that the academic power dynamics in Germany and Japan are similar. The faculty and students have a more hierarchical relationship there than in the US, and the students do not raise issues with their advisor directly, and their research direction was more guided, compared to the one in the US.

In the US, faculty and students generally have more equalitarian relationships, compared to the ones in other countries. Also, US students are more vocal, and they seem to like to raise and discuss issues with their advisors. On the other hand, students are expected to be more passive in Germany and Japan in general. Students do not question their advisors' advice or raise issues in their research. Advisors tend to give more directions and lead their students, compared to the advisors in the US. Thus, new international students who come to the US could be too passive in the advisor-advisee relationships until the problems become huge because both faculty and students could have different expectations from each other culturally. On the other hand, once the domestic students in the US go abroad, and they become "international students" outside of the US, they need to learn to interact with their advisors from their position as a novice in their field. Thus, faculty everywhere need some guidance in how to advise international students because we have culturally based ex-

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pectations and communication styles. Successful multicultural/cross cultural advising relationships will be one of the key factors to develop in global higher education and research.

There is a need to prepare faculty and students to work with people from different cultures. During Global Perspective 2011, I found that cultural differences in power dynamics between the advisor-advisee relationships exist. By practising cultural mentoring, the fast-growing global higher education and research could lubricate the relationship between faculty and students. A Bologna Process of cultural differences could increase the understanding of the challenges faculty and students go through and have them create successful advising relationships in global higher education and research. My experience with Global Perspective 2011 made me realize those cultural differences and power dynamics in the advisor and advisee relationship, and this knowledge will contribute to my advising experiences in the future.

The Role of Coursework in Doctoral Studies

Mareike Schmidt
University of Basel

One of the 2011 GPP topics was doctoral education. In this context, we were looking at questions like the following: Do we need PhD education and if so, why? How should we organize PhD education? What are key components of PhD education? It is not my intention to answer all of these questions in this article. Rather, I will focus on one specific issue within this discussion, namely the role of coursework in doctoral studies in the United States and Switzerland. In order to make the topic as concrete as possible, I will recount some individual stories of doctoral students and their experience with coursework in their doctoral studies. Of course, we cannot assume that these are representative of all doctoral students, but I believe they will raise some issues that can be seen throughout doctoral education in many fields and at many universities.

Let me start with one PhD student, Sabine, doing her doctorate at the Biozentrum at the University of Basel. In her department (the so-called "Phil-Nat", i.e. philosophical and natural sciences school), doctoral students have to take classes in the amount of 12 credit points during the course of their studies. The normal duration of study is approximately three to four years which means that the students have to get on average two credit points per semester. That roughly equals one lecture (90 minutes per week) or two colloquiums. Credit points can also be obtained by way of teaching classes (two credit points for a class of 90 minutes per week) or taking courses on transferrable skills etc. According to Sabine, the students at the Biozentrum are in general quite happy with the courses they can take. There is a broad selection of courses available throughout the entire "Phil-Nat" school which are specifically designed for PhD students. Sabine stresses that these classes often allow doctoral students to broaden their horizon and obtain some insight into fields of study that they didn't have the chance to really look into dur-

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ing their previous studies. Thus, the 90 minutes of class per week are a good way of broadening one's knowledge without losing too much time needed for one's own work and projects.

Sarah, who is also doing her PhD in Basel but at the medical school, tells us quite a different story. There, too, PhD students have to earn 12 credit points during the course of their doctoral studies. At the medical school, though, says Sarah, there are not enough courses being offered specifically to PhD students. As a consequence, the PhDs mostly take courses at the masters level and these are often times not adequate when it comes to the level of knowledge required: for the most part they are either too easy or too difficult for most PhD students depending on the PhD students' area of specialization and whether the courses are introductory or highly specialized ones. According to Sarah, there is not much opportunity to really get a glimpse of an area one is not or only a little familiar with as the bachelors courses are not open for the PhD students.

Let us now take a look across the Atlantic Ocean: Michelle is doing her PhD in sociology at Virginia Tech. She has to do 90 credits during her PhD studies (i.e. approximately 12 credits per semester), even though she had already received her masters degree in sociology before starting the PhD. Not all of the credits have to be obtained through classes, though; rather, she can also get "dissertation credits". Michelle can choose her classes from a rather big offering, however many of them will be for bachelors as well as PhD students. If so, the PhDs will have to do more in-depth assignments. In essence, Michelle considers some classes to be very helpful, in particular the skills classes like grant proposal writing, CV writing etc. However, many of these helpful classes fall into either one of the following two categories: a) you don't get credit for these classes or b) they are mandatory at a certain point in the curriculum which is not necessarily the best time during studies.

Aly, a PhD students at the Virginia Tech Transportation Institute, also needs to take 90 credit points. At least 27 of these must be course credit and at least 30 research credit. The idea of research credit seems to be quite prominent at the MIT's Whitehead Institute for Biomedical Research as well. There, PhD students spend about 40% of their time in classes during their first year of study; during the remaining five years, they have no more courses to take but rather work in the lab and eventually do two years of teaching on their own. In addition, the MIT offers a vast selection of good career seminars; however, these are not taken for credit.

With the US students I talked to, it seemed to be a recurring theme that classes are mostly for the younger PhD students. For instance, at the Sociology Department of Northeastern University, classes are taken during the first three years or the first three semesters of PhD studies depending on whether the student's previous degree is a bachelors or a masters degree. At the end of this coursework time, there are comprehensive exams which then – if they are passed – allow the students to continue into the dissertation phase.

Michael, who studies computer sciences at Virginia Tech, reported that 33 credits were needed to obtain a PhD in his department. According to Michael, this is only a requirement if you start your PhD directly after your bachelor. The classes then are essentially the equivalent to those required for a masters degree.

In comparison of the different stories I heard during the GPP 2011, I would like to draw a few conclusions.

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My first and foremost conclusion relates to the last point just recounted: much of the coursework that PhD students have to take in the US and which is on average considerably more than in Switzerland is aimed at young PhD students. With "young" PhD students I mean those which start their doctoral studies directly after having completed their bachelors degree. In the US, this seems to be quite a common course of study, while in Switzerland generally the masters degree is required to become a doctoral student. Hence, the starting position for many students in the US is different from the one of most Swiss PhD students. Accordingly, it is only reasonable that the program of study should be designed differently and the amount of required classes and credits higher. I would thus like to hereby utter a word of caution against trying to transplant the US PhD system into Switzerland too eagerly (and into Europe in general for that matter – think of the Bologna process). While there may be many elements worth importing, simply looking at the number of credits and believing that we in Switzerland should have "something similar" seems a little too short sighted.

This having been said, I will make some more constructive comments on what I believe some of these elements worth importing (in either direction) or creating should be. These comments are the essence of what I learned concerning PhD coursework during GPP 2011.

Ideally, in my view, coursework is an element accompanying the PhD student's independent research, offering some structure and guidance where necessary, but without forcing the student into a pre-determined framework which runs the risk of hampering rather than supporting the student's research.

In order to grant this form of structured support, offers and the freedom to choose are the key. There should be a large offering of courses open to PhD students which will allow them to broaden their knowledge both within their own discipline as well as across disciplinary borders. If possible, these would be PhD-only classes. These *studium generale* type courses should be complemented by selected courses specifically tailored to PhD students specializing in a certain field. Since they will mostly only be relevant to a very small number of students, these classes should be held in cooperation with other universities on a national and international level. Young experts should be enabled to get together both physically and virtually; e-learning options should be made use of. This would enable the doctoral students to build up a viable network early in their careers and to allow for the growth of future cooperation and sharing of knowledge. The third type of classes to be offered should again be highly interdisciplinary. There should be a vast offering of skills classes, ranging from grant proposal writing and CV writing via rhetorical and presentation classes to communication and leadership training. All of these classes should aim at being as concrete as possible in that they relate to the students' experience and research and enable them to reflect on their current work and to immediately implement the learning outcomes into their studies.

All in all, it is essential that PhD students are given the freedom to choose what courses best fit their field of research and their personal goals. Nobody will know better than the student herself which input best suits her current needs. In order for the students to accurately make this assessment, however, skilled and knowledgeable course advisors are needed which the students can turn to for information and counselling.

My vision is of self-determined but supported integrated doctoral studies. All courses the student takes should be of relevance to himself, his re-

search and his career goals. In my opinion, it is the universities' task to encourage, enable and support the students in actively designing and participating in their own tailor-made PhD studies.

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Pitfalls in Doctoral Education

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The term PhD consists of the words doctor and philosophy, namely Doctor of Philosophy. “Doctor” originates from the term doctorate which comes from the Latin docere, meaning “to teach” and “philosophy” comes from the Greek φιλοσοφία (philosophia), which literally means “love of wisdom”. Thus Doctor of Philosophy is a Teacher of Philosophy (Love of Wisdom). But is the sole job of a science doctorate only to teach loving wisdom or it has gone far beyond that? And if one’s main task is to teach, then how can one do it, since there are not enough academic positions for the graduating doctorates?

In the past few years there has been a serious increase in the number of science doctorates and at the same time no increase of positions for them in academia. As a consequence many of the freshly graduated PhDs cannot apply the specific knowledge learned during their studies. Or even worse they cannot find a job - either they are overqualified for the industry, or there are no academic positions in the universities. If the system does not change in a certain way the future PhDs are predestined to stay unemployed or regret that they have decided to do a PhD.

Short examples:
The following provides a short summary of the current situation of PhD holders in several counties:
China – Outburst of PhD Holders
The highest increase of people graduating with doctorates is observed in China. In 2009 around 50 000 people graduated as a PhD. In this way, China surpasses all other countries in producing PhD holders. Still China is developing fast and most of these PhD graduates find a job after graduating. But what can be assumed about the quality of these doctorates? The duration of the PhD program is only 3 years and the supervisors are very often not well qualified.

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The United States – Too Many PhD Holders and Very Few Academic Positions for Them

The United States is second only to China in awarding doctorates – it produced approximately 20 000 in the life sciences and physical sciences in 2009 and they are increasing each year. But unlike China, there the academic positions for the new graduates are not sufficient. By 2006, only 15% of the US doctorates in biological sciences got tenured positions six years after graduating and 18% untenured. In 1973, this percent was much higher - 55%! In a survey from 2010 among 30 000 scientists, still the academic positions were their top career desire. What shall they do when there are not enough academic positions available? Enter in a postdoc cycle where they are paid half of the salary of a scientist?

Germany – Constant Number of PhD Holders but still Few Academic Positions

It seems that Germany is one of the few countries which manage to keep the number of the graduating doctorates constant. It produced around 7000 science PhDs by 2005 thus being the top PhDs producer in Europe. Since they have many scientific institutes working closely with the industry, many doctorates eventually find a job in such an institute or get absorbed into the industry. In fact, only less than 6% of the science PhD holders go into full academic positions. The long path to professorship and the relatively low income of the academia in Germany makes many PhD graduates prefer the industry.

Switzerland – Not Enough Academic Positions for the Graduated Doctorates

In Switzerland, the situation is not very good either. There are very few academic positions for the graduated doctorates in the academia. There is high competition and it is extremely difficult to get academic position after graduating with a PhD degree. On the other side, the postdoc salaries are so small compared to the salaries in the industry that many researchers are finally forced to go into the industry.

For more on these, see Taylor M.C.: Reform the PhD system or close it down. Nature, Volume 472, (April 2011).

Considering the above examples, there are enough reasons that support the necessity of changing the current doctoral education programs. But what exactly should be changed and how? There are not few papers on this and many people have tried initiating something, but still to overcome the problems faced by a PhD holder a lot has to be done.

Most of the doctoral programs are based on a model defined in the middle ages in Europe which basically teaches the students to do what their supervisors are doing. Since then, the real purpose of a PhD was wrongly interpreted and applied. Unfortunately we are still following the same old model and even worse - those PhDs are increasing in numbers each year. Besides the wrongly assumed model, there are many other problems in the doctoral education. For example, a science doctorate has so specific area of research that usually one has problems to talk to colleagues at the same department and communication with other departments or disciplines can be almost impossible.

Something should be definitely changed. In many universities they have already started the reform. The doctoral education should be restructured completely everywhere.

What should be changed?

In the following several ideas of how to start with PhD reform are given:

Interdisciplinary Doctoral Programs
Making the doctoral program interdisciplinary is a must if the PhD students want to be in accordance with the twenty-first century. Since the faculty is very unlikely to change anything, the change should be initiated by the students. As long as the institutions are acting independently nothing is going to improve.

Cooperation instead of Competition
There is no need for so much competition between universities. Instead, cooperation between universities and researches should be fostered. A good example is a core faculty from the home department and rotating faculty from other institutions. This will reduce the number of faculty and at the same time it will provide opportunity for the students to communicate with more academicians from different fields and universities.

Mentors from Different Countries
Another good idea is having PhD mentors from different countries. Since the mentor is not only one, she does not have full control over the student and thus the student learns how to be more independent. Moreover, going to a different country in order to meet the other mentor, will make the student more flexible and understand the education system followed in places other than one's home university. Being independent is extremely important for the student as maybe this student will be a leader managing other people at the university or at a private firm in the future.

Remove Redundant PhD Programs and Create Non-Academic Ones
Since there are not enough academic positions for the PhD graduates, the acceptance of new PhD students should be limited. Developing non-academic PhD programs focused on and maybe even related to the industry is a good and necessary future step. Such programs can concentrate more on practical problems, industry know-how and at the same time provide the students basic technical training. There is still the danger that the students will miss some of the basics while skipping some coursework. Therefore it should be carefully investigated how much coursework should be sacrificed for acquiring industry know-how.

Online PhD
Another good idea is working more online. Distance is no longer a problem for communication when we talk about research. It is not only that students can have mentors from other countries and cooperate with each other more efficiently but there can be even a complete online doctoral program. For many students who does not have the possibility to go everyday to a university the distance learning will be the only and best opportunity.

Open Data Source
A very dreamy but very good to have is having open access to publications and even open data source which will be divided into disciplines. There, each PhD student from all over the world will be able to share parts of his work and at the same time will have access to the work and results of other PhD students. This will prevent students from working on the same problems and in parallell save time with not doing again something which has already been done.

Civic Engagement
The PhD students are doing their research not just for themselves but mainly to improve the world in a way or another. Therefore they should really try to explain the problems on which they are working in a simple way to the community. The common people do not need to know all the technical details but they definitely need to know the basic ideas about the current research. The PhD students

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are in the very best position of doing this. They shall invest some of their time into presenting and explaining their projects to the community.

Work in the Industry First?
Last but not least, if a person starts doing PhD directly after graduating there is always the possibility that after completing the PhD program, the work which they imagined they will have in a company, a bank or a lab can be totally different and not so inspiring. That is why it is a good idea to reconsider the wish of doing a PhD straight after graduation.

If we want a better future not only for the PhD holders and the academia but also for the whole world we definitely and urgently need a reform in the doctoral education system. The PhD unfortunately is no longer as prospective as it was once upon a time. In order to fit the fast changing world the doctoral education should be also changing continuously. Graduate students and postdocs have the most opportunities and capabilities of doing such a change. Somebody should start. Why not You?

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Graduate Education Systems: Europe vs. North America

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Introduction

For at least a decade now, academia worldwide has been under fire; taking criticism for failing to adapt to the fast changing world and the contemporary needs of the twenty first century (McCook, 2011; Nyquist & Woodford, 2000). Both undergraduate (Miller, 2011) and graduate (Editorial, 2011; Fagen & Wells, 2002) education have been suffering heavy fire, which is further reflected in the decreasing magnitude of public appreciation and funds. This criticism does not seem to be subsiding (Taylor, 2011), in spite of the global evidence for reform in academia (National Science Foundation, 2000). This paper presents a comparison between the current graduate education system in North America, particularly the United States, and Europe, particularly Switzerland.

The following sections present a comparison between the two graduate education systems (North American and European) synthesized into three main areas: general paradigm, university mission, and graduate students preparation. Before delving into the actual analysis, it should be noted that the European universities are highly heterogeneous. Differences between the different European universities are a lot more diverse than the differences between North American universities. This will be further noticed in the discussions in the following sections.

General Paradigm

There are a number of noticeable differences between the Graduate School system in North America and its counterpart in Europe. This section presents a few examples of these differences.

Probably the biggest and most obvious difference is the non-existence of a Graduate School in European universities. Although this is the general case, it appears that the European universities might be moving towards a North America-like system with

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a graduate school in every university. The University of Zurich and the Swiss Federal Institute of Technology, ETH, have already started a joint life sciences PhD program with a joint single graduate school. Similarly, several years ago the University of Milan started a formal doctoral school and, furthermore, last year appointed a Dean to this doctoral school.

Another obvious difference between the two graduate education systems is the Masters degree. While the Masters degree is considered an advanced, graduate, degree in the North American graduate education system, in Europe it is not. In European universities, bachelor and master degrees are considered basic education. It is highly unlikely that a student would quit school and enter the job market after attaining a bachelor degree. A Masters degree is considered necessary to enter the job market. On the other hand, doctoral degrees and postdoc appointments are considered more like scientists under training. Doctoral students and postdocs are treated like school employees and in the Swiss Federal Institute of Technology can sometimes be earning more than their colleagues in the industry! On a general average, however, there does not seem to be a significant pay difference between doctoral students in Europe and in North America.

In spite of being considered school employees, the power of faculty advisors over doctoral students in European universities seems considerably higher than the case in North America. One reason for this is the absence of graduate schools and the consequent absence of active graduate student organizations. Another reason is the way European universities are designed. Professors in European universities are a lot less in number than their North American counterparts, and each professor is typically responsible for a group of researchers and students. The researchers vary from being old experienced doctorates to young recent postdocs. The students on the other hand are predominantly doctorate students, with a few exceptions of outstanding masters students. In the European system, each professor and his/her group is analogous to a department head and a department in the North American system. Hence, European professors are more independent and have more power than in North America.

Diversity is another apparent difference between European and North American universities. It appears that the issue of diversity is of higher significance in the US higher education institutions, than in their European counterparts. This is probably due to historical and political reasons. In the US, the concept of diversity seems to be focused more on ethnicity and gender issues. On the other hand, diversity in European higher education institutions seems to be focused more on the integration of students from the different European countries.

University Mission

In general, the mission of the European universities lies in three main areas: education, research, and technology transfer. It is very interesting that although national and local governments are the main sources of funding for the European universities, there is very little focus on either civic engagement or community service. It appears that European universities see education as a sufficient community service and are not seeking to increase their public outreach. This vision might be understandable given that the school tuition and fees are significantly less than their values in North America, and that the universities are not entitled to control the number of admitted students. Nevertheless, European universities receive public funding for each admitted student, and as a result do not face the same pressure that North American universities face in securing annual budgets.

While the education and research missions are

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very similar to their corresponding ones in North American universities, technology transfer is not a common mission for the latter. US universities seem to place more emphasis on public outreach than European universities, but at the same time the latter seem to place more emphasis on technology transfer than the former. Technology transfer stands for the role the university plays in disseminating the research findings to the industry, in other words: transforming theory to practice. There are a number of possible explanations for this observation. One possible explanation is that the percentage of doctoral students entering academia in European universities is lower than it is in North America. Accordingly, European universities are investing more to help graduate (doctoral) students find their way in the industry. Another reason could be that since most of the university funds are from public sources and that partnership with the private sector is limited, more needs to be done to ensure the materialization of the research. Patenting seems to be one more reason. Apparently patent issues in Europe are not as critical as in North America.

Preparation of Graduate (Doctoral) Students

Universities in the US may have used to prepare doctoral students primarily by courses and research. However, recent years have witnessed an increasing focus on complementary skills and topics like teaching, mentorship, leadership, civic engagement, diversity, and interdisciplinarity. These complementary skills are sought to better prepare doctoral students for careers either in academia or the industry. On the other hand, it appears that European universities are preparing doctoral students to be researchers more than anything else. European doctoral students are required to take a minimal amount of courses and are expected to spend all of their time pursuing research. This may be explainable by the lower percentage of doctoral students entering academia in European universities, in comparison to North America. In addition, becoming a faculty in European universities is a lot more difficult than in North America; particularly because of the smaller number of faculty positions and the necessity of the habilitation degree (which is often referred to as a second PhD!). Hence, the European universities are investing more to prepare the doctoral students to become researchers, and not investing much to prepare them to become faculty. Unfortunately this explanation is flawed.

As mentioned earlier, these complementary skills are useful for careers either in academia or the industry. In fact, a recent study found that exposing graduate students to teaching improves their methodological research skills (Feldon et al., 2011). Similarly, the other skills such as technical or grant proposal writing, interdisciplinary research, and leadership are necessary for either career. This been said, it is important to note that the European universities have been going through a phase of change, the Bologna process (Armstrong, 2008; Jaschik, 2007; Sedgwick, 2001).

It is obvious that the European and North American graduate education systems, particularly doctoral education, are moving closer to one another. For example, the university research institutes in the North American universities and the competence centers in the European universities are two terms that stand for the same concept. They are research centers that aim to foster interdisciplinary research collaboration between scientists from different disciplines. Another obvious example is how European universities are starting to provide and encourage doctoral students to enroll in courses of transferable skills like technical writing, ethics, and management. In fact, the University of Basel in Switzerland started a program to enhance the teaching skills of its academic staff and to ensure quality of its research-based teaching.

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Conclusions

It is beyond doubt that higher education systems around the globe are enduring significant criticism and facing serious challenges. Graduate and doctoral education have not been left out from this criticism. The decreasing funds and increasing competition in the twenty first century have been acting as catalysts for global graduate education systems; trying to find an edge over their competitors.

This paper presented a brief analysis of the similarities and differences between the European and North American graduate education systems. The analysis was divided into three main areas: general paradigm, university missions, and preparation of graduate (particularly doctoral) students. Several differences between the two graduate education systems were noted and briefly analyzed. Nonetheless, it appears that the two systems are learning from one another (Gaston, 2010) and are becoming more similar than different. The pace of the reforms of the global graduate education systems does not seem to be sufficient; nonetheless, only time will tell whether worldwide graduate education systems will be able to stand up for their challenges.

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Rethinking the PhD – in need of reform or just a change of perspective?

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Introduction: overview of the Global Perspectives Programme 2011

The central themes of the GPP 2011 were the two topics: "Doctoral Education - Rethinking the PhD" and "Global Research – Interdisciplinary problem solving". During the joint meetings with the US delegation at Riva San Vitale and at Virginia Tech we discussed these two extremely important aspects of High Education. The summary of our discussions and the future perspectives were presented at the final conference in Washington, DC. Both discussions highlighted the necessity to improve the intercultural and interdisciplinary collaborations in the High Education sector in order to facilitate exchange of ideas and promote problem solving in the globalised world.

Looking back I cannot stop thinking about the central figure of both discussions – the PhD student or a recent PhD graduate. In contrast to an undergraduate student, a PhD student is someone who dares to continue challenging themselves in the High Education system in order to test their potential to influence its future. Given its pivotal role in the shaping the future of High Education I want to discuss in more details the role of a PhD education, namely, what aims a PhD student has and how well these aims are accomplished by the PhD programmes. In other words, I want to discuss whether the modern PhD education system is up to date with the needs of a typical PhD student and whether we need PhD reform or just a change of perspective?

PhD education: the typical career path

A PhD education has always meant to be a stepping stone to pursue a career in academia – a link between a university degree and a faculty position. During a PhD programme students study their subject in great depth, provide support for the research of their principal supervisor and acquire skills important for a future academic tenure track

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position, such as applying for funding and teaching students. At the end of a PhD programme a final examination by assigned faculty members checks whether a PhD student has fulfilled all the requirements of the programme and has been able to complete a piece of academic work to a high standard. A subsequent short term position as a postdoctoral fellow again tests the ability to think and work independently and perform at the highest level. Eventually, with enough experience and publications, a permanent faculty position can be assumed.

Nothing has changed in the usual academic career path. However, the trend we see now is that more and more people with PhD degrees leave academia in pursuit of an alternative career. The reason is that the number of people with PhD degrees exceeds the number of jobs available in academia. According to the National Science Foundation survey in 2006 only about one quarter of biomedical science PhDs held tenured or tenure-track positions. Universities have constantly expanded their PhD programmes to satisfy institutional status aspirations and demands on teaching, research, and laboratory assistants. From one point of view this strong competition for the faculty positions selects only the best for the role of permanent university staff member. However, the question arises - is it really appropriate to spend so much tax payers and private money on a classic PhD educations when so many PhD students leave academia in search for other career options which often do not require a PhD degree?

Rethinking the PhD: understanding the needs of a modern PhD student

Should we cut down on the number of PhD students admitted each year to a university? I am not convinced that our society, which is trying hard to provide everyone with an open access to High Education, would be prepared to cut down the number of PhD students in the current system. Many people want to do a PhD and universities are very interested in employing relatively cheap labour to assist in teaching and research duties. I believe that the solution to the problem will require a change in definition of the classical PhD education.

First of all, starting a PhD should not automatically imply a desire to pursue a career in academia. The skills acquired during PhD, such as analytical thinking and ability to manage long-term projects, can be applied to numerous jobs, for example, in government organisations, industry, publishing and many others. Unfortunately, within academia decisions by recent PhD graduates to search for employment elsewhere can often be met with criticism and treated as a personal failure. In my opinion, a PhD education is simply a continuation of the High Education process. The career options available for PhD graduates are numerous and PhD students should be aware of this from the beginning.

How should a PhD programme then be designed to help PhD students be fully equipped for both the career in academia and beyond? A first suggestion would be to make a PhD degree better connected to industry and the business world by increasing apprenticeship opportunities. Northeastern University in Boston provides its undergraduate students with the “Co-op” (short for “cooperative education”) programme which allows PhD students to gain professional experience related to their major degree or career interest during their studies. Such a programme would guarantee that a recent PhD graduate will not get outcompeted in the world of industry and business by more experienced peers who went to learn the trade during or straight after their undergraduate studies.

Let’s now have a look at the PhD programmes in

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the US and Europe and compare their strategies to prepare their PhD graduates for careers in and outside academia.

PhD education in the US vs. Europe (Life Science case)

In the US Life Science PhD programmes typically last 5-5.5 years. During the first couple of years PhD students are required to attend multiple lectures and seminars and complete extensive course work. The last three years are then mostly spent on a research project. In Europe a typical PhD programme lasts 3 to 4 years. Almost no course work is required and students are encouraged to spend nearly all of their time in the lab. I asked a number of PhD students in the US whether it is beneficial to have such a high load of course work during their PhD. All agreed that it helps them significantly to be up to date with the current state of science and research, and helps them to be more successful in their own project. A Swiss postdoc working in the US also noticed that the theoretical and practical knowledge of the US PhD students was at a higher level than his own as a result of the limited course work a PhD student is required to do in Europe. The common thing for both the US and European PhD systems is that the one's progress is assessed principally on the impact of scientific publications. However, longer PhD in the US affords more time for development of a broader knowledge base.

Teaching requirements are also very different between the US and European PhD programmes. In the US many graduate schools require PhD students to teach, the amount of teaching varying depending on the school and discipline. In contrast, in Europe the vast majority of PhD students in Life Sciences have no obligation to teach. In my opinion, teaching experience is crucial if one wants to pursue a career in academia. It is also very helpful for careers outside academia as it teaches how to communicate one's thoughts and ideas effectively. To be fair, PhD students in Europe are offered an opportunity to teach. For example, PhD students and postdocs of the Faculty of Science of the University of Basel are offered to teach the "Introduction into Biology course" for the 1st year undergraduate students. However, hardly any PhD students take this extra challenge being already overwhelmed by the research load of their own project.

What both the US and European PhD programmes have in common is that they understand the importance of developing soft or transferable skills. The University of Birmingham in the UK, for example, offers a Team building week to help its PhD students to learn to work in a team and develop leadership skills. The University of Basel Biozentrum PhD students have their own PhD club where they organise career events, invite alumni to speak about their career paths and organise PhD retreats that help students to network and learn from each other. Unfortunately, many PhD students chose not to get involved in the extra curriculum activities, believing them to be unimportant for their future careers. This attitude is frequently reinforced by their PhD supervisor.

Future of a PhD education

To finish I would like to suggest a few action points which in my opinion could improve the quality of a PhD education as well as employability of future PhD graduates:

- The length of the PhD programme should be standardised internationally (4-5 years would seem appropriate)
- The amount of course work should also be standardised internationally
- High calibre academic work must remain a requirement for a successful PhD however other skills and abilities should be developed
- Options to improve soft skills and get experience necessary for a career in and outside academia,

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such as teaching, outreach to the public, courses in economics and apprenticeship opportunities, should be offered to the PhD students; the amount of time needed for this activities should be incorporated in the curriculum

A PhD education is an important landmark in one's education. It requires hard work and a strong self-motivation. It tests people to the limit of their abilities and prepares them for the challenges of the world we live in. Our perception of a PhD education as only a stepping stone for the academic career path is, in my opinion, out of date. A PhD education today is an intermediate step to multiple career options. Universities across the globe should adapt to this new situation and modify their programmes to fulfil the needs of their PhD students.

GLOBAL RESEARCH

The Challenges of Interdisciplinary Research
Laurent Brault, University of Basel
A Global Network of Science
Marco Cavallari, University of Basel
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The Challenges of Interdisciplinary Research

Laurent Brault
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The increasing interest and development of interdisciplinary research (IDR) rises from the complex challenges facing our world. The convergence of informatics, engineering and technology is widely predicted to lie at the heart of the next technological revolution. Interdisciplinary science and technology has the potential to fundamentally transform healthcare, agriculture, energy, economic and many other areas of global concern. Economic, social and political changes associated with globalization are affecting established organizations. In this context, knowledge, education and learning are becoming an increasingly important component of this complex equation. IDR will allow not only facing complex problems but also to cover multiple point of views in order to generate more knowledge. To reach its goal, IDR will have to face many challenges of which some will be pointed out here and of which the first would be a clarify what is IDR.

What is Interdisciplinary Research

Even if it is assumed that interdisciplinary research is simply work which covers more than one discipline, it is often difficult to find a definition that is truly useful to the identification of IDR[1]. The definition of a "discipline" and discussions of the varieties of interdisciplinary, multidisciplinary, and trans-disciplinary research is matter of debate. Although there is not always agreement on these definitions, it is clear that areas of research are dynamic, continually emerging, melding, and transforming. Arguing for the fact that what is now considered as interdisciplinary might be considered disciplinary in the future. Nevertheless, a definition of interdisciplinary research from the American 'National Academies' report:

"Interdisciplinary research is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines

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or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice." [2]

From this definition, one question rises: what are disciplines, and to which extend discourse between them will be positive? Disciplines may be defined as "a branch of instruction or academia". This also involve to some extend the secondary meanings of the word, in terms of "conforming to rules and order" and the implication of this is that disciplinary boundaries are related to defined structures and strictures. There is a variety of factors which affect the likelihood of IDR being carried out. These include the level of multidisciplinarity in the research team and the diversity of a researcher's publications, as well as personal factors such as the size of the laboratory and researcher age. Based on established framework, the challenges for IDR can be grouped into four categories [3]:

- Institutional (such as funding schemes)
- Procedural (such as lack of access to evaluation tools)
- Disciplinary (such as cultural barriers)
- Personal (such as lack of experience and time constraints).

Institutional Challenges

Careful management and planning is crucial to the success of IDR projects. Meaningful interdisciplinary outputs will not emerge spontaneously from physical or intellectual proximity. Organisational arrangements can also either support or obstruct IDR; therefore changes may need to be made at the institutional level in order to facilitate IDR. Detailed suggestions for the forms, these changes might take are outlined in a report by US National Academy of Sciences and the European Union Research and Advisory Board. [1,4] The first of which focuses on ways to avoid unnecessary administrative barriers and that departmental and faculty divisions as well as the fact that the associated employment procedures, can be examined to ensure that they do not create barriers to IDR. Moreover, the development of shared research facilities, and the access to intra- and inter-institutional major research infrastructure and facilities is a key component. Therefore, a balance is needed between highly-specific funding mechanisms, and the ability to fund broad IDR. Specific funding is needed to support IDR and this challenge has been recently addressed by the creation of dedicated fund as for example in US with the NIH Common Fund (2006) and in Switzerland with the SNF Interdisciplinary Projects (2010). Institutional changes will facilitate the rise of IDR projects that will face framework, mentoring and training challenges that can be grouped as procedural troubles.

Procedural Challenges

Process-based factors which affect the success of IDR can arise from the other barriers. However, these can be overcome by appropriate planning to ensure that potential issues are identified at the start of an interdisciplinary project, and by introducing measures to overcome potential problems. For integrated working it is essential to establish accountability strategy, setting out interdisciplinary team timelines, requirements and responsibilities.[3] Researchers report that when they are free to move between collaborations they make more progress with interdisciplinary projects and have greater overall satisfaction in their professional lives. Moreover, the size of interdisciplinary centers and networks is key to their success, and that small centers (or small bounded networks within large centers, fewer than 20 affiliates) are found to have more knowledge creating connections than medium and large centers. The creation of new knowledge is dependent on interpersonal, spontaneous interactions, and concludes that an independent physical location is key to stimulating effective IDR, as well as a clear intellectual direction and flexible, intermittent, but intensive short-

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term stays which are dictated by the needs of the project. [5] Therefore, interdisciplinary collaboration will provides skills useful for further collaborative work to researchers. As a consequence, one of the major procedural challenges for IDR is the importance of management and leadership, and clear and well-articulated organizing principles which remain a challenge in disciplinary research. This include maintaining a focus on collaborative aspects of the project, taking decisions which may be seen as unpopular without damaging the collaboration, and assisting in the development of common vocabularies. IDR will here face the challenges inherent to the disciplines themselves.

Disciplinary Challenges

The reality of disciplinary boundaries can lead to the emergence of particular styles of thinking and approaches to research within a discipline. Disciplines are the preferred/traditional method for delineating academic research and boundaries set by disciplines define the parameters and scope of new information to be considered, whereas an "open-ended" framework could possibly overwhelm inexperienced researchers. Therefore, communication issues arising from disciplinary differences must address communication strategies.[3] Common vocabularies can emerge spontaneously during the lifetime of a project, based on an integration of the individual vocabularies used in a specific discipline. The importance of space for 'social time' constitutes a challenge for overcoming disciplinary differences and this require shared space. The creation of social spaces such as occasions, events, networks and the creation of common physical spaces like shared seminar room will facilitate IDR. Interestingly, the establishment of a common working protocol at the initiation of an interdisciplinary research team is an important tool to address many of each disciplinary specific problems in the context of a particular IDR project.

Personal Challenges

Individual skills required for IDR are different from those necessary for individual research, and effort must be made to acquire the appropriate skills, such as the ability to integrate different perspectives and communicate effectively with researchers from other disciplines. The rewarding mechanisms tend to favor narrowly drawn projects with specific goals that have to be achieved within short periods. The lack of time and the high risk of such projects creates an entry barrier for young researchers to participate in IDR. Even if IDR-relevant skills can be acquired by participating to such projects, institutions or departments may have to provide training and support in these areas to researchers at an early career stage to provide a strong basis in order to develop long term IDR expertise:

"Not everybody is willing to go out on a limb, but somebody has to in order to bridge the gaps between our disciplines"

In the development process of an IDR project, it is important to identify team members that possess personal skills that will favor the most effective collaborative environment, as well as to include specific research specialisms.[3] Another approach for creating an effective IDR would be that any team may involve people of two main categories of researchers: the one that are discipline-oriented with in depth knowledge and those who are able to have broader view of the project.[6] Moreover, the possibility for collaborators to meet face-to-face is a key component of successful collaborative research and personal interaction is likely to be an effective way to overcome challenges associated not only with discipline barriers as discussed above but also with personal behaviors.

Conclusions

Research in a particular discipline can be limiting, and, in some cases, may create artificial barriers

which restrict the type of questions that can be asked. Interdisciplinary research will offer new opportunities to address the challenges of the 21th century. One benefit of interdisciplinary training is that it offers the possibility of understanding better the complexities of the new problems that our globalized world is facing. The institutional, procedural, disciplinary and personal aspects of research will have to integrate the specific IDR needs in order to promote its development. The expansion of IDR projects will lead to progress, originality and innovation that will help to solve the problems of our society.

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A Global Network of Science

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A recent issue of the Lab Times (Issue 3, May 10th 2011) pictured a running researcher and a running businessman on its cover. The two comic figures were depicted as if competing in a 100m final. Given the increasing administrative tasks a researcher has to cope with, he needs to unite the two comic figures in a single person. The cover article was based on a survey commissioned by APEC, a French employment agency, and conducted May to October 2010 by a French member firm of the Deloitte Consulting brand. Entitled *"The Ideal Researcher – 20 Skills You Ought To Have"* it summarized the quintessence of interviewing eighty research managers from eight different countries (France, Germany, the UK, the Netherlands, Switzerland, Finland, the USA and Japan) covering public and private sectors. Even though missing on major regions (Asia, Latin America and Africa) and despite obvious cultural heritage among the questioned individuals the outcome, that is, the answers to a chosen set of queries considering the demand of skills but not their availability was very similar. Among these twenty skills only six key skills were identified as crucial for the next decade. These six key skills list as follows (Lab Times, Issue 3, May 10th 2011):

- analysis and mastery of computers and sophisticated IT tools
- the ability to work with researchers from other disciplines (interdisciplinarity)
- can develop a "network"
- possession of an "enterprise / business culture" and management skills
- project management
- awareness of the pertinence of the research and its impact on the environment (single most important quality in the ideal researcher of the future)

Many of these main points rely on networks and one even states network development. But

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how does one create a network? What types of networks exist? How does one maintain networks alive once they are established?

In a very simplistic way one could distinguish two types of networks: social and professional (including science, business and politics) ones. One has to add a further type of network, the specialized network meaning networks among people of the same scientific discipline. How do they differ? Social networks are established first and in most cases their build up and maintenance is trained from childhood on. Social competence is the soft skill helping to gain networks and is perfected since playing in the sandbox. Scientific networks are started with higher education among graduates and can be greatly enhanced by the professor and other more experienced researchers. A single well recognized professor can open almost any door for his students if he is willing to share his network with his possible successors.

Cherry-picking on ones own connections can be detrimental if it is too polarized towards success or business neglecting social components. I would like to claim that networks should be grown naturally and not forced as this forges stronger links. Even today's IT tools like Facebook, LinkedIn, Xing, ResearchGATE and others help to remember connections and being updated on a much broader base in less time, they still are not able to replace the direct face to face contact.

Urs Gasser, executive director of the Beckman Center for Internet and Society at Harvard University (http://cyber.law.harvard.edu), said: "Be active if you want to be noticed!" This is of increasing importance in an accelerating world where time is a scarce good forcing new communication skills and techniques like the (elevator) pitch. Thirty seconds to convince somebody of something is a form to cope with time constraints according to the CAB (Cognition: awareness or learning; Affect: feeling, interest or desire; Behavior: action) model adapted from marketing. But is persuading somebody of something the same as building a friendship or does the latter need more time than thirty seconds or just a pitch?

The question remains if, for an individual, a better network is built by quality or quantity?

If I will be fortunate enough my future might be decided by a former colleague that I met while visiting the Massachusetts Institute of Technology (MIT) or by people in connection with the swissnex in Boston. These visits surely influenced, if they did not change, my career plans altogether.

Swissnex (http://www.swissnex.org) is a professional networking institution directly associated with the Swiss government to aid international cooperation on "strategic scientific topics". What could be done by Swiss higher educational institutions themselves to help their future scientific leaders to develop their networks under the brand of their university or under the "Swiss" brand as Switzerland as a small country has only a few universities?

On my way back to Basel, from the US, I used the time to read about and to turn the idea of networking (in research and higher education) over in my mind. Ending in a bunch of dissipated thoughts that I gathered below.

How did history shape the higher education landscape in Europe? Basel as an example emerged from personal empathy and most likely from many experiences and connections, made in his youth during the time of the Council of Basel, of Enea Silvio Piccolomini better known as pope Pius II that sent his official consent in form of a

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charter to found an university in Basel. As pope he at the time was one of the most influential persons of the Old World (they did not know the New World yet) and appeared as benefactor for Basel and its university founded as early as 1460.

The novels of Dan Brown, and the movies based thereon, inspired the masses and led even the Time to print a special issue on *"Secret Societies – Decoding the Myths and Facts of History's most Mysterious Organizations"*. Templars and Freemasons represent ancient forms of very effective networks spanning the globe and amassing wealth through papal and secular privileges gained by their circle of friends and acquaintances.

When Thomas Jefferson founded the University of Virginia in 1819, its faculty mainly consisted of foreign docents maybe due to the lack of national ones, maybe due to the or maybe due to Jefferson's network that reached out to France installed when he was minister to France. His contacts in France and correspondence with French revolutionists including the Marquis de Lafayette and the Comte de Mirabeau had a strong influence on the design of the University of Virginia not only architecturally but also on research and especially teaching. Nevertheless, overtime the University of Virginia lost a great part of its international network and nowadays foreign professors are underrepresented in the faculty of a university which were particularly instrumental in the evolution of Internet networking and connectivity. Still, in accordance with university career rules, highest tenure can only reached by international reputation.

Collaborative cultures

The report *"Knowledge, Networks and Nations: Global Scientific Collaboration in the 21st century"* (28.3.2011, ISBN: 978-0-85403-890-9) of The Royal Society states that science was increasing during the last decades and will continue to increase globally. The key points about collaborations and their impacts are summarized as follows:

- The scientific world is becoming increasingly interconnected, with international collaboration on the rise. Today over 35% of articles published in international journals are internationally collaborative, up from 25% 15 years ago.
- Collaboration is growing for a variety of reasons. Developments in communication technologies and cheaper travel make it easier than ever before for researchers to work together; the scale of research questions, and the equipment required to study demands that researchers are mobile and responsive. Collaboration enhances the quality of scientific research, improves the efficiency and effectiveness of that research, and is increasingly necessary, as the scale of both budgets and research challenges grow.
- However, the primary driver of most collaboration is the scientists themselves. In developing their research and finding answers, scientists are seeking to work with the best people, institutions and equipment which complement their research, wherever they may be.
- The connections of people, through formal and informal channels, diaspora communities, virtual global networks and professional communities of shared interests are important drivers of international collaboration. These networks span the globe. Motivated by the bottom-up exchange of scientific insight, knowledge and skills, they are changing the focus of science from the national to the global level. Yet little is understood about the dynamics of networking and the mobility of scientists, how these affect global science and how best to harness these networks to catalyse international collaboration.

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– Collaboration brings significant benefits, both measurable (such as increased citation impact and access to new markets), and less easily quantifiable outputs, such as broadening research horizons. The facilitation of collaboration, therefore, has a positive impact not only on the science conducted, but on the broader objectives for any science system (be that enhancing domestic prosperity or addressing specific challenges).

Communication skills and knowledge exchange, also among scientist from different fields, need to be based on an equal footing to allow joint actions for research project or problem solving. The claim for interdisciplinarity heavily relies on soft skills of individuals to avoid unequal partnerships. Such unequal collaborations are very likely to influence the publication record of the involved scientists and thus their further careers. Obviously, the influence can be to the better or the worse according to the affiliation of the scientist to the dominating or the dominated partner of a collaboration. Similar rules of cooperation are desirable according to the report of the Council for Industry and Higher Education (CIHE, www.cihe.co.uk) named *"Powering Up: Business and Universities Collaborating for Manufacturing"*:

Whatever the nature of the collaboration and modes of working, it must be based on cooperative best practice working principles. These include:
–co-location or virtual networking;
– long-term and often rolling contracts with industry;
– easily accessible support resources including laboratory facilities;
– systematically tying universities into regional manufacturing business needs;
– trained and dedicated staff - both academics and business people - who understand research and business. This enables them to facilitate the relationship and helps to align Higher Education and industry vision.

However, collaborative culture can often by weakened by the challenges of intellectual property negotiation, which can all too easily undermine a relationship.

The key point is that the specialist in one field is able to understand the field of another specialist and to interact with him as equal individuals. Creating a circle of trust through honest information and exchange of thoughts are the seed of a successful network that allows mutual growth.

University Outreach

To raise awareness of the pertinence of the research and its impact on the environment, researchers are challenged to participate in outreach programs. University outreach as conducted in the Unites States, where it is part of the tenure track procedure and assessed regularly during an academic career, offers a unique chance to directly experience the impact of one's research on the local community.

In comparison, Swiss universities are missing similar outreach programs that in Switzerland may only be found at applied science universities due to their close interaction with industry and local production. A compensation may be the willingness of Swiss people to travel, increasing intercultural exchange and their closer contact to nature due to lack of megacities increasing affiliation to the environment.

There are upcoming recommendable events for networking and about networking at the COST exhibition (http://www.cost.eu/events/exhibition) entitled *"Networks of Science and Technology"* to be held in the European Parliament in Brussels (Belgium) from the 18th to the 20th of October 2011. "With the aim of making science available to

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society, COST is committed to bringing the results of research carried out within its Actions closer to policy-makers, and highlight the contribution that collaborative networking activities make towards a more innovative European Research Area."

Local and international outreach programs not only augment awareness of the researcher but help to overcome the fear of science, especially in third world countries, once the researcher is seen as a social person. The ability to communicate to non-science people in an open, honest and most importantly understandable way is one of the claimed soft skills for future researcher. Only conversations on an equal footing are able to foster mutual understanding and support from the scientist to the community and vice versa or for any two communication partners by that leading to knowledge dissemination. Thus we can design the future through empathy.

Public Outreach: the Challenge of Sharing Knowledge and Information

Christina Cuonz
University of Basel

Introduction

The question as to the impact of our research is vital not only in terms of our achievement as academics, but also in terms of our self-perception as researchers. Making important results accessible to other scientists is, without any doubt, one of the core tasks of every researcher. However, does it really suffice to make research results transparent to the academic world exclusively? It seems the answer to this question has turned into a clear *no* during the last decade. Promoting public awareness of science by means of public outreach activities has become one of the great challenges for 21st century Higher Education and research institutions.

This report aims at explaining what is meant by the concept of public outreach and at showing its increasing influence on the academic landscape. Furthermore, four small case studies on public outreach activities at Higher Education institutions in the USA are provided. They are by no means exhaustive, but they may be able to shed light on the manifold ways in which the concept of public outreach is interpreted and put into practice.

Public Outreach: What it is and why it matters

Ray (1999: 25) defines public outreach (or science outreach) as

> [...] a meaningful and mutually beneficial collaboration with partners in education, business, public and social service. It represents that aspect of teaching that enables learning beyond the campus walls, that aspect of research that makes what we discover useful beyond the academic community, and that aspect of service that directly benefits the public.

In other words, public outreach refers to various activities (initiated by researchers or research institutions) that enable and facilitate the involvement of non academics in research results and processes. The aim of such activities is to engage

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in a dialogue with the broader public. As a matter of course, we need to be more precise when it comes to the term "activities" and "aspects" (see definition by Ray above): What exactly can researchers *do* in order to put the concept of public outreach and broader impact into practice? Before I provide an answer to this question, let me briefly state why it becomes more and more relevant to today's researchers. In a report on global scientific collaboration in the 21st century (Royal Society, 2011), public outreach is mentioned as one of the aspects of research that will gain importance in the coming years: "[...] public participation and 'citizen science' will become increasingly important, as global challenges become more prominent and more public resources are spent on them." Indeed, carrying back results, information and knowledge to those who enable us to undertake research, seems only logical. As a matter of fact, the US National Science Foundation requires that proposals address not only the intellectual merit of the submitted projects explicitly, but also their broader impacts. Lok (2010: 416) resumes the activities that are listed in the foundation's proposal guide as follows:

- Developing educational materials for elementary, high-school and undergraduate students
- Involving these students in the research where appropriate
- Creating mentoring programmes
- Maintaining and operating shared research infrastructure
- Presenting research results to non-scientific audiences such as policy-makers
- Establishing international, industrial or government collaborations
- Developing exhibits in partnership with museums
- Forming start-up companies
- Giving presentations to the public

The list shows that public outreach is an umbrella term for a wide range of activities that reach from one day rather low-key events to year-long projects that call for professional organisation. While some universities have established community relations or scientific outreach offices[1] that support researchers in their public outreach activities, other researchers have to organise these activities without any professional support during their research time.

Public Outreach Activities at Higher Education Institutions: Four Examples

In the following, I will present some public outreach activities by institutions that were visited by the participants of the Global Perspectives Programme 2011 during their visit to the USA.

Berkham Center for Internet and Society, Harvard University:

The *Hyper-Public Symposium* at Berkham Center for Internet and Society is an example for a public outreach activity that aims at establishing not only interdisciplinary collaborations but also collaborations between science and industrial protagonists. The symposium entitled *"Hyper-Public: A Symposium on Designing Privacy and Public Space in the Connected World"* was a two-day event in June 2011 which brought together computer scientists, ethnographers, architects, historians, artists and legal scholars. During four sessions, the members of this very heterogeneous group discussed people on the one hand side ("the maker, users and transformers of new spaces and technologies" (cf. Symposium's Website)) and the future on the other hand side ("scenarios of radical technological change creating a vision of the world we want to live in" (ibid.)). Professor Urs Gasser explained to the GPP delegation that, while it is definitely important to be an objective researcher, it is crucial to advance one's opinion as a researcher, too, in certain contexts.

Virginia Tech Transportation Institute (VTTI), Virginia Tech University

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During a guided tour at the Virginia Tech Transportation Institute, civil engineer and PhD student Aly Tawfik mentioned several ways in which the institute engages in public outreach activities. According to Tawfik, the institute is taking the question as to how scientists can serve the community very seriously. The institute, for example, does not only engage in driver education but it also offers school days for students from first grade to college. By showing them the unique Smart Road that is part of the institute's research facilities, their interest in technology is sparked. It is important to stress that the VTTI has a special team at its disposal which organises these events and activities.

University of Virginia, Community Relations

The University of Virginia is a public university. This status dictates service to the society, particularly the commonwealth of Virginia. Thus, it does not come as a surprise that the university's public outreach activities are manifold and organised professionally by the Community Relations Office of the university. The Community Relations Office defines three different types of outreach: outreach to residents (this includes, for example, the arrangement of tours to the university), outreach to non-profits (the university provides assistance in meeting the needs of local non-profit organisations) and outreach to schools (this encompasses, for example, the arrangements of talks by professors and researchers at area schools). The *Day in the Life Program* is an excellent example for the creation of a mentoring programme as public outreach activity. Students serve as mentors for local youth. Mentors and mentees experience academic, cultural, athletic and social events at the university together. This should help local youth to "set goals, increase self esteem and build confidence in their ability to pursue higher education." (cf. Community Relations' Website)

Conclusion

The four examples provided in the scope of this report show that public outreach comes in various forms and that the type of activities that researchers engage in depend to a large extent on the resources they are provided with. While some Higher Education institutions rely on the initiative of single researchers or research groups alone, others provide them with professional help in order to meet their public outreach goals. As public outreach will become increasingly important in the academic landscape of the 21st century (also as a decisive criterion regarding grant proposals), it is a major competitive advantage for institutions when researchers receive more professional help when they wish to carry their results back to the broader public.

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WEBSITES

Website of the Hyper-Public Symposium: www.hyperpublic.org (15.11.11)
Website Community Relations, University of Virginia: http://www.virginia.edu/communityrelations/ (15.11.11)

NOTES

1. For example the Community Relations Office at the University of Virginia or the Office of Science Outreach at Stanford University: http://www.virginia.edu/communityrelations/about.html and http://oso.stanford.edu/

OTHER TOPICS

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Maintaining Autonomy Among the Standardization Goals of the Bologna Process

Carmen Byker
Virginia Tech

Introduction

Paired with the necessity for a competitive educational system in an ever-globalizing society and the need for an economic renaissance, 29 Education Ministers representing countries across Europe signed the Bologna Process in 1999 in order to reform higher education. Today, 46 countries support educational restructuring in Europe. The declaration was written to connect institutions of higher education through standardization of degrees and qualifications, to encourage mobility, to amplify the social dimension of research and teaching aims, to shift to student-centered learning, and to centralize the administrative system. With the exception of the Salzburg Recommendations (designed to reform doctoral education specifically), the explicit goals of the Bologna Process have remained relatively similar since the inception of the declaration. While the principles of the declaration intend to solidify higher educational standards within 46 member countries, potential conflicts arise in the ability of institutions to maintain cultural autonomy with respect to standardization goals through the Bologna Process.

Methods

A case study based in eight Swiss, German, and Italian Universities during the summer of 2011 exemplifies particular techniques employed to maintain independence in a process that strives to encourage harmonization. While campus administration shared the specific details of education at their university to a group of Virginia Tech graduate students enrolled in a *Global Perspectives* course, the topic of the Bologna Process naturally occurred in conversation. Qualitative data relating to the Bologna Process was collected from each conversation and separated into reoccurring themes. Participating Swiss, German, and Italian institutions included: University of Zurich, ETH Zurich, University of Basel, University of Freiburg, University of Applied Sciences and Arts

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of Southern Switzerland, Università della Svizzera italiana, Politecnico di Milano, and 'Accademia di Mendrisio.

Results

Table 1 provides detailed examples of qualitative data collected from respective universities. Three key themes emerged from campus administrators that both enhance and inhibit cultural autonomy while following standardization goals of the Bologna Process: education, organization, and language.

One primary improvement identified was the reshaping of education. The centralization of information, solidifying of degree programs, and student centered learning were suggested as enhancements to the university learning environment. On the other hand, some institutions voiced concerns about their cultural autonomy and saw no need for change in their educational system, as their current program worked.

The choices that universities make in the organization of administrative systems distinctly impacted the degree to which cultural autonomy or standardization through the Bologna Process was enhanced or inhibited. In Switzerland, the financial and educational organization of cantons and states inhibited goals of the Bologna Process, especially in regards to mobility of students. On a positive note, the Bologna Process was acknowledged for forcing systems to standardize at the lowest levels—within cantons, provinces, and states. Administrators commented that more useful standardization can occur at higher levels only after the lower levels are organized.

Language equally enhanced cultural autonomy and inhibited standardization. Although some classes were taught in English to encourage mobility, interviewees clearly noted the significance of native language knowledge in each university. Language served as one way to safeguard cultural and standardization changes, as large portions of students were naturalized residents and modification of educational programming was not a necessity.

Conclusions

Maintaining independence from a system that seeks to harmonize clearly remains an important objective for the higher educational institutions identified in qualitative observations. The Challenge of Bologna, a book written by Paul L. Gaston, calls universities to move beyond resources and reputation to focus on what is important—improvement of educational practices and learning outcomes. From a variety of perspectives, the real challenge in higher education in light of the Bologna Process is to strive to achieve the delicate balance between the improvement of the institution's learning outcomes, along with the preservation of that institution's unique educational, organizational and linguistic heritage.

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Table 1. The ability of institutions in higher education to maintain autonomy with respect to goals of standardization through the Bologna Process (BP).

Institution	Education	Organization	Language
UniZürich	-Curriculum is more flexible and does not necessarily follow the BP. -Master degree with transferrable skills is somewhat expected and makes the possibility of future PhD studies in other places easier. -PhD students used to be mini post docs, but now have a more structured and organized program.	-Tax payer system limits the mobility of students. -Grassroots reorganization from institutes to disciplines	- German is most widely spoken at the undergraduate level, but there are an increasing number of science classes given in English. The language limits the number of students crossing borders.
ETH	-Why would Switzerland change a system that is working? Master students graduate in 4-5 years at ETH, not 3 according to BP.		-Teachers are rated on their clarity of language use to better suit the needs of students.
UniBasel	-A massive evolution from professorial positions that were largely independent to ones where student demands play an essential role.	-There is a debate about whether foreign students should pay higher fees as their families to do not contribute to canton taxes. -Greater focus on the organization of university as a whole than on individual disciplines. -The BP has caused a renationalization of European universities, where the first level of standardization is being addressed at the national level. -Harmonization and mobilization goals are achievable in 100 years.	-Language is a challenge for international students, but is only a symbolic barrier. -Undergraduates do not have scholarly maturity to cross borders. Swiss schools are attractive at scientific level, but are too idiosyncratic at the cultural level. -Graduate level students can easily adapt.
UniFreiburg			
SUPSI		-There are less finances from cantons for foreigners.	-Classes are mostly taught in Italian, but electrical engineers need to be proficient in German as they travel to Swiss-German speaking portion of the country for practice.
USI		-The number of international students are accepted based upon the number of Italian students that apply. The Ticino canton charges international students more	-At the undergraduate level, courses are taught in Italian and English. -At the Masters level, the English language is spoken if the advisor is interested in students.
PoliMi	-BP helped to launch the PhD program.		-Undergraduate foreign students must take exam for language proficiency. -2 out of 29 Master programs taught in English.
L'Accademia di Mendrisio	-Universities accept international students to stay competitive in the sciences.	-Best students come from the best high schools, which are usually Swiss	-Bachelor taught in Italian mainly, but design program taught in English

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Writing in Universities: A Graduate Level Examination

Kerry Dirk
Virginia Tech

Although I knew that very few universities outside of the United States have compulsory first year writing courses, I was not aware of the extent to which writing is a focus of one's education in the universities of our visit. After quickly learning that none of the people we spoke with had an understanding of undergraduate writing practices, I turned my attention to the writing of the PhD students and the support, if any, that they are given. Very few PhD programs in the US have any focus on writing in one's discipline, so from my experience most students learn how to write seminar papers, conference papers, and academic publications through trial and error and/or help from their advisors. Much to my surprise, many of the universities that we visited, especially in Switzerland, have a much greater support system in place for their PhD student writers, even offering courses on how to write in specific academic disciplines.

Several of the universities have a separate language center that works as an interdisciplinary space that student writers can visit for help. Interestingly, I found that many students at these universities were unaware that such centers exist, so the centers may not yet have reached their full potential. The University of Zurich and ETH Zurich both share a language center that offers transferable skills courses such as scientific writing. Some of the specific courses they offer include the following: Introduction to Writing at Doctoral Level: Natural Sciences and Engineering, Writing Research Papers for Publication, Basic Academic Writing Skills, Grammar for Academic Purposes, and Conference presentations.[1] This center also provides resources for teaching development.

The University of Basil also has a language center, with broad courses such as Writing to be Published and quite specific courses such as the following: English for Natural Scientists, English for Medicine, English for Pharmaceutical Scientists,

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Legal English, etc.[2] These courses are taught by people with diverse backgrounds in Business, English, and Philosophy, for example. Despite the diversity of courses at this center, very few of the PhD students with whom I spoke were aware of the course offerings. One Biology student claimed that their writing support consisted of students giving their papers to an English secretary for proofreading, and another student expressed her desire for more help with law writing. Overall, despite these very specific course offerings targeted toward students in various disciplines, there seems to be a need for disciplines to make students more aware of these options.

Other universities had fewer options for students. USI has one required PhD course on research policy and grant proposal writing. According to their website, "this course will provide to PhD students information and competences concerning the overall framework of the Swiss research policy and research system, as well as on the interaction with funding agencies and procedures for project submission and proposal writing."[3] Overall, this course seems much more focused on the particulars of doing research in Switzerland than on the actual proposal writing. On the other hand, SUPSI has no official writing courses for students but does offer CV writing help. And finally, Polytecnico di Milano also had no formal writing instruction, although one PhD student explained that he felt like his dissertation was quite a mess. I could not find any information about the remaining universities of our visit either on the websites or through my discussions with people at the university.

Overall, I believe that the use of a language center as a localized place of support for disciplines is something that US institutions may want to consider implementing. While universities in the US often have writing centers – which cater primarily to dissertation-writing students in the summer – more specialized writing courses could be of great benefit to students.

NOTES

1. <http://www.sprachenzentrum.uzh.ch/angebot/sprachen/liste_en.php?sprachnr=5&gruppe=14>

2. <http://sprachenzentrum.unibas.ch/index.php?menu_id=23&lang=en>

3. <http://www.com.usi.ch/en/education_course_details?id=2049>

Academic careers in Switzerland and the United States of America

Leon Gay
Virginia Tech

Abstract
Professorship conveys social prestige in most countries. However, given different traditions, social contexts, and varied scopes of higher education institutions, a variety of paths for building an academic career exist worldwide. This paper compares the development of academic careers in the U.S. and Switzerland. Although both countries have similar requirements for an advanced degree (which is a frequent requirement for professorship), dissimilar contexts introduce divergences on academic career development. Dissimilar opportunities arise from different cultural traditions and economic structures in both countries. The main differences in academic careers between U.S.A. and Switzerland can be described in terms of personal aptitude and choice, social context, and financial opportunity.

Introduction

This paper originated from a naïve question: What are the steps for becoming a professor and developing an academic career in the U.S. and in Switzerland?. The answer is not simple and such question is naïve due to its vagueness. Many factors need to be considered for a thorough answer, and therefore this paper is very likely incomplete.

There are different types of professors, as there are different types of higher education institutions. Some professors are research-oriented, or teaching-oriented, or professors of practice. Each professor type may follow a different pathway to an academic career. Furthermore, not all professors require a doctorate, and not all persons obtaining a doctorate will work in academia. The role of academe and its faculty in contemporary society are subject to unprecedented challenges, questioning, and conflicting goals. For example, academic tenure is under critical review and discussion [1].

Background

Contemporary western universities are notably

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different from their antecessors. Antique universities were relatively isolated, mostly mono-cultural, primarily religiously-oriented institutions. The contemporary university is frequently secular, multicultural, and deeply integrated within its surrounding social and economic context. Virtually all scholars formed in the old universities were intended for continuing an academic tradition, while today's advanced degree holders increasingly develop their careers in industry or as consultants, not in academia. Although there are multiple causes for such trend, personal choices play a significant role and personal motivations for pursuing an advanced degree are increasingly complex [2].

Academic Careers in Switzerland and the United States

As it was mentioned, there is not a unique path for becoming a professor. Different countries and world regions have diverse requirements and pathways for academic careers. Within the same country, different academic career paths exist depending on the type of institution where the person is expected to work. Professional schools, research universities, and teaching universities may all have dissimilar objectives and academic staff needs. Scholars, where professors are included, are considered to have skills and certifications for all other professions, so academia is sometimes called "the host profession" [3].

The American path to an academic career evolved differently from Europe despite having an European origin. The U.S. graduate education can be considered largely successful [4]. The Bologna process in Europe acknowledges the success of the American model of higher education. Although the Bologna process is undoubtedly economy-driven, its consequences are far reaching for Europe and worldwide.

Both American and Swiss students must meet similar requirements for achieving an advanced degree enabling them for an academic career, and therefore they develop similar profiles. Requirements for professorship include an advanced degree, developing teaching skills and experience, and sometimes the ability to engage in funded research. A significant difference is the timing for deciding on a possible future academic career path: Swiss students started an enabling path for academia around middle school, while American scholars can decide by the end of high school. The Swiss system evaluates every student abilities and interests in order to direct them where they are more likely to be successful between two main parallel career paths: professional and academic. Changing from one career to the other after some years is possible, but not simple. The American system also has both paths, but the decision of which one to take depends strongly on the student's personal preference and financial means. The Swiss system directs students at a rather early age but provides financial opportunity for everybody to complete their degrees. The American system provides more freedom of choice, but probably not everybody has the same financial opportunity to achieve the desired degree.

In addition, the "higher education markets" for professors have significant differences in the U.S. and Switzerland. Not all doctorate holders are employed in academia, especially in Europe. The doctoral degree originated from, and is still strongly focused on formation of scholars, but both the attractiveness and opportunity of getting an academic position tend to diminish everywhere, particularly in Europe [5]. American scholars seem to have much more mobility than their European counterparts, creating more opportunities for new scholars to integrate to an academic career path. The ratio of tenured professors is relatively high in the U.S. compared with Europe [6, 7], but the current trend is reducing the total number of tenured posi-

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tions available.

Conclusion

Swiss students start preparing to become professors based on early external assessments, in theory aligned with the students' personal interests. Their financial access to higher education is mostly guaranteed by subsidies from Switzerland's fiscal policy. American students are given free choice of whether pursuing an academic career, but financial opportunity is not guaranteed.

Both Swiss and American paths to professorship have similar requirements. However, there are significant differences in financial opportunity, career options, and higher education market openings for new professors. While the Bologna process represents an European response to a successful American higher education system, the American system is still evolving. Paradoxically, the evolution of the American system of higher education is not always consistent with Europe's Bologna process.

NOTES

1. W. G. Tierney, "Tenure and Community in Academe," Educational Researcher, vol. 26, no. 8, pp. 17-23, Nov. 1997.

2. J. A. Lindholm, "Pathways to the Professoriate: The Role of Self, Others, and Environment in Shaping Academic Career Aspirations," The Journal of Higher Education, vol. 75, no. 6, pp. 603-635, 2004.

3. The American Academic Profession: Transformation in Contemporary Higher Education. Baltimore: Johns Hopkins University Press, 2011.

4. P. G. Altbach, Comparative higher education : knowledge, the university, and development. Greenwich, Conn.: Ablex Publication Corp., 1998.

5. J. Huisman, E. de Weert, and J. Bartelse, "Academic careers from a European perspective: The declining desirability of the faculty position," Journal of Higher Education, pp. 141–160, 2002.

6. R. L. Clark and J. Ma, Recruitment, retention, and retirement in higher education: building and managing the faculty of the future. Edward Elgar Publishing, 2005.

7. C. Musselin, "European academic labor markets in transition," Higher Education, vol. 49, no. 1-2, pp. 135-154, Jan. 2005.

Community engagement within European universities

Eric Hodges
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Introduction

The Morrill Acts of 1862 and 1890 started a revolution in American higher education that both opened access to higher education to a larger portion of the population and inculcated community engagement as a critical mission of institutes of higher learning. In the recent decades, the enterprise of higher education has become much more international and global. Because of advances in information technology and fundamental shifts in the nature of the global workforce, the nature of scholarly research has become more global and the preparation of graduate students must change along with these trends in order to prepare the academic leaders of the future.

In response to this challenge, the Graduate School at Virginia Tech, under the leadership of Dr. Karen DePauw, created a program for graduate students known as the Global Perspectives Program. The Global Perspectives Program is designed to foster global collaboration among scholars and prepare the next generation of scholars for the evolving field of global higher education.

As part of my participation in the program, I decided to ask two questions about higher education in Switzerland. First, to what degree is community engagement a part of the mission of the Swiss universities? Secondly, are there institutions in Switzerland that resemble the American idea of land-grant universities? The answer to these two questions will be informative of the cultures of higher education in the United States and Switzerland and perhaps help identify potential areas for collaboration and strategies for successful implementation of the respective missions of higher education.

The Land Grant Revolution

The Morrill Land Grant Acts of 1862 and 1890 authorized the creation of landgrant universities and colleges throughout the United States in order

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to "the liberal and practical education of the industrial classes in the several pursuits and professions in life." This act led to the creation of institutes of higher learning throughout the United States not only committed to the traditional missions of higher education, discovery and teaching, but also committed to outreach and engagement with the surrounding communities. This commitment is captured in Virginia Tech's mission statement:

Virginia Polytechnic Institute and State University (Virginia Tech) is a public land-grant university serving the Commonwealth of Virginia, the nation, and the world community. The discovery and dissemination of new knowledge are central to its mission. Through its focus on teaching and learning, research and discovery, and outreach and engagement, the university creates, conveys, and applies knowledge to expand personal growth and opportunity, advance social and community development, foster economic competitiveness, and improve the quality of life.

George McDowell in his paper, "Engaged Universities: Lessons from Land Grants[1]" uses the model of Virginia Tech and its original mission of engagement with the agricultural model to demonstrate the success of an engaged university. McDowell argues that this move towards engagement in education was beneficial in two ground breaking ways. First, by extending higher education to those who would not have otherwise had access to education, the Morrill Act started what John Taylor called "the charter of America's quietest revolution.[2]"

Secondly, by Virginia Tech scholars becoming more engaged with local farmers in the surrounding areas, two things happened. First, there was an explosion in both the quantity and the quality of research in agricultural science. Agricultural scholars had new research subjects and discovered topics they never would have considered if not for engagement with the local farmers. The second occurrence was that agricultural productivity sky rocketed and the American agricultural model became one of the more efficient businesses in the global economy.

The Graduate School at Virginia Tech through its innovative Transformative Graduate Education (TGE) program attempts to make this mission a reality through its Citizen Scholar program. The Citizen Scholar Engagement initiative at Virginia Tech encourages graduate students to create a mutually beneficial partnership with the community by utilizing their research and academic skills to solve real-world problems. The Citizen Scholar initiative also endeavors to foster the belief that graduate students are not only dedicated researchers and scholars but also engaged citizens with a special skillset that is essential to the functioning of society.

Global Perspectives

Another aspect of the TGE program is the Global Perspectives Program (GPP). Global Perspectives Program provides Virginia Tech graduate students with an opportunity to explore trends and issues of global higher education, faculty roles and responsibilities in higher education from a global perspective, organization and structure of higher education, student demographics, academic programs and more. Participants attend seminars and visit selected partner universities in Europe. Our particular group visited partner universities in Switzerland, Germany, and Italy and formed a close partnership with another cohort of Global Perspective students from the University of Basel. The leader of the program, Dr. Karen DePauw, asked the Virginia Tech students to select an area of inquiry to focus our discussions with university faculty, staff, and students. My question was: What is the level of community engagement within the

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European universities? Furthermore, are there institutions of higher learning in Europe similar to the model of land grant universities found in the United States?

I found that there was community engagement within the Swiss universities but the modalities were different depending upon the type of institution. Amidst these different modalities, there were three common trends mentioned in the majority of the presentations we received. The three common links to the community mentioned by the universities were: technology transfer, business incubators, and canton-based development strategies. Technology transfer involves strategies to help migrate technologies that are pioneered in the academy to implementation within industry.
Business incubators offer a suite of services, including educational programs on business basics, networking opportunities, and the use of university technology all aimed at encouraging entrepreneurship and economic growth. The Canton-based universities envision the funding provided for higher education as directly benefiting the community by educating the future business and political leaders in the community.

In addition to these three general trends, there were also specific outreach activities identified at the specific institutions. The University of Zurich for example allows the use of their forensic laboratory to help the local police to measure Blood Alcohol Content (B.A.C.) and to attempt to use DNA evidence to solve crimes. In addition, Zurich hosts a Science Bar open to the community to provide a forum for discussing the pressing scientific issues of the day. ETH opens their library for public use and also hosts a science day for community outreach.

In response to the question of whether the Swiss system of higher education has an equivalent to the land-grant institution created by the Morrill Act of 1862, the short answer is no. However, there are some institutions that mirror certain aspects of the spirit of the land-grant colleges. SUPSI, the Swiss Institute for Applied Sciences, focuses on the "practical" sciences, such as a Smart Grid project, that looks to increase the efficiency of society's energy consumption. This focus on the practical sciences is similar in spirit to the original mission of the land grant universities.

USI, another Swiss university, is centrally located in Lugano. However, USI has several satellite campuses located throughout the southern region of Switzerland. The locations of these satellite campuses are based on the needs of that specific region. For example, USI has a satellite campus that focuses on textile manufacturing in the region where textile manufacturing is the major industry. Both of these elements, focusing on the practical sciences, as well as the correlation between the needs of the region with the focus of the academic study are reminiscent of the land-grant model.

NOTES

1. George McDowell, "Engaged Universities: Lessons from the Land-Grant Universities and Extension." Annals of the American Academy of Political and Social Science, Vol. 585, January 2003.

2. John Taylor, "The Masks of Society." New York: Appleton-Century-Crofts, 1966 . pp. 273.

Academic degrees and positions (in natural science)

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This report is an overview of similarities and differences between two education systems, from my own personal view. Education systems vary from country to country; and the path to pursue higher education and degree can be confusing and challenging. It is important to go a step back and give a description of the compulsory education level. Even though it is a rough description it may, however, be essential to understanding the path of the two education systems. While in the US a single primary education level of 12 years comprising elementary and secondary education exists, in Switzerland there are four different types of education open to the pupils, when they conclude their 9 years of primary school (Basel city). The admission to different kind of schools depends on their qualifications earned during compulsory schooling. Those going to the matura school ("gymnasium") receive broad general education in seven basic subjects, a major subject and a minor. Successful results on the examinations are required to obtain the Swiss maturity certificate ("Maturitätszeugnis") allowing the student to apply and be admitted to the university of interest. This is the direct route taken by those, who intend to go to university. In the US systems, every one who has completed the primary education level, can apply to university. There are several admissions criteria, which vary between the universities. The application procedures are costly and time-consuming. In most cases the students have to apply to several universities. Once admitted, the students engage in undergraduate study.

Moving to the degrees available at the university, I will give you a brief explanation of degrees in Swiss and US academia mainly focused on natural science field. As we know, there are different degrees that we can earn during our student lives. Here I simplified the degrees in an informal list giving first a short description of the US system following by Swiss system:

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Undergraduate degrees

Associate's degree

This degree is available from public community colleges, private two-year colleges, for profit technical institutes, four-year colleges or universities. The students need to choose an occupational major in early years to be career ready in two years. The cost of the credits at a community or vocational college is not high. The credits are usually transferable to four-year colleges.

This degree is similar to the Swiss vocational education and training (VET). This program has the aim to prepare the students with the skills and knowledge for a giving occupation. For a VET certificate is needed two years program and for VET Diploma four years. During the four-year program the students, who want to go to university, have the option to attend general education courses and apply for the Federal Vocational Baccalaureate examination. After successful results on examinations they are awarded with a higher education certificate and can continue their studies at the university. Another option open to the students outside the universities is the enrollment in a professional education and training (PET) program. The program is based on their previous work experience. Through this program the students obtain more specialized and extensive knowledge and skills, but also develop personal management abilities. It is expected that the students apply the newly acquired knowledge and skills. This PET program prepares the individuals for leadership positions.

Bachelor's degree

The path to earn the bachelor's degree is very similar in both systems. It requires 180 credits and can be completed in a full- or part-time study. The students usually take general and core courses. The courses often contain laboratory work providing firsthand experience in scientific research method. In US it is accomplished in two-, three- or four-years program or even longer, mostly because some students are enrolled part-time. As it was mentioned before, many students get the two-year college degrees; afterward they move to a four-year college or university and study two years more to earn a bachelor's degree. While in Switzerland it is usually a full three-year program at the cantonal university. The length of study varies depending on the research field and the university. American and Swiss students often pay most if not all of their tuition, however the tuition of Swiss universities is lower than American tuition. To access the cantonal universities a valid Swiss maturity certificate or an equivalent foreign upper secondary school certificate, which qualifies the student for admission to university, is required. Those Swiss universities of applied sciences provide more practice-oriented courses and the admission criteria include a previous half-year or year internship. The students have the opportunity to combine part-time study and work. After completion the study and passing the examinations the students receive a degree of Bachelor of Science, B.S. or S.B.

Graduate degrees

Master's degree

There are more differences than similarities for this degree in both education systems. This is a 1.5- or 2-years program, beyond the bachelors. It requires students to complete a master's thesis or a research paper. Doing a master's degree allows the students to advance in the field of interest or to develop expertise in a new area. The most remarkable difference is that master degree in the US is not always required before pursuing a Doctorate. Sometimes the master degree is earned during the doctoral degree. While in the US the students have a number of choices of possible master's degrees depending of their educational goals, in Switzerland there is a single science master program. i) Research master's degree is similar as our degree. It involves participation in advanced seminar and courses; and the completion and defense of master

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thesis. ii) Professional science master degree is designed to gain advanced training in science and simultaneously to develop workplace skills such as business, communications and regulatory affairs. iii) Course Work master's degree, as the name describes, it includes just course work with the intention the students go deep in their knowledge in the field selected. The students usually do not intend to pursue research or PhD. iv) Practice oriented master's degree is awarded for professional studies and generally do not have an academia research component. It involves a supervised project in most cases and often it is a final degree for the person.

Maybe for the reason that we have one science master program, it is built on the basis of what the students have learned in the bachelor's degree. Therefore, the program provides students with in-depth knowledge of their science area and opportunities to develop their professional skills in the field of interest. The Swiss master's degree system allows the students to select a scientific discipline that they want to study in depth by taking advance courses and seminars relevant to their needs and interests. The student performs a supervised project in the laboratory and prepares a research-based thesis. The degree is awarded after completion of master's thesis and successful defense of the oral examination; and it is required to start a doctoral program.

Doctoral degree

The two countries have different graduate degree programs for doctoral degrees. Although the program for life science in the US also consists of three-four years, a median time lapse from bachelor to doctorate is seven years. There are various forms of financial aid from teaching and research assistant-ships to scholarship or to loans. Typically, American doctoral programs involve three stages of academic work. The first stage consists of coursework, laboratory studies and passing a number of written examinations. The second stage consists of designing the research project, where the student is required to enroll in advanced seminars and forms a dissertation committee. After approval of research project the student start his independent research, the last stage. When the committee accepts the submitted dissertation, the student gets scheduled for the dissertation defense. After passing the defense, the doctoral degree is awarded to a student. The application procedures as the program itself are quite different between the two countries. To be admitted to the doctoral program at the Swiss universities, students must hold a master's degree or equivalent foreign diploma. The students decide the research field of interest, contact the professor and ask for opportunities. Swiss PhD students already got most of the coursework and laboratory studies during the master program. Therefore it is usual that the PhD students start their research project immediately after beginning their program. They attend to few advanced lectures and seminars. In natural science, a PhD curriculum consists of 3-4 years of full time research and study. The degree is awarded after completion of PhD thesis and successful defense of oral examination.

Habilitation

The degree called "habilitation" is known in the German-speaking Switzerland and it is like professional certification rather than tenure position. Teaching skills are also evaluated and the university expects that the degree holders teach a specific academia area. This degree is not always required for a faculty position.

The positions in academia are not always clear to most of the students and the organization of the staff differs across the countries. Here I will briefly describe different positions at a research university giving remarks when there are some differences

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between the two systems.

One of the starting levels in academia is the position of **research assistant**, which is a temporary job. Most of the assistants are graduate students or upperclassmen and have other employment options. They work in laboratories assisting professors with their research, however they are not independent and are not responsible for the outcomes of the research. Similarly in Switzerland this position is available and occupied from undergraduate or graduate students. However there are few opportunities available for students to work at the university. The traineeship in the laboratories takes place mostly during the summer break.

Most of the PhD students are hired as **graduate research assistants**. Thus, it is an academic research position and the candidate usually works in its own research under the supervision of principal investigator or/and professor. Maybe due to different curricula of doctoral programs and cost of education, the activities of doctoral students are quite different. While many American students combine their study with teaching or other activities in order to pay the tuition, the Swiss students work in full time paid employment. This situation is quite often in natural science to support students to focus on their experimental investigations, but students of other fields are in part-time employment. The funding comes mostly from the university or the Swiss National Science foundation (SNSF).

Most of the doctoral degree recipients, who want to continue in academia, enter a **postdoctoral position**. In both education systems the postdoc position at the university is uncertain and sometimes without rank. Although the postdoc position in Switzerland is often classified as regularly employee researches, it is a kind of paying temporary staff position. In general, a postdoc in science is part of a team in an established research laboratory. This is thought of as a chance to build their own research program, learn new techniques, write grant and train graduate students. The goal of this period is to prepare the postdoc to become an independent researcher able to conduct professional research. A postdoc period varies and has increased over the last few years; there are several reasons for this. It could be that the project is promising and the postdoc wants to follow it and bring to the end; or job opportunities are scarce or non-available. A postdoc position at the university of Basel is available up to 6 years. Depending of the funding sources the postdocs status varies. If a postdoc works on the grant of a principal investigator (PI), then the postdoc works on the PI's project and has less flexibility in choosing a research project. Holders of those positions are often extremely dependent on their supervisors, and their stipends can be reduced or even stopped. A postdoc supported by a competitive fellowship has more prestige and flexibility in choosing a program and adviser. Swiss postdocs holding such kind of fellowships go abroad to absolve one to three years training. This is essential and prerequisite for a faculty position.

Usually there are three ranks for faculty in American universities that include **assistant professor, associate professor and full professor**. In Switzerland these positions correspond to junior professor, extraordinary professor and ordinary professor. The review process for the candidate to be promoted from one to the next rank involves a series of steps and includes evaluation of teaching, research and service aspects. The details of tenure process are often vague and may differ from country to country as well as from university to university. Generally the professors hold tenure-track appointment, but this is not always the case. Like the assistant professor or junior professor, they do not always have tenure appointment and is term-fixed. After five years approximately the candidates undergo evaluation procedures through a university

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committee. By positive outcomes the academic staff are promoted to associate professor. At least five years as associate professor at the university the candidate can advance to full professor.

Moving in the world of academia is exciting and challenging, but we have to learn the structure of our own university and be aware of the organization of other universities. Gaining a global picture of academia helps us to realize our chances, responsibilities, rights and obligations as a member of an academic community.

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China on the Move – international mobility trends

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In the course of the GPP 2011 visit to the U.S., the group was very fortunate to attend a meeting at the Swissnex outpost in Boston, a beautiful setting for the presentation of Raisa Belyavina on new global trends and directions in student mobility around the world. Working for IIE (Institute of International Education) and being the editor of one of its recent publications called *Student Mobility and the Internationalization of Higher Education* (2011), she enriched our discussion with many new insights and facts on how and why students move across the globe in order to access higher education. For example: According to the OECD there are currently over 3.3 million students studying in a country beyond their own; a 65 % increase since 2000. Where do these additional 65 percent of international students originate from and what are the destinations they choose to access higher education? To answer these kinds of questions the Institute of International Education (IIE) was founded in 1919 as a private non profit organization. However, IIE does so much more than handing out questionnaires and gathering data to compile statistics. In collaboration with governments, foundations and other sponsors, IIE creates programs of study and training for students, educators and professionals. These programs include the flagship Fulbright Program and Gilman Scholarships administered for the U.S. Department of State. Altogether it is a great institution fully committed to global education.

The first decade of the 21st century has witnessed changes in the scale and range of global educational mobility. Over the last decade, the number of students studying outside of their home country has been growing at an unprecedented rate. In the case of the U.S. the number of students going abroad has more than doubled in the past decade (in 2008/09 260’327 U.S. students studied abroad). While most of the traditional host countries are seeing the numbers of international students con-

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tinue to rise, newly emerging hosts have entered the competitive higher education market and are re-directing the flow of global talent. China certainly plays a leading role in these new trends in student mobility and it is the aim of this article to shed some light on how China is shaping the future of internationalization in the global higher education market. All the numbers and facts used to do so have been retrieved from the official IIE census called Open Doors which can be accessed via www.iie.org/opendoors. The article considers the reports on international educational exchange for the years 2000 and 2010.

Let us first have a look at the historical trends for China as a sender of students to the United States: from 1950 until 1975, China sent not a single student to the U.S., but considering the political situation at the time this is not surprising. However, in the 1980s the numbers of Chinese students in the U.S. grew dramatically and in 1988/89 China even displaced Taiwan as the leading sender and remained the leading place of origin until it was displaced by Japan in 1994/95. China regained its position as the leading sender again in 1998/99 and held it until 2001/02. After this India overtook China for an interval of 7 years until 2008/09; however, according to the most recent census of 2009/10 China has since displaced India and is currently back to being the leading place of origin for students coming to the United States. What does this mean though in absolute numbers? In the academic year of 2009/10 there was a total of 127'628 students from China studying in the U.S., a 29.9% increase from the previous year. With the exception of the year 2002/03 (possibly as a reaction of the 9/11 events) this number has steadily been increasing since 1995/96, when the number of Chinese students in the U.S. stood at 39'613. On what academic level and in which academic fields do international student seek their degrees in the U.S.? Traditionally the majority of countries are sending students at a graduate level abroad (52.1% in 2009/10), but there has been a steady upsurge in international undergraduate enrollments (31.3% in 2009/10). Most international students choose to study in the fields of either Management and Business or Engineering, again students from China and India are highly represented in both these fields.

Not only has China massively increased the number of students it sends to the U.S., but also it has started to take part in the market place of higher education as a providing country. In 1995/96 there were 1'396 U.S. students going abroad to China. In the most recent study of 2008/09 enrollment numbers have increased 9.8% to 13'674 U.S. students. Considering the absolute numbers this may seem marginal compared to other host countries (in the same academic year 141'955 U.S. students studied abroad in Europe), nevertheless there has been clearly an upward-trend for more than a decade and there is no reason to assume it will change direction. In the future, we might very well see China becoming a leading destination for international students, moving from being international consumers of education to becoming international education providers.

However, one should not assume China is an exception among the developing countries. Non-traditional destinations are increasing in popularity in general. Consequently there has been a downward-trend for the traditional destinations of Europe. Even though in 2008/09 the United Kingdom with 31'342 U.S. students still ranked number one in the destinations U.S. students choose for their stay abroad, this accounted for a decrease of 6.0% to the previous year. An even greater decrease in enrollments of 10.8% was seen in the enrollments for Italy, holding second rank on the list of destinations. Besides China ranking fifth, also many other destinations have entered the market of providing

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higher education. For example Chile experienced a 27.9% increase in enrollments in 2008/09 and South Korea had an even higher increase of 29.1%.

The data clearly indicates that on the one hand, there are new players such as China competing in the market for higher education and re-mapping the traditional world of higher education. On the other hand, there is not only a re-direction of the flow of international students but also a heavily growing demand for higher education overall. With larger numbers of students seeking a global education outside their home states, more countries face the challenge of providing the capacity to accommodate and educate this growing mass.

So far we have focused on the data of mobility itself; however, to really understand why students are attracted to China or why Chinese students increasingly choose to study abroad, only the context can provide us with satisfying answers. We need to ask ourselves: What is China doing at the national and institutional level to attract international students and to send more of their own students abroad? Therefore, based on the most recent IIE publication *Student Mobility and the Internationalization of Higher Education: National Policies and Strategies from Six World Regions* (2011), China's internationalization strategies will shortly be portrayed.

In its efforts to promote international student mobility, the Ministry of Education in China works closely together with the non-profit organization *China Scholarship Council* (CSC). CSC administers scholarships and data collection on behalf of the Ministry to support outbound as well as inbound mobility. Its two main goals are to enhance the competitiveness and internationalization of Chinese higher education and to cultivate creative and international talent through overseas education of Chinese students and scholars. Together with the Ministry of Education, CSC has over the last two decades implemented a number of national policies to promote student mobility. Concerning outbound mobility, CSC provides 12'000 scholarships annually to Chinese citizens for study overseas. These scholarships are very popular among Chinese students, however a very large number of Chinese international students are self-financed. According to the most recent data, students from China comprise 25% of the global total of international students (820'000 students), which means that out of 100 students 5 study overseas. When it comes to inbound mobility China already represents one of the top destinations within Asia. To further increase enrollments of international students in Chinese higher education institutions, CSC grants 20'000 scholarships to international students annually. In 2009 for the first time the number of inbound international students exceeded 230'000. With 27.1%, South Korea was the leading place of origin of international students in China in 2008/09 and U.S. students comprised 7.8%. Besides granting scholarships, CSC also organizes different fairs and conferences to promote its cause, such as the International Graduate Scholarship Conference or the International Graduate Scholarship Fair.

As China implements more national policies that create more educational opportunities and as more Chinese higher education institutions achieve world-class status, it is to be expected that enrollments of international students will continue to increase over the next years. China has already emerged as an important player in the global market for higher education and it aims to further improve its competitiveness and the level of engagement in global educational exchanges – transitioning from labor to knowledge economy.

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Happy Scholars , Merry Scientists

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I was rather surprised when one of the GPP participants from Virginia Tech asked me: 'Do you think that PhD students and post-docs at your university are *happy*?' Moreover, his question proved to be of the rhetorical kind as he added: 'In the US, they're not'.

After our visit to several US universities where we invariably found enjoyable company with our peers, I have serious doubts as to his pessimistic assessment of the general state of happiness in Amercian academe. Still, his question kept me thinking: Are young academics and university professionals *happy*? Is happiness a relevant factor at academic institutions? And if it is, in what does an academic's happiness or unhappiness really consist?

Let us leave the realm of academe for a moment and turn to other lines of work. It seems that over recent decades, the happiness of the workforce has more and more been recognised as an important economical factor. Traditionally, qualified employees were regarded as just another tradable commodity where supply and demand governed the prize and market-standard salaries guaranteed an employee's satisfaction. In the course of time, however, many employers came to realize that a great variety of factors was relevant in attracting, hiring, and – especially – retaining employees. As important as it is for a firm to keep attracting new talent in order to maintain potential for innovation and keep up with new developments, it is equally vital to retain qualified personnel. Losing well trained and highly specialized employees always comes at the prize of losing expertise and know-how. Hiring an employee is a long-term investment, all the more, as the hiring process itself is often laborious and cost-intensive. What are the factors, then, that ensure an employee's satisfaction or, to use the loftier concept, an employee's happiness?

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Importantly, employees want to see their work duly acknowledged – not only in terms of a big paycheck. Promotion opportunities, support of on-going education efforts, and participation in decision processes are equally important and influence a candidate's decision to take up or turn down a new job offer. More importantly, today's employees are determined to strike a balance between their professional and personal lives instead of sacrificing the one on the altar of the other. And here, it appears that a reasonable balance not only ensures the general satisfaction and well-being of an employee, but also affects her/his efficiency – in a positive way! We could speak of the work-life-balance paradox: The more acknowledgment and support someone finds at the workplace for her/his private life, the more s/he will be willing to contribute to the employer's success. Ideally, then, an enterprise does not create an atmosphere of rigid expectations where each employee delivers precisely that to what s/he is contractually obliged. Rather, it should foster an environment where everyone is motivated to strive for his personal best and go the extra mile if necessary. Flexible working hours, opportunities for part-time work, and assistance in accommodating professional and family lives are instruments in promoting an employee-friendly workplace.

This last point, the reconciliation of work and family, proves to be especially important when it comes to hiring women: In many areas of higher education today, the majority of degrees are earned by women.[1] Accordingly, it is vital for every employer to secure a fair share of the growing number of highly qualified women. Yet, having a family is still a major obstacle in the career development of women (and, to a lesser degree, of men).

Moreover, the traditional gender roles of male breadwinners and stay-at-home wifes give way to other forms of household organization. The example of Switzerland shows that in 2007, in a majority of couples both partners are in paid work.[2] Although the numbers suggest that role stereotypes persist in that men usually work full-time while women focus on part-time employments, the general development is towards a more equal distribution of paid work. Especially, highly qualified women are likely to be in full-time employment irrespective of their relationship status.[3] More and more people, then, need to reconcile their own careers with their partner's, a difficult task which becomes even more difficult as soon as a couple decides to have children.

How does this relate to Higher Education institutions and the employment situation of academics engaged in university research and teaching?

I believe that most scholars and scientists at university level meet one central prerequisite for happiness at the workplace: They enjoy what they do! Indeed, they commonly enjoy the privilege of working in the field to which they have chosen to dedicate themselves. In the following, I will optimistically posit this as an axiom and focus more on structural and technical factors.

To some extent, research universities are governed by a paradox: While their main goal is originality and innovation, the institutions themselves are characterised by rigid hierarchy and general conservatism. Academic careers follow largely predetermined patterns: From the first assistantship during one's PhD to a full professorship at a high-ranking institution, an academic career is a linear sequence of stages each of which is meticulously regulated and must be passed at a specific age. To be a successful academic, a candidate must complete this *cursus honorum* at a high pace,

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without interruptions.

Moreover, the high competition in science and scholarly research adds to the rigidity of academic careers. Every researcher simultaneously competes within at least three different frameworks. At his own institution, s/he is accountable to her/his colleagues and the governing body of the university, especially when it comes to the allocation of assets. In securing third-party funds from agencies such as SNF in Switzerland or NSF and NEH in the US, s/he will compete with other academics both from her/his own field and with those from other disciplines. Even within the narrower framework of his/her own academic field s/he will be faced with a twofold challenge: In her/his specialised work and publications, s/he competes with other specialists worldwide while in applying for a suitable job, s/he will often be measured against representatives of her/his discipline who do not necessarily share her/his specialisation.

As the 'function of authorship' is central to the modern-day discourse of science, a scholar's/scientist's participation in these competitions is highly personalised. It is primarily her/him – not the academic institution – who faces the competition. Her/his name appears on the published paper, and her/his publication list will ultimately be compared with those of her/his peers. As the worldwide scientific and scholarly communities operate 24/7, every scholar/scientist will feel anxious to spend as much of her/his days on work as possible to keep up with progress made elsewhere. Unsurprisingly, then, part-time work is not much in vogue among academics.

It will be immediately clear that academics therefore face special challenges when they have to reconcile their careers with their partner's or, indeed, with family life and the up-bringing of children. Interestingly, studies show that a majority of established researchers are confronted with these challenges. According to a major survey from 2008 on *Dual-Career Academic Couples* conducted by Stanford University's *Clayman Institute for Gender Research*,[4] only 14% percent of the academic workforce in the US are not currently living in a relationship; surprisingly, female academics are much more likely to be single than their male peers (21% opposed to 10%). Of those academics who live in relationships, only 13% have stay-at-home partners (only 5% of female academics, but 20% of men). Around 72% of the academic workforce, then, have partners with professional lives of their own; moreover, roughly half of the partners are also working at HE institutions.[5]

As most dual-career couples naturally seek to live and work in geographic proximity to each other, they are likely to turn down job offers which would entail moving to a place where their partner does not find suitable work. If both partners work in academe, this often means that they seek work at the same institution. Concern for the partner's professional life is often a major factor for candidates in a recruitment process. Accordingly, the study promotes awareness of Dual-Career issues among university administrators and suggests that guidelines and standard protocols for dual hires should be put in place. 'Universities are in danger of losing some of their most prized candidates if suitable employment cannot be found for qualified partners' (p. 2). Especially for women, dual hires prove to be an important hiring incentive: Female academics are more likely than men to have partners working in academe (40% as opposed to 34% of male academics; for women in ‚hard sciences' it is even 48%)[6]. Tellingly, women are more likely to consider their partner's career first: 21% of female faculty with partners in academe state that their partner's career is primary

while 20% value their own career more; of male academics only 5% give precedence to their partners' career, but 50% to their own.[7]

The study by *Clayman Institute* provides fascinating information on workplace demographics in US academe (e.g. why are women more likely to partner up with men of equal academic rank while their male peers are comfortable to have partners less qualified than themselves?)[8]. Yet, it is important to note that the study has a firm focus on hiring practices in HE, especially on the recruitment of senior-ranking faculty. Therefore, other aspects of Dual Careers in academe are not taken into account.

The study as it is has three blind spots: Firstly, it tends to neglect junior researchers and the influence of Dual Career issues at the start of academic careers. Secondly, the study is exclusively dedicated to full-time faculty and gives no information on alternative work arrangements in academe: Are there scholars/scientists working in part-time or job-sharing arrangements? And if there are, does that affect an academic's career opportunities? Equally, we do not learn what percentage of the partners of academics work part-time. Thirdly, the study does not consider how the objectives of Dual Career Couples change once they have a family.

Although dual hires are relatively rare (only 10% of all faculty surveyed in the Clayman Institute study were hired together with their partner) and not always accepted by other faculty, many universities today have established special offices to promote awareness for Dual Career Couples and assist them in their needs (e.g. assistance in the job search of a partner). At Virginia Tech, for example, a Dual Career Program is open to all partners of newly recruited faculty and university administrators. Its main objective is to provide spouses and partners of VT employees with personalised information and assistance in their job search.[9] If there are suitable openings at VT, they will be assisted in the application process. At Harvard, a similar program was established after a *Task Force on Women Faculty* had identified this as a promising recruitment tool in 2005.[10] Moreover, many US universities participate in initiatives such as the *Higher Education Recruitment Consortium* (HERC) founded in 2000 as a consortium of Northern Californian institutions and re-launched as a nationwide platform in 2007.[11] HERC was explicitly created to accommodate the needs of Dual Career Couples and provides a database of job openings in American HE that allows for a simultaneous search of two jobs in geographical proximity. At the same time, HERC coordinates efforts to provide and assess new initiatives in academic recruitment.

In Switzerland, similar efforts have been made in recent years. Most significantly, the *Rectors' Conference of the Swiss Universities* (CRUS) and the *Swiss University Conference* (CUS) implemented the *Federal Equal Opportunity at Universities Programme* which resulted in the creation of a number of mentoring programmes for young academics and in a doubling of the childcare facilities at Swiss universities.[12] In the programme's current third period (2008-2011) special focus lies on Dual Career Couples. On the one hand, the CRUS encourages universities to create Dual Career Counseling Centers similar to VT's programme cited above. On the other, it provides financial assistance to Dual Career Couples hired by Swiss universities (e.g. seed money for a spouse/partner to establish her/his research in Switzerland).[13]

While the value of these efforts is beyond any doubt, it is again noteworthy that they focus almost exclusively on already established researchers,

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most commonly on newly hired full professors and their spouses/partners. This is especially striking in the example of the CRUS initiative which explicitly identifies in its report the need to focus on junior academics: 'Die DCC-Problematik betrifft auch und ganz besonders Nachwuchswi ssenschaftlerinnen. In dieser Phase der Karriere werden künftige Weichen gestellt.'[14]

Indeed, especially young Dual Career Couples with family are faced with problems. Women are most likely to give birth in the years between 25-35, the critical years for an academic career. At this age, most young researchers complete their PhDs and embark on a second research project. Thus, it appears that especially for women, assistance in reconciling academic work and family life is vital. Statistics suggest that still today a significant number of women leaves academe upon completion of their PhD. Although for a number of years, the majority of PhDs has been earned by women, they are still heavily underrepresented at the level of the *Habilitation* and even more so when it comes to recruiting new professors. In many cases, women turn their backs to university careers because there are no opportunities for part-time work in academe. For the universities, this comes at a painful loss of talent.

How can a university counterbalance these tendencies? Here, the German university of Konstanz has entered unchartered territory as it decided to dedicate significant ressources to a comprehensive system of *Familienförderung*. The reconciliation of academic work and family life was identified as a core task of university administrators.[15] Interestingly, many of the ressources provided by the *Familienaudit* in Konstanz are open to the entire university community (e.g. students enrolled at the university can take advantage of childcare facilities). More importantly, the programme specifically addresses the needs of young researches at the early stages of their careers. To name only two examples: Young researchers are evaluated according to flexible criteria where individual factors such as the specific family background are taken into consideration, or scholars/scientists who attend to household and family duties are eligible for special funds to hire research assistants.

I have started this essay with the pessimistic statement of an American colleague who believes in the general unhappiness of academics. From my essay, a reader might be tempted to think of me as just another pessimist who focuses on the threats to happiness rather than on happiness itself. For the record, then: I am pretty happy at what I do. Indeed, most of my colleagues are (or they are good at pretending). I even suspect that the general happiness of academics is well above average. Yet, this should not keep us from improving areas where improvements can be made, and especially not from keeping pace with demographic and socio-economical developments. Here, addressing the needs of Dual Career Couples and academics with families at an early stage of their careers is vital.

In the US especially, there is much talk of attracting the *best and the brightest* academics. If this is indeed the objective of university administrators they should help to create an environment which allows for flexible and open career paths. If they do not, they will inevitably end up attracting not the best and brightest but the best and the brightest among the few who meet the abstract requirements of standardised curricula.

NOTES

1. Cf. the data for the years 1980-2010 (degrees earned at Swiss universities), published at <http://www.bfs.admin.ch/bfs/portal/de/index/themen/20/05/blank/key/gleichstellung_und/abschlussquoten.Document.134812.xls>. For a gendered perspective on Swiss education in general (not only HE), see *Sozialberichterstattung Schweiz. Auf dem Weg zur Gleichstellung? Frauen und Männer in der Schweiz.* Dritter statistischer Bericht. Bundesamt für Statistik. Neuchâtel 2003. pp. 23-9 [downloadable from <http://www.bfs.admin.ch/bfs/portal/de/index/news/publikationen.Document.26011.pdf>].

2. For details see *Familien in der Schweiz. Statistischer Bericht.* Bundesamt für Statistik. Neuchâtel 2008, pp. 65-6. [downloadable from <http://www.bfs.admin.ch/bfs/portal/de/index/news/publikationen.html?publicationID=347>]. The numbers show that in no more than 13.8% of *childless* couples only the male partner is in paid work; in couples with children, the percentage is much higher depending on the age of the children (between 36.2% in couples with infants to 19% in couples with children aged 20-24). In 35.9% of childless couples both partners work full-time (opposed to 8.1-14.6% in couples with children).

3. From the latest data published by the *Bundesamt für Statistik* "Ausbildungsstufen der Vollzeit- und Teilzeiterwerbstätigen nach Geschlecht, Nationalität, Altersgruppen, Familientyp" (<http://www.bfs.admin.ch/bfs/portal/de/index/themen/03/02/blank/data/03.html>; file name: je-d-03.02.01.17), I calculate that approx. 45% of women employees with a degree from an HE institution work full-time as compared to only 38% with secondary school degrees. Still, only a fourth (25%) of all full-time employees with HE background are women.

4. Schiebinger, Lorna/Davies Henderson, Andrea/Gilmartin, Shannon K.: Dual-Career Academic Couples. What Universities Need to Know. Stanford, CA 2008 [downloadable from <www.stanford.edu/group/gender/publications/index.html>]. The study centers on 9043 full-time faculty from 13 leading US research universities.

5. Schiebinger et al. pp. 1, 13.

6. Schiebinger et al. p. 13.

7. Schiebinger et al. pp. 34-7.

8. Schiebinger et al. pp. 19-21.

9. See the brochure at <http://www.hr.vt.edu/employment/dualcareers/content/file_Dual_Career_Program.pdf>.

10. Cf. the article "Harvard Task Forces on Women release findings and recommendations" in the

Harvard Gazette from May 16 2005 [downloadable at <http://news.harvard.edu/gazette/story/2005/05/harvard-task-forces-on-women-release-findings-and-recommendations/>]. For the program, see <http://www.faculty.harvard.edu/work-life-benefits-and-perks/dual-career-assistance>.

11. See <www.hercjobs.org>.

12. Cf. the programme's brochure at <http://www.crus.ch/dms.php?id=7060>.

13. Cf. the brochure „Förderung von Dual Career Couples" [downloadable at <http://www.crus.ch/dms.php?id=7495>.] For the areas covered, see esp. p. 5: " Gleichzeitig ist eine kompetente und professionelle Information und Beratung für Dual Career-Paare an den Universitäten unter As-pekten der Attraktivitätssteigerung für die Universitäten wünschenswert. Hier sollten auch unterschiedliche Fragestellungen zu Rahmenbedingungen wie etwa Lebensqualität, Versicherungen, Kinderbetreuung, Schulen, Wohnen etc. erfasst werden".

14. Förderung von "Dual Career Couples", CRUS, p. 5.

15. For the programme, see the well-documented webpage at <http://www.familienaudit.uni-konstanz.de/>.

Observations of Technology Use in Public and Users' Agency

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As electronics become smaller, more inexpensive, and more useful, people are using more of them more often. Beginning with portable cassette players, then cell phones, and now with mp3 players and smart phones, the visibility of technology on one's person has been increasing. Individuals' time spent with their electronics is increasing. Our technology and our mediated connection to others and the world through them are nearly ubiquitous. In the U.S., a casual observer can confirm this in any urban setting or academic campus.

Where in the early 2000's the evidence of people's attachment to their technology was Apple's trademark white cable leading to ear buds, the fashion is now bolder, with companies like Skullcandy specializing in large, decorative, over-the-ear headphones[6]. Additionally, with the increased popularity of communicating via text, people are not only walking the streets or driving without the ability to hear their surroundings, but we have also begun to impair our visual attention. Examples of public concern for safety and etiquette around walking while distracted have even made it into the New York Times[4]. Further, campaigns of public concern for distracted drivers are growing to the point of passing legislation prohibiting certain kinds of usage of mobile technology[1].

Why do we give so much attention to our technology, even to the point of endangering our lives and those around us? These technologies mediate our communication with other individuals. In Alone Together, Turkle describes a young student who feels the only times it is acceptable to be delayed in his response to text messages from his peers are when, "[y]our class has a test. Or you lost your signal" [7]. It seems possible that the new technologies that we use to mediate our interaction with others may impress their own or their users' demands on us in new ways. However, human-computer interaction is contextual. We must look at the people

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involved in the interaction and the social context in which they interact with their technology to have a full understanding [3]. Do users of such technologies in other cultures use the technologies the same way? Do they experience similar feelings of decreased agency?

Even outside of the U.S., there is evidence that users of "this plethora of new widgets and systems" experience feelings of confusion and disability[2]. To build on this, I undertook to make observations of urban and campus life across various locations in Europe including Freiburg, Germany, Milan, Italy, several locations in Switzerland (Zurich, Basel, Lugano, Riva San Vitale, Mendrisio, Bellinzona), and several in the Netherlands (Amsterdam, Utrecht, Eindhoven, Nijmegen).

While Bannon [2] is in Europe (Ireland), and therefore we have some evidence of these phenomena prevailing there as well, my observations indicated a much lower incidence of people using these various communications technologies in public. During the course of 17 days in the aforementioned locations, I planned to photograph examples of people talking on their phones, texting or otherwise using mobile phones, or wearing headphones (walking, sitting, driving, whatever).

Interestingly, while the incidence of driving was drastically lower at each of these locations than in even many rural locations in the U.S., still the number of examples of communications technology usage was practically zero. Most notable were the observations of virtually no communications technology usage in the center of Zurich, and on the campuses of University of Zurich and Swiss Federal Institute of Technology, which continued to other cities and universities such as Basel. In light of the fact that Switzerland's cellular adoption rate of approximately 124% is so much higher than the U.S.'s 90% [5], I expected a similar or greater occurrence of mobile communications technology usage in public.

If the technology has penetrated Switzerland even more than the U.S., why isn't their usage more apparent? Future work might further explore the differences in how the people relate to each other over technology and whether Turkle and Bannon's assertions of our lack of agency hold across many cultures. From this first exploration, it seems that many Europeans must not share with us in the U.S. these feelings that keep us constantly attached to these technologies.

NOTES

1. Association, G.H.S. 2011. State Cell Phone Use and Texting While Driving Laws.

2. Bannon, L. 2011. Reimagining HCI: toward a more human-centered perspective. *interactions 18*, 50-57.

3. Dourish, P. 2004. *Where the action is: the foundations of embodied interaction*. The MIT Press.

4. Neistat, C. 2012. Texting While Walking. In *New York Times*.

5. Olaya, D. 2011. Mobile Cellular Subscriptions.

6. Skullcandy 2011. Skullcandy Headphones.

7. Turkle, S. 2011. *Alone together: Why we expect more from technology and less from each other*. Basic Books.

The role of Women in Higher Education in Switzerland

Simoni Triantafyllidou
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Introduction

The two main discussion themes in the 2011 Global Perspectives Program were Global Research- and Reforming the PhD. As a female doctoral student in an engineering field, I could not help but wonder with what capacity I would be able to fit in or even shape that discussion, after obtaining the ultimate degree in my field. I was therefore interested in finding out how European options in academia compare to those in the United States. specific goals of my project were to explore a) the number and position of women in higher education at visited institutions, and b) Mechanisms to support access and achievement of women in such careers. Information on these topics was obtained through the presentations of each institution's representatives, reading materials provided during our visits, and informal discussions with students from the University of Basel in Switzerland. Because I was unable to obtain adequate information for Politechnico di Milano in Italy and the University of Freiburg in Germany, this report will focus on the institutions visited in Switzerland.

ETH (Eidgenössische Technische Hochschule)

Rector Heidi Wunderli-Allenspach (Vice-president on education) was the first female professor at ETH. She asserted that we lose too many women along the line (Wunderli-Allenspach, 2011). This fact is especially true for a heavily technical institution, in a country where women did not vote until 1971 and where traditionally there was no need for them to work due to affluence. Indeed, statistics indicate that females comprise about 30% of the doctoral student population, but women at the professor level (full time) are only 8% (ETH annual report, 2010). This is consistent with the average trend in the European Union, as presented by Eurostat: the overall European trend in Science for the years 2002 and 2006 shows a discontinuity from a fairly solid percentage of females at the student level (about 30%) to a poor percentage at

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the professor level (about 10%) (EU She Figures, 2009). Such a discontinuity does not exist for men (EU She Figures, 2009). The female personnel of ETH, including scientific/technical/administration staff and apprentices, are 30% (ETH annual report, 2010).

SUPSI (Scuola universitaria professionale della Svizzera italiana)

Discussions with the Director of SUPSI (Gervasoni, 2011) revealed that the ratio of women to men entering the university is 50:50, but at the professor level it becomes 40:60. Certain study disciplines are preferred by women, while others by men. As a result, within SUPSI different disciplines look very different in terms of the women/men balance (Gervasoni, 2011). For example, some fields like engineering have only 20% women, but some others have 90%. Even so, on average, SUPSI appears to have a stronger female presence at the professor level, compared to other Swiss institutions and the European average.

University of Zurich

The Dean of Faculty of Science expressed the need to increase the applicant pool to include more women, and mentioned that incentives to attract women professors exist, such as part-time appointments and day-care centers on campus (Hengarder, 2011). Such incentives appear to be particularly important for Switzerland, considering that children have a break from school in the afternoon, and traditionally mothers need to find ways to work around their children's schedule.

University of Basel

Contrary to incentives offered at the University of Zurich, discussions with post-doctoral researcher Soledad Levano (2011) revealed that there are neither part-time appointments offered, nor day-care on campus. In 2008 female full professors at this university comprised 16% of the total professor population, and some efforts are undertaken to increase that percentage (University of Basel Equal Opportunities Program, 2010). This is consistent with the goal of the federal government to increase the presence of women in academia. Specifically, in the whole of Switzerland only 7% of full professors were women in 1998 and 14% were women in 2006, while the goal of the Federal Equal Opportunity Program was to increase that percentage to 25% by 2012 (University of Basel Equal Opportunities Program, 2010).

USI (Universita della Svizzera Italiana)

USI maintains an Opportunities Service, in order to approach the goals of the federal government. Its main goals are listed as: a fairer presence of women and men at all levels and especially at the tenured-professor rank, obtaining working and study conditions that are more compatible with the demands of family life, stimulating academic career paths for women, and ensuring that the gender dimension and the culture of diversity are integrated into teaching and research (USI Equal Opportunities Service, 2011).

Conclusion

Overall, women represent a minority (~10% on average) in Swiss academia, consistent with the European Union average and consistent with the situation elsewhere in the world. In recent years, efforts have been undertaken to increase that percentage, so as to meet the federal government's goal of 25% by 2012. Initiatives such as day-care on campuses and part-time appointments are offered in some institutions. While recent numbers illustrate progress in correcting the imbalance, there is clearly a long way to go. Numbers and statistics aside, this trip offered the opportunity to interact with successful women at both sides of the Atlantic. Dean DePauw from Virginia Tech and Heidi Wunderli-Allenspach from ETH are inspiring examples to follow, while several of my female

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co-travelers have already accepted academic positions or are in the process of doing so. On a personal level, this trip made the aspiration of becoming a female professor seem less daunting, and prepared me to ask the right questions in the pursuit of a female-friendly academic environment.

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A Survey of the Swiss Education System and Future Preparedness in STEM Fields

Eric Williams
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Introduction

The ability to obtain a good education has long been an indicator of an individual's future potential. However, formal education is not an end in itself as it is merely a stepping stone along life's path. Upon completion of studies one must choose which career they wish to have, and be prepared with the skills and training to do so.

Switzerland is a country which boasts a high level of wealth and influence in Europe. It is well known that Switzerland produces one of the highest number of patents per capita in the world. This measure can be thought as a remark on the quality of the Swiss education system as a whole however this has clearer impact within the STEM (Science Technology Engineering Mathematics) fields.

It is the aim of this paper to briefly discuss the higher education system in Switzerland. Particular focus will be made to the elements addressing translational skills that help STEM students in their future careers. A majority of the content was developed as part of the 2011 Global Perspectives program and notes collected therein[1].

Curriculum of Swiss STEM

Swiss schools have resources and support that enable them to support various tracks which prepare students for particular career paths early on. This early distinction in academic trajectories produces specializations and skills in students and prepares them to make the decision on what type of higher education institution they want to attend. Some students choose their track at a young age of 15 or 16 which will determine whether they will seek an apprenticeship, attend technical school or go onto the university after they finish high school.

It is important to consider the various types of institutions which Switzerland teaches STEM. In Switzerland there are two tracks for STEM

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students, one being the traditional university education and that of the applied science education (Fachhochschulen). The graduation requirements and expectations vary between schools and definitely across the two tracks. It should be mentioned that both tracks provide students different career outcomes for corresponding fields across tracks. The universities prepare students with higher level of theoretical development and the applied technology schools provide more hands on training and experiences. The applied technology offers degrees up to the MS and the universities are able to produce PhD students.

Students who seek to enter the university are required to pass the matura exam prior to entry. Upon the completion of this requirement they may choose any university and almost any major without obtaining authorization or meeting additional requirements. This has historically kept the retention and graduating rates relatively low on the world scale. However, since the introduction of the Fachhochschulen (universities of applied science) in 1997, the OECD found that graduation rates for tertiary education in Switzerland nearly tripled [2]. This means that with the applied technology schools, there are more potential workers who are capable of performing growing number of STEM jobs. From the OECD's report on Education it was clear that Switzerland boasts a high percentage of students who go through the applied technology schools[2].

Funding applied research allows for better technology transfer. The Swiss institutions are actively looking to promote startup companies through incubators at ETH and the Fachhochschulen through both federal and European Union funding. These develop partnerships between academia and industry furthering the experiences available to students.

Extracurricular experiences

The future preparedness of a STEM student often requires the correct introduction to real world problems and technology. Internships and research experiences are designed to fulfill that role for students while they are in school. Both institutional tracks give students freedom to experience labs and corporate internships, but the applied technology schools require them.

The Fachhochschulen require students to work on industry sponsored projects prior to completing their degrees. Since the goal of the Fachhochschulen is to produce students with applied technology backgrounds these work experiences are excellent ways to prepare students for future careers in industry. At one of the Fachhochschulen, SUPSI, the faculty must either work in industry or research in addition to teaching. This provides additional relevant information and advice to the students wishing to go into industry after graduating.

The universities typically do not require students to take internships yet they do offer labs and real world experiences through other programs. The federally supported ETH and EPFL are STEM focused institutions, but they are considered to be more similar to the university model found in UZH and UniBasel[3]. Students attending ETH and EPFL are potentially coupled with industrial partners for their undergraduate thesis requirement, but do not have time alloted for internships. In UZH and UniBas students will not likely have a chance for industrial internships, but research experience is possible in university labs.

In the universities and ETHs the training for doctoral students has begun to change from a purely academic trajectory to one where most tend to go to industry after their studies. There are a lot of high level R&D jobs in Switzerland and Europe in general and many PhD students are brought in to satisfy the industry needs. Surprisingly, there

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seems to be a lack of direct preparation for doctoral students to enter academia in Switzerland. The rise from PhD student to professor can take several years of postdoctoral work, so the option to remain in academia is perhaps far fetched. The universities have limited programs to teach students either pedagogy or preparatory courses for either the skills or the professional development as it seems the culture has been changing ever so rapidly where most students do not plan to enter academia[1]. However, students may be a teaching assistant for their advisor when needed[1]. They may also find extracurricular groups to help in their professional development, but student groups don't seem to be as ubiquitous as they are in the US.

Conclusions

In conclusion, the education system in Switzerland offers various alternatives to receive a STEM education. The career outcomes for students vary by program, school and individual, but the system is set up to provide education and training for individuals at the tertiary education level. The information that was received as part of the Global Perspectives Program was instrumental in collecting a good portion of this data with additional material found from the OECD.

NOTES

1. Williams, E., 2011. Notes from global perspectives, May.

2. OECD, 2010. Education at a Glance: OECD Indicators. OECD Publishers.

3. ETHZ. Curriculum structure: Bachelor programmes <http://www.ethz.ch/prospectives/structure/curr bachelor/index EN>.

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