

The frayed and bent fragments are strewn over the floor, some in small piles, others left orphan. Mostly muted greens and browns for pastures and frolicking horses, but there are a few flashes of brilliant orange and red for flowers in the foreground. I already completed this one only last week but the thrill never wears off, no doubt a relief to my parents and their thin wallets. I don't do jigsaw puzzles for the picture at the end. An exasperated voice pierces through my ordinary paradise and pleads with me to move to a table, but the floor is where I need to be. I have to surround myself with the components in order to understand the whole.

This love for puzzles, challenges, and patterns drove me to physics and applied mathematics. From there, it was a summer of research experience in 2015 that drove me to astrophysics and into the physics of black holes. Whether I am poring over thousands of entries in a file or debugging a section of code, I am transported back to that experience of solving a jigsaw puzzle. I'm once again sitting on my bedroom floor surrounded by colourful fragments, modules to be pieced together into something meaningful and challenges to be tackled with grit and determination. Yet from the beginning I have looked back and counted the steps to where I am today with incredulity. During the scholarship application season of 2014, I realised that if I were to go to university at all then it would have to be by the generosity of my community. That initial investment by my community, and every investment after, has been a key driving force in my studies and my community work. It ensures that no matter how far I go, I remain firmly grounded by the values of my family, teachers, and coaches.

It is both my responsibility and joy to be a role model to young Tasmanians with a budding interest for science. I look for those who have been overlooked, particularly within poor and rural communities. Whether I am providing entertainment, advice, or knowledge, I see the impact that each small action has on this region. It's a child with eyes brimming full of questions, barely able to contain their curiosity and sit still. It's a retired farmer joining in on citizen science for the first time in their life, sharing that science with their neighbours over Sunday lunch. Almost all of us can think of a particularly influential person in our lives; perhaps a teacher, a coach, an aunt, a minister, or a family friend. They treated us with respect and gave us responsibility, and in return we became better students, athletes, musicians, and citizens. A small amount of attention and dedication can drive a young person to be better than they were yesterday, and I know that through even the smallest of interactions I can give others the confidence they need to follow their interests.

This insatiable need to feed value back into my community has lead me all over this state and back home again. Beginning with only a single undergraduate student under my tutelage in 2016, I have now directly interacted with well in excess of 1000 young Tasmanians and have reached countless more adults through public appearances, radio and newspaper interviews, and social media. I hope that some will pay the favour forwards in the years to come, driving knowledge and support both locally and on a world stage.

It is with this goal in mind that I look to Oxford University for a DPhil in Astrophysics with its long history of impactful science outreach. This includes the Zooniverse platform which hosts both Galaxy Zoo and Radio Galaxy Zoo (RGZ), the latter of which I have been involved with throughout my time at university and which acted as my first encounter with citizen science. In 2017, whilst beginning to write the paper on my RGZ work, I travelled back to my hometown to present the results at TastroFest in Ulverstone. This year I returned to TastroFest with Prof Simon Ellingsen to present an introductory talk on the story of super-massive black holes, even managing to get four Tasmanian astrophysicists together in a single room. For a community with no easy access to higher education or to academics themselves, this local representation makes a difference. Throughout my career I want to find new and exciting ways to involve the general public in the science of black holes and the physics of the world around us.

Excellent community engagement in science also requires excellent science. I know that a degree at Oxford University will give me access to world-renowned researchers and state-of-the-art computing facilities, whilst social events such as the Occam Lectures at Merton College will help me to broaden my horizons even further. My research experience in Active Galactic Nuclei jets, galaxy cluster properties, and the intervening cosmic environment have solidified my passion for the dynamics of black holes and leave me well-poised to tackle the challenges of research. Of particular interest to me is the physics of the material that falls into black holes – the physics of the accretion disk. The models currently favoured in many areas of astrophysics are highly simplistic. They assume every nicety that we might hope to see and every nicety that we know is not physically realistic, and their use could potentially obscure relationships within the data we seek to understand.

Transient and clumpy properties in accretion disks are poorly understood, yet these strange behaviours could have monumental implications for the evolution of stars, black holes, galaxies, and the universe as a whole. Under the supervision and tutelage of researchers such as Prof Steven Balbus and Prof Alexander Schekochihin, I aim to strike new ground in this swiftly-moving field through increasingly complex simulations and analyses. Through the rigours of science, we can all piece together some small part of this 13.8 billion-year-old puzzle we inhabit.