

## Fellows at ESO

### Chian-Chou Chen

彗星, a book about comets first attracted me to astronomy. It was on a shelf in a seemingly unremarkable bookstore surrounded by food vendors in a typical night market in Taichung in Taiwan. At first I was enjoying the fried chicken and bubble milk tea more as I casually flipped through the book. After a few pages, I put aside my food, sat down, and finished the whole book. Despite the hot summer the book gave me goose bumps, with fascinating photos and mysterious facts, describing this thing that is flying across the Universe, a concept that effectively blew my mind.

Despite being inspired by a book, I was in fact a wild child with no interest in reading. If anything, it was thanks to my father that I would read about physics. For example, books by Richard Feynman got me thinking about things like angular momentum before it was taught in school. The black holes that appear in Stephen Hawking's books would get me thinking about space and time the whole day. My father would tell me about Einstein's theories of relativity and we would both be overwhelmed by the concept of converting mass into energy.

I was fortunate enough to carry on my passion about physics during undergraduate studies, at which time I got into the summer research programme offered by the Academia Sinica Institute of Astronomy and Astrophysics in Taipei. During those two months, I worked on my first ever project about astrophysics, using the Submillimeter Array (SMA) to study the molecular gas and dust around protostars. I reduced the data, analysed the results, made plots, and presented a poster at a local conference. In hindsight, that summer programme was extremely valuable, allowing me a first taste of being a real astronomer, and I liked it.

After undergraduate studies, I entered the military, as a result of mandatory public service in Taiwan. Because it is public service, I got to meet people from a variety of backgrounds, whom I would probably never have had a chance to meet had I not joined the military. We would talk about our lives and the plans for the future, and during this time – effectively a



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gap year – I became motivated to apply for PhD programmes in the USA, which unlike European ones do not need a master's degree. After a huge amount of work putting in applications, an acceptance email from the University of Hawaii came out of the blue during the Chinese New Year in 2008. I was dancing with my mother, picturing what life ought to be in the next five years in the island paradise.

Besides regular courses, in order to help with the search for ideas for PhD topics, the university requires students to undertake two one-year research projects in the first two years of the PhD; these two projects can cover vastly different topics. I carried out my first graduate research project with Jonathan Williams, making good use of my knowledge and skills about the SMA and protostars, which eventually led to one of my first publications. For the second project, I was eye-

ing something completely different, involving larger physical scales: galaxies, galaxy clusters, and cosmology. During that time I was taking a course with Len Cowie about these topics, and thought why not combine my skills in the submillimetre with galaxies. Fortunately, Len happened to have a project on exactly that idea at the same time, and after a few chats we decided to team up, along with Amy Barger and Wei-Hao Wang – close collaborators of Len – to work on my second graduate project; the starting point of my now decade-long research career on the submillimetre galaxies. It in the end it went so well that we published the results not long after the end of the second year.

What came after the end of the second project was also the good news about the commissioning of the new submillimetre camera, SCUBA-2,

mounted on the James Clerk Maxwell Telescope (JCMT). The community at that time had long been waiting for this revolutionary camera to survey the submillimetre sky at an unprecedented speed. Given the timing, it seemed natural to work with Len on a PhD topic about submillimetre galaxies using SCUBA-2. On the other hand, I realised that it could be risky to rely on a new instrument for the whole PhD, so I decided to use SCUBA-2 for only half of my thesis, and designed the other half involving the SMA, the facility that I knew well and that was working. Luckily, with the invaluable help of Len and Amy, both halves worked well and the thesis was successful.

My skills and first-hand experience with SCUBA-2 led me to my first postdoc at Durham University in the UK, working with Ian Smail on ambitious SCUBA-2 legacy surveys and various follow-up programmes using the Atacama Large Millimeter/submillimeter Array (ALMA) and ESO's Very Large Telescope (VLT). During this time I also had the freedom to explore and build up my own research projects, moving towards becoming a completely independent researcher. It was not easy, and most proposals failed. It was when these failures happened that I really appreciated working in a well-established group, with many other projects that are also worth pursuing; mitigating the possible damage from these failures to one's career. Luckily after many tries I started to slowly build up a research programme, at which time Ian suggested the ESO fellowship.

The offer from ESO came rather early, an excellent gift for Christmas. After some serious discussions with my partner we decided to take our newborn child to Germany — a country where I had lived, for a brief period of time, when I was five. Despite that, at first we worried that life could be a bit difficult since we don't speak the language, but the idea of having complete freedom to do research in Munich overcame that worry. In hindsight, coming to ESO was perhaps one of the best decisions I've ever made. The vibrant atmosphere of the research environment at ESO constantly fosters new projects and collaborations. The logistical support that ESO provides, in particular

for people with small children, is unparalleled. Perhaps most importantly, the goodwill from people to make ESO a better working place can be seen in almost every corner. Overall, it has been eye-opening for me personally to experience such a motivational environment, and I will for sure bring these values to wherever I go for the next step of my career.

### Alexandre Galle

I was not dedicated to being an astronomer, or even a scientist. But at one point in my life I was looking for something exciting, interesting, and more importantly — to do work I really like. Now here I am, working at the most productive worldwide observatory, and operating the most advanced instruments and telescopes. Here is my story.

I spent my childhood in the Normandy countryside, in the northwest of France, and this is where my passion for amateur astronomy began. The countryside is an amazing place as it is free of light pollution, giving access to astonishing night

skies. Lying down in the grass near a lake, listening to singing frogs; this is how I started becoming a stargazer, watching the moving celestial sphere, the brightest planets and our Milky Way rising over the horizon. However, at that time I was not thinking of studying celestial bodies — I was just a dreamer, amazed in the face of the Universe.

I had a normal high school education, not really oriented towards continuing on to university, but rather aiming for a professional degree so that I could start working as soon as possible. I actually did not really like studying and I wanted to escape it as soon as I could. After my high school degree, I started working as an electrical engineer for various companies. Although it was quite interesting, I did not really like it, and I did not see myself doing that kind of job all my life. So I started to look for other interesting things to do. I tried to join the Air Force, via a three-day test to become a fighter pilot, but I failed during the second day. I then went to the army to be a paratrooper; however I quickly realised that such a life was not for me. Fortunately, a



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few days before leaving the army, something triggered in my brain while I was alone in the dormitory looking through an astronomy magazine. I actually do not remember exactly what happened, but this was the moment I decided to start to study again, with the goal of becoming an astronomer.

I gathered a lot of information on how to reach that goal, and I realised that this was a long-term objective, with at least eight years of study, requiring patience, motivation and determination. But this did not scare me. I had to leave the countryside for the nearest big city and spent two years at University of Rouen starting to learn general physics. However, once I became aware that the university did not specialise in astrophysics, I moved to the capital, to one of the best universities in Europe specialising in science and medicine, called Pierre & Marie Curie University or Paris VI. There I studied fundamental physics, astronomy and astrophysics and after a few years I obtained my master's degree. It was a long and hard road to the degree because such a high level of study requires time and lot of effort.

It was almost the end of the road; I was about to start a PhD, which is actually where you really start investigating and learning how to become a researcher. The choice of PhD project is very important as, for most of us, it determines our future field of research. In my case, my PhD topic was influenced by my master's thesis. Before starting my PhD, I spent three months at the Observatoire de Paris for my end of year master's project. I worked under the supervision of Pierre Kervella with MID-infrared Interferometric instrument (MIDI) data, an ESO first-generation interferometric instrument. The topic of this master's thesis was to spatially detect nearby infrared emission around Cepheid stars, caused by possible circumstellar envelopes.

This work was really exploratory, as we did not know anything about these envelopes, which had only recently been discovered. I reduced and analysed the MIDI data for two Cepheids, which resulted in the detection of nearby warm infrared emission. This work led to a scientific refereed publication, to which I am proud to

have contributed. During this project, my supervisor asked me if I would be willing to continue this exploratory work on circumstellar envelopes of Cepheids for a PhD, and I obviously accepted. As part of this PhD, he also asked if I would be interested in applying for an ESO studentship programme and going to Chile for two years. This was a hard choice to make as going to a new country meant that I would have to deal with a different culture, language, money and have a different way of life without my family and friends. This was not like going to Spain or England because Chile is 12 000 km from France, so it was not possible to come back for the weekend. It had been a long time since I decided to start studying again, but I was still determined and motivated so I saw this opportunity as a new adventure that could only be of benefit to me. When ESO awarded me the studentship, I was obviously happy, but also anxious at the thought of starting a new and completely different life.

At ESO, I was co-supervised by Antoine Mérand, an ESO staff astronomer. These two years of my PhD resulted in one of the best parts of my personal and professional life. I met a lot of people; some are now friends, while others became collaborators. This studentship enabled me to be in direct contact with an operational observatory, its instrumentation, and to collaborate closely with astronomers across various fields of research. This work in an international environment provided a great experience at the most productive ground-based astronomical observatory in the world. Unfortunately, everything has to end, and after two years I had to come back to France to finish my PhD. Nine years have passed since I took the decision to study astronomy. This long journey led me to obtain a PhD and I was now an astronomer.

However, all this was the "easy" part. I then had to find a postdoctoral position, and maybe after some years, a permanent job in a University, research institute or observatory. Because of the strong links I have with this country, I came back to Chile for a postdoctoral position at Universidad de Concepción, in the group under Wolfgang Gieren, a recognised expert in the field of Cepheids and the distance scale. This position allowed me

to become a mature and independent astronomer, create new collaborations (and friends), and start new research projects. After about three years in Concepción, it was time to look for a job again. An astronomer job is quite precarious, and you can spend years looking for a permanent position — if you are lucky enough to get one.

After Concepción, I was awarded a four-year ESO Fellowship. Here I am now, an astronomer at the Very Large Telescope Interferometer (VLTI), the interferometric part of the ESO Paranal Observatory. As a fellow, I am part of the Science Operations team, where 50% of my work consists of mainly supporting observations for the community. We can also be involved in other operations related projects, for example, the development or improvement of operations or instrumentation. In my case, I developed several tools for the VLTI that help during night operations, for instance an automatic fringe search panel for the Precision Integrated Optics Near-infrared Imaging Experiment (PIONIER) instrument, and a real-time data display for the VLTI, specifically for interferometric data. The VLTI is probably the most complex part of the observatory as it combines the light coming from four telescopes, passing through tunnels and mirrors, and the light path between all the telescopes needs to be perfectly controlled. I am one of a few astronomers who have the privilege to operate four 8-metre class telescopes simultaneously, which is amazing. With this fellowship, I have improved my technical and scientific knowledge in various fields. I learnt how an observatory works, and I am proud to have been part of the operation and to have participated in the improvement of some VLTI tools.

I am now starting the fourth year of my fellowship. After 240 nights of operating ESO instruments and telescopes, I am not going to Paranal any more as there are no longer any functional duties. I can now focus mostly on my research, whilst also taking time to apply for my next position. I do not know what the future will bring, but I do still love what I am doing, which is probably the most important thing.

## Dominika Wylezalek

*“Der Mensch muss bei dem Glauben verharren, dass das Unbegreifliche begreiflich sei; er würde sonst nicht forschen.”*

*“One must hold fast by the belief that the incomprehensible is comprehensible; otherwise one would not search.”*

J. W. v. Goethe

What may sound like a cheesy quote from a different century actually describes quite well why I became an astronomer. I also chose this quote for the first page of my PhD thesis.

When I was five or six years old, on clear starry nights, outside in my parent’s garden, I started to wonder how big the Universe was and what was behind its boundaries. Neither my Mum nor my Dad could ever give me a satisfactory answer apart from “it’s infinite”. When I protested: “No, but it has to have a boundary and there must be something behind it”, they would just repeat the same sentence: “It’s infinite.” That did not satisfy me at all. I think it was then that I decided — although it was not a conscious decision — to learn and study hard enough to become an astronomer and work on understanding the Universe better.

As a teenager, I did not always have this goal in mind. I was easily interested in and excited by many different topics and my “dream job” included everything from being a vet, medical doctor, politician, to restaurant owner. However, I still enjoyed physics the most and decided to start my studies at the University of Heidelberg, which offers a wide range of astronomy classes as part of the physics curriculum.

In my third year in Heidelberg, I started to work at the Landessternwarte Heidelberg (Heidelberg Observatory) for my bachelor thesis project on polarisation measurements of variable active galactic nuclei (AGN). I also got in touch with the extra-solar planet search group there and got the chance to lead observing runs at Lick Observatory, USA. As there is no telescope operator provided at the Coudé Auxiliary Telescope at Lick Observatory, I had to familiarise myself with the telescope, the software, the operation of the dome, the guiding system and even the maintenance of the instrument (for exam-



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ple, refilling liquid nitrogen at the end of the night). In the current era of remote and queue observing, I realise now that my experience at Lick was quite unusual and valuable (especially spending more than a week completely alone at the top of a remote mountain). This experience helped me to develop a deep understanding of what it takes to operate and run a telescope, how much fun it is, and how important it is for an astronomer to understand where and how data are being taken.

After finishing my BSc in Heidelberg, I moved to the University of Cambridge in the UK to obtain my master’s degree. Although that year was probably the most study-intensive year of my life, I greatly enjoyed having the opportunity to attend lectures by some of the top astronomers in the world and was highly

inspired by the academic environment in Cambridge. I vividly remember finding Stephen Hawking’s office during one of my first weeks there and taking a selfie with the name plaque.

When I received an offer from ESO for a PhD position in 2011, I did not hesitate to accept it. My thesis project focused on investigating distant galaxy clusters, especially those associated with powerful, radio-loud active galactic nuclei (AGN), and I was supervised by Carlos De Breuck and Joël Vernet. Galaxy clusters are the largest gravitationally bound structures in the Universe and pushing the observations to the highest redshifts, which I did during my PhD, allows us to draw conclusions about the build-up of structure in the Universe over several billion years.

About one year into my PhD, I was given the opportunity to spend six months at the NASA Jet Propulsion Laboratory (JPL) and Caltech working with Daniel Stern, the Principal Investigator of the project. During these six months, I continued working on my primary PhD project but started to become heavily involved in other large collaborations on distant galaxy clusters. I even got the chance to assist the team with observations at the Keck Observatory and Gemini Observatory in Hawaii. Spending two full nights at 4200 m for the Gemini run was certainly quite tough but we were rewarded with great science data and amazing views from the top of the summit in the early morning hours. In my final year as an ESO PhD student, I also joined the K-band Multi-Object Spectrograph (KMOS) team for a science verification run to the Paranal Observatory. I tested parts of the reduction pipeline and instrument operation procedure and received training in the commissioning of this unique instrument.

After finishing my PhD degree in 2014, I accepted an offer of a postdoctoral researcher position in Nadia Zakamska's group at the Johns Hopkins University in Baltimore, USA. In Baltimore, I shifted my research focus from studying clusters around powerful AGN to studying the AGN themselves and AGN feedback processes in detail. I am extremely fascinated that the energy output of AGN can impact the evolution of their host galaxies and the build-up of their stellar mass, even though the difference in physical size spans many orders of magnitude. I use multi-wavelength photometric and spectral (preferably spatially resolved, integral field unit [IFU]) observations to address various aspects in the field of AGN feedback studies and galaxy evolution.

The Physics Department of the Johns Hopkins University shares a campus with the NASA Space Telescope Science Institute (STScI) which operates the Hubble Space Telescope, and is heavily involved in the development and management of the James Webb Space Telescope (JWST). The proximity to STScI allowed me to work closely with instrument and telescope scientists and to become familiar with the expected capa-

bilities of the JWST. In late 2016, I put together a team of world experts in my field to write a proposal for Early Release Science observations with the JWST to observe three high redshift quasars with the Mid-InfraRed Instrument (MIRI) and the Near InfraRed Spectrograph (NIRSpec) instruments in IFU mode. The effort was rewarded and the proposal was accepted, making my team one of 13 teams worldwide that will obtain and receive some of the first data taken with the JWST. Although the launch of JWST has been rescheduled twice in the last 12 months, preparing the proposal and the observations and working with the data has been and will certainly be one of the highlights of my career.

In 2017, I moved back to ESO as a Research Fellow where I continue to work on AGN, AGN feedback processes and galaxy evolution. After having worked on this topic mainly with collaborators in the USA and South America, I am now looking forward to growing my scientific network in this field in Europe.

For my functional duties at ESO — which I spend 25% of my time on — I chose to become a member of the Multi Unit Spectroscopic Explorer narrow-field mode (MUSE NFM) commissioning team. Throughout the last year, I have been working very closely with adaptive optics engineers, software developers, instrument scientists, the Instrument and Operations Team, and part of the consortium, including assisting with two commissioning runs at Paranal. I became responsible for various aspects, including: the performance analysis; developing performance models; checking on the fulfilment of the specifications; and working with software developers to implement these models into the exposure time calculator for MUSE. I have been greatly enjoying working and communicating with experts from different professions. This work also allows me to exploit MUSE much better for my own science because I know and understand all its capabilities, limitations and operation modes in much greater detail than before.

With the opening of the ESO Supernova Planetarium & Visitor Centre, the Garching campus has been enriched by an amazing outreach centre that is doing

a great job of educating the public about astronomical research and communicating ESO's mission to the public. My own passion for science has been nurtured by local outreach activities, and I enjoy very much “giving back” to society by joining in such events, now not as a participant but as a scientist. I have, for example, given talks during the ESO Open House Day and the European Researchers Night and to high school students in both the USA and Germany. Seeing the sparkle in the eyes of children, teenagers and adults alike when I talk about galaxies and black holes in the Universe is very rewarding, and I hope to inspire some of the younger generation to consider a career in science. In particular, I hope to act as a role model for the next generation of female scientists, who continue to be underrepresented in the fields of physics and astronomy.

I spend most of my free time cooking, travelling, horse riding and hiking in the Bavarian and Austrian Alps. When I am out at night in the middle of the mountains or visit my parents, who also live quite remotely, I am still amazed by the night sky and the vastness of the Universe. Although I understand the many components of the Universe much better today than 25 years ago when I first started to wonder about the size of the Universe, I am more aware than ever before how much we still do not know, and how much is still waiting to be discovered and understood. Contributing my share to this endeavour is what drives me and my research every day.