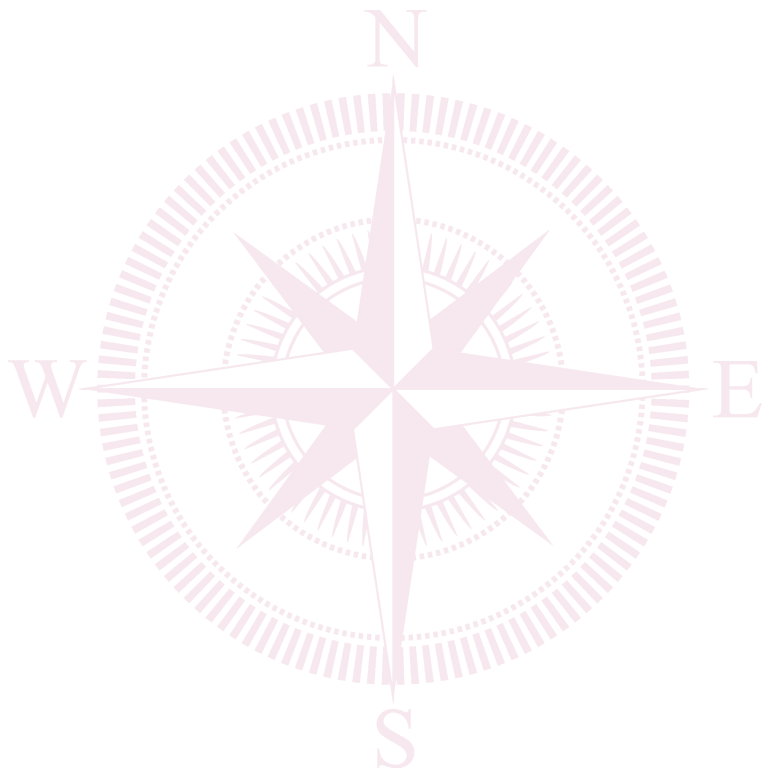


Women and GIS

Mapping Their Stories



Catherine Ball

Rising high with 'drones for good'



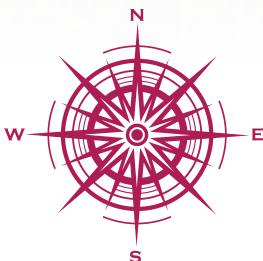
Cathy has won many awards for her work in business and education. The awards have opened networks, expanding her connections to mentors, sponsors, and business partners.

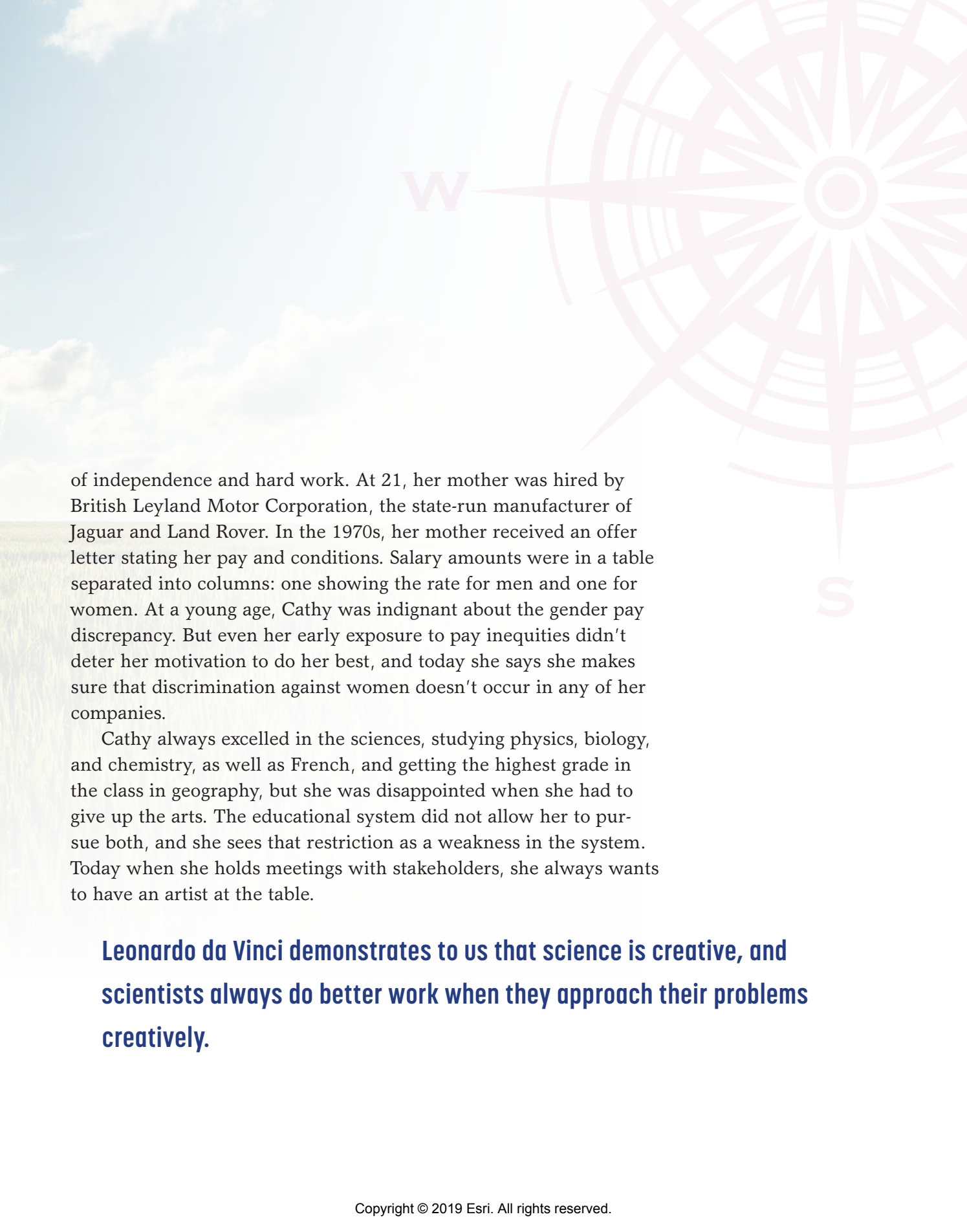
ON ONE OF HER FIRST PROJECTS AS AN ENVIRONMENTAL CONSULTANT

on Australia's West Coast, Dr. Catherine "Cathy" Ball was struck by how difficult it was for scientists to monitor various animals on land and in the sea. It occurred to her that scientists should be able to get their data more easily and more safely. Perhaps she was inspired by the aerial images from David Attenborough's documentaries of the natural world that she had enjoyed as a child. Perhaps it seems like an obvious use now but using drones for this research hadn't been done before.

In 2013, Cathy envisioned reconnaissance aircraft that was being used to search for insurgents in Afghanistan instead being used to track and monitor turtle colonies. She educated stakeholders and overcame naysayers so that her team could fly human-size remotely piloted aircraft systems (RPAS), commonly called *drones*, hundreds of kilometers to track turtle habitats off the west Australian coast and, in the process, spotted endangered animals such as oceanic manta rays not seen by researchers in years. She learned a lot about what kinds of people she needed on her team to complete projects such as this one successfully. Now she leads five start-ups in Australia, all driven by values, with plans to go global.

She has come a long way from Nuneaton, a small town in the West Midlands region of England. Raised in a single-parent household, Cathy credits her mother with inspiring in her a strong sense






of independence and hard work. At 21, her mother was hired by British Leyland Motor Corporation, the state-run manufacturer of Jaguar and Land Rover. In the 1970s, her mother received an offer letter stating her pay and conditions. Salary amounts were in a table separated into columns: one showing the rate for men and one for women. At a young age, Cathy was indignant about the gender pay discrepancy. But even her early exposure to pay inequities didn't deter her motivation to do her best, and today she says she makes sure that discrimination against women doesn't occur in any of her companies.

Cathy always excelled in the sciences, studying physics, biology, and chemistry, as well as French, and getting the highest grade in the class in geography, but she was disappointed when she had to give up the arts. The educational system did not allow her to pursue both, and she sees that restriction as a weakness in the system. Today when she holds meetings with stakeholders, she always wants to have an artist at the table.

Leonardo da Vinci demonstrates to us that science is creative, and scientists always do better work when they approach their problems creatively.

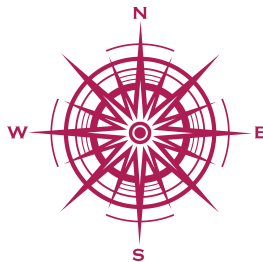


As she was growing up, certain events affected Cathy and influenced her life choices. Watching *Live Aid* on television as a girl made Cathy wonder how there could be such famine and suffering in the modern world. She thought she would go into medicine but changed her mind later during her gap year between high school and college. In the late 1990s in Zambia, Cathy witnessed what seemed like an entire generation disappear because of the spread of the killer disease AIDS. She realized that medicine wasn't enough and decided that environmental health was a better option for people and the planet. She was also influenced by the Piper Alpha oil rig explosion, which killed 167 workers in July 1988 in the North Sea off the coast of Scotland. Primarily caused by human error and miscommunication, it remains the world's deadliest oil rig accident and was the cause of improved safety regulations. Her father had been working on another oil rig in the North Sea at the time, and the disaster underscored Cathy's commitment to the environment and to working safely.

Cathy attended the University of Newcastle-upon-Tyne (now Newcastle University) in the United Kingdom (UK), obtaining a bachelor of science with honors in environmental protection and a PhD in spatial ecology, and descriptive and predictive statistics. Her mother worked hard to send her to school, where Cathy always held two part-time jobs to cover fees and living expenses. Once Cathy completed her education, she had to find a job to pay off her debt, and it looked as if becoming an environmental consultant for a corporation was the way to go. She says, "At that point, debt was making the choices for me."

During the next 10 years, Cathy worked as an environmental consultant with various corporations in the UK and Australia. Her skills and qualifications were equivalent to a passport, and, as a single woman, she thought "now or never" and made the leap across the world to Australia. Her innovation to use drone technology led to a promotion that allowed her to move across Australia to Queensland, a region that is now a global leader in the use of drone technology, spurred by Australia's airspace regulations that allow for developing smarter drone operations commercially.

[US President] John F. Kennedy once said, “Conformity is the jailer of freedom and the enemy of growth.” I was taught to conform, but I’ve always been a free spirit at heart. [At that job] I had mentally left the building, and I no longer wanted to be in the system. I realized the only thing I could rely on was myself. I had been using my brain and my brand. But I wanted to be more than a replica of the system that I left. So I took my brain, my brand, my heart, and my gut, plus my ideas about how the world could be a better place, and I found myself on a winding, bumpy path of running five start-ups.



Although successful in various consulting positions, Cathy felt confined. She was still paying off her student debt, and although she wasn't climbing the corporate ladder and wasn't challenged by the work, she still thought it was the smartest way to go forward. Shortly after being awarded 2015 Telstra Queensland Business Woman of the Year for her innovation with drones, Cathy was laid off from her job. She recalls one sleepless night, getting up and staring in the mirror, and at that moment, she suddenly understood the paradox of an immovable object meeting an unstoppable force and saw clearly that she was letting fear make her decisions for her. She knew then and there that she could rely only on herself. Going back to bed, she was able to get some sleep—and hasn't looked back since.



Entrepreneurs need to be fleet, active, prescient, and willing to give it a go. Risk is just part of it. I am more fearless now than ever before.

Cathy is a scientist who became an entrepreneur, speaker, author, and innovator. Being an entrepreneur gives her more choices, she says, and she likes having control over her life.

Cathy currently manages five start-up businesses: Remote Research Ranges (RRR), the World of Drones Congress, World of Drones Education, the *Gumption Trigger* book project, and One Planet Woman. All are values-based businesses, which means they uphold integrity for the planet, Cathy says.

Cathy founded and is executive director of RRR, an advisory firm to international businesses, state, federal, and local governments, and schools, charities, universities, and parks. The firm advises on drone technology, big data management, and geoethics, the ethics around geospatial data. An expert in understanding drone technology, Cathy says the important thing is how the technology is used. She stands firmly for the #dronesforgood movement, whether it's bringing food to devastated villages in war-torn or disaster-affected countries, monitoring power lines, seeking people lost after a cyclone, or rescuing swimmers at sea.



Cathy leads the World of Drones Congress, which hosted over 1,200 delegates in 2018. The Premier of Queensland launched Australia's first statewide drone strategy. Additionally, the Australian National Drone Safety Forum was initiated.

The World of Drones Congress, first held in Brisbane, Australia, in 2017, supports the growing drone economy across the Asia Pacific region. Frustrated by the lack of business conversations around drone technology, Cathy envisioned a business, legal, investment, and ethics conference to help professionalize the drone industry by focusing on how drone technology could be used to keep people safe and generate new sources of revenue. She met with business partners who agreed with her vision and thus started the conference to connect people and facilitate the industry's development. Cathy expects the congress to be long running and expand internationally. World of Drones Education is the education and training start-up app related to the congress.

Educating girls and boys about drones is important to Cathy.

She wants to see a world where just as many females as males are engaged in science, technology, engineering, and math (STEM). Currently women make up less than 1 percent of the global drone industry.

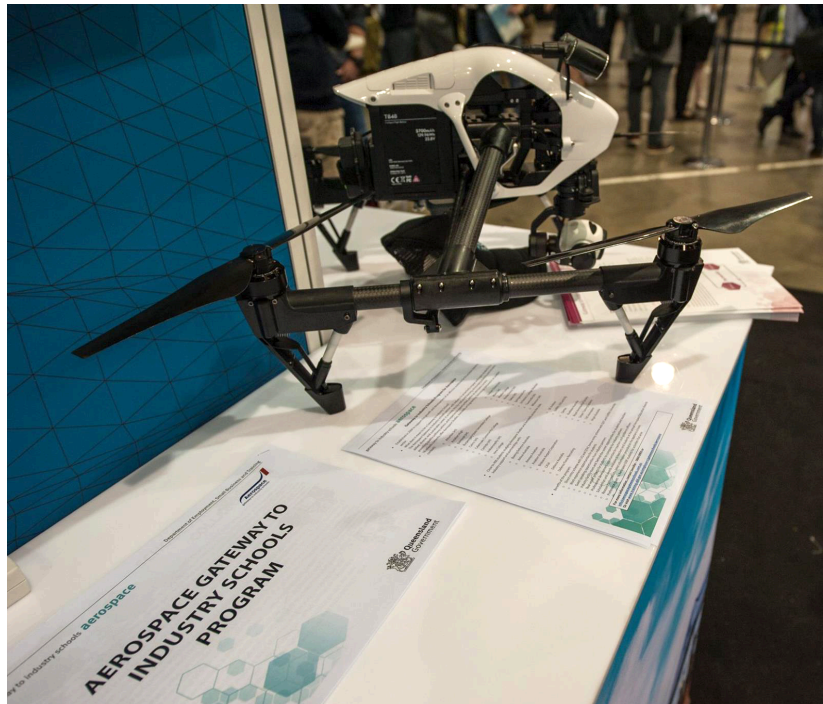
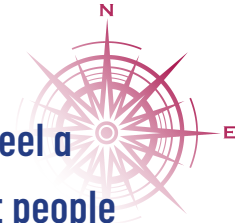


Image by AustralianMiniadventures

In 2016, Cathy crowdfunded and curated *Gumption Trigger*, a collection of stories by Australian women who have overcome obstacles through determination and gumption. Their stories of resilience serve to inspire other women working to realize their own dreams.

Through One Planet Woman, Cathy advises other start-up businesses and arranges speaking engagements.

Cathy wants to change the world, even though people tell her she can't.



If you believe you can't change the world, you certainly won't. I feel a responsibility to make the world a better place. I have heard that people have more regrets in life for things they haven't done, so I am doing all I can, even if I fail or make mistakes. My motto is: She who dares, learns. We can create change from outside the system that influences the system.

In 2017, revenue from her start-ups exceeded \$1 million.

Sometimes Cathy finds she needs to be patient while those around her catch up to her vision. But it is worth the effort, she says, because she knows that she will not go far without the collaboration of others.

She and her husband are busy raising their infant son—it could almost get overwhelming, she says, but Cathy has a great reservoir of energy and vision that keeps her going. She imagines that her 12-year-old self would have been astonished to see her now. Young Cathy would not have allowed herself to dream quite this big. As an adult—as an accomplished speaker and networker, an innovator, a creator, a champion of social justice and the environment—Cathy is creating opportunities to change the world. She wants to leave some good behind and feels confident she will.

She reminds us:

All of us need to support the outliers because they are the ones that create a better future. ✨

Ranu Basu

Seeking human interconnectedness on a global scale

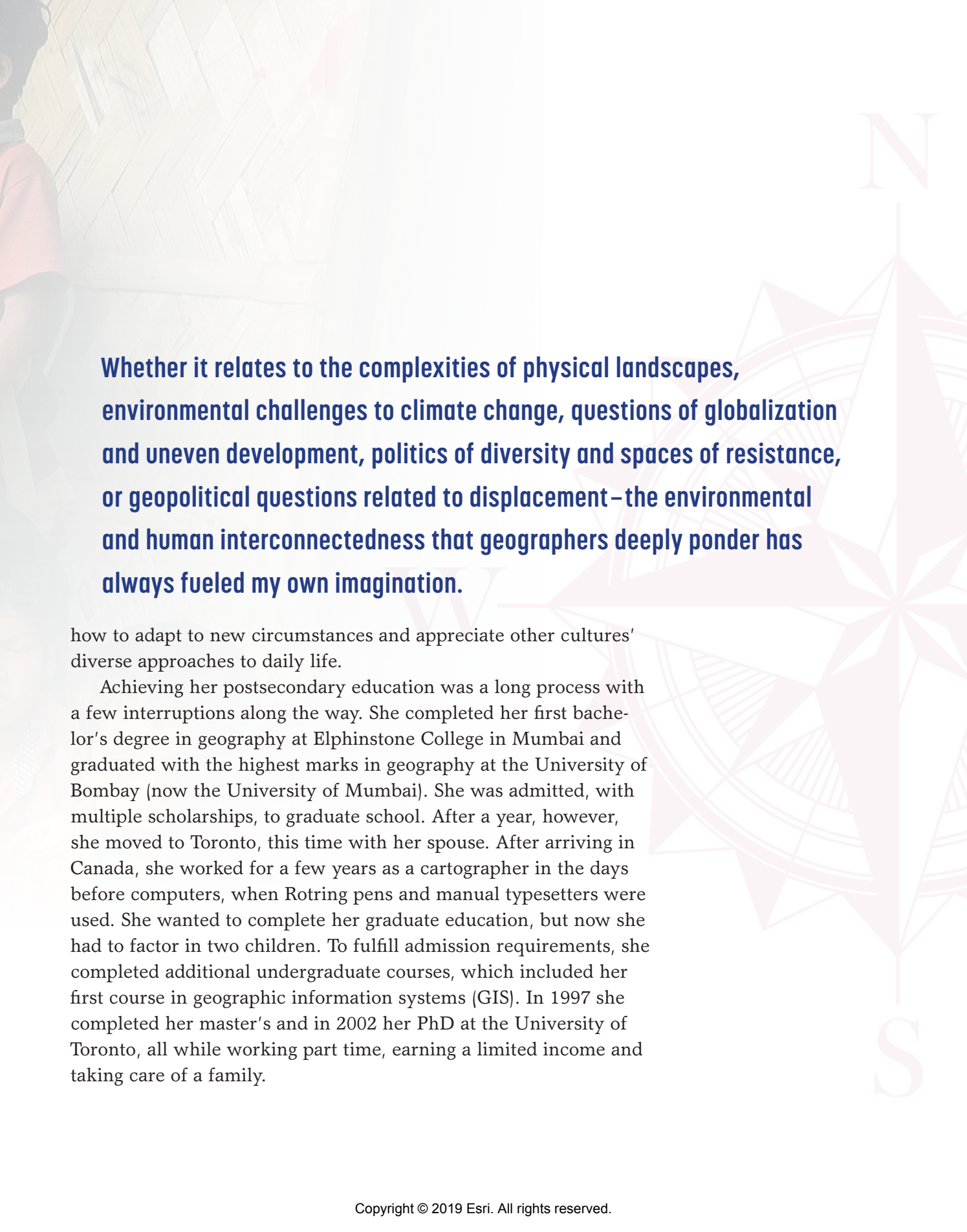


IN HER WORK, RANU BASU STRIVES TO BRING LIGHT TO COMPLEX QUESTIONS

related to contested spaces of power and resistance. She unravels the geographies of communities that are displaced or marginalized because of systemic inequities and disparate levels of power. As an urban, social, and political geographer, she has lived and engaged with a global community and is deeply committed to understanding the stories, maps, and data that are part of broader social and transformational change. As a feminist geographer, she understands and communicates the values of diversity, power, and activism in her work and lives her life immersed in and inspired by the experiences of many different communities.

Ranu has long been fascinated by the mysteries of geography and the power of maps as discursive and strategic instruments for change.

Because of the nature of her father's profession working in a multinational company while she was a child, Ranu and her family moved frequently—from Canada to Peru to different parts of India and then back to Canada. Ranu never attended a school for more than three years at a time, and it seemed as if she was always going through a difficult process of adjustment and readjustment while she learned to read and write in a new language, make new friends, and adapt to new cultures. Yet this dislocation helped her learn



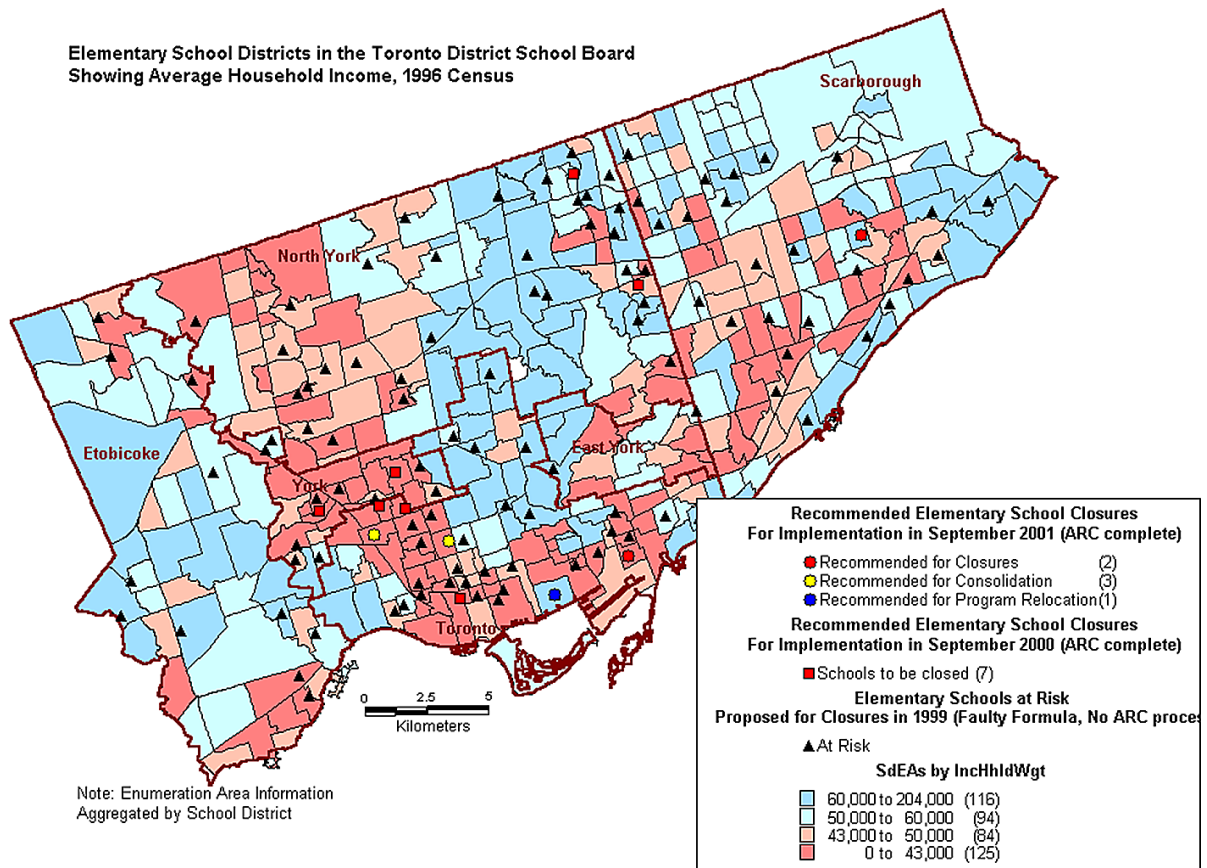
Whether it relates to the complexities of physical landscapes, environmental challenges to climate change, questions of globalization and uneven development, politics of diversity and spaces of resistance, or geopolitical questions related to displacement – the environmental and human interconnectedness that geographers deeply ponder has always fueled my own imagination.

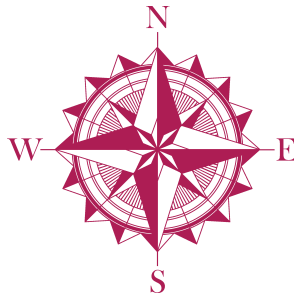
how to adapt to new circumstances and appreciate other cultures' diverse approaches to daily life.

Achieving her postsecondary education was a long process with a few interruptions along the way. She completed her first bachelor's degree in geography at Elphinstone College in Mumbai and graduated with the highest marks in geography at the University of Bombay (now the University of Mumbai). She was admitted, with multiple scholarships, to graduate school. After a year, however, she moved to Toronto, this time with her spouse. After arriving in Canada, she worked for a few years as a cartographer in the days before computers, when Rotring pens and manual typesetters were used. She wanted to complete her graduate education, but now she had to factor in two children. To fulfill admission requirements, she completed additional undergraduate courses, which included her first course in geographic information systems (GIS). In 1997 she completed her master's and in 2002 her PhD at the University of Toronto, all while working part time, earning a limited income and taking care of a family.

On every step of her journey, she was encouraged and supported by her spouse and the community around her. "A child-care center with wonderful caring staff at the university allowed me to pursue my studies with confidence while a network of women provided a community of support in my neighborhood. The neighborhood was home to primarily migrant working-class communities with extended families, including many grandmothers! As childcare was expensive, an informal and unspoken culture of caring and watching each other's children was the norm. Doors remained open, and children ventured into and out of each other's homes. Food was shared, carpooling [was] regular, homework space [was] open, and celebrations were galore! Writing a dissertation (on the neoliberalism of education and politics of school closures in Toronto) in the midst of this made it all seem so much easier!"

Ranu created this map showing school closures in Toronto as part of her dissertation.





GIS is not just a descriptive mapping exercise leading to the production of visually appealing and powerful maps, but a deeply heuristic process that requires reflexive and theoretical consideration. I thus try to impart to my students the importance of using a “critical eye” when reading and analyzing maps; and to reflect carefully on the underlying historical/economic spatial processes and political/social structures that lead to such outcomes and [their] broader implications, whereby questions of inequity, stigmatization, and oppression are not further reproduced through the process of careless mapping and interpretation.

The faith that her PhD supervisor, Professor John Miron from the University of Toronto, and other mentors placed in her also gave Ranu strength and supported her through the challenging years. "Prof. Miron was a pioneer in the field of GIS in human geography (when GIS was primarily restricted to physical geography) and spatial statistics in location theory. He taught me not only the methods and means of empirical inquiry using GIS in the social sciences, but also the many challenges of GIS mapping and cartographic representation, especially in human geography," she says.



One aspect he emphasized, which is often ignored with the large proliferation of data and ease of mapping, is questions of how the process of mapping needs critical interrogation both technically and philosophically, as there are issues of ethics and privacy that need to be carefully considered.

Currently associate professor in the Department of Geography at York University, Ranu's research and teaching interests relate to the geographies of marginality, diversity, and social justice in cities; power, space, and activism; critical geographies of education; social sustainability and the meaning of public space as it relates to migrants; and the provision of infrastructure for marginal groups in suburban regions. She explores these various themes through her research, activism, and writing projects.

Recently, she embarked on a five-year Social Science and Humanities Research Council of Canada-funded project titled *Subalterity, Education, and Welfare Cities* that traces the historical and geopolitical impacts of conflict and displacement on cities and schools in Havana, Cuba; Toronto, Canada; and Kolkata, India. Ranu has served on executive boards at her university for many years, including the Centre for Refugee Studies (CRS), the City Institute at York University (CITY), and the York Centre for Education and Community (YCEC), and currently serves on the York Centre for Asian Research (YCAR) Executive Committee.



Ranu visits an old schoolhouse at Biran Farm, Cuba.

Ranu, who says she enjoys the privilege of working with many committed and talented colleagues and students at York University, is deeply inspired by the communities she has observed in Cuba and India. She has met diverse groups working passionately to build a socially just society, maintaining their high ideals and standards as they face constant challenges on a daily basis. For instance, in Cuba, despite over five decades of an economic blockade, the educational and health-care systems are world renowned because of the commitment and solidarity of its people. In Kolkata, teachers in municipal schools speak of their daily challenges yet remain determined to bring children who are street vendors into their classrooms, even if for only a few hours. In Toronto, local migrant communities organize to build subaltern cosmopolitan communities of support sharing common experiences of exile and pain.

The field, she notes, is a place of learning/unlearning, activism, and critical reflection. Using a method termed *spatial phronesis* (including work in GIS), which involves practical wisdom gained from ethnographic inquiry, reflexive observation, and active participation, she spends time in libraries and archives, collecting

data from diverse sources. Ranu also works alongside educators in the classroom and participates in social and political events. One of her favorite experiences was in Kumirmari, a remote island in the Sunderbans at the confluence of the Ganges and Brahmaputra Rivers and at the edge of the vast Sunderban forest, home of the Royal Bengal Tiger and other wildlife. Ranu's mother had also spent many childhood years in Kumirmari prior to India's independence. Over time the island has experienced many challenges—from flooding disasters, constant migration flows, and political unrest to abject poverty and developmental conundrums. For Ranu, working with

Ranu with schoolchildren on the Sunderban island of Kumirmari, India.



the educators, children, and residents on the island was a transforming experience—personally, intellectually, and politically.

Ranu encourages young women to follow their own inspirations, to persevere and constantly challenge themselves, and to not let anyone disillusion or discourage them. She advises them to be astutely aware of historical and structural conditions that lead to disadvantage or privilege. She advises women to find allies and build networks of support, and to engage in “slow scholarship”—a feminist movement advocating for a slower pace and supportive scholarship allowing the time to be reflexive while living, thinking, and experiencing academic life more holistically. And she encourages them to take time to unwind and have fun.

Ranu will continue to explore questions of equity and social justice, rationality and power relations in planning decisions, and trends in geopolitical displacement resulting from violence and conflict. She wants to raise awareness of systemic impediments such as race, class, and gender divides that continue unabated and the resistance that follows from within. In the future, she envisions further engaging in community mapping with GIS in refugee camps and remote communities and schools as a critical political and empowering tool.



We need to build a society of support systems and international solidarity that takes care of its most vulnerable populations, especially those who have been forced to the margins. In a world driven by market logic, women often continue to bear the brunt of additional societal challenges related to social reproduction inequities and precarious working conditions, violence, and exclusion. *