

Programm Point Sud 2019

Translating the Square Kilometer Array A Dialogue on Methodological Challenges and Interdisciplinary Area Studies

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**Institute for African Studies/University of Ghana/Legon
Ghana Space Science and Technology Institute
Report**



Translating the Square Kilometer Array. A Dialogue on Methodological Challenges an Interdisciplinary Area Studies

Conveners

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Themes and Objectives

The workshop took place in Accra between 18-24 August 2019. It was an interdisciplinary meeting, bringing together members of natural and social science department located at Universities in Africa and Europe. The object anchoring our conversation during the workshop was a radio telescope that had been recently built on the outskirts of Accra, which is part of the larger Square Kilometer Array Project (SKA) based in South Africa.

The Ghana Radio Astronomy Observatory is based on recycled material from a telecommunication ground-based satellite previously owned by the Ghanaian government for broadcasting and tracking satellites, and then later by Vodafone as a telecommunications receiver. In 2017 the facility was converted into a telescope with money from South Africa's Renaissance Fund.

Ghana now hosts the second radio astronomy facility in Africa and is the first amongst several African countries to become part of a scientific network that is comparable in size to the human genome project.¹ South Africa currently hosts a much larger network of individual telescopes which together are referred to as the worlds "largest scientific instrument" plus "Africa's largest scientific project".² The telescope in Accra was built in the framework of extending the network from South Africa into the African continent (referred to as the "African Very Long Baseline Interferometry Network", or AVN). There are seven other African countries that will join the SKA/AVN in the near future.³

The Square Kilometre Array (SKA) project is one based on the techniques and infrastructure of radio astronomy. Since the 1950s, radio astronomy has ushered in a revolution in doing astronomy since it is a technique that enables objects in the universe to become visible that cannot be seen with the naked eye. The visible part of the universe is a mere 5% and the radio astronomy projects show us that a large part of what we are influenced by is invisible to us, that is, what we do not see. Part of what we do not see are frequencies on the electromagnetic

¹ Benoit, K. (2018): "The Challenges of Big Data for the Social Sciences". *Lecture*, London School of Economics and Political Science (LSE), London.

² Gastrow, M. (2015): "Science and the Social Media in an African Context: The Case of the Square Kilometre Array Telescope". In: *Science Communication*, 37(6), 703-722.

³ Asabere, B. D., Gaylard, M., Horellou, C., Winkler, H., & Jarrett, T. (2015): "Radio Astronomy in Africa: The Case of Ghana". In: *arXiv:1503.08850*.

spectrum, and this is where the tools and devices of radio astronomy become so interesting. They make visible objects that emit radio waves, gamma rays, and micro waves. Thus, the SKA helps us make things visible.⁴

The AVN is part of the SKA, both of which are based on the method of interferometry. The basic idea of interferometry is that by connecting distant telescopes, a network is formed to create one larger virtual telescope. This is made possible by the technique of radio astronomy which collects digital signals from space in the larger electromagnetic spectrum to make things in outer space visible that would have otherwise been invisible to the human eye.

A recent special edition in the *Journal for African Studies*⁵ puts a focus on the Square Kilometer Array and the context of radio astronomy in South Africa. This provides a useful comparative approach to the study of radio astronomy as a social, political, scientific and economic infrastructure in Ghana (and Africa in general). Anticipating this, and the gap in research on the development of radio astronomy outside of South Africa, we framed the workshop “Translating the SKA: A Dialogue on Methodological Challenges and Interdisciplinary Area Studies”. The workshop involved physicists from Ethiopia, Nigeria, South Africa, France, Ghana and Kenya together with social scientists from European countries (from Germany, Switzerland, Serbia, Italy, Slovenia and France). This group of people made up the main participants of the workshop.

Methodology and Results

Figure 1 below is a short list of people and the presentations that they gave during the workshop. Each person’s presentation draw from their field of research, focusing on their disciplined way of making a particular object of research visible – ranging from stars and galaxies to people, concepts and the telescope itself. Thus, for some it was what the telescope can ‘see’ (all of which is beyond the visible spectrum), mostly framed as natural science practice. For others, their object of research was the telescope itself which was made visible through conceptual categories and theoretical frameworks in the social sciences. Out of these interdisciplinary presentations emerged scientific and socio-political discussions.

From the perspective of the workshop organizers, it was interesting to combine these perspectives using the concept of ‘translation’ to develop some interdisciplinary methodologies for doing Space Science in the context of South Africa and Ghana (and beyond), providing a framework for the ongoing evaluation and research of Space Science infrastructure.

⁴ Twidle, H. (2019): “Impossible Images: Radio Astronomy, the Square Kilometre Array and the Art of Seeing”. In: *Journal of Southern African Studies*, 1-24.

⁵ Walker, C. (2019): “Cosmopolitan Karoo: Land, Space and Place in the Shadow of the Square Kilometre Array”. In: *Journal of Southern African Studies*, 1-22.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Theme	TELESCOPE Telescope as object of knowledge	DEVELOPMENT Research and training	COLLABORATION Mutual understanding and common languages	VISUALIZATION Sensing, measuring and translating	KNOWLEDGE The emergence of concepts	OUTPUT Writing
Keynote 09:00-10:00	<i>Drive from Yri Lodge to the Ghana Radio Astronomy Observatory in Kuntunse.</i>	Mirjana Povic Development in Astronomy and Space Science in Africa	Mike Bruton The Fourth Industrial Revolution and its Relevance to Africa	Oliver Müller & Eva Schneider Visualizing the Invisible	Davide Chinigò Disassembling the Square Kilometer Array (SKA): Scale and assemblages	Lena Eckert Writing, gender, knowledge
10:00-10:30	Coffee Break					
Discussion 10:30-12:30	Bernard Asabere The Ghana Radio Astronomy Observatory (GRAO)	Paul Baki, Augustine Chukwude & Odo Finbarr Astronomy development in Kenya and Nigeria	Tadej Pirč Interdisciplinary research and translations between telescopes, science and society	Kadiatou Diallo & Andrea Zimmermann Aesthetics and Space	Siri Lamoureux & James Merron Placing Outer Space: The signal and the noise	Hanna Nieber Writing the world and form(ulations)
12:30-14:00	Lunch Break					
Emerging translation	Infrastructure	Becoming	Translation	Aesthetics/Aesthesis	Interference	Futures
Translating workshops: 14:00-15:30	James Chibueze The African Very Long Baseline Interferometry Network (AVN)	Sarah Abotsi-Masters & Samyukta Manikumar Development in Africa with Radio Astronomy (DARA)	Susann Ludwig Comparison	Basil Bucher Collections and 'Immutable Mobiles'	Rose Marie Beck Conceptual Stowaways	<i>Group discussion and plans for the future</i>
15:30-15:45	Coffee Break					
Colloquium Presentation 15:45-16:30	Nana Klutse-Browne Space Application, Climate and Weather	Group writing sessions and presentations	Group writing session and presentations Planetarium visit	Group writing session and presentations	Group writing session and presentations	End

Figure One: Workshop Program

Each day's keynote presentation and discussions were summarized during a 'translation session' where we elevated the inputs to a higher level of abstraction, attempting to engage in collaborative work, interpretation and mutual elaboration of key themes and issues. These discussions were complimented by one-on-one discussions during the tea, lunchbreaks and group dinners throughout the workshop. The group also took trips together, such as to the telescope in Kuntunse, to the University of Ghana at Legon, and to the planetarium in Accra. This was, in sum, the basis of the weeklong workshop made possible by PointSud. The following presents some of the main points from our discussions.

Development in Astronomy and Space Science in Africa

Space science in Africa – as elsewhere – promotes long-term collaborative projects, with a variety of 'spin offs' emerging from research and development in this field. In the context of the SKA/AVN project, these spin-offs are expected in a variety of formats of innovations, such as the management of big data and the functioning of high tech and incredibly sensitive instruments. The nature of these instruments was discussed by Prof. James Okwe Chibueze (South Africa), Prof. Augustine Chukwude (Nigeria), Dr. Bernard Asabere (Ghana) and Prof. Paul Baki (Kenya). This context of 'development' was further highlighted in Prof. Chukwude's presentation of the genesis and development of astronomy in Nigeria at the University of Nsukka, historical background which has led to a current collaboration with Dr. Odo Finbarr, also from the University of Nsukka, who will join us for the next workshop in Bayreuth in February 2020 (in the framework of the Africa Multiple Cluster funded "SKAnning African Skies: Seeing and Becoming").

The Square Kilometer Array (SKA) and Africa Very Long Baseline Interferometry Network (AVN) are based on the techniques and infrastructure of radio astronomy. Since the 1950s, radio astronomy has ushered in a revolution in making objects in the universe visible. Advancements in relationship to this technique has led to the development of technologies ranging from radar and wireless communication to x-ray machines and noise cancelling headphones. It is within this context that Prof. Mike Bruton framed the SKA/AVN as a major actor in the "fourth industrial revolution", as a "post-industrial revolution" that solves old problems and creates new ones, and is based of digital (big) data that is generated from the

activities of modern life which are increasingly mediated by ‘smart’ technologies. According to Prof. Bruton, radio astronomy is expected to contribute to this ‘revolution’, with potential to refashion the infrastructures involved in this economy, challenging how and through what means (big, digital) data is stored, captured and dealt with (a point highlighted in Basil Bucher’s later presentation). As a “problem solving revolution”, it demands a totally new way of thinking, according to Prof. Bruton. And in this new way of thinking, astronomy is a driving force also because it is interdisciplinary.

The development of capacity in Space Science and Technology – through research and training of young practitioners – equips students in African Universities for application in a number of fields. At the moment the scale is perhaps rather one sided toward South Africa and partner European universities in the context of the SKA, but the development of the AVN means that there will be more demand in West and East African countries for experts in physics, astrophysics, engineering, computing and maintenance. In light of this universities and training schools in these countries have begun a drive to advertise STEM fields more aggressively to young students. In this context, Astronomy – and radio astronomy in particular – has come to represent a major strategy for an ‘African Renaissance’, prestige projects and regional integration on the African continent. Drawing from her experience and engagement with developing the Space Science and Technology Institute in Ethiopia, Mirjana Pović discussed the gendered politics of these aspirations of developing Space Science Infrastructure and Technology.⁶

Observations made of the sky lead to the development of tools that advance the ways in which life is lived on earth. At the same time, life on earth is structured around creating a context for the observation of outer space (which has very specific requirements). The conditions under which radio and optical astronomy is best accomplished makes remote locations in Africa (as well as in Latin America, Siberia and Islands in the Atlantic and Pacific Ocean) ideal, with low light and electromagnetic interference. As much as astronomy is about furthering the goals of humanity and developing life on earth, its actual application is rather sensitive to human beings and the devices of modern civilization. In his presentation, Davide Chinigò gave us background on the situation in South Africa and how the Karoo was represented by the SKA management as ‘empty space’ where in fact there are people living there. Chinigò is critical about ‘universalistic science’ articulated in the post-colony that seems to privilege big science over the smaller live worlds of people living near these facilities.⁷

There are some geographic particularities of this kind of large scale big scientific network – which are specific to Africa and places like it (which are comparable in very specific technical and economic circumstances, being on the geopolitical margins of Europe and North America). Radio astronomy requires ‘quite sky’s’ while optical astronomy relies on ‘dark’ skies.⁸ This is because optical astronomy relies on naked eye observation. Interference in this context comes from nearby cities. In terms of radio astronomy, interference is constituted by everyday devices ranging from cellphones to microwaves. This brings with it a whole range of additional problems which we sought to unpack as problematizations (or ‘problem spaces’), discussed (or ‘translated’) during the workshop (while also comparing the context of the Square Kilometer Array with the African Very Long Baseline Interferometry Network).

⁶ Pović, M., Backes, M., Baki, P., Baratoux, D., Tessema, S. B., Benkhaldoun, Z. et al. (2018): “Development in Astronomy and Space Science in Africa”. In: *Nature Astronomy*, 2(7), 507-510.

⁷ Chinigò, D. (2019): “From the ‘Merino Revolution’ to the ‘Astronomy Revolution’: Land Alienation and Identity in Carnarvon, South Africa”. *Journal for Southern African Studies*, 749-766.

⁸ Agar, J. (1994): “Making a Meal of the Big Dish: The Construction of the Jodrell Bank Mark 1 Radio Telescope as a Stable Edifice”, 1946–57. In: *The British Journal for the History of Science*.

What is worth noting is that the conditions in Ghana are quite different compared to South Africa. The Ghana Radio Astronomy Observatory is located about 20 kilometers from the center of Accra and is densely populated, having rapidly urbanizing at least since the construction of the telecommunications satellite – the radio telescope’s previous incarnation, 30 years ago. Now, constructed as ‘interference’, the people who have built houses around the facility are faced with legal action from the management of the facilities plus Vodafone, who still own land adjacent to the telescope. This point was demonstrated during our field trip to the telescope in Nkuntunse on the first day of the workshop, and the telescope’s operators explained to us the functioning of the telescope and the ‘encroachment’ of people living in Nkuntunse.



Figure Two: ‘Encroachment’, photo by James Merron

The AVN/SKA project – and the Ghana Radio Astronomy Observatory in particular – pose sociological, technical and scientific questions and concerns. This is what we had explored during the workshop, giving the natural and the social scientists time to elaborate on their areas of research which were relevant to making the object of research visible. In this regard, a model was elaborated by Prof. Rose Marie Beck who framed the SKA/AVN project as an ‘apparatus’. The model as a framework of reference had multiple areas of contribution in conceptualizing the scientific network and to consider how the SKA/AVN project functions within the larger socio-scientific-political landscape and what that means in the context of scientific practice, in general. Viewing the SKA/AVN as an ‘apparatus’ provides the kind of scope that we will develop further during future collaborations in 2020 (in particular the aforementioned *Africa Multiple Cluster* at the University of Bayreuth, plus in the context of several panels at the Society for the Social Study of Science Conference in Prague in July 2020).

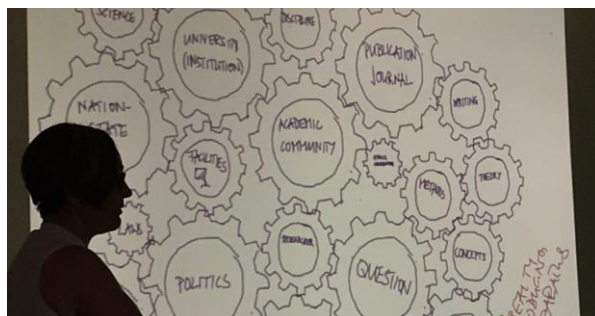


Figure Three: “Apparatus”, Photo by James Merron

Framing a Research Interest: Translation

Now moving a level higher in abstraction, the following outlines our attempt to ‘translate’ inputs made during the workshop. Referring back to Figure 1 on p. 5 – the workshop program – each keynote and discussion session led into ‘translation workshops’, the main objective of which was to create a mutually beneficial conversation between the natural and the social scientists participating in the workshop. Therefore, we asked: What does it mean to ‘translate’, in particular to ‘translate the SKA’?

The first most obvious translation is turning what is invisible into something visible through a series of transformations (or ‘transductions’) that are technical and intellectual. For instance, a signal must be collected by the dish, intercepted by a receiver and turned into data. These bits of data must further be turned into numbers, which can be assembled and ‘reduced’ in digital form. This reduced data can then be processed into a form that becomes a visualization of some (hyper)object in the universe.

Another form of translation is that which is set in the context of the social, political and cultural mediations, institutionalizations and negotiations that make the large-scale network of devices and personal of the SKA/AVN possible. This process is never linear, it is patchy and – at times – contradictory and anomalous. In this sense the translations can be rendered as a research object within which to frame an interdisciplinary collaborative research project. Using a background from the social sciences – and informed by science and technology studies⁹ – it makes visible what the SKA/AVN is as well as *what it is turning into*, and what it is capable of becoming (together and co-constituted with the people operating and making reference to it). This, together with tensions that emerge in this context of doing scientific work was a major output from the sum of translation workshops and collaborative projects emerging from this workshop.

Translating the SKA

As a group we are now in a process of reviewing these translations collaboratively. With time we will have a final output and have begun setting the basis for further collaboration to maintain this network of interdisciplinary collaboration (through the aforementioned *Africa Multiple* postdoc working group and workshop).

Below, Susann Ludwig has provided notes from the workshop. Together with inputs from James Merron these come together to form an outlook – which rather than being a conclusion – is meant to indicate the direction we are taking to concretize our collaborative ideas. These notes offer a tracing which attempt to account for the multiple translations which took place during the workshop. The tracing consists of input presentations, summaries, discussions, ethnographic notes and research results and it connects particular issues concerning the SKA with general debates on science, knowledge and interdisciplinarity.

Translation 0: The starting point, or the telescope challenges

What is the telescope, and what does it do?

Perhaps answering this question depends on the background of the observer. It is a big eye that allows us to see deeper into the sky. It is a complicated imaging machine that works in similar ways to a satellite or an MRI. For the astronomers, the telescope is an aid for

⁹ Sismondo, S. (2010): *An Introduction to Science and Technology Studies*. Chichester: Wiley-Blackwell.

visualizing ‘hyper objects’¹⁰ in outer space (ones that are not visible to the eye, because they do not emit light). For yet others, the device is a tool for gathering and collecting data from satellites, for instance. Yet for another group of people and concerns, the radio telescope in Ghana is a facility through which STEM is promoted. It is a source of national pride as well and opportunities for students, and international cooperation (especially between the ministers of science and technology in Ghana and in South Africa). The observatory can therefore be conceived of as a political tool as well as a source of potential conflict. Yet at the basis of it, at its core, the telescope extends our senses to the universe and – as such – is also a source of inspiration for young and old addressing questions about the universe and our place within it. The telescope is also a site of collecting and sharing knowledge that becomes evident in the large-scale infrastructure for data storage and collection which might contribute later to the “4th industrial revolution”, somehow. The telescope therefore also challenges us and the telescope in isolation is useless. It requires people and infrastructure.

Translation I: Comparison as a matter of concern

“(…) Our practices are crucial. They make the kind of telescope we see. So, the telescope is what we have „made relevant by our practice of looking at it”.¹¹ Now, how does each and every one of us look at it? And what happens, if we put them together? What happens, if we attempt to create fractional coherence or constructive interference with these accounts? The point is not to choose between traditional knowledge and science or natural sciences and social sciences. “The point is not to choose”, but to escape. Here, this means emphasizing that practices do not contradict each other. Rather, they have diverging ways of having things and situations matter. They produce their own lines of divergence as they produce themselves”.¹²

Being with researchers from different fields of study is a great resource to question the assumptions. We are unfamiliar with each other’s practices, we wonder, questions pop up, explanations are needed. And the reason why we are not afraid to either ask or dismiss these questions is because we have something common. We have a common concern (idea of a common concern: Isabelle Stengers “Comparison as a matter of concern”); i.e. the SKA. And I think that common concern has a lot of potential. (…)

So, again: how can we make sure we know and not just assume common ground? By making stuff explicit. Reflect on what we usually take for granted and asking questions. We might be stating the obvious, but we do so in an attempt to encourage us to think about this together. To create common ground by helping each other reflect on our own backgrounds and practices. What matters to us? What is our matter of concern doing research? What do we investigate, and more importantly, how do we do that? How about we just try to make our interest explicit first? We will do that by focusing on the telescope. What is the telescope to us as a researcher? Why does it matter to me? “

Translation II: Discussion on Science and Knowledge

What is the idea of science? What is the purpose of acquiring knowledge? Where does science come from? This is a very interesting question, which African Studies – and the study of Africa – have contributed to the disciplines.¹³ As a general starting point, we can say that scientific reason ranges from deductive explanations to inductive explanations. And this is where science started (according to Tadej Pirc – one of the workshop participants): wondering

¹⁰ Helmreich, S. (2016): “Gravity’s Reverb: Listening to Space-Time, or Articulating the Sounds of Gravitational-Wave Detection”. In: *Cultural Anthropology*, 31(4), 464-492.

¹¹ Stengers, I. (2011): “Comparison as a Matter of Concern”. In: *Common Knowledge*, 17(1), 48-63.

¹² Stengers, p. 378

¹³ Mudimbe, V.-Y., & Appiah, K. A. (1993): “The Impact of African studies on Philosophy”. In: *Africa and the Disciplines: The Contributions of Research in Africa to the Social Sciences and Humanities*, 113-138.

and curiosity in science. And then there is religion, which is also based on reason and logic. Whether religion and science are complementary or competing is subject to debate (as it was discussed during the workshop between Mike Bruton and Tadej Pirc).

According to Eva Schnider, who works in pure mathematics, “we do not ask questions about the world, but we create our own world”. This creates curiosity and most mathematicians do math because of genuine interest in that and not in its application (that is, for instance, using mathematical models to translate radio data into images). And when it comes to engineering, this is driven by a curiosity to change things (i.e. an intrinsic motivation as well as extrinsic motivation to get funding). A distinction between science and vocation (Distinction: curiosity and profession and calling, see German: *Beruf* and *Berufung*) and science is important here, which has been a concern in the social study of science.¹⁴ Oliver Müller – an astrophysicist from Switzerland – cited Richard Feynman: “science is like sex. It has its uses, but that is not why we do it”.

Science and scientific work lend to an assumption of the sole geniuses who sits in their labs and makes discovery after discovery. This image of science conceals the reality that scientific work is the achievement of a network of scientists which could hardly be said to be the accomplishment of one individual person. This state of affairs is visible when it comes to publishing and sharing data and codes. Working on stuff together rather than hiding results in order to be able to work on it alone. What, then, is the role of curiosity and creativity (particularly when it comes to making up the publicly sanctioned identity of the ‘good scientists’)? Indeed, finding new connections highlight the importance of creative thinking in science.

In addition to this, genius – whatever that is – is also bound to the social, historical, economic and technological context in which a person or group of people live. Whatever the case – individual or collective – scientific practice is based on a rigorous scientific approach toward excellence in experimentation and output. This output has had a particular appeal to military and industrial complexes, attaching us to the idea that science is in the service of development. In this frame, what is the impact of the economy on science? Is science in service of the economy? Or is the economy in service of science? What are the implications on the equal distribution of wealth and the constraints of science, technology and innovation in terms of progress? Asking what this looks like ‘from Africa’ can yield important insights, which may disrupt received ways of knowing in Europe and North America.¹⁵

This outcome-oriented approach has further atomized science into the natural and applied versus the social and soft. Furthermore, this distinction – whether real or perceived – between the basic and applied sciences splits scientific activity between solving problems vs. curiosity (in these sense that you do not know what you will find, but you want to know).

At some level, the natural sciences suffer because they are burdened with the question: what do we get back? Applied sciences do not have that problem. Then at another level, that of curiosity, it is about finding means – such as funding, methods and justification – to satisfy a curious and basic approach to scientific inquiry. However, not everyone who does science is particularly curious, or needs to be. Thus, we can redefine science and scientific activity constantly. The logic and architecture of this definition however is based on the rules and

¹⁴ Weber, M. (1946): “Science as a Vocation”. In *Science and the Quest for Reality* (pp. 382-394). Springer.

¹⁵ Mavhunga, C. C. (2017): *What Do Science, Technology, and Innovation Mean from Africa?* Cambridge & London: MIT Press.

methods that inform how the object of research is made up into a researchable thing – and it might be interesting here to turn to the work of Elísio Macamo.¹⁶ On this note it is often assumed that the scientists make their discoveries in the lab with the exclamation “Eureka”. However, it is more often that the scientists exclaim “that is strange” before endeavoring to provide an explanation about what makes it so strange and how to understand that.

Whatever the case may be, science is about evidence. Although this is ambiguous since evidence is constituted as such in relationship to the policies that inform or give rise to that activity through which the evidence was generated and evaluated. It is precisely here that understanding the social context becomes relevant to understanding science and the production of scientific facts. At this level of analysis, it becomes important to put into view the process of science and the process of society. What is it progressing towards? And what is constitutive of this progress? What is the relationship between progress, the practice of science and the instruments through which this practice is accomplished? What is the relationship to accurate results, precise measurements, rigorous scientific process and avoiding error? And in there is an interesting account of the practice and procedures of during scientific work. That is, the need to cross check one’s observations, to separate the signal from the noise.

Can we breach scientific methods? Rethinking our method means asking what we assume to be normal. And seeing what is normal is accomplished when we disrupt what we take for granted. This is another point in which to reference Elísio Macamo’s work, cited earlier, particularly when it comes to clarifying the theoretical frameworks, conceptual categories and the methodological procedures through which the object of research is contrived. This reflection is as relevant to the social sciences as it is to the natural science.

Perhaps the most productive approach comes in the form of the presentation given by Rose Marie Beck, which is to conceive of science as an ‘apparatus’. If we look at science as machine like, we can identify the component parts and see how it works.

Translation III: Visualizing the discussion as an ‘apparatus’

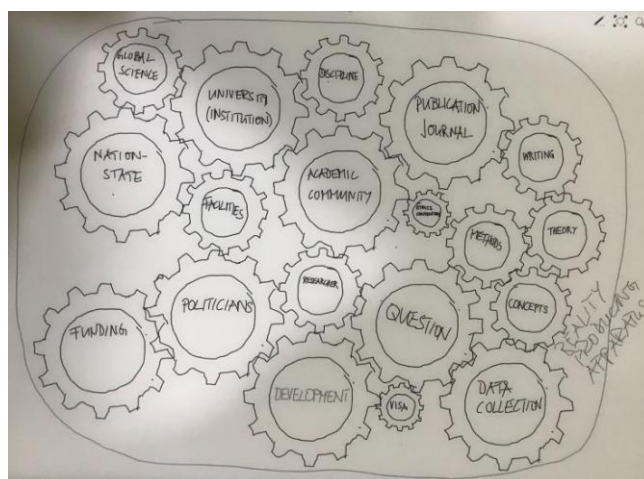


Figure Four: “Science as an Apparatus”, map designed by Rose Marie Beck

In order to describe science in its complexities, to account for it as a self-reflexive practice as well as an instrument to scientific problems and, therewith, to capture the discussions we had throughout the workshop, Prof. Rose Marie Beck conceptualizes science as a reality-

¹⁶ Macamo, E. (2016): “Before We Start: Science and Power in the Constitution of Africa”. In: *The Politics of Nature and Science in Southern Africa*. Basler Afrika Bibliographien.

producing apparatus. The concept of apparatus relates to the work of Karen Barad, who uses it to understand dynamic, material-discursive practices and reveal otherwise disguised boundary making practices. To illustrate the point, she gives the example of the Stern-Gerlach experiment, which seemed to be failing until one of the scientists smoking a cheap cigar hazardously influenced the procedure. The ashes of a cheap cigar become part of the experiment and turn it into a success, which triggers two kinds of results: first, new, unanticipated knowledge and second, and more importantly, the reflection of how knowledge is being produced. The cigar is the difference-maker here and this is deeply embedded in stereotypical gender and class relations at the time, i.e. people smoked in the laboratories, men smoked cigars, lower income men smoked cheap cigars. In other words, the cigar changed everything, though everything is in the cigar. There is no such thing as a single independent entity, but only entities in relations consisting of relations – the apparatus. What we perceive as reality is the result of the whole apparatus – of things in relation – and part of which is science. If we zoom in a bit, we see global science, the nation state, politics, questions, journals, research ethics, data collection, universities, theory, writing, concepts and infinitely more gears, which make that apparatus work and move.

Translation IV: Visualizing Space

“Very interesting discussion on space and place today. Participants: Paul, Davide, Tadej, Issa, James and Susann. Tadej joined the session on space because he wanted to talk about space and place conceptually. Paul starts off talking about the four dimensions: length, wide, depth and time. That is spacetime. He continues to talk about gravity, but also of being born again and religion. James talks about the detection of waves. We detect them, but we cannot stop them. We receive them, but the photons keep bouncing around. Otherwise we would not be able to see each other. We would be in complete darkness. How are we going to translate this?

Paul seems to be uneasy with that task. Davide comes along with a piece of paper. The very fact that we are forced to come up with an outcome of our discussion comes with abstraction and something we should agree on, at least a little bit. James starts with the paper asking Paul: “What is this, is it space or place? I am thinking that this is place”, but Paul says that it is space. Ok. James puts the marker on the paper asking: “What about the marker?” Paul says that the marker is sitting on space. But what about place? Place, he says, is what happens to the marker. We talk about something else. Susann refers back to this: “What about me observing the marker sitting on space?” Space is expanding, Paul says and, therefore, maybe the marker is expanding, too. This very expansion creates space. So, Susann observing the space and the marker is her expanding with the marker, it is her in relation to the marker. She is sitting on space as well. The marker sees her just like she sees the marker. Maybe not seeing, but they are both present. There is nothing beyond space, Tadej concludes. Alright, space is THE thing.

Another conversation starts about receiving signals. Paul says that astronomers do not experiment with the universe, all they do is observe it. Then Davide throws the social component in, explaining what the social sciences talk about when they speak of „the social production of space“. From a social sciences perspective space is expanding as well. We realize that as we deal with space, it is difficult for us to put it in boundaries. The question of where does it start and where does it end is a challenging one. And the closer we look at the space we are dealing with – or our field – if you will, the bigger and more complex it becomes. Davide talks about the historicization of space, which is a social science means to turn space into place. Paul speaks of the social dimension, as a fifth dimension: length, wide, depth, time, social. Where do we place the social in all this?

The social seems insignificant to the universe, but to us the scales of the universe are insignificant sometimes, so we might as well take the social seriously. So, again, where do we place the social? James suggests: the observer, “just to put something out there”. Yes, we are the people who observe, who produce the social and the science. But is the social just us? We are just like the marker; we sit on space as it expands and so does everything else, we do. Simple as that? It somehow seems disconnected. Of course, the social is us, but would we place us in this framework of length, wide, depth, time? Are we even on the same level? We might not matter to the universe, but the universe matters to us, so we might as well think about the social dimension in the equation. They keep talking about time and place and Susann is thinking: Is NOW the social dimension. Not the now that is the present placed between past and future, but a NOW that is informed by the past and the future.

Translation V: ‘Translation Chain’ SKA

This is a chain of translation presented by James Merron and Siri Lamoureaux and complemented by the group during the session. It offers a tracing of the SKA project from the idea to its implementation and impact and explores its stretches and connections across time, space, people and disciplines. The tracing is neither exhaustive nor comprehensive, but it visualizes the crucial point of translation happening at all scales:

- International initiative, the money for it: Renaissance fund. Ghana and South Africa.
- A place for the telescope (found via Google Earth)
- Bernard is contacted and acts as an intermediary. Enrolls actors (speaks to ministers, universities, scientists, ground that belonged to Vodafone)
- Space science initiative (ministry of science and technology)
- Land
- Population issues (contestation)
- Human Resources in astrophysics (citizen and subject and the becoming of...)
- Inauguration ceremony and national pride
- Proposal. Observation time. Justification of the object as valuable (signal-noise ratio: 1-7)
- Isolation of the object by the astronomer: finding a source
- Training on the object
- From analog to digital
- Mobility of data for correlation (VLBI) not single dish
- High amount of data
- Correlation in the Netherlands
- Data selection
- Purification of the data. The cream from the milk.
- Measurements. The scientific questions that astrophysicists undertake.
- Signs and meaning. It is not the image, but it is its equations and calculations
- Writing, pretty pictures, clearly isolating the noise
- Metacode (Rottenburg) – register of power (Siri) – double blind to reduce bias, language of agreement
- Review. Validation by epistemic community. Acceptance or rejections.

This chain of translation provoked an interdisciplinary exchange on questions of meaning-making and knowledge production. Here is a glimpse of this discussion, which raised more questions than answers:

Sustainability of the Event

In the aftermath of the Point Sud workshop in Ghana, Susann Ludwig, James Merron and Hanna Nieber – in collaboration with Irina Turner at the University of Bayreuth – proposed a Postdoc Working Group titled “SKAnning Space from Africa: Seeing and Becoming” to the *Africa Multiple* Cluster at the University of Bayreuth. We were successful, and the upcoming workshop in February 2020 will give us the resources to maintain our network and prepare a publication. Within this framework, we pursue further networking activities and extend the concept of translation by exploring its ‘becomings’. We are appreciative of Point Sud providing us with the resources that allowed us to initiate an international, interdisciplinary network of scholars collaborating on the SKA.

Participants

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19. Dr. Oliver Müller, Physics, University of Strasbourg, France
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22. Samyukta Manikumar, Member of the third Kenyan DARA cohort
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25. Dr. Finbarr Chidi Odo, Physics, University of Nigeria, Nsukka
26. Dr. Mirjana Povic, Astronomy and Astrophysics Research Division, Ethiopian Space Science and Technology Institute



Photo by Andrea Zimmermann