**ETH Global Lecture Series: The Power of Partnerships**

**Address by the Vice-Chancellor and Principal of the University of Pretoria**

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The idea of working together is embedded in many cultures – it is reflected in popular sayings, slogans and in popular songs: in English we talk about strength in numbers; many hands make light work; together we can; united we stand, divided we fall; and so on. In our complex and dynamic 21st century context cooperation and collaboration are more important than ever before. A number of factors have made the rationale for working together more compelling than ever before.

There is growing recognition that the nature, scale and complexity of the socio-economic development problems facing humanity now and in the future are such that they cannot be solved in isolation. In an article published in 2015[[1]](#footnote-1), I commented that the grand challenges faced by the world are becoming increasingly vexing to solve. Food, water and energy security, climate change, environmental sustainability, poverty alleviation and human security are some of the oft-named grand or ‘wicked’ global problems, which have been defined as ‘social messes’ or ‘untamed problems’[[2]](#footnote-2) characterized by poorly defined requirements, unclear boundaries and contested causes that no single discipline or institution is able to address[[3]](#footnote-3). Singular, linear approaches to science are evidently inadequate to address these contemporary issues and what is required is integration across scales and across actor perspectives.

When I made this observation I was affirming the perspective expressed in a 2014 article in *Nature* byPhilip Sharp, Nobel Laureate in Medicine, and Alan Leshner, CEO of the American Association for the Advancement of Science (AAAS) who argued that:[[4]](#footnote-4)

“Searching for solutions (to today’s global challenges) requires that the scientific community operate in fundamentally new ways... Developing effective solutions requires converging approaches, such as the integration of knowledge from the life, physical, social, and economic sciences and engineering… Research-performing and training institutions, such as universities and research institutes, have critical roles to play... it is essential that they develop appropriate training programs and help stimulate multidisciplinary international collaborations.”

The growing importance of working together is reflected in the rise of academic co-authorships*.* In a recent article in *Nature,* Adams[[5]](#footnote-5) analyses data on co-authorships, long established as a valid proxy for research collaboration[[6]](#footnote-6), which illustrates that “a fundamental shift is taking place in the geography of science”. In his words, “co-authorship has been increasing inexorably. Recently, it has exploded”. Over the past half century, the number of authors of research papers published in Nature has increased fourfold. Papers with more than 100 authors which were still rare in the 1980s has become common, there is a growing number of papers with over 1 000 authors, and some exceed 3 000.

In tandem with the growth in co-authorships, collaborations between nations have also expanded. So, for example, every country in Europe collaborates with every other country in the region, and while no country shared more than 1 000 joint papers with any other country in the 1980s, the UK and Germany had around 10 000 joint publications in journals indexed in Thomson Reuters’ Web of Science in 20, and the USA now has close on 60 000 joint publications with its three largest collaborators (China, the UK and Germany) alone.

Another trend is a discernible move to multidisciplinary and transdisciplinary work among scientists and researchers. As stated by one of my colleagues Bernard Slippers et al[[7]](#footnote-7), in a global world focussed on Sustainable Development Goals what is required is “a ‘fundamentally new’ approach which encompasses interdisciplinarity (collaboration between disciplines), transdisciplinarity (involving knowledge ‘generators’ beyond academia), internationalisation and social responsibility of research. It is especially crucial that this approach also bridges the divide between the biophysical and social sciences, since, as stated by Brown et al[[8]](#footnote-8) “…it is the only way to drive global sustainable development that delivers social inclusion, environmental sustainability and economic prosperity.”

Support in academic circles for multi- and interdisciplinary research which blurs the divides between natural and social sciences and humanities has gained traction and so too the view that multidisciplinarity does not go far enough. Proponents argue that the point of departure when tackling seemingly intractable problems should be framed by the problem itself in all its dimensions, and not by disciplinary lenses alone, even if they are multidisciplinary.[[9]](#footnote-9)

It is fair to say that there is broad agreement in scientific circles that the scale and complexity of challenges facing society today requires more than multi- and transdisciplinary research networks – it also requires convergence between the engineering and the natural, human and social sciences.

However, the move to multi- and transdisciplinary convergence science should not be understood to replace disciplinary excellence. As pointed out by Slippers et al[[10]](#footnote-10):

“….some issues will remain the remit of disciplinary focus and depth. Excellence in interdisciplinary science relies on effectively connecting disciplinary excellence, not replacing it”.

Some refer to ‘T-shaped’ researchers who are able to both cultivate their own discipline and look beyond it – in other words, depth AND breadth are key.[[11]](#footnote-11)

These trends are reflected in initiatives such as Future Earth, the international research initiative of the International Council for Science (ICSU) that aims to develop the knowledge for responding effectively to the risks and opportunities of global environmental change and for supporting transformation towards global sustainability in the coming decades. Future Earth will mobilize thousands of scientists while strengthening partnerships with policy-makers and other stakeholders to provide sustainability options and solutions.

And nowhere is the need to address these grand challenges in a sustainable and socially responsible manner more acute than in developing economies, such as on the African continent, where the problems faced more often than not threaten the very existence and survival of large sections of the population.

Working together has, however, proved complex and challenging. To better understand and successfully navigate these challenges and complexities, it is important to recognise that scientific collaboration takes many forms. There is the most common form where individual researchers elect to work with another individual researcher. Koehn and Obamba[[12]](#footnote-12) conceptualise a “collaboration continuum” whereby partnerships can be placed at one end with networks at the other and a range of alliances in between. Partnerships, they point out, are typified by formal agreements, fewer parties and dense collaboration compared to networks which, they indicate, are characterised by looser and shifting interactions. The parties involved may include individual researchers, universities, NGOs and funders.

Where do African and South African institutions stand within the context of the rise of academic co-authorships and the move to multi- and transdisciplinary approaches to research and scientific work?

With respect to Africa there are relatively low levels of research productivity and global competitiveness and researchers face systemic problems such as poor facilities, lack of funding, and political instability. In 2013, the science originating from Africa represented only 1,5% of the global scientific output. South Africa stands out as of the African total, South Africa represents 41%. But there is good news in that scientific output in African countries has been growing over the last decade. Noteworthy is that SA published almost three times more citable papers in 2013 than in 2003. A recent analysis of collaboration in Africa[[13]](#footnote-13) confirms that co-authorship is rising too. African countries also exhibit growing levels of collaboration and the majority is with countries outside Africa.

While the fact that Africa is increasingly participating in international collaboration is encouraging, this situation does sound some caveats pertaining to the prerequisites for successful research collaboration. Regardless of the variation, across the continuum a pervasive issue is symmetry or asymmetry of relationships. The tendency in successful partnerships is to look for mutual benefit among equal partners. But, North-South collaboration is inevitably skewed and asymmetrical.

Asymmetry can be a significant inhibitory factor. General wisdom about collaboration is that when equal partners work together for mutual benefit, this synergy will produce better outcomes. Ranking systems and research assessment exercises have gained influence and it seems that such rankings and bibliometric indicators may have a determining effect on choices of partners.

For North–South partnerships and in the case of Africa in particular the emphasis is often on capacity building. A general pattern for North-South collaboration is that the African partners mainly assist in fieldwork and data collection. The highly collaborative nature of research in Africa exhibits a very low fractional count or proportionate contribution when compared to that of the international collaborators.[[14]](#footnote-14) For South African universities, who are the continent’s undisputed leaders in collaboration, the situation is somewhat different. They generate nearly two thirds of the region’s total fractional count, and generally collaborate widely, both within the continent and with international partners.

As Roger Jeffrey noted from his own experience “the challenges of ensuring equity among partners of very different academic power and status, across continents, within complex research projects involving different disciplines with their own norms, and balancing the needs of capacity development of individuals and for institutions can be major sources of conflict”[[15]](#footnote-15). African researchers from time to time have referred to the exploitative nature of global research partnerships and this had led to a growing number of publications on factors that foster effective and successful partnerships.

Many of these publications refer to principles and values such as trust, mutual respect and recognition for example, all of which are important - but the reality is that funding for research partnerships in Africa comes disproportionately from the North and this has a bearing on how partnerships are shaped and perceived. Recently, African universities and researchers have been working much closer to governments, high net worth African individuals and companies to increase local funding for research and development. A year ago the African Summit on Higher Education in Senegal gave specific attention to this issue and hopefully the dialogue started there will bear results.

A realistic approach is outlined in a recent book by Koehn and Obamba on sustainable development collaborations in Africa where the authors write about “near symmetry”.[[16]](#footnote-16) It is an approach which grapples with the question of how to develop sustainable, equitable transnational higher education partnerships whilst acknowledging the realities faced by African universities.

African universities find themselves juggling multiple expectations with low levels of resources. Universities in South Africa and across Africa are expected to commit their teaching, research and services to the social and economic transformation of the country promoting economic growth, driving human capital development, knowledge creation and innovation. All this whilst dealing with growing student enrolments without the concomitant expansion in resources.

In South Africa with a number of relatively strong universities, near symmetrical partnerships is reality. Pre-partnership synchronization is typically identified as a critical success factor. At the institution to institution level this means that there should be overlapping objectives with respect to international partnerships accompanied by the commitment to make these work. South Africa has five research intensive universities that contribute the major proportion of all publications, patents and doctoral graduates. The University of Pretoria is the largest of these in terms of student enrolments and graduations.

Beyond the institutional commitment to research intensity and internationalization, symmetry in collaboration is shaped by mutuality in the subject–matter of the collaboration which should match both the research strengths and capacity, and the institutional, regional and national needs, of both partners. In North-South, or developed and developing country collaborations, particular attention should be given to ensuring that the research conducted also serves the developmental priorities and objectives of the less well-resourced partner(s) in the equation[[17]](#footnote-17), and that they do not become entirely reliant on the wealthy partner to maintain existing research facilities and activities.[[18]](#footnote-18)

Collaborations and partnerships, as complex as these might be, are enabling mechanisms that support South African universities’ vision to be world class. This sentiment is echoed in the AU’s *Agenda 2063 – the Africa We Want* where the need for collaboration across social institutions is identified as a non-negotiable prerequisite to address own national needs and problems in a sustainable way. This is also unequivocally stated in SA’s own National Development Plan ‘Our future: Make it Work’. At my own institution, the University of Pretoria, international collaboration and partnerships is an underpinning driver in our long term Strategic Plan, UP 2025, and we make deliberate efforts to select partnerships that strengthen our ability to impact on South Africa’s and Africa’s socio-economic development.

We have adopted a vision of a research intensive socially engaged university. Inherent to this vision is our desire to foster collaboration with multiple external institutions, agencies and stakeholders without abandoning the ideals of classical scholarship such as critical inquiry and analysis, intellectual freedom, and humanism.

Brown et al[[19]](#footnote-19) list five principles for successful collaboration based on their own personal experiences, all of which resonate with points I made earlier: forge a shared mission; develop T-shaped researchers; nurture constructive dialogue; give institutional support and bridge research, policy and practice.

As pointed out by my colleague Prof Danie Visser from UCT, research networks with both African and international partners pay dividends. The African partners bring southern hemisphere perspectives on social and environmental issues and provide opportunities for comparative case studies, while the international partners bring state of the art resources, equipment and expertise, plus a desire to help solve pressing global problems.[[20]](#footnote-20)

On a final interesting note of special significance to South African universities who are currently in the thrall of intense contestations pertaining to historical, economic and cultural exclusion or perceptions thereof, bibliometrics seem to suggest that teams with greater ethnic diversity generate papers that have higher impact in scientific literature.[[21]](#footnote-21) This suggests that teams with members from diverse ethnic backgrounds may benefit from a greater variety of perspectives.

Meaningful partnerships can be mutually transformational. By working together across divides of discipline, geography, and ethnicity partners, we enhance the potential to make a profound impact on the world. After all, our recent lived realities have shown via crises of migration, climate change and the like that our futures are co-dependent or coupled.

 What this means that is the future of the citizens of the global North are interlinked with the outcomes of the contemporary development challenges of the global South. Progress in tackling the sustainable development challenges of our time is dependent upon working collaboratively with those in the South.

In a time when in universities we tend to focus on quantitative indicators let me conclude by pointing out that there is evidence that collaborative papers tend to get cited more often[[22]](#footnote-22), and papers and patents published by larger teams show a direct positive influence on output and impact across all fields of science. Moreover, these large research teams tend to attract significant research funding.[[23]](#footnote-23)

Our visit to ETH Zurich is an opportunity for us to build on current collaborations and to forge new partnerships and networks that will enable us work together to have an impact both locally and globally. On behalf of all South African participants I wish to express appreciation for hosting us and for creating this unique opportunity to bring us together.

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16. Koehn & Obamba note 12: 14 [↑](#footnote-ref-16)
17. Pouris & Ho note 6: 2183; Adams note 5: 336 [↑](#footnote-ref-17)
18. Nature index note 14: 562 [↑](#footnote-ref-18)
19. Note 3: 316-317 [↑](#footnote-ref-19)
20. Quoted in Nature index, note 14: 560. [↑](#footnote-ref-20)
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22. Adams note 5: 336 [↑](#footnote-ref-22)
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