



JUMPING JIVE

Project ID: 730884

Final report on exchange visits hosted in Europe

Deliverable:	D9.3
<i>Lead beneficiary:</i>	University of Manchester
<i>Submission date:</i>	25/06/2021
<i>Dissemination level:</i>	public

Contents

Executive Summary	2
1. Overview/Introduction.....	2
2. Associated and linked training programmes.....	4
2.1. Development via Radio Astronomy in Africa (DARA).....	4
2.2. JUMPING JIVE WP9.....	4
3. Delivery 9.3 – Final report on exchange visits	6
3.1. ASTRON/JIVE traineeship scheme.....	6
3.2. Visits to European Institutes and associated training events	9
3.3. African Interferometry Winter School	10



Executive Summary

This Delivery report (D9.3 ‘Final report on exchange visits hosted in Europe’) focusses on the opportunities for African researchers and graduate trainees to gain experience in Europe that have been initiated and supported by JUMPING JIVE work-package 9.

The motivation, aims and benefits of these exchange visits are multi-fold: a) they provide new opportunities to emerging researchers and technical staff from African nations to gain the new skills and importantly develop new contact networks, b) allows these new skills and contacts to be efficiently embedded within African research and infrastructure institutes (such as future AVN host countries), c) allows a targeting of these activities toward early-career scientists, rather than established scientists who may have access to more opportunities. This helps to build future and sustainable expertise communities. d) helps to develop new links and new collaborations between Europe and Africa. Each of these objectives provides mutual benefits for African and European research Institutes and facilities (including JIVE) and individuals alike.

This action is one of 3 key areas within the WP9 of JUMPING JIVE. Over the course of JUMPING JIVE, since 2017, this programme has supported multiple individual visits from Africa countries to European institutes. In each case, these have fostered new relationships between European and African Institutes and their staff. In addition, this part of WP9 has also played a key role in seeding the new development of training initiatives, both in Europe and South Africa. These are providing long-term and sustainable opportunities beyond the current funding envelope of the JUMPING JIVE programme. These opportunities span both technical and operational skills development to provide necessary skills for the future development and operations of infrastructures being developed in Africa such as the AVN, MeerKat and phase-2 of the SKA.

For completeness, the full-scope of all of the activities of this entire work-package are initially outlined in this report. This brief description provides the wider context of this activity and how it links and support programmes within JUMPING JIVE WP9 and other related programmes to maximize the overall benefits and impact.

1. Overview/Introduction

Throughout the continent of Africa, a number of large research infrastructure projects are being developed these include significant investment in radio astronomy and VLBI. The most notable of these are the development of an African VLBI Network (AVN), MeerKat and the SKA. For these large projects to be sustainable, as well as provide maximum benefit to the



local economic regions, they require a skilled workforce of local scientists and technicians to both operate and use such facilities. However, many of these projects based in low to middle income countries¹ where there is limited access to advance training in science and technology education and training. This results in a lack of this skilled local workforce and highlights the need to provide graduate and postgraduate level training opportunities which will both benefit these research facilities as well as act to stimulate economic growth in these countries. Education and sustained economic growth go hand in hand in lower to middle income countries and form one of the key global challenges identified by the UN, EU and the UK's Overseas Development Agency.

Radio astronomy encompasses all of the science, technology, engineering and mathematics (STEM) skills that underpin the emergence of a strong developed economy. The modern astronomer needs knowledge in physics, mathematics, chemistry and computing. To develop, maintain and run the telescopes and instrumentation requires key skills in technology and engineering. Via a coordinated programme of training and providing new opportunities, we aim to inspire and train a new, diverse generation of young people to engage with these skills.

The training and skills development programme that this work-package contributes to aims to engender a research ethos as well as communication and diagnostic skills that are transferable to many aspects of a developing economy. The training team includes engineers, astronomers, and experienced entrepreneurs from the telecommunications and space industry who will impart their drive and enthusiasm to open the minds of the trainees to a world of possibilities in the academic, industrial, knowledge and commercial sectors.

This JUMPING JIVE work-package aims to help to address some of these issues via multiple actions (see Section 3). At the core, the programme is a large and ongoing basic training course in astronomy and astrophysics that introduces graduate students from seven (7) sub-Saharan African countries² to the subject area. This programme works in close collaboration with UK and ZA led initiatives (DARA –see below) to maximize the impact and reach of the training. Alongside this core training programme via the JUMPING JIVE initiatives, we are providing a range of enhanced opportunities, including short-term visits and networking opportunities that are designed to support these talented future scientists and engineers reach their full potential. These provide mutual and collaborative benefits in Africa and Europe for institutes and individuals alike by building new and sustainable expertise networks between countries and institutes in Europe and those in Africa.

¹ As defined by the Organisation for Economic co-operation and development:
http://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/DAC_List_ODA_Recipients2014to2017_flows_En.pdf

² Seven countries currently involved are : Zambia, Namibia, Kenya, Botswana, Ghana, Mozambique and Madagascar. Seed programmes and discussions with several further African countries (e.g. Egypt, Nigeria, Gabon etc) are underway with a view to future inclusion.



2. Associated and linked training programmes

This JUMPING JIVE work-package operates in close collaboration with a number of parallel research and development programmes within Southern Africa based around radio astronomy. This collaboration provides an essential framework within which these EU contributions can be cost-effectively channeled with maximal impact. The key associated programmes are described below.

Close coordination between JUMPING JIVE and these programmes is facilitated by the named work-package leads (Beswick & Hoare), both of whom are leading contributors to, and executive management committee members of, the DARA project. Hoare is the overall PI of DARA, and Beswick leads the organization of DARA/JJ Unit 4 training within the 'basic training' portion of DARA (see JUMPING JIVE Deliverable 9.2). These close connections between JUMPING JIVE and DARA ensure a full coordination of these two partner projects.

2.1. Development via Radio Astronomy in Africa (DARA)

The DARA project (PI: Hoare) is a multi-year (2017-2021, this project has recently been awarded a no-cost extension due to the impact of COVID) joint UK-ZA funded programme to enhance the human capital development in southern African countries which will be the host sites for future African VLBI Network telescopes. This is a two-tiered programme, providing (1) Basic training for graduate students in Astrophysics and Radio Astronomy via an annual training course open to graduates with a first degree in Physics or a related subject such as mathematics, engineering or Computing, and (2) provide advanced training opportunities for participants to qualify for a Masters or PhD in astrophysics. These two tiers of training, form a coherent human capital development project delivering a significantly inspired and up-skilled pool of young professionals to drive economic development.

2.2. JUMPING JIVE WP9

The DARA project forms an essential framework for human capital development within southern African counties involved in radio astronomy and VLBI via the AVN. However, this programme has a number of limitations. In particular this programme is only able to offer a relatively small number of advanced training opportunities (~10 in total), limited technical and operational training, and has a limiting capacity in terms of the number of expert lecturers available to teach in Africa.



In order to complement and enhance this activity work-package 9 of JUMPING JIVE has developed 4 specific action areas which expand and enhance the DARA programme by providing increased levels of technical and operational training, as well as intermediate training and up-skilling opportunities for students both before and after completion of higher-level degrees.

The four primary action areas of this WP provide new training and development opportunities that support the wider human capital development programme. These four areas are:

- Organize and support the participation of European radio astronomers as expert lecturers in the joint DARA/JUMPING JIVE basic training programme. The role of this work-package is particularly critical as it allows the broader expertise base within Europe to contribute thus enhancing the quality of the training provision, and expand the capacity of the existing scheme to include new countries. In particular, JUMPING JIVE participation is targeted at the technical and operational aspects of this programme.
 - **Target audience:** Physics & Science graduate students.
 - **This is a coordinated joint DARA-JUMPING JIVE activity**
- Facilitate and support European radio astronomers to travel to AVN and prospective AVN countries to deliver a range of seminars and lectures on astronomy and VLBI to major physics departments across the country. This programme reaches many hundreds to thousands of undergraduate and postgraduate students from multiple disciplines in each of these host countries, acting to both inspire and inform future scientists, engineers and users of the prospects of VLBI and radio astronomy
 - **This is solely a JUMPING JIVE activity.**
- Fund short-term training placements for African staff and students to develop their radio astronomy expertise in both scientific and technical/operational areas. These short training trips (<few months) are being hosted in a number of EU institutes.
 - **This is solely a JUMPING JIVE activity.**

The results of this activity are reported in this deliverable.

- Support the development of an AVN technical & support network forum to connect technical and operational staff within AVN countries. This activity aims to build an advanced community of scientists and install the framework for sustained operations.
 - **This is solely a JUMPING JIVE activity.**

In the remainder of this delivery report we describe in more detail the first of these activities 'Basic Training Programme' and the specific contributions from the JUMPING JIVE project.



3. Delivery 9.3 – Final report on exchange visits

This delivery 9.3 *'Final report on exchange visits hosted in Europe'* is focused on the short-term training placements action (third Bullet in Section 2.2) involving short-term placements and supported visits in Europe and established research institutes. Included within this remit are the development of longer-term and sustainable training and exchange opportunities which will continue to deliver parts of this programme beyond the JUMPING JIVE initiative.

Impact of COVID on this part of the programme:

Since Spring 2020 the onset of the global COVID pandemic has resulted in numerous travel restrictions being imposed to safeguard global public health. Alongside these, the majority of institutes in Europe and Africa have restricting visitors and large events. This has had significant impacts on the final year delivery across this work-package, including the cancellation or postponement of multiple planned events, including short-term exchange. Where feasible alternative activities, utilizing remote communications and adapted hybrid events have been initiated to mitigate this impact, including the successful remote running of large training events through 2021. This work will be ongoing until the end of the current extended project period.

3.1. ASTRON/JIVE traineeship scheme

In 2017/18 two Jumping JIVE partner institutes in the Netherlands (ASTRON and JIVE) in association with Jumping JIVE WP9 set up a new 12-week long traineeship scheme hosted at ASTRON, NL.

This scheme (Traineeships in Science Operations with Massive Arrays³) has now developed into a world-leading annual programme which hosts between 2 and 6 trainees from a very wide range of backgrounds. There remains a special focus on participants from developing countries and traditionally underrepresented backgrounds, with guaranteed places for trainees from African nations. This scheme was designed to provide the necessary support (travel, accommodation and subsistence) to make it accessible to participants from all background.

³ More information on this scheme can be found at <http://jive.eu/traineeship-science-operations-massive-arrays> <https://www.jive.nl/training-next-generation-support-scientists>



The programme enables astronomers (*postdoc, PhD or graduate student level*) to spend a trimester (12 weeks) at the institute in Dwingeloo in the Netherlands. Under the supervision of Telescope Scientists, the trainees develop fundamental skills and novel experimental methods on systems using technologies that produce cutting-edge science now and contribute to the development of the SKA. This is an important programme that provides substantial experience for participants which is otherwise unavailable to many of the participants.

The JUMPING JIVE Work-package 9 provided initial impetus and funding for this scheme, helping it to become a reality. The first traineeship programme (Spring 2018) was opened only to applicants from African and AVN partner countries through a competitive application process and assessed by a panel from three different institutes (ASTRON, JIVE, UMAN). This advert was disseminated in a targeted way amongst the DARA and Jumping JIVE WP9 partner countries, with a total of 35 applications received. Of these 17 were deemed appointable to these training positions underlining the large demand for such opportunities. In 2019 there were over 50 applications from all over the world with half coming from Africa.

Due to the success of this programme, ASTRON has increased its institutional funding for the scheme enabling it to be expanded to include up to 4-6 candidates from 2019. In order to maintain the diversity and impact of this scheme on the developing world at least one position was guaranteed to be filled by a trainee from Africa, with all necessary support provided such that there are no barriers between the most talented individuals and these opportunities.

All trainees are selected on the basis of merit and potential. At the final 2019 selection two African based participants, from Zambia and Ghana were offered positions exceeding the reserved allocation on merit alone. Unfortunately, the 2020 traineeship programme, which was due to commence in March 2020, was canceled due to the COVID pandemic. It is intended that this will recommence at the soonest possible opportunity with the core hosting institutes supporting this programme beyond the JUMPING JIVE project period.

The following trainees from Africa or linked with the AVN were selected for these positions:

- 1) 2018: Bernard Duah Asbere (male, Ghana) – Bernard is an engineer working at the Ghana Radio Astronomy Observatory. He was selected and participated in the 2018 traineeship scheme. During the traineeship, he gained invaluable experience in facility operations from the ASTRON and JIVE staff members. He is now using and transferring this experience to the operational team with the Ghanaian Radio Astronomy Observatory where he leads the operations team for the converted 32-m radio telescope which is in the process of being integrated into the EVN. Bernard has also extended the connections he built within this programme and now combines his position in Ghana with a role within the LOFAR operations team in the Netherlands. This is further building the connections between traditional European research institutes and African institutes.



- 2) 2018: Emmanuel Bempong Manful (male, Ghana) - Emmanuel is a graduate of the DARA/JUMPING JIVE Basic training programme (see Deliverable 9.2), and a DARA funded advanced student who is currently enrolled on a PhD programme at the University of Bristol under the supervision of Prof. Birkenshaw. Emmanuel, under the agreement of his PhD supervisor, took a 3-month study leave to participate in the traineeship. This programme helped him to build networks with researchers in ASTRON and members of the LOFAR and JIVE operational staff. This both benefited his research and technical development, with him subsequently becoming a new LOFAR science user. He plans to take the skills he has learnt during this programme back to Ghana on the completion of his PhD in late 2021.
- 3) 2019: Benedicata Woode (female, Ghana): Benedicata who was undertaking a PhD at the University of Ghana took a leave of study to participate in the 2019 traineeship



Figure 1: Noah and Emmanuel at ASTRON, NL during the 2029 ASTRON/JIVE Traineeship programme.

programme. Benedicata has subsequently taken a position as a telescope operator at the Ghanian Radio Telescope. She completed her PhD in Radio Astronomy in 2021.

- 4) 2019: Noah lumbwe Chanka (male, Zambia): Noah was also a former DARA basic training graduate.

Unfortunately, due to COVID travel restrictions, it was not possible to continue this training programme in 2020, but it is hoped that this will be resumed in later 2021 or 2022



3.2. Visits to European Institutes and associated training events

Throughout the period between 2017-2020 (pre-COVID) a number of individual short-term placements and support have been provided to researchers and students across a number of African countries to visit institutes in Europe and where possible combine these visits with training events and meetings (e.g. European Radio Interferometry School).

- 1) Isaac Mutie (Technical University of Kenya). In 2017, Isaac Mutie was supported to attend the European Radio Interferometry School which was held at JIVE/ASTRON. In addition to attendance at the meeting he extended his visit (hosted at JIVE) and was mentored by JIVE support staff. After returning to Kenya following this visit, Isaac set up a number of classes with fellow students within his institute in Nairobi in order to disseminate material that he had learnt both at ERIS and JIVE. Isaac has subsequently gone on to complete a MScR in Radio Astronomy at the University of Manchester, and is now enrolled as a PhD student (in Radio Astronomy) at the Technical University of Kenya in Nairobi. He is also using the experience he has gained help to lead new training events in Kenya as part of the DARA/JUMPING JIVE Basic training course and helping to develop the following generation of radio astronomers in his country.
- 2) Benedicata Woode (University of Ghana). In 2018 was hosted at the Universities of Manchester and Leeds in the UK for a period of 3 months. During which time she developed her research in astrophysical Masers and learn key VLBI data reduction skills. Benedicata is now working as telescope operator at the Ghana Radio Astronomy Observatory.
- 3) Mohamed Darwish (Egypt): In 2019 we support Mohamed Darwish from the National Research Institute of Astronomy and Geophysics (NRIAG) in Egypt to attend the 2019 European Radio Interferometry School held in Goteborg, Sweden. Mohamed, who is working toward his PhD in galactic astrophysical masers, is one of only a handful of radio astronomers in Egypt. He, along with his supervisor Prof. Saad, are actively trying to increase interest in radio astronomy in Egypt. This was a unique opportunity for Mohamed to attend a specialized international meeting and training course. He was selected to be sponsored to attend this meeting following an open call.
- 4) Naftali Kimani (Kenyatta University Nairobi): In 2019, Naftali was supported (travel-only) to visit Karl Menton and colleagues at MPIfR, Bonn. Naftali is a young research leader in Kenya developing a new research group focusing on VLBI. This trip enables him to continue and further develop the research in his group in collaboration with European scientists. This trip was partially supported by MPIfR.
- 5) Lott Frans (Namibia): In early 2020 Lott was supported by Jumping JIVE WP9, Observatory Cote d'Azur, Nice and INAF to spend 3-months in Nice, with visits to INAF, Bologna and ASTRON/JIVE, NL. These networking visits included Lott giving



talks to researchers at INAF. Lott had previously graduated from the DARA basic training course, and working at the University of Namibia as a physics and astronomy tutor whilst completing his MSc thesis based on water vapor site testing on Mount Gamsberg in Namibia, the future site of the African Millimetre Telescope.



Figure 2: Issac Mutie working with Jay Blanchard & Ross Burns at JIVE during his exchange visit.

3.3. African Interferometry Winter School

The value and impact of these short-term visits are large on individuals and participating institutes. Complementing these and extending the reach and promoting the sustainability of these activities we have also provided direct support to the newly formed African Interferometry School. This school has a similar purpose to the European Radio Interferometry school but is located in South Africa at North-Western University. The first of these schools was set up in 2019 and now run annually. The combination of modest Jumping JIVE and DARA funding enabled this programme to start and has directly supported the participation of students from Namibia, Kenya, Egypt, Ghana, Zambia, Nigeria, Mauritius, Botswana and



Madagascar that would not otherwise have been able to participate. This has proved to be a cost-effective way, due to reduced travel and subsistence costs, of providing the benefits of short-term exchange trips to a larger cohort, and importantly this support has allowed the African Radio Interferometry School to develop into a long term and sustainable activity.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730884

