



Global Young Academy
The voice of young scientists around the world

A faint, light blue world map is visible in the background of the central section, showing the outlines of continents and countries.

'The Global State of Young Scientists'

Project Report and Recommendations

Irene Friesenhahn
Catherine Beaudry

Global Young Academy (GYA)

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Co-Chairs' Foreword

The contemporary scientific enterprise is, increasingly, moulded by two powerful forces. The first is globalization. Research priorities are more and more transnational and so demand a global, rather than a national, response. The second is innovation. Nations around the world increasingly recognize that their prospects for economic health and societal development stem ultimately from a secure, well-supported and educated workforce.

Against this background stand young scientists and researchers. Widely recognized as being among the most creative and energetic researchers, young researchers can also be more mobile and better trained than ever before. They constitute a vast pool of global talent that stands to change the geography of knowledge in fundamental ways. These early career researchers also play a central role in knowledge economies because they can be the key innovators and creators that provide the intellectual capital needed to grow a strong national research and innovation system. When viewed against the spectrum of emerging challenges faced by nations world wide – rapid economic globalization, ageing populations, increased demand for highly skilled labour, and the expansion of systems of higher education – the necessity of nurturing and promoting young researchers seems more urgent than ever.

Yet, there is little consensus, and even less research, on the strategies to best support early career researchers. For this reason, the Global Young Academy has undertaken a preliminary assessment of the challenges facing young researchers around the world. This report is the result of that effort.

As the voice of young scientists around the world, the Global Young Academy (GYA) is dedicated to offering an outstanding forum for investigating issues concerning young researchers. The GYA is strategically positioned to co-ordinate a global study on the state of young scientists. Through its members, who stand to become the future leaders across scholarly disciplines, the GYA is positioned to access relevant national bodies, contact points, young scholars, literature and data in countries across continents. The GYA has also been able to capitalize on its global outreach and leverage in order to conduct this precursor study to assess the global knowledge on the state of young scientists. The existence of this report is testament to young scholars' determination to strive for a better environment in which to be passionate, innovative and creative.

The aims of this project have been to survey the field as comprehensively as we can in the time we have to get a preliminary snapshot of what is known and not known about young scholars around the world. We need to know where to focus our energies, and how best to direct our limited resources to supporting young researchers and the innovation system of which they are a part. Our aim is that when the world needs to know more about how young scientists and scholars are faring in different parts of the world, it is the GloSYS project to which they will return. This report is the first step along that journey.

Sameh Soror and **Rees Kassen**

Co-Chairs, GYA

GloSYS Working Group Preface

The report you have before you represents the results of an initial assessment of the state of young scientists globally. The need for this study can be traced back to the founding of the GYA itself. In 2008 the InterAcademy Panel: the Global Network of Science Academies and the World Economic Forum brought together outstanding young scholars from around the world at the WEF's Annual Meeting of New Champions, or 'Summer Davos' in China. At this and subsequent meetings, the experiences and challenges facing young scholars were aired and key themes identified. And thus the idea for the Global State of Young Scientists, or GloSYS, study was born.

It is heartening that there was an immediate appetite among GYA members to explore the barriers and facilitators to early career scholars around the globe, not to bemoan the situation but to stand shoulder to shoulder with our fellow young scholars around the world and using our newfound influence to allow theirs to be heard. That beacon has been lit, and the appetite among GYA scholars for further work on these areas remains strong.

The precursor study lays important foundations and further work to explore emerging themes is warranted. We hope this will not be a one-off effort, and this report should by no means be the final word on the state of young researchers. Rather, we see this work as forming a launching point from which future, more comprehensive studies will come. The members are ideally placed to continue this important work, using their passion, creativity and energies: what early career scholars are known for. The working group are committed to taking the vital next steps for further work. Plans are being developed for a longitudinal, cross-sectional study to gather continual observations of the global state of young scientists, researchers and scholars. At the same time, key findings to emerge from the precursor study identified key areas which warrant further in-depth study: the role political insecurities play, gender inequalities, and regional differences; as does the position of young professional researchers who may or may not be within the academic sector, such as those who move in to (or in and out of) the private sphere. Much longer-term, regular assessments will bolster our ability to pick-up on how long-term social changes (e.g. political, societal, cultural) affect the barriers and facilitators these young professionals identify. Our hope is that, in doing so, we can provide valuable information for decision makers and policy makers that can be used to benchmark progress towards creating better support networks and research systems that encourage education in the sciences, provide stability for researchers, create a research system that promotes excellence and impact, and forms a vital part of the innovation and wealth-creation system of the country. We very much hope others share our sense of purpose and we welcome ideas for further action.

Karen Lorimer

GYA Working Group Deputy Lead, on behalf of the working group

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This report would not have been possible without the help of the GYA working group for their dedication, creativity and vision contributing to the development of the project, for their advice all along the project, their insight into the policy recommendations and on how to implement them. We are also grateful for their careful proof reading of the manuscript: Tilman Brück for the original mobilisation around the theme, Regina So for her considerable help throughout the project, Karen Lorimer for her invaluable comments and leadership in writing the preface, Orakanoke Phanraksa, Abidemi Akindele and Aftab Ahmad for their careful editing of the text and very pertinent comments, as well as Laura Petes and Guruprasad Madhavan for their invaluable comments and ideas that contributed to improving the text. We would also like to thank all the participants of the GloSYS International Expert Workshop who volunteered their time, expertise and support to develop the initial ideas. The co-chairs of the GYA, Rees Kassen, Bernard Slippers and now Sameh Soror, deserve our gratitude for the many discussions throughout the project, their superb insight and for their careful proof reading of the text.

We are extremely grateful to Heidi Wedel for her efficiency in coordinating the GloSYS activities, for keeping us on target and on time and for generally facilitating our work. She made sure that everything worked smoothly and for that we are deeply grateful. We would also like to thank Maria Mayer without whose precious help we would have never managed to deliver this manuscript on time. Carl St-Pierre also deserves our gratitude for his help on the interview guide, on the questionnaire and for rapidly and very efficiently, when time was tight, providing the necessary statistics for the report. Thank you also to all the GYA members and National Young Academies (NYA) who collected literature and data in their countries, found interview partners and circulated the survey. It is this international network of committed academy members that enabled the GYA to reach out to world regions without any or only limited previous research and allowed the study to move beyond the usual domains of enquiry in Western Europe and Northern America. Finally, we are also indebted to the participants in our interviews and to those who participate in the survey for sharing their experiences with us. They shall remain anonymous for obvious reasons. Without them, this report would not have been possible.

None of these people or organisations are responsible for any remaining errors, and the views expressed in the document are those of the authors and do not reflect those of the organisations above mentioned.

Irene Friesenhahn, GloSYS Project Officer

Catherine Beaudry, GloSYS Project Leader and GYA Working Group Lead

Table of Contents

Co-Chairs' Foreword	5
GloSYS Working Group Preface	6
Acknowledgements	7
Executive Summary	10
Introduction	12
Aims of the project	14
The GloSYS precursor study	16
Global discourses and developments in the past	16
The GloSYS precursor study design	20
Description of the GloSYS survey sample	21
The Support Structure	24
Mentors	25
Trusting relationships	26
Guidance and mentoring	27
Support networks for women	29
The Academic Profession	29
Diversification	30
Specialization	33
Mobility	34
Transparency	35
Attractiveness	36
Gender-related issues	37
Parenthood	38
Career	39
Obstacles	42
Attractiveness	44
Cultural differences	45
Obstacles	45
Career	48
Attractiveness	50
Workload	52
Conclusions	55
Recommendations	56
References	58
The Global Young Academy	62
Our Mission	62
Who we are	62
What we do	62
Background	63

Index of Tables

Table 1 – Total number of interviews and survey responses	22
Table 2 – Science System in target countries	23
Table 3 – Weekly working hours during and outside term time	32
Table 4 – Wished work load	32
Table 5 – Most attractive consequences of mobility	35
Table 6 – Family-related characteristics of scholars by gender (proportion and number of children)	38
Table 7 – Reasons career breaks by gender (proportion)	39
Table 8 – Career development prospects by gender (5-point Likert scale, converted into percentages for the chances of gaining a permanent position or professorship)	39
Table 9 – Top 8 reasons that contribute to a successful career in academia by gender and parenthood (average ranking from 1, most important, to 8, least important)	41
Table 10 – Age and age-related characteristics of scholars by gender and parenthood	42
Table 11 – Main differing barriers by gender (proportion)	43
Table 12 – Work-family balance as a barrier encountered by gender and parenthood (proportions)	43
Table 13 – Top 6 reasons that make academia attractive to scholars by gender and parenthood (ranking)	44
Table 14 – Barriers encountered per region (proportion)	46
Table 15 – Barriers encountered per region (proportions)	47
Table 16 – Career prospects per region (percentages)	49
Table 17 – Career prospects per region (percentages)	50
Table 18 – Success statements per region (5-point Likert scale)	51
Table 19 – Number of hours dedicated to academic tasks per region	53
Table 20 – Wished modifications in working hours by region	54

Index of Figures

Figure 1 – Gross domestic expenditure on research and development (GERD) as a percentage of gross domestic product (GDP) in 2010	18
Figure 2 – Countries targeted in the survey	22
Figure 3 – Academic background of the survey participants	24
Figure 4 – Most important advisors of early career researchers	25

Executive Summary

This report provides a snapshot of recent scientific literature and new analyses of the state of young scholars in different world regions. Young scientists play a vital role in today's research and innovation systems. Understanding how young researchers can succeed in and contribute to the knowledge landscape, and what obstacles they encounter in the process across the world is the subject of the GloSYS project. By exploring the global state of young scientists and identifying their opportunities and concerns, the GloSYS project aims to initiate change and catalyse improvement in the global research system.

The GloSYS precursor study adopts an inclusive approach focusing on all world regions and selecting countries with different development stages. Methodologically, the study draws on existing literature and on our own empirical data integrating the internationally comparative results from 650 survey respondents with the authentic voices of young scholars gathered in 45 semi-structured interviews.

Results from the GloSYS precursor study show that the current knowledge on the state of young scientists is incomplete and geographically biased with knowledge primarily produced in Europe and North America. GloSYS identified global deficits and a need for action in the following areas:

- **Mentoring and support structures:** There is a need for more systematic and constructive support and mentoring that account for the professional and personal advancement of young scholars. Support for young scholars must be both interpersonal offering advice and guidance but also structural e.g. in form of start-up grants and programs for young scientists.
- **Focused training:** The training of young scientists often leaves them poorly equipped for the duties and responsibilities once they reach a permanent position. There is a need for aligning young scientists' skills with the responsibilities and diversified tasks on the next level and helping them to acquire knowledge, techniques and procedures that help them to be globally competitive and participate meaningfully.
- **Transparency and fairness:** An increase in transparency and fairness of the assessment process would improve the career development of young scholars and are considered prerequisites for diversity and sustainability in science.
- **Working conditions:** Many young scholars shoulder extreme workloads to progress in their careers and to live up to what is expected from them. They not only feel that originality and inspiration take second place but also that their working conditions can place unneeded constraints and barriers to their private life.
- **Cultivating values:** A good work-life balance, fair payment, an acceptable workload and the appreciation of new ideas and commitment are the pre-conditions for job satisfaction. Support factors such as

adequate infrastructure and the availability of start-up grants, an increase in job stability and family-friendly policies allow young scientists the freedom to be creative and productive while balancing professional and personal duties, but they also enhance the progress of the national research systems.

A number of structural conditions present challenges to research in this field and to the current understanding of the state of young scholars. In particular, there is heterogeneity in the higher education systems across nations, a lack of comparable data from different regions, and a lack of comparable literature. Developing countries are a heterogeneous group, ranging from the least developed countries to emerging economies. Thus, their research and higher education systems show broad diversity both nationally and internationally. Furthermore, there is also a lack of comparable statistics, as well as missing or incomplete data on the academic systems. The collection of primary data e.g. through surveys together with the use of secondary data from the national statistical records or UNESCO statistics has been a widely adopted practice; however it harbours the risk of double and miscounting. With regard to literature the topics of interest vary across countries and regions depending on the most important challenges in each national higher education system. Therefore the existing base of literature differs strongly across countries and regions.

These adverse conditions notwithstanding, the GloSYS precursor study provides a systematic overview of the diverse state of young scholars across the world. The findings of the GloSYS precursor study offer a very valuable source of information for young scholars, universities, funding organisations and stakeholders working in science, academia, politics and the government. From this preliminary study, we are able to formulate a number of recommendations that the GYA would like to see brought forward at the policy and institutional level:

1. Address the lack of resources, whether material or personnel, and the lack of funding for young scientists across regions of the world.
2. Develop a nurturing culture aimed at providing better and more appropriate mentoring and supervision at all levels of early career, from PhD to the first 5–10 years of academic independence and beyond, so that researchers can learn and feel supported.
3. Provide means by which scholars and researchers can achieve a better work-life balance. Research organisations need to adapt to the realities of women and family issues.
4. Value all aspects of the academic profession, and do not expect that scholars will excel at everything. A healthy division of labour may be more productive.
5. Ensure academic freedom while maintaining a healthy balance between basic and applied research in the portfolio of national and international funding programs.
6. Encourage and perform further studies on young scholars throughout the world so that institutions can learn from the best practices in other regions while accounting for various research systems.

Introduction

"In a global, knowledge-driven economy the keys to economic success are a well-educated workforce, technological capability, capital investment, and entrepreneurial zeal - a message well understood by developed and developing nations alike throughout the world that are investing in the necessary human capital and knowledge infrastructure. Key in this effort will be building strong relationships between universities, as the source of new knowledge and the well-educated graduate, and industry, with the goal of adding value to the knowledge and human capital necessary to produce competitive products, processes and services to achieve profit and social prosperity in a global economy."

Duderstadt and Weber 2006

Research and innovation is widely recognized as one of the most important engines of economic growth, socioeconomic development and enlightenment for countries around the world. Research plays a vital role in a knowledge driven economy and in recent years, particularly since the 2008 financial crisis affecting the global economy, innovation has become critical for the global economy, despite the increasing complexity of current economic, environmental and social challenges.

Early career scholars play a central role in this new knowledge driven economy through being the key innovators and creators that provide the intellectual capital needed to grow a strong national research and innovation system. Additionally, the young scholars of today will be the pool from which the scientific leaders of tomorrow emerge; the science system of the future in any country can only be as strong as its pool of young talent today. As such, understanding precisely how young scholars can succeed in and contribute to the knowledge landscape and what obstacles they encounter in the process across the world is a timely and important focus of concern for countries around the world.

The careers of young scholars are increasingly characterised as mobile and international. Young scholars evolve within an increasingly globally competitive context, but also in environments strongly shaped by local and national institutions. Their work is crossing borders and boundaries as a result of rapid advances in information technology, declining cost of international travel and falling administrative barriers to young talents. The European Commission's 'European Charter for Researchers' and 'Code of Conduct for the Recruitment of Researchers' both state that:

"Employers and/or funders must recognise the value of geographical, intersectoral, inter- and trans-disciplinary and virtual mobility as well as mobility between the public and private sector as an important means of enhancing scientific knowledge and professional development at any stage of a researcher's career [...] they should fully value and acknowledge any mobility experience within their career progression/appraisal system."

The European Charter and Code for Researchers

Hence it is not only important to study the state of young researchers from an international comparative perspective but also with regard to linking the international science system with specific national higher education landscapes.

It is against this backdrop that a number of Young Academies have started throughout the world, the broad purpose of which has been to bring together outstanding scholars in order to foster interdisciplinary activities and provide them with a policy platform. Ter Meulen and Stock (2010) (respectively past President of the German Academy of Sciences Leopoldina and President of the Berlin Brandenburg Academy of Sciences and Humanities, Berlin, Germany) stated in a Science editorial in 2010:

"The idea of a Young Academy has been spreading around the globe, because every nation must support and develop its younger scientists, promoting their national and international mobility, competitiveness, and leadership potential."

The first Young Academy began in Germany in 2000 and was followed by many others from South Africa to Scotland. There are currently 20 National Young Academies in the world¹ and a number of similar bodies elsewhere in the world². A number of other countries will also be electing their first members shortly, for instance, the College of New Scholars, Artists and Scientists in Canada. A dynamic Young Academy Movement can therefore be observed all over the world, hence shaping the structure of academia and research.

In the light of the changing global research system, the GloSYS precursor study aims to obtain an encompassing picture of young scholars' status and working conditions in different countries around the world. The study is directed by a number of central questions that are relevant to capture the multiple facets of research as a career path. How do different countries support researchers in the earliest stages of their careers, and what impact does this have on research productivity, impact, and innovation? What are the career paths and future prospects for young researchers of today? What are their expectations and goals? How is globalization, through increased mobility and the use of social

1 Die Junge Akademie (Germany, 2000), De Jonge Akademie (Netherlands, 2005), Junge Kurie (Austria, 2007), Sudanese Academy of Young Scientists (Sudan, 2007), National Academy of Young Scientists (NAYS) Pakistan (Pakistan, 2009), Nigerian Young Academy (Nigeria, 2010), Thai Young Scientists Academy (Thailand, 2011), Young Academy of Sweden (Sweden, 2011), South African Young Academy of Science (South Africa, 2011), Philippine Academy of Young Scientists (Philippines, 2011), Young Academy of Denmark (Denmark, 2011), Zimbabwe Young Academy of Science (ZIMYAS) (Zimbabwe, 2011), RSE Young Academy of Scotland (Scotland, 2011), Young Academy of Japan (Japan, 2011), Egypt Academy of Young Scientists (Egypt, 2011), Academy of Young Scholars of the Polish Academy of Sciences (Poland, 2012), The Young Academy of the Israel Academy of Sciences and Humanities (Israel, 2012), Young Scientists Network – Academy of Sciences Malaysia (Malaysia, 2012), Sri Lankan Academy of Young Scientists (SLAYS) (Sri Lanka, 2012), Jonge Academie (Belgium, 2012).

2 Council of Young Scientists of National Academy of Sciences of Belarus (Belarus, 2003), Association of Latvian Young Scientists (ALYS) (Latvia, 2005), Council of Young Scientists at the Foundation of the First President of the Republic of Kazakhstan (Kazakhstan, 2007), Venezuelan Young Scientists Network (RedJIV) (Venezuela, 2010), Centre for Young Scientists at the Montenegrin Academy of Sciences and Arts (Montenegro, 2010), Liberian Young Association for the Advancement of Science (LYAAS) (Liberia, 2012), Council of Young Researchers of the Russian Academy of Sciences (Russia), ABC Young Affiliates (Brazil), Young Academy of Europe (EU, 2012).

networks, changing the academic profession? What are the obstacles young researchers around the world face and what strategies can be used to overcome them?

The GloSYS precursor project adopts a three-pronged approach. Building on the academic state of the art on young researchers, the project integrates an internationally comparative perspective, paying particular attention to the role of global collaboration, mobility, motivation and career advancement.

The most distinctive trait of the GloSYS precursor study is its focus on capturing the voice of international young researchers themselves. This approach, alongside a detailed assessment into what is known from academic research on the comparative state of young scientists around the world creates a very authentic and unique study.

Aims of the project

The “Global State of Young Scientists” (GloSYS) project aims to provide a ‘snap-shot’ of the state of young scholars globally that can be used to identify global trends, challenges and models for improvement of the situation of young scholars everywhere, and across disciplinary areas.

This precursor study set out to examine key indicator areas, identified by the GYA working group, in order to gain a deeper insight into the current global state of young scholars, including:

- Motivation to enter research
- Support mechanisms for young researchers, including promotion, job security, and workplace stability
- Access to career mentoring
- Gender equality
- Scientific productivity, excellence, impact and innovation
- Career paths and obstacles faced
- Obtaining grant funding
- International mobility
- Interdisciplinarity, and
- Self-perception and effectiveness

These indicator areas were identified by GYA members who formed a working group to focus on issues related to young scientists around the world. The intention of this project was to lay the foundation for future periodical and longitudinal research in this area.

The central steps in achieving this goal are:

- Cultural sensitivity in research and the consideration of national and regional conditions: Conducting the study and analysing the data with a team of regional subject matter experts and regional representatives from the GYA to deepen our understanding of the underlying south-north disparities in science;
- A reliable global estimate of the state of young scholars: Selecting a strategic and representative spread of countries for the study which will allow for a coherent, global overview and cross-country comparisons which are necessary to capturing south-north disparities;
- Empowering young scholars all over the world: Providing sound information and comparable data to facilitate the diffusion of knowledge among scholars, policy makers and other stakeholders about young researchers' working and living conditions.

The remainder of the report is composed of five chapters followed by a brief conclusion and recommendations. The first chapter explains the context of the project including the pertinent literature as well as a detailed description of the study design. Preliminary findings from both the interview process and the pre-test survey are then presented in the following four chapters. The second chapter introduces the findings regarding the support structure around scholars while the third chapter focuses on the academic profession per se. The last two chapters concentrate on gender differences (fourth chapter) and on cultural differences (fifth chapter).

The GloSYS precursor study

"The global research landscape of the past decade has become so dynamic as to be described in terms of tectonic movements, most importantly for that of China. Continents – and countries – once distant from one another both physically and metaphorically are now appearing side-by-side and still new landforms are emerging. In another decade, the geography of science is sure to be very different from that of today."

Thomson Reuters 2013:5

Global discourses and developments in the past

The studies on the state of researchers – in particular at an early stage of their career – and the development of the academic profession in general reveal a number of global trends affecting the developed and the developing world to different extents. These trends point to a severe north-south disparity regarded against the backdrop of global investments into science and education. Research and innovation systems throughout the world are in a process of rapid growth and transformation. During the last two decades alone global expenditure on research and development (R&D) has doubled and the R&D workforce accommodates about six million people worldwide. Whilst growing in all regions around the world, R&D investment is concentrated in North America, the European Union and Japan. The investments by industrial nations but also by emerging countries in education, research and innovation increase continuously (see Source: Federal Report on Research and Innovation 2012: 45). In the developing world, only a small group of countries in each region benefit from R&D expenditure and output (refer to Gaillard, 2008 and Arber et al., 2008 for example). China proves to be the exception with a rapid rise of R&D investments over the last decade. Overall the intensification of competition in science is to be expected resulting in a fiercer struggle for talent, technologies and locations in the future and marginalizing world regions that are not globally competitive.

In contrast to the discrepancies in R&D investments, the proportion of scientific papers by authors from developing countries that are published in established bibliometric databases has increased significantly.

Thirty years ago, scientific publications produced in developing countries accounted only for 5% of the world's output and only India, South Africa and Argentina were listed amongst the top 25 countries (Garfield 1983). In recent years, scientific publications from developing countries accounted for about one-fifth of the global share (Gaillard 2010). Asia and most notably China and India contributed to narrowing the gap to the developed world. Not only Asia but also Latin America, in particular Brazil, have experienced growth in their world share of publication during the last decade.

"This [...] demonstrates that the historical gap between the science haves and those that have had less or very little is closing. The world is no longer bipartite (Europe and North America) in terms

of significant and even top-level science. It is now at least tri-partite (Europe, North America, and Asia) and perhaps more as select nations in South America (Brazil), Africa (South Africa), and the Middle East (Saudi Arabia, Turkey and Iran, the last not a G20 member) increase their output, gain world share, and advance in citation impact."

Thomson Reuters 2013: 4

The overall progress in science is particularly positive. Developing countries increasingly shape and influence communication in science and contribute to the global advancement of knowledge. However, emerging economies and developing countries are still a heterogeneous group. Their science and innovation systems show a wide-ranging diversity both internally, e.g. in terms of regions, and internationally. This regional variety still implicates an uneven concentration of performers in particular with regard to their contribution to science and innovation (UNESCO 2006: 13).

Our scan of the literature encountered comparable issues of regional variety when searching for the keywords "young scientist" and "academic profession" in the Web of Science database. In both cases, North America and Europe contribute to more than two-third of the existing publications in these research fields while developing countries – with the exception of China – are entirely excluded from this scientific discourse. Analysis and reflection on social processes such as the state of early career researchers within certain national and regional contexts is an area of research in which the current level of knowledge is still strongly biased towards research from developed countries in North America and Europe, even though a growing role of the developing world is to be expected.

In general, the availability of literature and comparable findings on this topic is sparse. Some of the few international comparative projects are the Carnegie Study on the Academic Profession (surveyed in 1992 and published between 1995 and 1998, among others by Altbach 1996 and 1998, Arimoto 1996, Arimoto and Ehara 1996, Boyer et al. 1994, Enders 1997a and 1997b, Maassen and van Vught 1996, Teichler 1996, 1998) and also the subsequent study on the academic profession in 2006 and 2007 coordinated by Cummings and Enders. The discussions during this time focused on both, the changing academic profession and the changes in the higher education and science systems. Research suggested that scholars feel strongly committed to the ideal of academic freedom and collegiality. However, as a result of the increasing pressure on the academic profession, the core identity of academics and universities appear threatened. Organizational change was traced back to the expansion, massification and formalization processes in higher education (e.g. Teichler 1998, Altbach et al. 2009, Altbach et al. 2010). These changes led to a stronger differentiation between teaching and research roles, increasing pressure for productivity and efficiency for the academic staff, strengthening the role of the government and university management as interface and facilitators between traditional academic ideals and new expectations for productivity and visibility. A central topic in this context is the transformation of the traditional academic roles partially induced by the shifting expectations from society. In modern knowledge societies, information and learning are the most fundamental resources. This increased the importance and the demand for science and research but challenged the logic behind traditional academic roles mainly consisting of research and teaching.

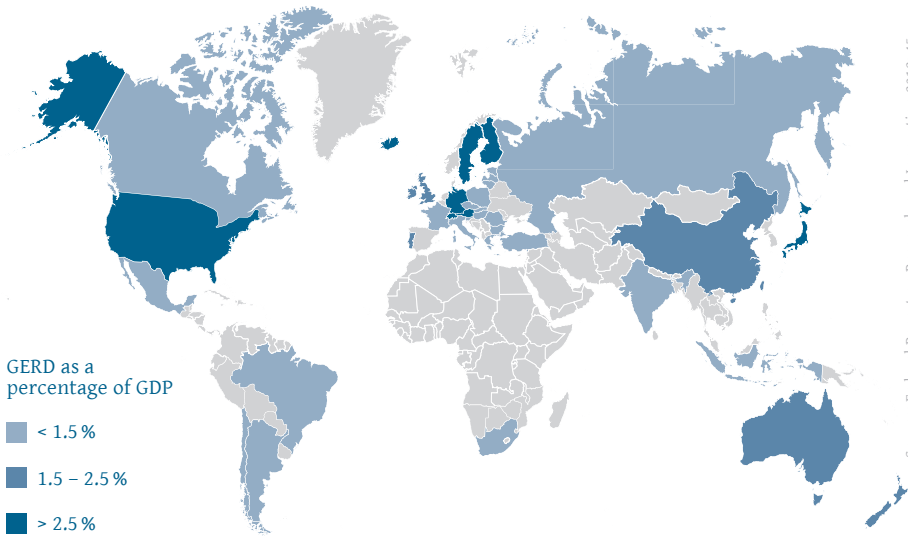


Figure 1 – Gross domestic expenditure on research and development (GERD) as a percentage of gross domestic product (GDP) in 2010

Most studies apply a regional perspective and focus on science and higher education in specific areas of mostly developed countries such as Europe (e.g. Enders 1997, Gabaldón et al. 2004, Musselin 2004, Kehm and Teichler 2013) and North America (e.g. Levine 1999, Fox and Stephan 2001, Honan and Teferra 2001, Altbach et al. 2011). The topics addressed in those studies cover a wide variety of aspects related to science as a career choice such as career trajectories of PhD holders and mobility (e.g. Auriol 2010) as well as career perspectives and conditions of young researchers in specific national contexts but also – on a more general note – higher education policy issues (Kaiser et al. 2007), global networks and collaboration (e.g. Hunter and Leahey 2008), the definition of excellence in science (e.g. Lamont 2008, Lamont and Huutoniemi 2011), gender disparities and work-family conflicts (e.g. Hunter and Leahey 2010, Fox et al. 2011).

Publications concentrating on developing countries are rare and often fail to reflect on science and academia from within. Most available knowledge consists of studies coordinated by researchers working abroad and not in the region under examination. The topics of interest differ amongst world regions implicating that comparable data is not available on a global scale. Regional studies on the academic profession in Africa (e.g. Tettey 2010, Gaillard 2003) primarily focus on staff recruitment and retention and the struggle to create and maintain dynamic and sustainable intellectual life in many African states. An exception in this context is South Africa, a country in which the Academy of Science

(ASSAf) and the Young Academy of Science (SAYAS) actively observe and reflect on the development and the changes in science and higher education (e.g. ASSAf 2010 and 2011; SAYAS 2012 and 2013) also concentrating on the professional development of early career researchers.

Studies in Asia often emphasize the creation of opportunities for regional cooperation and development. Regions such as South-East Asia, which are confronted with numerous similar challenges of an expanding higher education system including the rapid growth of knowledge and information, economic restructuring and financial constraints, seek to establish stronger regional partnerships to establish sustainable development and global competitiveness in their science systems (UNESCO 2006). Studies on academic careers in Asia increasingly deal with processes of internationalisation from a comparative perspective (e.g. Huang 2003 and 2009; Kogan and Teichler 2007). However, the Asian context is only partially researched focusing primarily on countries in East and Southeast Asia and to some extent on parts of South Asia, leaving Central Asia and the Middle East widely ignored.

Scholars all over the globe are under increasing pressure to justify the returns on tax-funded public investments. They are expected to do research that ensures relevance in response to “public needs”, excellence compared to scientific standards and be accountable to society. Consequently, many studies in the past years focus on the effects of national and institutional control mechanisms, the greater marketization in the higher education system and the changing behaviour of scholars evoked by these trends such as increased productivity, the focus on marketable research problems, the increased competition for resources and funding and the attempt of advancing reputation and standing. These changes, however, challenge the traditional self-perception of academics as being autonomous, mostly independent from contemporary problems and free of constraints to produce useful knowledge in an economic or social sense. Research widely overlooks the fact that young scholars are influenced in their choice of pursuing an academic career path by a combination of factors ranging from national circumstances, global standards to individual motives, interests and expectations. Analysing and reflecting on global trends, but also on national and individual factors that vary between world regions – and ultimately constitute the global state of young scholars – is the objective of the GloSYS precursor study.

The GloSYS precursor study design

The GloSYS precursor study combines quantitative and qualitative data on early career researchers in selected countries across the world, namely semi-structured interviews and an online survey. These diverse sources of data are jointly analysed to give an account on the status of early career researchers and to offer specific recommendations on how to best support young scholars along their career paths in different world regions.

GloSYS Definition of Young Scientist or Scholar

A Young Scientist is defined as a postgraduate or early career researcher of any discipline actively pursuing a research career, usually without being fully established, yet.

She/ he will have received a PhD or an equivalent doctoral qualification up to 10 years ago and is usually between 30 and 40 years old.

The idea for the precursor study was devised by the GYA working group “Global State of Young Scientists” and the research conducted by the GloSYS project team. Two meetings were convened in the course of the project. Firstly, an international workshop of experts in science studies, representatives from National Young Academies and government delegates, to present the preliminary results of the interviews and to further develop the concepts of the project. An important activity during this meeting was to get feedback and comments on a questionnaire being pre-tested as part of the GloSYS precursor study. Secondly, an internal wrap-up workshop of GYA members took place to discuss the project findings and to deliberate on the most suitable policy recommendations.

This was a mixed methods project, employing qualitative, semi-structured interviews, and a quantitative online survey. The GloSYS precursor project aims to acquire a genuine contextual understanding of the state of young scholars considering multi-level perspectives, as well as cultural influences. Therefore an approach that utilises multiple methods is most suitable for the GloSYS project to draw on the strengths of each qualitative and quantitative methods (e.g. Johnson, Onwuegbuzie and Turner 2007).

Semi-structured interviews usually include the use of an interview schedule, but flexibility remains in allowing participants to expand on their responses (Bryman 2008). The iterative nature of this process allowed us to adapt the original questions in light of new issues introduced by the respondents. Interviewing young scholars who shared their experiences helped capture the central issues of the topic and contributed to the further development of questions for the survey. The challenges in this precursor study were to include different cultural perspectives while considering varying national conditions. Qualitative data provided a depth of understanding of concepts and emphasised the voices of participants through quotes.

The interview framework included the following topics: professional background, career development, present position and scientific collaborations of the respondents. Furthermore, the respondents were also asked about their goals and challenges, support and promotion possibilities, as well as the balance between family and career. The interviews were conducted via Skype, in some cases also over the telephone and face-to-face. Confidentiality was guaranteed before the interview. The interviews were audio recorded, then transcribed and anonymised before analysing. In total, 45 interviews of a length of 1 to 1.5 hours were conducted in the course of six months. The interviews were analysed using a content analysis method. This is a rigorous form of analysis to describe qualitative material in a systematic way using a coding frame. Successive parts of the qualitative data were assigned to the categories in the coding frame³, according to the 10 themes of issues considered, hence embedding the interview material into a communication model (Mayring 2000).

An online survey was conducted to provide a descriptive and analytic assessment of the status of early career researchers in different world regions, including information such as age, gender, discipline, job conditions, job satisfaction, future prospects and aims, as well as their motivation to pursue a career in science or academia. An important aim of the online survey was to provide an understanding of trends and central issues relevant to careers in science in a global context.

An important objective of the pre-test survey was to test and validate the questionnaire. This is especially important in light of the global nature of the survey and the cultural diversity of the respondents. Our aim was to create a culturally inclusive approach that accommodates the realities in different national contexts and this precluded more in-depth study until further funds become available. The pre-test survey was disseminated through the GYA and National Young Academies all over the world using a snowball sampling technique. The members of the young academies were asked to complete the online questionnaire and circulate the invitation amongst their colleagues who matched the target group. The advantage of this method is that we were able to use the network of Young Academies as multipliers without introducing an in-group bias into the data. The survey invitation was disseminated in the home institutions of the Young Academy members and amongst their disciplinary peers reaching young scholars in different countries outside of the Young Academy network. The web-designed survey included 650 early career researchers working in universities and research institutions in 12 countries and five regions across the world. All answers were recorded automatically and analysed by SPSS. Two levels of analysis were employed, namely univariate and bivariate.

Description of the GloSYS survey sample

The countries in which the survey was disseminated are the following (see Figure 2): Brazil, Canada, Egypt, Germany, Japan, Nigeria, Pakistan, South Africa, Sri Lanka and Thailand, Tunisia and USA. This selection of world regions also includes three developed countries but focuses primarily on the seven developing nations in which only very limited knowledge is available on the situation of early career researchers.

³ The coding frame is available upon request to the authors.

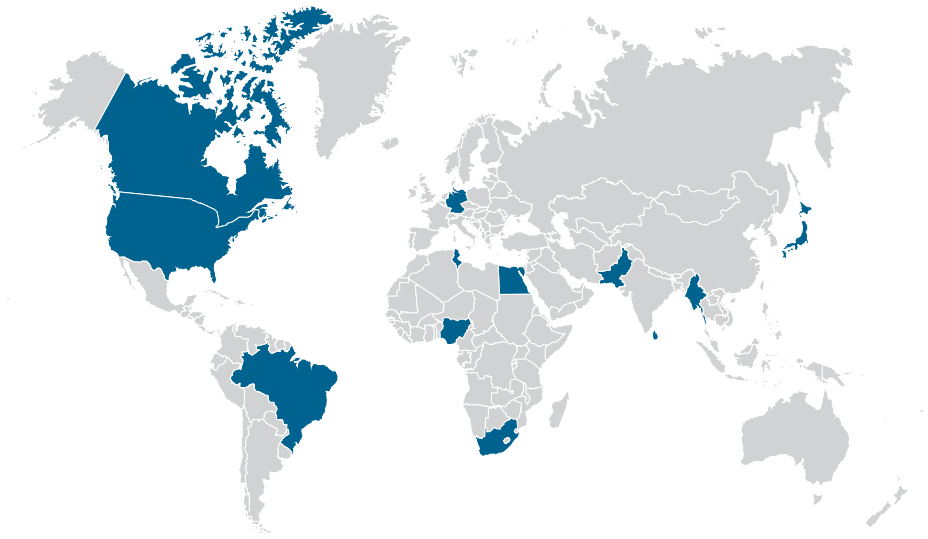


Figure 2 – Countries targeted in the survey

The research systems vary in these countries with regard to size and gender distribution (see Table 2). The underrepresentation of women in science is still visible, with the data revealing a gender gap in most countries. This result is consistent with those highlighted in the UNESCO paper on Women in Science (2012) that found that women still account for a minority of the researchers worldwide. However, the overall gender distribution in our survey was almost equal, including 51% female and 49% male participants. The representation of women who participated in the pre-test survey of the GloSYS precursor study is in some countries higher than the regional average: in Africa 45,3%, Asia 53,5%, Europe 59,7%, in the Middle East 44,5%, in North America 61,5% and in Latin America 40%.

Table 1 –Total number of interviews and survey responses

Number of semi-structured interviews	45
Total number of survey responses	650

Table 2 –Science System in target countries

Country	% Female Researchers in all sectors	Researchers in Higher Education	Female Researchers in Higher Education
Brazil	48.0%	94,003	-
Canada	34.6% ^a	49,780	17,223 ^a
Egypt	42.1%	19,025	-
Germany	20.6%	90,355	29,855
Japan	-	125,263	-
Nigeria	23.4%	4,564	1,060
Pakistan	23.7%	18,180	5,407
South Africa	39.0%	10,614	4,671
Sri Lanka	39.3%	579	243
Thailand	50.3%	11,987	6,766
Tunisia	51.2%	16,627	8,870
USA	-	186,049	-

Source: UNESCO data from 2010 or latest available year

Note: ^a For Canada, the data is extracted from Statistics Canada’s University and College Academic Staff System [UCASS]

The respondents have very diverse disciplinary backgrounds (see Figure 3). However, the majority of participants were young scholars working in the natural, technical, applied and life sciences. The proportion of respondents working in the arts, humanities and social sciences collectively amount for only about 25% of the sample.

On average respondents were between 33 and 34 years when completing the survey in the summer and autumn of 2013. Most of them had received their PhD within the past 6 years between 2007 and 2013 matching the project definition of early career researcher. In our sample, 42% stated that they were married, 41% of the respondents said they were single, and 14% were in a relationship outside wedlock. In addition, 31% of the participants reported to have children.

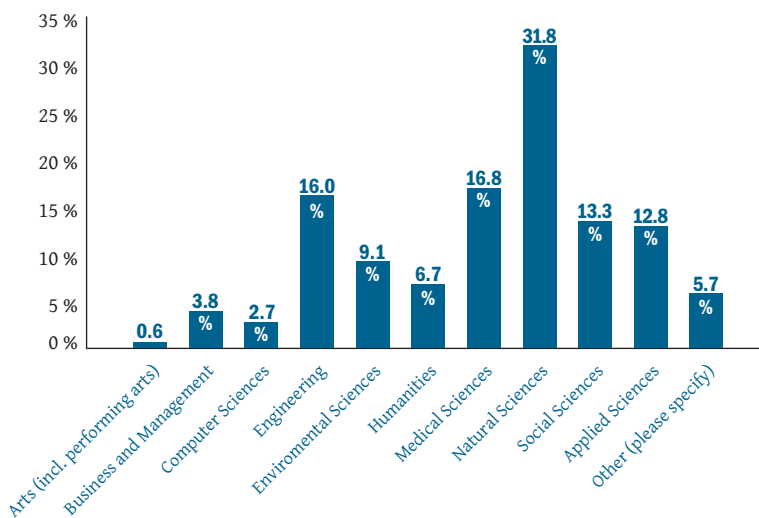


Figure 3 – Academic background of the survey participants

The vast majority (84%) stated working in a full-time position which most participants took up not longer than four years ago. The data is not biased towards members of the very specific group of Young Academies, as only 21% of the participants stated being members, whereas the remaining 79% are not affiliated with the network of Young Academies at all. That science is a borderless enterprise for many early career researchers was underscored by the fact that more than 55% declared having already worked abroad. In our survey, the research systems of developed countries have benefited from the immigration of foreign scholars, whereas the flow of global talent is reversed for developing countries. The remainder of this report will analyse and discuss the findings of the GloSYS precursor project in greater details.

The Support Structure

“ You need people around you who at least believe in you, that you know that you do the right thing, because without that I don’t think you can do anything. Support is important, yes! ”

Postdoc, Natural Sciences, India

Early career researchers benefit from the direction provided by mentors and research supervisors. There is a vast literature on the importance of mentorship in helping facilitate the future success of young scholars, showing benefits such as more productive research careers, a more positive outlook on their future prospects, better preparation in making career decisions, better integration into the profession and increased networking opportunities (Roch 1979, Cameron and Blackburn 1981, Allen et al. 2004). Without a doubt, support is important during the early stage of academic careers. Having a supportive superior, a mentor or senior peers who believe in their junior colleagues or who help them pursue their goals actively, is a valuable stepping-stone for launching a successful career.

Mentors

The analysis of the semi-structured interviews shows that the type of support helpful to young scholars can be very diverse, ranging from introducing them to distinguished scholars in the field, including young scholars into the network of more senior colleagues, providing references, sharing experiences related to grant or scholarship applications or providing informal advice. The pre-test of the survey further demonstrates (see Figure 4 for details) that there is wide consent on the circle of most important advisors on which young scholars rely regarding their career decisions. This circle consists of senior colleagues (63%), mentors (39%), as well as family and friends (34%).

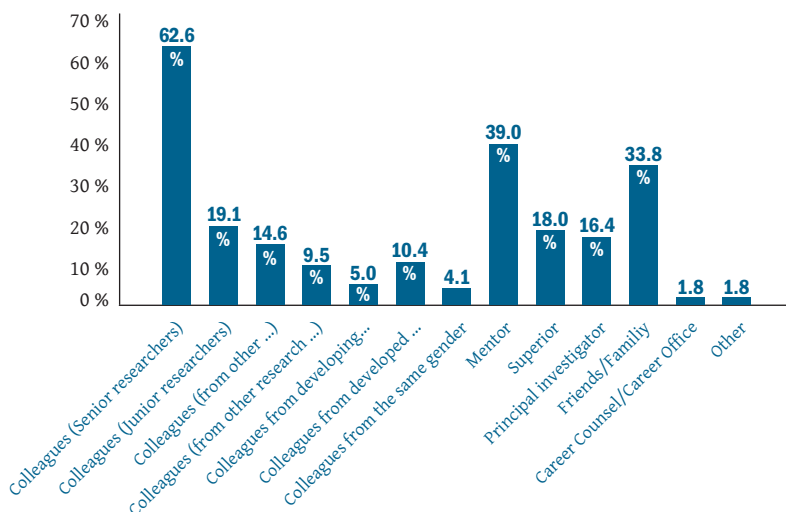


Figure 4 – Most important advisors of early career researchers

The interview participants stated that the benefit of having a circle of advisors lies in the encouragement and reassurance they provide in addition to giving feedback, exchanging ideas, discussing results, and encouraging young scholars to accept new challenges. Our survey indicates that these advisors are usually mentors or senior peers such as supervisors and Principal Investigators (PIs).

In our survey the lack of mentoring was identified as a critical career obstacle. It was ranked amongst the top four obstacles⁴ young scholars encountered in their careers. This issue of mentoring was also addressed in the interviews, comparing the support young scholars received themselves to the mentoring they want to provide for their own students.

Early career researchers generally regard supporting and advising younger members of the community as their obligation. In most cases young scholars felt, that they would like to give better support to their students than they had experienced themselves. In particular in the humanities and social sciences, young scholars more often lack a support network, role models and peers who guide and advise them in their own choices.

“ I think it's important to have a role model, to have a mentor who you actually can approach with questions. I didn't really have and don't really have this. It's also important to not only believe in what you do but also step up and be more courageous and actually accept more challenges. I think you need, and I'm trying to do that (for my mentees), a lot of encouragement to pursue that kind of career. I'm much more approachable on all these different things than my professors were when I studied, and I feel much more supportive in different areas because I think that's important and it's part of the responsibility aspect. ”

Assistant Professor, Humanities, Germany

The increased awareness of the importance of support for students and younger colleagues of the team also appears quite strongly in our pre-test survey results. The results show that 30.6% of our survey respondents stated they would like to increase their time for training and supervision if they could.

Trusting relationships

Early career researchers perceive the period of time between being in a postdoctoral position and a permanent academic position as the most insecure and unstable phase of their career. It was often described as a 'bottle neck' in the interviews since a large number of highly qualified young researchers are competing for one of the rare but secure faculty positions. During this risky period of time, young scholars seek advice and support to help them navigate around possible pitfalls. As the survey results demonstrate, job insecurity is perceived as a career barrier in Europe but not as strongly in the rest

⁴ In the questionnaire, this was referred to as 'barriers encountered in one's career'.

of the world (see Table 14 below). However, data indicate that career trajectories are diverse, leading into a number of possible specialties in and outside of academia. Therefore, advisors play an important role helping young scholars to identify possible directions and to assess potential career prospects. The pre-test survey results on barriers and career prospects will be discussed in greater detail in the chapter on cultural differences.

All over the world, trusting relationships in science are cherished and considered the most beneficial and fruitful support for the career development of young scholars. Therefore, being on good terms with mentors and senior colleagues and establishing relationships of mutual trust and esteem was described as the most important factor for career success. During the interviews however, differences were identified between developing and developed countries. While in developing countries those friendships helped in securing the most attractive jobs, such as professorships, within their national higher education system, researchers in developed countries benefited from the global network of their senior friends giving them access to the most respected research groups, labs and universities, allowing them to present their work at the most prestigious conferences and publish in the most important books and journals.

“ *I see myself like I have my family here, but also my family at the University, like I see it as my family, my group, everybody supports each other. And I look out for their best interests and usually their best interests are also my best interests.* ”

Associate Professor, Sciences, Canada

These supportive relationships are generally maintained when young scholars advance in their careers. Supporting a selected group of younger colleagues can be regarded as informal intergenerational contacts in the research system passed on from generation to generation. In the literature the importance of establishing socio-technical networks for career advancement is also emphasized (Latour 1987, Callon 1989) helping young scholars to gain recognition and credit for their work. However, not all young scholars are automatically included into this circle but still feel that being well connected is a decisive factor for successfully continuing an academic career. In some cases the relationship amongst colleagues was not only based on mutual trust but it was even perceived as a familiar and caring environment. During the interviews, examples of particularly close work relationships were mentioned throughout all the regions we covered in the survey (see figure 2).

Guidance and mentoring

When it comes to their professional development most young scholars felt that there is a difference in the responsibilities and expectations on each career level and an increase in pressure to be productive and to attract research funding. A perceived paradox is that pursuing a career in academia is

only possible for outstanding researchers; however their actual research time decreases in favour of management, teaching and supervision tasks in the course of their career.

“ *So this advising part: I am not very good at it. I don't think I am. But I'm learning it, because nobody taught us this. It's like parenting. Nobody teaches you how to be a parent, you just learn it on the way. So nobody taught me how to be a good advisor, I'm learning it on the way.* ”

Assistant Professor, Sciences, Turkey

Original research work is progressively handed over to junior colleagues. The insecurity about quality standards in academic work and the common question of “how good is good enough”, is regarded as a factor of insecurity in their career choices. Being “out of the business” is an enduring hazard for young scholars who fear a sudden end to their career if they are not able to attain an advanced position in which they can demonstrate their competences and develop independent research projects. Being productive mainly in terms of the number of publications is regarded as one of the most decisive factors when striving for career advancement. The other helpful factors that have been named are networking and politicking.

“ *You need to know the right people, so they can probably support your work and help you work and grow faster.* ”

PhD, Sciences, Nigeria

However, even if they are hardworking, productive and well-connected, young scholars – in particular in developed nations – feel that this is not sufficient for career success as they are also dependent on luck, the availability of suitable positions and the number and the quality of their competitors.

“ *Basically no matter how successful you are you never know that you are successful enough to be able to reach the next step.* ”

“ *What people expect from you is that you have to be able to produce enough data in order to have enough publications in your group, you need to get in third party money, you need to give lectures, and probably they should be evaluated in a positive way by the students because all of this basically are the criteria that you need to proceed to the next step (...). And if a habilitation doesn't work, or an advanced postdoc position doesn't work, well give it one or two years and you're out of the business.* ”

Assistant Professor, Sciences, Switzerland

Support networks for women

Furthermore, with regard to gender differences in science, female researchers often feel that they are less likely to win the favour of their senior colleagues and are not included into disciplinary support networks. Depending on the cultural regard of women in a world region, they even face gender discrimination and rejection when applying for research positions and promotion. Women often feel that they need to work much harder than their male colleagues to defend their position or advance in their careers.

“ *We all have got children and I think we understand each other. We understand where we’ve come from. So we’ve all had to take career breaks when we had our children and we all know about the problems when you come back to work. You know, your child will fall ill and then you have to rush off to take care of your child and then you are working on something still late at night, and I think that – I know it sounds strange but that is a kind of bonding that has actually kept us together over the last six months.* ”

Postdoc, Sciences, Australia

The importance of support between female researchers was occasionally emphasized in the interviews but did not appear very strong as a selection criterion for collaborations in the pre-test survey. The academic systems in some countries offer permanent academic positions to young scholars, while in other regions, young scholars only have access to fixed-term contracts. These permanent positions and long fixed-term contracts allow young researchers to develop their careers at their own pace, offering them the possibility to apply for promotion in a centralized evaluation as soon as they fulfil the necessary criteria defined for each career level. However, there is no guarantee that these types of positions are available and allocated to the most suitable candidates. In general, female researchers seek more contact with other female colleagues. Mutual understanding of each other’s situation and shared experiences in their careers are perceived as important support system amongst women. Gender issues will be further addressed in the fourth chapter of this report.

The Academic Profession

“ *I like the independence in academia and the flexibility although it can be a problem sometimes. Having flexibility means that you really work much longer than you should which is good sometimes, which is of course exhausting some other times. Of course the other aspect of independence is that you can more or less choose the topics you want to work on as long as they’re somewhat feasible.* ”

Research Group Leader, Natural Sciences, Turkey

Traditionally, the academic profession has been a dynamic field characterized by progressive transitions and a lack of stability. Literature in different parts of the world intensively reflects on the constant changes in the academic profession for half a decade now (e.g. Altbach 1980, 1996 and 1998, Neave 1983, Clark 1987, Gumpert 2000, Enders 2001, Bexley et al. 2011), suggesting that a crisis is brewing. The expansion of the higher education sector, the increasing importance of knowledge and lifelong learning in society, and easy access to information and knowledge throughout the world have been proposed as reasons for these developments. Consequently, scholars are becoming redundant as the gatekeepers of exclusive knowledge, yet at the same time are expanding as a professional group. The result is the loss of both status and rarity.

More recently, the financial crisis in 2008 massively impacted science and higher education due to the disruption and reduction of funding for research by governments and research funding organizations throughout the world. Young scholars are keenly aware that competition for jobs is increasing and the chances of obtaining research funding are lower than even a few years ago. In developing countries the 2008 recession also led to currency deflation, making it more difficult to purchase research equipment and consumables and to hire researchers. In some cases, researchers complemented their income from other sources or by doing additional jobs as their research salary was not sufficient to make a living. The results of the pre-test survey indicate that 22.6% of the researchers surveyed supplement their salaries with outside remunerated activities.

Young scholars' professional situations are susceptible to economic and social risks. Many respondents perceived themselves as helpless and unable to control their career development because success in the academic system and adequate working conditions are highly dependent on outside influences. Although academia faces varying external conditions such as economic and social factors sometimes creating new challenges and threats, the academic profession has always been responsive and adaptive to external changes. Furthermore, the working conditions in the research system are constantly in an internal process of dynamic transformation preserving the flexibility and innovativeness of this sector.

Diversification

The pressure to differentiate from peers or to set oneself apart rose everywhere in the world. Funding is a relevant issue in this context, as it allows young scholars in any country of the world to develop their field of research. Gaining resources is an opportunity to differentiate themselves from peers by doing original research. However, differentiation is not solely achieved by producing good research results.

“If you're on an academic career track, you have to aim to become a boss. No possibility to say, 'I'm a researcher, I love my job and I find my stable position here'. In my opinion this is missing. I mean not everyone is able to be a boss and not every-one is willing to be a boss. In academia there is not really a plan B. The plan B is obviously to take the exit road to industry.”

Assistant Professor, Natural Sciences, Germany

In a changing and even unstable academic environment, young scholars feel the pressure to demonstrate leadership and relevance, but also the need to increase productivity and to strive for research excellence and reputation when competing for resources and positions (e.g. Locke and Teichler 2007). The findings of the GloSYS pre-test survey correspond with literature in identifying the top five criteria for career advancement in all countries: 1) the number of publications, 2) the reputation of the journals in which these papers are published and 3) having attracted grants and external funding, 4) the number of citations and 5) having won awards. However, it is noticeable that this list focuses on the research side of the academic profession, while ignoring the relevance of the variety of other tasks relevant to scholarly daily work, such as teaching, supervising students, participating in committees, etc. The transitions in the academic system did not only demand adaptation strategies in resonance of external, social developments but also in reference to the organization of the academic profession.

“ It is pretty different, being a graduate student or a postdoc, right? So it's a learning experience, you have to figure how to teach a course. You have to figure out how to mentor a number of students; put together lab meetings and write grants and try to manage them. Actually managing the grants are somewhat challenging [...] because there's not much administrative help... ”

Researcher, Biology, Turkey

The simple differentiation and classification of scholars in past decades according to their primary responsibilities at the university (research or teaching) and their affiliation to sub-disciplines and specialties, is not precise enough in today's academic system. The analysis of academic work shows that young scholars are involved in many different activities that are acknowledged as important aspects of academic work.

“ You come to a point where you have done everything that you could. I have a lot of articles out, I have teaching experience, I have volunteer work, I have worked on a project, I have written grants, I have got money from grants, I have every category covered in my CV. I think that at the end it really comes down to luck. I've been in the job market and I've been on the other side in the hiring committees and it's really luck. At the end of the day it really doesn't have to do so much with your CV as it has to do with so many other things that are so beyond you. ”

Postdoc, Natural Sciences, India

Besides research and teaching, young scholars are also involved in administration and services, training and supervision, group management and occasionally also in community outreach activities. A majority of the respondents in the GloSYS pre-test survey stated that they would appreciate more time for research, but also for their activities in the area of training and supervision.

Table 3 – Weekly working hours during and outside term time

		Teaching	Research	Admin & Services	Training & Supervision	Group Management	Other	Total
During	Mean	10.93	16.32	7.88	6.87	4.57	8.11	54.68
	Nb obs.	250	271	243	238	187	55	
Outside	Mean	4.52	19.76	7.88	7.95	5.05	11.19	56.35
	Nb obs.	139	254	218	212	165	64	

Table 3 shows the average weekly working hours for each academic task reported by the survey respondents. It is remarkable that young researchers all over the world work considerably more than the regular 40-hour-week, amounting on average to 54.68 hours during term and 56.35 hours outside of term. In addition, when asked how they would change their workload if they could (see Table 4), all of them would increase their time for research. Furthermore, the results show a slight tendency to increase the time for training and supervision. In contrast, there is no indication that young scholars would like to reduce their working hours significantly. The distribution of workload on the teaching and group management is perceived as “just right”, whereas on average they would prefer to spend less time on administration and services.

“ I should focus a lot more on writing papers and documents like grant applications, but there are so many other things going on that I just can't. [...] It ends up piling up on your desk and you end up doing this in addition to your normal work hours, and then, of course that's not really funded. Lots of academics are workaholics. ”

Assistant Professor, Sciences, Switzerland

Table 4 – Wished modifications of work load

		Teaching	Research	Admin & Services	Training & Supervision	Group Management	Other
Wished modifications	Mean	1.82	2.61	1.47	2.18	1.94	1.96
	Nb obs.	289	297	282	284	253	50

Note: On a 3-point Likert scale: less time (1), just right amount of time (2), more time (3).

The issue of workload was also addressed during the interviews. Many young researchers in both the developed and developing world stated that their job and contract conditions did not necessarily support their career development aims. In many cases, universities hire highly qualified researchers but expect them to shoulder primarily teaching duties and other non-research-related workload.

“*I'm really hoping that I can establish this area and take it further, but I know the difficulties in establishing and being in only research positions. So my other plan is to actually go a bit more into academia and go into teaching because that gives you a bit of a foothold in the university.*”

Postdoc, Sciences, Australia

This also corresponds with the survey responses stating that they would like to decrease their workload in administration and services (see Table 4). An often-raised issue with regard to postdoc positions is that young scholars feel trapped in an intermediate position of having many responsibilities but not equal power to participate in faculty decisions. These results are similar to those obtained by Kongsmak et al. (2013).

Specialization

Resulting from the diversification of the academic profession is an increasing work specialization (Musslin 2007). Depending on the career level, a clear division of labour can be witnessed in particular in the natural, technical and life sciences. While early career researchers such as postdocs but also doctoral students are primarily involved in so-called bench work, e.g. conducting experiments and measurements, scientists in the higher echelons of the hierarchy, such as assistant, associate and full professors where this classification applies, usually dedicate their time to raising research funds, supervising and coordinating their teams and establishing partnerships and collaborations.

“*As a postdoc I didn't have any people to supervise, whereas now I have PhD students and postdocs. That's basically the way I do research now: discussing with my co-workers, double checking their data and advising them to redo measurements or to do control experiments. I am involved in a lot more projects now. You kind of play yourself. And pressure-wise things became worse because people expect from you to produce enough data in order to have enough publications in your group, you need to get in third party money, you need to give lectures, and probably they should be evaluated in a positive way by the students because all of this basically are the criteria that you need to proceed to the next step and only that step is a stable position.*”

Assistant Professor, Sciences, Germany

Literature also suggests (Becquet and Musselin, 2004) that there is clear division of tasks according to career levels demanding a shift of skills and competences throughout the career trajectories of scholars. Consequently, contact with research work decreases with seniority in the course of scholars' careers. This development affects the humanities and social sciences less strongly as managerial roles, large research teams and extensive collaborations are not widespread in these disciplines.

“ *But the postdoc position in the States was really basically you work hard, play hard, [...] and then coming to Basel, things changed again, [...] I did my own project so I was still working in the lab, but within the first one to two years, I had my first PhD students and I got other project students and you know, my work transferred from a lab based work to an office based work of supervision. [...] So now-a-days, even though I really like doing experiments I can do this in the week before Christmas comes, as a Christmas gift.* ”

Assistant Professor, Sciences, Switzerland

In spite of the shifting responsibilities and tasks on each career level, young scholars in our study appreciate the freedom to develop their own ideas and to work on problems that they find exciting in their academic work. The interview respondents perceived the increasing responsibility for the development, qualification and supervision of junior team members as one of the most challenging aspects, but also the responsibility to attract funding allowing the team to develop their research.

The interviews highlighted that conditions of the respondents are similar across the world, e.g. the situation of building a lab from scratch, not knowing whether your institution will have money to secure your position in the future, a lack of resources and research staff and – at least in some developing countries – not knowing if electrical supply will be stable throughout the week. In particular in developing countries in Asia, however, a lot of respondents feel secure in five-year contract positions. They are also confident that their contracts will be prolonged. Most of the interviewed researchers were not in a permanent position. This instability brought them to work long hours and weekends keeping up on publications, hoping to stand out as hard working and reliable or supplementing their income with additional jobs.

Mobility

“ *In Turkey the retention of students is very common, you know, this brain-drain thing. I mean, I cannot complain too much because I went through this too. I went outside and spent most of my time abroad and most of our students would like to do that, too. We have a relatively small pool of graduate students, or postdocs that stay with us compared to those that go to Europe or the US. I think very recently people are coming back just like myself, but the net flow has always been to the outside. The reason is mostly because the research environment and funding, and infrastructure are of course much better in the US and in the EU.* ”

Research Group Leader, Sciences, Turkey

Mobility is often regarded as a chance for the professional development of early career researchers. Working in another country for 2 to 4 years during a postdoc is considered to be beneficial and a well-regarded path of an academic for most of the interviewed scholars. Reasons for mobility are mostly to work in a specific field or with a specific researcher. When asked to rank the most attractive consequences of mobility (from 1 most attractive to 6 least attractive), an increase in productivity was identified as the most important factor for working in another country (see Table 5).

Table 5 – Most attractive consequences of mobility

1	Increased research output / productivity	2.5830
2	Increased collaboration / network	2.7954
3	Acquisition of new skills / techniques	3.1320
4	Personal development	3.9538
5	Boost international visibility	4.1584
6	New environment / culture	4.4521

Note: Ranking from 1 (most attractive) to 6 (least attractive)

Problems while working abroad can be cultural differences and language, but also the insecurity of the benefits of mobility for career advancement. In developing and emerging countries, mobility is usually regarded as a chance for the individual researcher but often involves emigration to countries where the working conditions and career prospects are expected to be more beneficial.

Transparency

“*In fact they, at the very beginning of every academic year you are given a rubric which has the criteria, you know, against which you are going to be evaluated, so you know from the very beginning, and of course you tailor your portfolio, and for that matter your performance, accordingly. You know where to put the emphasis.*”

Postdoc, Humanities, Qatar

There is no international standard of research evaluation. In some countries the criteria against which researchers are evaluated are very transparent and the procedure is formally defined. In most research systems however, evaluations are decisions taken by peers on the basis of rather informal

and situational criteria. The procedures vary tremendously including peer review of submitted scholarly work, oral exams in front of a committee, paper-based evaluations in the categories research performance, successful grants, number of students supervised, and international outreach depending on the priorities of the universities and research institutes. The purpose of evaluations can be diverse, too. Besides the selective evaluations for job, grant and scholarship applications, evaluations are also performed to assess if a candidate is ready to reach the next career step, to motivate and reward researchers with a financial bonus for good work or detect performances which do not meet the standards early on.

“ I think lots of reviewers are selected randomly. If you consent with them, then you are okay. But if they think in a different way, you have to defend quite a lot. And sometimes I think that reviewers are not really experts. So it is quite hard to talk about your research in a very plain language in order for them to understand you. ”

Researcher, Sciences, Taiwan

Young scholars also feel that the choice of research problems is not entirely free and partially influenced by trends and the focus on fields that are of national interest and for which funding is available. The lack of transparency in selection criteria e.g. for funding, grants, jobs, etc. is mainly related to the fact that decisions are not only based on the candidate's competences and achievements but also on uncontrollable factors such as the economy, the general funding situation, shifts in the national research focus and suitable vacancies, etc. In developed countries researchers frequently have to reapply for the next job and feel like being in a continuous evaluation process. The rising number of competitors for a limited number of available positions, the ambiguity in the evaluation criteria and the need for being well-connected within the scientific community in order to be noticed and to be given the chance to advance in one's career are the major concerns of young scholars. Researchers who have already reached a tenured position or a rather secure position feel less pressure and often regard evaluation as options to advance further. Rewards and incentives are rarely used to honour good work at early career stages. Universities in developed countries occasionally offer bonus systems for tenured professors.

Attractiveness

Independence, flexibility and creativity are the criteria that matter most for young academics and this is also what motivates them to pursue a career in academia. While the motivation and interest in their research field brings young scholars into the academic profession, they face challenges and struggles along the way, but also appreciate academic values.

The job as an academic is considered to be exciting, diverse, creative and flexible in terms of office hours (whether it's about coming later in the morning or staying long hours and weekends). In spite

of the job insecurity, two-thirds of the survey respondents stated that they feel hopeful or somewhat hopeful about their career prospects, and more than 80% of them indicated that it was excitement about their work that motivated them most to pursue an academic career. The opportunity for intellectually stimulating work, the passion for a field of research and the chance to contribute to new knowledge are the most esteemed benefits of working in academia.

“*I really wish... I really hope to get to a stage where I'm able to establish something, and then make it easier for researchers, young people who'd love to get into research, to work. I would like to make a conducive environment for them to do something out of this society, to create something out of it themselves. I'm saying this out of the struggles I had to go through. I have gone through a lot of troubles trying to make things work, and I know my supervisor put in lots of effort for us. So I would love to do something like that, too. But making it available to people who are interested in research, so that when you have an area that pleases you, you come around and do some work. Also finding a way to subsidize their costs, so that they will have better comforts in working, not working and thinking of how to get money, you know.*”

PhD, Sciences, Nigeria

While these criteria are mentioned by academics all over the world, the moral involvement with their research differs strongly. Motivation for academics in developing countries also means to ‘give something back’ to your home country or to improve the quality of life for all societies. A deep and widely shared commitment of academics to scholarly values, in both teaching and research, affects the recruitment and retention of academic staff in developing and emerging countries. A strong personal commitment to scholarship and the ambition to contributing to the advancement of society pull young scholars in developing countries towards research. This was perceived more strongly in the interviews of scholars in the developing world. Regional differences will be further examined in the last chapter of this report.

Gender-related issues

The sample obtained from the pre-test of the survey is composed of 325 women and 316 men. Considering the proportion of female scholars in the various countries studied (see Table 2), our pre-test clearly oversamples women in some parts of the world. We will bear in mind the potential bias introduced by this oversampling but will not post-stratify the resulting sample as this is a pilot study aimed at testing the questionnaire on a global scale. Having an equal number of men and women at this point is not problematic and provides the necessary critical mass to properly identify the main issues at stake regarding gender-related issues.

Parenthood

Let us first assess the differences in the family-issues regarding the scholars surveyed. Table 6 presents information about relationships, parenthood and career breaks. While our sample consists of slightly more male scholars that are married or in a relationship than female scholars, many more men have children than women.

“ You are absolutely equal till you have a child, and you have a child and you suddenly realise... the world is not that equal. ”

Postdoc, Sciences, Australia

Amongst the parents, we find no difference between men and women in terms of family size (measured by the number of children). Unsurprisingly, more women than men have taken a career break. The most important reason for women to take a career break is obviously maternity leave (see Table 7). For men, the most common reason to take a career break is to pursue job opportunities in non-research fields, followed by unemployment.

The second most important reason for women to take a career break is health-related. We presume that it is still perceived as a woman’s task to take care of sick children or of elderly relatives. This burden however falls disproportionately on childless women (18.42%) as opposed to women with children (3.7%) or men without children (4.17%). Men with children (0%) appear to be spared this task and appear never to be sick themselves (these results are not shown). We can therefore say that career breaks for women are family and health related while for men, they appear more economically related.

Table 6 – Family-related characteristics of scholars by gender (proportion and number of children)

Gender	Statistics	In a relationship ^a	Parents	Nb Children ^b	Career break
Female	Mean	51.69%	38.75%	1.6579	31.94%
	Nb obs.	325	320	76	216
Male	Mean	58.86%	68.40%	1.8205	20.00%
	Nb obs.	316	307	117	220
Significance of Mann-Whitney test		0.068	0.000	0.792	0.004

Note: ^a Proportion that are either married or in a partnership; ^b Average Number of children. Only for the parent-scholars (hence the smaller number of observations).

Table 7 – Reasons for career breaks by gender (proportion)

Gender	Statistics	Parental leave	Unemployment	Health	Job-opportunity in non-research field
Female	Mean	36.92%	13.85%	12.31%	21.54%
	Nb obs.	65	65	65	65
Male	Mean	18.60%	20.93%	2.33%	37.21%
	Nb obs.	43	43	43	43
Significance of Mann-Whitney test		0.042	0.336	0.067	0.076

Career

In general, men are more hopeful than women regarding their career prospects in general, and in particular about finding a research position, teaching position or a professorship in academia (see Table 8). No difference between the sexes is observed with regard to the prospects of raising research funding or finding a non-academic permanent research position or in finding other career opportunities outside academia. One female survey participant more hopeful than her female colleagues mentioned that she is particularly hopeful “because [she is] very talented and able to work hard; because [she is] a woman, and women are needed in the [sic] academia; because [she] feel[s] passionate about research.”

Table 8 – Career development prospects by gender (5-point Likert scale, converted into percentages for the chances of gaining a permanent position or professorship)

Gender	Statistics	Perception about career prospects ^a	Chances of finding a:		Chances of becoming a full professor ^b
			teaching position in academia ^b	academic research position ^b	
Female	Mean	3.7350	51.79%	55.00%	44.44%
	Nb obs.	200	190	188	187
Male	Mean	3.8966	58.38%	60.57%	53.92%
	Nb obs.	203	191	193	199
Significance of Mann-Whitney test		0.066	0.040	0.058	0.002

Note: ^a From hopeless (1) to hopeful (5); ^b Percentages built from the averages of the middle point of the 5 categories: 0–19% (1), 20–39% (2), 40–59% (3), 60–79% (4), 80–100% (5).

Turning now to the elements that contribute to a successful career, we find very similar perceptions for both genders. For both men and women without children, “scientific publishing and highly cited papers” as well as “scientific breakthrough” are the two most important elements (see Table 9). With a little more experience, the second most important element switches from “scientific breakthrough” to “obtaining scientific awards and research grants”. As both men and women with children are generally older than their childless colleagues, we do not believe that this observation is due to the parenting aspect of their lives, but simply to their older age and implied greater maturity in the academic profession (see Table 10 for the age breakdown by gender and parenthood). We propose that a certain level of pragmatism is acquired with age and that without funding the expected scientific breakthrough is unattainable. One scientist that feels a little less hopeful than average indeed explains that it is “[f]rustrating to see international scientists publishing ideas you had, but never had the funding, resources, students and postdocs to do the experiments and really compete at an international level.” We will examine the resource issue in greater details in the next chapter.

The fourth most important element that contributes to a successful career is related to networks. While young female scholars and parent-scholars of both genders seek this network locally amongst colleagues, “mutual support networks amongst colleagues and collaboration”, young male scholars seek to establish a more international network via “participation in scientific conferences”. Scholars with important family responsibilities are presumably a little less mobile for numerous short trips to conferences. Once men and women have children, or are simply older, their perception of what contributes to a successful career is very much aligned with one another: having a good mentor takes the fifth position, and participating at conferences ranks sixth.

Table 9 – Top 8 reasons that contribute to a successful career in academia by gender and parenthood (average ranking from 1, most important, to 8, least important)⁵

Reasons	Statistics	Female without children	Male without children	Female with children	Male with children
Scientific publishing and highly cited papers	Rank	1	1	1	1
	Mean	3.5966	2.4466	2.8367	3.0476
	Nb obs.	119	103	49	84
Scientific breakthrough	Rank	2	2	3	3
	Mean	4.5966	3.5049	4.9184	4.4762
	Nb obs.	119	103	49	84
Obtaining scientific awards and research grants	Rank	3	3	2	2
	Mean	5.0084	4.5243	4.4082	4.3647
	Nb obs.	119	103	49	85
Mutual support amongst colleagues and collaboration networks	Rank	4	6	4	4
	Mean	5.4286	6.2427	5.2653	5.9765
	Nb obs.	119	103	49	85
Having a mentor/supporter	Rank	6	8	5	5
	Mean	6.2521	6.5728	5.8163	6.1647
	Nb obs.	119	103	49	85
Participation in scientific conferences	Rank	8	4	6	6
	Mean	6.4034	5.5146	6.4694	6.2000
	Nb obs.	119	103	49	85
Doing research in the most topical fields	Rank	5	7	7	8
	Mean	6.1176	6.3689	6.4898	6.6000
	Nb obs.	119	103	49	85
Mobility	Rank	7	5	8	7
	Mean	6.2941	6.1942	7.6531	6.2706
	Nb obs.	119	103	49	85

⁵ An important flaw of the questionnaire regarding the elements that contribute to a successful career in academia is the lack of elements regarding teaching and supervision. This will have to be remedied in the future.

Table 10 – Age and age-related characteristics of scholars by gender and parenthood

Gender and parenthood	Statistics	Age	Nb years since PhD	Occupies a permanent position in academia
Female without children	Mean	31.4286	3.1156	24.08%
	Nb obs.	245	147	245
Male without children	Mean	31.5781	3.8087	27.60%
	Nb obs.	192	115	192
Female with children	Mean	37.4156	6.0159	46.75%
	Nb obs.	77	63	77
Male with children	Mean	37.2288	6.0316	54.62%
	Nb obs.	118	95	119

Note: There is a significant age difference between parents and non-parents, but not between genders of the same parenthood status.

When it comes to what it means to be an academic, both men and women respond in similar ways: research comes first, closely followed by teaching, while training and supervision takes the third rank. In other words, both genders understand the academic profession the same way. For the BRICS countries and for the African countries, teaching and training and supervision are in reverse order. This observed tendency is mainly due to African and BRICS women, in other words, women from South Africa. The report further investigates regional distinctions in the next chapter.

Obstacles

Although both genders feel the same about what academia is all about, they have experienced different obstacles in their career, whether in academia or outside of academia. Comparing the barriers encountered by female and male scholars throughout their career, our results nevertheless show important similarities on all but four indicators (see Table 11): lack of support from superiors, gender inequality, job rationalisation, all of which are more often reported by women, and political instability or war, which is more often reported by men (presented in Table 11). Interestingly, while the proportion of men and women that experience job instability is similar, a greater proportion of women have actually experienced job rationalization (the position occupied by an individual disappears from the organisation). Their fear therefore more often turns into reality as compared to their colleagues. In addition, no significant difference can be observed if we introduce parenthood in the balance.

Table 11 – Main differing obstacles by gender (proportions)

Gender	Statistics	Lack of support from superiors	Gender inequality	Job rationalisation	Political instability or war
Female	Mean	50.61%	17.07%	21.34%	9.15%
	Nb obs.	164	164	164	164
Male	Mean	41.18%	4.58%	13.07%	16.34%
	Nb obs.	153	153	153	153
Significance of Mann-Whitney test		0.093	0.000	0.052	0.054

Surprisingly, work-life balance does not appear as an issue systematically reported by women. To be able to find significant difference between groups, one has to also consider whether men and women have children. Then the issue of work-life balance is discriminant across groups and clearly stands out for women with children (see Table 12), 72 % of mothers report this as a barrier encountered in their career. This clearly contrasts with childless women and men, which report this barrier in similar proportions. All other two-by-two comparisons yield significant results (see the Mann-Whitney tests in Table 12).

Table 12 – Work-family balance as an obstacle encountered by gender and parenthood (proportions)

Gender	Statistics	Without children	With children
Female	Mean	31.58%	72.00%
	Nb obs.	114	50
Male	Mean	26.51%	47.06%
	Nb obs.	83	68
Significance of Mann-Whitney test		Female without children	Male without children
Male without children		0.442	
Female with children		0.000	0.000
Male with children		0.037	0.007

“When my daughter turned one and a half months, I was back in the lab. I was turning down conferences for about two years and it would be nice if I didn't have to, but priorities are different and I have no regrets, no regrets.”

Associate Prof, Sciences, India

Attractiveness

Despite these barriers, a number of reasons contribute to making academia attractive to scholars of both genders (see a brief list in Table 13). Once again, both genders, whether they are parents or not, rank the various attractiveness factors in very similar fashion. While we can postulate from the observations that women generally rank student contact higher than publication or other visibility opportunities, the differences in ranking are not statistically significant in this pre-test analysis. This stronger sense of collectivity amongst female scholars compared to male scholars warrants further investigation.

Table 13 – Top 6 reasons that make academia attractive to scholars by gender and parenthood (ranking)

Reasons	Statistics	Female without children	Male without children	Female with children	Male with children
Research	Rank	1	1	1	1
	Mean	3.1835	3.1176	3.1739	3.4667
	Nb obs.	109	85	46	75
Flexibility	Rank	2	2	2	2
	Mean	3.6606	3.6235	3.7826	3.6667
	Nb obs.	109	85	46	75
Collaboration/Networking	Rank	3	3-4	3	3
	Mean	5.0459	5.1765	4.6739	5.3467
	Nb obs.	109	85	46	75
Work/life balance	Rank	4	3-4	4	5
	Mean	6.0092	5.1765	4.7609	5.9067
	Nb obs.	109	85	46	75
Publication/other visibility opportunities	Rank	6	5	6	4
	Mean	6.1101	5.9176	6.1087	5.5333
	Nb obs.	109	85	46	75
Contact with students	Rank	5	6	5	6
	Mean	6.0550	6.2706	5.8043	6.1200
	Nb obs.	109	85	46	75

“Honestly, and this is very non-intellectual, but I like flexible hours. For me it's the flexible hours and creativity. I think that there is creativity around it and that it's not boring. I get very easily bored. Academia is not boring.”

Postdoc, Humanities, Serbia

This pre-test analysis of gender differences has highlighted a number of avenues for future research, which, with more comprehensive data, can hopefully contribute to understand more fully some of the gender issues touched on here. One such avenue of research consists in disentangling the age and parenthood issue. In the pre-test sample, parents, whether male or female, are about 37 years old, while childless scholars are close to 31.5 years old. The current size of the sample does not allow the further subdivision into young and old parent-scholars.

The lack of role models, mentors and support from superiors are clearly identified as obstacles by the scholars surveyed. In the pre-test questionnaire, the support networks among women ranked at the bottom of the scale, while they were regularly mentioned during the interviews. This obviously requires further investigation. Adding questions in the future questionnaire on the gender of mentors, supervisors, superiors, etc. in addition to women's networks may shed some light on the lack of support perceived by young female scholars. In a sense, academia or research outside of academia, should be able to learn from best practices in non-research fields of employment. As long as academia and research in general will remain a “male-dominated” bastion, this will continue to be a struggle for women, despite the fact that they understand the academic profession in the same way that men do. As more women enter academic circles and gain permanent employment as scholars and researchers, it is of crucial importance to continue to monitor the progress made in terms of support, mentoring, work-life balance, and similar issues, in global longitudinal studies.

Cultural differences

One last aspect of a researcher's life that this report will address is the environment in which one works, which is heavily influenced by the surrounding culture. The sample size of the pre-test survey does not allow for the comparison between countries with the exception of Germany and Thailand. In the spirit of global inclusion, we have chosen to use the entire sample and not to focus on specific countries. As a consequence, we compared various country groupings, by development level and regional levels, and chose the latter classification for this particular chapter of the report.

Obstacles

When comparing career obstacles with regard to support and stability issues, Europe stands out in contrast to the rest of the world. In particular, job insecurity is encountered as a career obstacle by

83% of the respondents from Europe (see Table 14). This is clearly related to differences in the science and higher education systems both within Europe and compared with the rest of the world. Whereas in most parts of the world, permanent or tenure track positions are also available to early career researchers, many systems in Europe, e.g. the German higher education system, mainly offer fixed-term contracts to the postdoctoral and early career researchers, reserving permanent job opportunities for a small fraction of scholars at the professorial level. One surveyed researcher mentions that “[t]here is a federal law in Germany (“Wissenschaftszeitvertragsgesetz”⁶) that forbids taking fixed-term contracts more than 12 years [and that he is] only allowed to take tenured jobs now, but [that] there are no such posts (beside the full professors).”

Table 14 – Obstacles encountered per region (proportions)

Regions	Statistics	Lack of mentoring	Lack of support from superiors	Job insecurity	Political instability or war
Africa	Mean	45.31%	45.31%	31.25%	9.38%
	Nb obs.	64	64	64	64
Asia	Mean	40.00%	45.00%	15.00%	13.00%
	Nb obs.	100	100	100	100
Europe	Mean	52.78%	58.33%	83.33%	2.78%
	Nb obs.	72	72	72	72
MENA	Mean	26.92%	36.54%	30.77%	30.77%
	Nb obs.	52	52	52	52
Americas^a	Mean	29.63%	40.74%	44.44%	11.11%
	Nb obs.	27	27	27	27

Note: ^a Americas refer to The Americas: South, North and Central.

With the exception of Europe, job insecurity is not regarded as such a crucial issue, as early career researchers in most systems benefit from more stable positions.

“*I think university jobs are pretty secure, in the sense that you’re going to be paid your salary to the time you retire.*”

Postdoc, Natural Sciences, India

In this context, it is also striking that Europeans experienced more career obstacles in interpersonal and social situations, such as lack of support from superiors (58%) and lack of mentoring (53%) more often, in particular compared to the respondents in the Middle East and North Africa (MENA) and the Americas. However, respondents from Africa and Asia also stated that a lack of support from superiors

6 Wissenschaftszeitvertragsgesetz 12. April 2007 (BGBl. I S. 506)

and a lack of mentoring have been severe career obstacles for them (see Table 14). Another interesting finding of our pre-test survey is that political instability and war are noticeable career barriers experienced by early researchers in MENA. Considering the recent “Arab spring” and the ensuing instability in the region, this is hardly surprising.

Obstacles related to a deficit in training opportunities to advance professional skills (see Table 15) were primarily experienced in MENA (55.8%) but also in Africa (39%) and Asia (39%). In Europe and the Americas, the lack of training opportunities seems to be less of an obstacle for young scholars. With regard to resources, we found that a lack of personnel or equipment⁷ affects researchers in Asia (64%) and MENA (61.5%) more often than in other regions, although in Africa (51.5%) and Europe (51.4%) this is also understood to be a difficulty.

Table 15 – Obstacles encountered per region (proportions)

Regions	Statistics	Lack of training opportunities to develop professional skills	Lack of resources: personnel, equipment, etc.	Lack of funding opportunities / research grants	Limitation of academic freedom
Africa	Mean	39.06%	51.56%	70.31%	15.63%
	Nb obs.	64	64	64	64
Asia	Mean	39.00%	64.00%	62.00%	23.00%
	Nb obs.	100	100	100	100
Europe	Mean	27.78%	51.39%	54.17%	8.33%
	Nb obs.	72	72	72	72
MENA	Mean	55.77%	61.54%	71.15%	25.00%
	Nb obs.	52	52	52	52
Americas	Mean	29.63%	40.74%	66.67%	22.22%
	Nb obs.	27	27	27	27

The lack of funding opportunities and research grants is a universal concern affecting young researchers throughout the world, most prominently experienced in Africa (70.3%), MENA (71.2%) and the Americas (66.7%) but also reported to be a severe issue elsewhere.

“ I know of a lot of researchers who are extremely hard working, extremely clever but sometimes the situation is such that you really cannot continue. And it is the financial situation and some very good ideas they’ve not been able to pursue, not been able to get funding, and not been able to convince people. So that is a reality for researchers and that’s just the way it is. ”

Postdoc, Sciences, Australia

⁷ The term ‘material’ was used in the questionnaire.

Funding and grants are prerequisites for the careers of young scholars, enabling them to perform research projects and gain professional experience. Ultimately, acquiring financial resources is the decisive hurdle for young scholars to advance their careers and establish themselves as members of the profession. Therefore, the consciousness of funding and grant opportunities (or the lack thereof) particularly applies to young scholars, who still need to prove and distinguish themselves. In times of rising competition for limited financial resources, securing research money is crucial to build a career in academia.

“*There are other challenges in the university, a lot of teaching, you know, you’re really overburdened with teaching and the funding is not that good.*”

Postdoc, Natural Sciences, India

Limits to academic freedom were not perceived as the main barrier to progress in any region. It is, however, noticeable that Europeans seem to be particularly free in their academic work (see Table 15) compared to the rest of the world, clearly indicating that research topics are chosen independently of societal needs compared to other regions where research may be more demand driven. This relates to our findings on respondents’ perception of career success, which we address in the next section of this chapter.

Career

Although excitement is an important motivator everywhere, Europeans most strongly agreed with the statement that it is the excitement about their work that motivates them most. In Africa, Asia and the Americas, in contrast to the excitement aspect, success was mainly perceived as actively and continuously pursuing advancement. Our data shows that in MENA, researchers adopt a more idealistic concept of success, stating that their work needs to contribute to the greater good. This idealism can also be found in Africa and the Americas but seems to be much less prevailing in Europe. When being asked to assess their career prospects for obtaining funding, finding a permanent research position and becoming full professors, young researchers in Africa seem to be the most confident group.

Table 16 – Career prospects per region (percentages)

Regions	Statistics	Obtaining research funding	Finding a permanent research position in academia	Becoming a full professor
Africa	Mean	50.58%	68.21%	68.26%
	Nb obs.	69	67	69
Asia	Mean	51.53%	58.66%	49.03%
	Nb obs.	131	127	124
Europe	Mean	46.40%	34.84%	28.99%
	Nb obs.	100	95	99
MENA	Mean	43.58%	56.40%	57.69%
	Nb obs.	53	50	52
Americas	Mean	50.93%	66.00%	55.00%
	Nb obs.	43	40	40

Note: Percentages built from the averages of the middle point of the 5 categories: 0–19% (1), 20–39% (2), 40–59% (3), 60–79% (4), 80–100% (5).

Career prospects with regard to the chances of obtaining research funding were assessed in a similar way all over the world (see Table 17). Respondents in all world regions believe their chances to be about fifty-fifty. More remarkable differences were found regarding the prospects of finding a permanent research position in academia and of becoming a full professor. Respondents in Africa (68%) and the Americas (66%) are most confident of finding a permanent research position, followed by early career researchers in Asia (59%) and MENA (56%). Only in Europe do respondents believe that their chances of finding a permanent research position in academia are only 35%. When asked to assess their prospects of becoming a full professor, the expectations were in perfect accordance with the previous question. Again, only 30% of the European scholars believe that they will be able to get a full professorship, whereas 68% of the Africans are confident in their ability to access a professorial position.

Table 17 – Career prospects per region (percentages)

Regions	Statistics	Finding a permanent teaching position in academia	Finding a permanent job as a researcher outside academia	Finding other career opportunities outside academia
Africa	Mean	71.49%	46.31%	50.00%
	Nb obs.	67	65	66
Asia	Mean	61.59%	40.41%	40.58%
	Nb obs.	126	123	121
Europe	Mean	39.07%	33.23%	51.80%
	Nb obs.	97	99	100
MENA	Mean	58.63%	48.00%	50.80%
	Nb obs.	51	50	50
Americas	Mean	65.79%	37.89%	44.05%
	Nb obs.	38	38	37

Note: Percentages built from the averages of the middle point of the 5 categories: 0–19% (1), 20–39% (2), 40–59% (3), 60–79% (4), 80–100% (5).

Respondents were also asked to assess their career prospects in teaching (see Table 17). In all world regions except Europe, respondents rated their chances of finding a permanent teaching position in academia as high. Again the Africans showed the highest level of confidence, as 71% believe that a permanent teaching position is a likely career prospect. Europeans showed a very different perception, as only 39% of the respondents believe they will find a permanent teaching position. However, Europeans rate their opportunities outside of academia fairly highly, with 52% stating this possibility as a career prospect.

Attractiveness

All categories of scholars agreed with the idea that a successful career in academia is intrinsically related to “enjoying what you are doing”. This is true whether we compare gender, with or without children, development level or country, with the exception that for MENA countries, “doing good for mankind” comes up first. The good of the community and a certain level of selflessness therefore appears more important for both men and women from the MENA countries.

An interesting finding of the GloSYS pre-test survey, related to the lack of limitations on academic freedom perceived in Europe (see above), is the importance of excitement about research work reported by European scholars (see Table 18). These observations would seem to point towards identifying Europe as the only remaining place where academic freedom and non demand-driven research are still valued. For most other regions, particularly in Africa, Asia and in the Americas, actively and continuously pursuing advancement appears as the measure of success that the survey scholars value the most. As highlighted above, the MENA countries consider the common good above their personal interests in regards to success, reporting that their “work has to contribute to the greater good” as the success statement with which they agree the most.

Table 18 – Success statements per region (5-point Likert scale)

Regions	Statistics	Opportunity ^a	Excitement ^b	Own abilities ^c	Pursue advancement ^d	Greater good ^e
Africa	Mean	4.2029	4.3913	3.4857	4.4493	4.4203
	Nb obs.	69	69	70	69	69
Asia	Mean	3.7405	3.9924	3.5000	4.1212	3.9769
	Nb obs.	131	132	132	132	130
Europe	Mean	3.4608	4.2157	2.7647	4.0198	3.5700
	Nb obs.	102	102	102	101	100
MENA	Mean	4.3396	4.3148	3.9434	4.3019	4.4808
	Nb obs.	53	54	53	53	52
Americas	Mean	3.6744	4.1395	3.1628	4.1860	4.0930
	Nb obs.	43	43	43	43	43

- Note:
- a To be successful you have to take advantage of every opportunity
 - b The excitement about my work is what motivates me most
 - c Career success depends mainly on your own abilities
 - d To be successful you have to actively and continuously pursue advancement
 - e My work needs to contribute to the greater good

Workload

Although less than half of the respondents answered the questions about the number of hours devoted to various academic tasks throughout the year, whether during term time or outside of this period traditionally devoted to teaching duties, we nevertheless present the results to give a general sense as to how different regions perceive their workload. Table 19 highlights the striking difference between the MENA countries and the other regions in regards to teaching hours, only 7.69 hours during term time as compared with more than 10.30 hours. While it is not possible to make a direct link between the lack of training opportunities to develop professional skills reported by MENA scholars in Table 15 and the lower than average time devoted to teaching in this region, it is nonetheless an interesting coincidence. Scholars in these countries may find it beneficial to train the next generation of scholars in these skills while devoting a little more time to teaching. Another stark contrast between MENA countries, not shown in the table, consists in the number of hours spent on other tasks such as committee work and outreach: 18.5 hours during term time and 25 hours outside of term time.

“*In Egypt, we only have very few staff members and they all have multiple tasks. When they see an active person they give them even more tasks and jobs. Many researchers have to split their time between one job and another, and another, and another. This is the real and actual problem; why academics in Egypt have trouble getting promoted because they divide their time between many things doing many different jobs to get extra money.*”

Associate Professor, Technical Sciences, Egypt

Scholars of the Americas also devote an important part of their time to other activities: 12.5 hours during term time and 15.7 hours per week outside of term time. Activities mentioned by the scholars surveyed include committee work, outreach, consultancy, etc. As a consequence, during term time, scholars from MENA countries and the Americas work more than 60 hours per week as opposed to 50 hours per week in Europe and around 55 hours in Africa and Asia. Out of term time, Asian and MENA scholars work about 4 hours more while in the Americas, the workload decreases slightly.

Table 19 – Number of hours dedicated to academic tasks per region

Regions	Statistics	During term time			Outside term time		
		Teaching ^a	Research ^b	Total	Teaching ^c	Research ^d	Total
Africa	Mean	12.45	14.30	54.96	5.05	19.25	55.21
Asia	Mean	11.41	15.92	54.68	4.89	17.42	58.62
Europe	Mean	10.64	16.44	50.30	4.49	22.10	50.92
MENA	Mean	7.69	16.77	63.86	4.20	16.86	67.07
Americas	Mean	10.30	20.83	62.32	2.25	24.42	60.77

Note: a Significant differences in teaching hours between MENA countries and African, Asian American countries during term time;
 b Significant differences in research hours between American countries and African, Asian, European and MENA countries during term time;
 c Significant differences in teaching hours between American countries and African, Asian and MENA countries outside of term time;
 d Significant differences in research hours between European and American countries and individually with African, Asian and MENA countries outside of term time;

During term time, only the MENA and American countries devote the equivalent of double the teaching time to research endeavours. In contrast, in African countries, it is barely a few hours more that are devoted to research. We must however warn the reader that teaching out of term may have been misinterpreted by a few respondents as teaching hours in that period seem high. This will have to be further investigated.

In relation to the lack of mentoring and support from superiors reported in Table 14, our preliminary observations show that the number of hours per week devoted to training and supervision by European scholars is less than half that of scholars from other regions in the world. The lack of mentoring therefore seems to be present at all levels of the hierarchy and not solely for young scholars. It is part of the organisational culture. European scholars would not however increase by much the number of hours dedicated to this task, not anymore than scholars from other regions in any case (see Table 20). A change of culture in this regard would probably be an improvement.

Table 20 – Wished modifications in working hours by region^a

Regions	Statistics	Teaching	Research	Administration and services	Training and supervision	Group management
Africa	Mean	1.8679	2.8036	1.4423	2.3077	2.0000
	Nb obs.	53	56	52	52	39
Asia	Mean	1.8228	2.5854	1.5395	2.0132	1.8308
	Nb obs.	79	82	76	76	65
Europe	Mean	1.7895	2.5750	1.3733	2.2029	1.9623
	Nb obs.	76	80	75	69	53
MENA	Mean	1.9394	2.6000	1.5806	2.2121	2.0667
	Nb obs.	33	35	31	33	30
Americas	Mean	1.6296	2.4375	1.4138	2.3000	1.9565
	Nb obs.	27	32	29	30	23

Note: ^a Measured on a 3-point Likert scale: less time (1), just right amount of time (2), more time (3).

Most scholars would reduce considerably the number of hours spent on administration and services (1.5), reduce slightly the amount of time devoted to teaching (1.8), increase slightly the time devoted to training and support (2.2) and definitely spend more time on research (2.6).

Before turning to conclusions and recommendations, we can state that different regions have different characteristics and face various challenges, which are too broad to summarise in a short conclusion. There however seem to be a worrying lack of academic freedom throughout the world, and a consistent lack of resources and funding in some poorer parts of the world.

Conclusions

In many respects, the research system is a truly global endeavour. Throughout the world, researchers share a common understanding of what academia entails, as well as a passion for what they are doing. Our precursor study suggests that young scholars enjoy their work. It is in particular the excitement associated with research and discovery that motivates them to pursue an academic career path. They also value the flexible nature of the work, allowing them to dedicate their time in a self-organised and autonomous fashion. Knowledge in science and academia is universal, inviting researchers from all over the world to participate in and contribute to its creation and use.

However, underneath this idealistic conception of academia, our precursor study also reveals significant challenges for the community of young scholars all over the world. The issues that are most prominent address the following aspects of academic life:

The **mentoring and support structure** offered to support young scholars in their careers is particularly crucial in fostering professional growth and success. All respondents acknowledge the need for more systematic and constructive support and mentoring that account for both transitions in their careers while advancing professionally and changes in their personal lives when taking on responsibilities for a family. In Europe in particular, the lack of mentoring was perceived as a barrier, leaving young scholars to their own devices in a fairly unstable higher education labour market, with only limited chances for job security.

In the developing world, the main concerns centre around the issues of **education and training**. Development of professional skills, as well as the acquisition of knowledge, techniques and procedures is important to maintain an inclusive and participative research system that empowers young scholars to contribute to and engage in science and academia regardless of their origin. Apart from the aspect of inclusiveness, high-quality training also prepares young scholars for the diversified tasks and responsibilities that academia holds for them.

Transparency and fairness are crucial aspects guiding young scholars on their quest and helping them to plan their careers and prepare for the tasks in front of them. Transparency and feedback are essential in terms of evaluations, promotion criteria, as well as academic standards in research and teaching. Fairness is particularly important with regard to the distribution of responsibilities and the workload that is placed on them, taking into consideration their career stage and personal situation. It is particularly important to emphasize that a modern research system must break with the habit of regarding young scholars as “cheap labour”. Instead, the academic system must learn to nurture and encourage their young talents by providing the opportunities for training and professional growth to establish a sustainable and strong academic workforce.

An often-neglected issue is **work-life-balance**. Many young scholars feel overwhelmed by their workloads and the range of their responsibilities, fearing that their opportunities for creativity, innovation and originality are being diminished. Our precursor study indicates that this issue becomes even more crucial once young scholars have to balance work and family responsibilities. Although having undergone a number of transitions in recent decades, the academic system still does not adapt to young scholars' reality of being professionals with private lives.

Recommendations

- 1 Address the lack of resources, whether material or personnel, and the lack of funding for young scientists across regions of the world.

This could be achieved for example by pooling resources across and within regions, by building inventories of the resources available and providing sharing agreements between institutions. This would also optimise the use of expensive investments. This could be a viable alternative to setting up large collaborative networks in areas for which these are not traditionally supported.

- 2 Develop a nurturing culture aimed at providing better and more appropriate mentoring and supervision at all levels of early career, from PhD to the first 5–10 years of academic independence and beyond, so that researchers can learn and feel supported.

Developing a culture of mentoring and of helping each other is necessary, particularly in some parts of the world. These could take the form of half-day or full-day workshops on how to manage various aspects of research and academic life and could be part of a continuing education system for scholars and researchers. This includes a number of professional skills for master and doctoral students that may not want to remain in academia and for young researchers that may want to diversify their career interests. These would also ensure that organisations promote and incentivise the use of best practices.

- 3 Provide means by which scholars and researchers can achieve a better work-life balance. Research organisations need to adapt to the realities of women and family issues.

The long working hours that researchers feel the pressure to put in is often incompatible with proper work-life balance. We were surprised to realise that the average scholar works more than 50 hours per week. The choice should not be between normal working hours and long working hours induced by cutthroat competition. This is not sustainable in the long run. Young female, and to some extent male, students are currently put off a career in research by simply witnessing the current pressures under which their professors and teachers are working and the length of their working week.

4 Value all aspects of the academic profession, and do not expect that scholars will excel at everything. A healthy division of labour may be more productive.

Research is perceived as the only performance measure to navigate through academic, and research, life. Teachers that are moderate at research are discriminated against, while excellent researchers that do not excel in teaching are tolerated. A diversity of skills should be reintroduced and valued within organisations.

5 Ensure academic freedom while maintaining a healthy balance between basic and applied research in the portfolio of national and international funding programs.

Blue-sky research, and this is mostly true in the scientific and engineering fields, is the only way to supply ideas for an innovation pipeline. This type of research may not have immediate impacts and organisations need to realise that while some projects may have short-term impacts, others may only yield changes in a decade or even in a generation or two. Developing more appropriate measures of impact, beyond the current bibliometric obsession, is crucial to insure proper incentives. The fragile equilibrium between blue-sky and more applied research needs to be maintained.

6 Encourage and perform further studies on young scholars throughout the world so that institutions can learn from the best practices in other regions while accounting for various research systems.

This recommendation reaches out to the academic community that was invited to the first GloSYS workshop in Hannover in May 2013. Following this pre-test, the GloSYS questionnaire, after a few minor modifications, is ready to be launched and the GloSYS team is ready to work alongside the large research groups interested in the study of science and researchers, while keeping a focus on young scholars and under-researched regions.

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The Global Young Academy

Our Mission

The Global Young Academy empowers and mobilizes young scientists to address issues of high importance to science and their own careers. Specifically, the Global Young Academy (GYA)

- provides a voice for young scientists around the world,
- promotes science as a career of choice for young people,
- narrows the gap between science in the developed and developing world,
- encourages novel, scientific approaches to solve problems of international significance,
- promotes inter-disciplinary, international and intergenerational scientific dialog.

Who we are

The GYA provides a rallying point for outstanding young scholars from around the world to come together to address topics of global importance. Our up to 200 members include leading young scientists and researchers, who are typically within 3 to 10 years from earning their PhD and below the age of 40 when admitted, come from all continents and a wide range of disciplines. Members are elected to four-year terms on the basis of their demonstrated research excellence and a commitment to improving the state of science and the science-society interface. Following their four-year term members become alumni and play a variety of roles including networking and mentoring. The vibrancy of the GYA results from the energy of its members who are passionate about the role of science in creating a better world. The GYA is governed by an Executive Committee and is supported by a Senior Advisory Board composed of outstanding senior scientists and science managers, respectively.

What we do

Current projects focus on supporting the establishment and cooperation of National Young Academies, improving Early Scientific Careers, Science-Society Dialogue, Science-Education, and Science in the Developing World. The GYA has begun to impact global science policy by promoting

National Young Academies (NYAs) around the world. For example, the GYA has contributed to the formation of NYAs in Egypt, the Philippines, Japan, Zimbabwe, South Africa, Nigeria, Israel, Canada, and other countries. As the voice of young scientists around the world the GYA has drafted statements of relevance to young scientists and international science policy. The GYA is developing a number of projects aimed at improving the effectiveness of science, including in developing countries, by building linkages between young scientists from different countries. GYA members believe strongly that scientists need to do more than just high quality research to contribute to society and in that spirit are supporting initiatives in science education and outreach in their home countries or in the countries of other members.

Background

The GYA grew out of discussions amongst top young scientists and researchers from around the world convened by the IAP for the World Economic Forum “Summer Davos” meetings in 2008 and 2009. The GYA was officially founded in February, 2010 with support by the IAP: the Global Network of Science Academies. Since October 2011, the GYA has an office hosted by the BBAW in Berlin, Germany, led by a Managing Director with extensive international experience. Between 2011 and 2013 the GYA office and activities were funded by the Volkswagen Foundation. From 2014 core-funding for the GYA comes from the BMBF initially for 3 years. In addition, the GYA has received project funding from the IAP, TWAS, DAAD, the BMBF, the Volkswagen Foundation and the Robert Bosch Foundation as well as financial, in-kind and logistical support from partners and hosts of events such as the German National Academy of Sciences Leopoldina, the South African academies and the Department of Science and Technology, the Dutch academies and the Chilean academy and institutions.

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