OUR SOUTHERN LOCATION

SOUTHERN OCEAN

SOUTHERN SKIES

BIODIVERSITY

UCT recognises the unique geographic position and context of our institution. Located at the tip of southern Africa, the university has three oceans on its doorstep, the great southern skies above and the most diverse floral kingdom in the world. Focusing on our location and its resources as a strategic research area, UCT is well placed to address the unique challenges and opportunities presented by our geography. This includes studying the environmental dynamics of southern Africa, developing solutions to address the region's challenges and opportunities, and translating global goals on curbing biodiversity loss into locally relevant, achievable Africanised targets.

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SOUTHERN OCEAN

UCT's proximity to the cold Atlantic and warm Indian oceans and to the vast, pristine and ecologically significant marine environment of the Southern Ocean, presents unique opportunities for researchers to study the intricate dynamics of this oceanic region. Our researchers have contributed to increased understanding of climate change, oceanography, and marine life. They also support the development of sustainable policies and practices to protect and preserve the ocean's delicate ecosystems.

MARINE AND ANTARCTIC RESEARCH CENTRE FOR INNOVATION AND SUSTAINABILITY (MARIS)

MARIS uses ocean biogeochemical and numerical modelling to understand ocean productivity, atmosphere–ocean interactions, ecosystem function and polar climate, and climate change impacts on marine ecosystems.

NANSEN-TUTU CENTRE (NTC) FOR MARINE ENVIRONMENTAL RESEARCH

The **NTC** is hosted by the Department of Oceanography. It develops and implements operational oceanography and methods of data integration into models in the South Atlantic Ocean, the Indian Ocean and the Southern Ocean. NTC focuses on ocean state, marine environmental and ecosystem modelling.

Southern oCean seAsonaL Experiment (SCALE)

SCALE is a novel interdisciplinary research expedition that spans decades and seasons in the south-east Atlantic sector of the Southern Ocean. These long-term and experimental observations contribute towards a greater understanding of the role of fine-scale dynamics in shaping the phasing and magnitude of the Southern Ocean seasonal cycle through innovative integrated experiments using ships and robotics.

SEAmester

Dubbed as 'South Africa's class afloat', **SEAmester** introduces marine science as an applied and cross-disciplinary field to students. Its long-term vision is to build capacity within the marine sciences. The strength of SEAmester is that postgraduate students combine theoretical classroom learning with the application of this knowledge through ship-based and hands-on research. The state-of-the-art research vessel, SA Agulhas II, provides the ideal teaching and research platform for SEAmester; its size, comfort and shipboard facilities allow large groups of students and lecturers to productively interact over a period of 10 days.

FITZPATRICK INSTITUTE OF AFRICAN ORNITHOLOGY

Almost one-third of all seabirds are on the global Red List and they comprise nearly half of all threatened birds in South Africa. The **Fitzpatrick Institute's seabird research programme** assesses the severity of threats faced by seabirds and attempts to provide practical management solutions to reduce these threats. Southern Ocean species are mainly threatened at sea by fishing mortality and climate change, and by invasive species on land. Monitoring seabirds provides a window into the health of the Southern Ocean.

SOUTHERN SKIES

UCT research in this area spans stellar and galactic astrophysics, and extragalactic astronomy, and extends into the fundamental physics that underly the nature of the universe. UCT also plays a leading role in the Square Kilometre Array, which on completion will be the largest and most sensitive radio telescope ever built. The Department of Astronomy – the only dedicated university-based astronomy group in South Africa – and the High Energy Physics, Cosmology and Astrophysics Theory Group are two groups that undertake this research.

NATIONAL ASTROPHYSICS AND SPACE SCIENCE PROGRAMME (NASSP)

NASSP is a multi-institution consortium between university and national facility partners with an aim to produce MSc graduates with the appropriate skills to continue with PhD studies in astronomy, astrophysics and space science. UCT hosts one of the three nodes, and together the bodes will develop capacity to support the South African government's significant investment in astronomical facilities and infrastructure, including the Southern African Large Telescope (SALT), the MeerKAT radio telescope, and the Square Kilometre Array (SKA).

MEERKAT LARGE SURVEY PROJECTS

Besides leading many research projects on SALT as principal investigators, members of the UCT Astronomy department lead four of the ten **MeerKAT Large Survey Projects**. These will add up to an investment of about one-third of all the time available on MeerKAT over the first five years of its operation. The MeerKAT array is the pre-cursor to the SKA and will be incorporated in the mid-frequency dish component of the SKA: this places UCT astronomy, its staff and postgraduate students at the very forefront of this research.

SOUTHERN AFRICAN LARGE TELESCOPE (SALT)

The South African Astronomical Observatory in Sutherland is home to **SALT**, the largest single optical telescope in the Southern Hemisphere. The reason SALT was erected outside the town of Sutherland, some 370km from Cape Town, is because it is one of a handful of locations in the world that is ideal for stargazing. Here, the dark, unpolluted night skies are so clear they offer perfect viewing and the area is known as the "Gateway to the universe." UCT and a network of scientists are using SALT to study one of the hottest topics in contemporary astrophysics: the origin of gravitational wave mergers.

BIODIVERSITY

The Western Cape has one of the most unique biodiversity ecosystems in the world, the Cape Floristic Region, which includes unique animal and plant life that can only be found in this province. Biodiversity is the key indicator of the health of an ecosystem and is under threat in the Western Cape because of alien invasive species, uncontrolled fires, the encroachment of agriculture and the built environment, unsustainable use and climate change. UCT researchers address the threat to biodiversity in a number of ways from rare collections of plant and birdlife, to conservation and biology. Much of this, deeply situated in the local context, is of global significance.

BioSCape

Regarded as one of the most biodiverse areas on the planet, South Africa's Greater Cape Floristic Region is the subject of a first-of-its-kind biodiversity survey conducted by NASA. The collaborative campaign, dubbed **BioSCape**, has scientists from the United States and South Africa working closely together to map marine, freshwater and terrestrial species and ecosystems within the region. Satellites will gather additional data, while teams on the ground will make observations at locations of particular interest. Ultimately, the campaign will help scientists understand the structure, function and composition of ecosystems in the study area.

FITZPATRICK INSTITUTE OF AFRICAN ORNITHOLOGY

The Fitzpatrick Institute is uniquely positioned to take advantage of the vast untapped biological resources of the continent. Its current research can be broadly placed within the themes of Understanding Biodiversity (evolutionary and behavioural ecology) and Maintaining Biodiversity (species-level conservation and global change). The Institute explores large-scale patterns of biodiversity, primarily among birds, to detect overlooked units of biodiversity ('cryptic' species). The Institute is also home to the Niven Library, Africa's most comprehensive ornithology collection.

INSTITUTE FOR COMMUNITIES AND WILDLIFE IN AFRICA (iCWild)

From contending with apex predators in and around farmlands, to managing inner-city 'pest' animals that thrive in human-transformed landscapes, human–wildlife conflicts are as diverse as they are pervasive. Yet these conflicts exact costs, frequently leading to the injury, persecution and death of wildlife, and even threatening the lives, livelihoods and wellbeing of people. **iCWild** is dedicated to mitigating human—wildlife conflict, improving human wellbeing and protecting biodiversity in Africa. It seeks sustainable, cooperative solutions to conflict by conducting problem-driven research, engaging with key stakeholders to influence policy and practice, and building the capacity of conservation researchers and practitioners.

PLANT CONSERVATION UNIT (PCU)

The **PCU** is a world-class, African-centred research and postgraduate training unit that aims to improve the ecological understanding of Africa's biomes, the pressures facing them and the opportunities for conservation that benefits both biodiversity and people. PCU has several unique projects that contribute to its success. Not only does it have its own palaeoecology laboratory and fossil pollen reference collection, but its repeat photography database is the first of its kind in Africa, integrating a range of methods to reconstruct past environmental change and understand how these processes have shaped today's landscapes.

Photo credits: **Front:** "Cape Point" flickr photo by BasL shared under a Creative Commons (BY-SA) license; **Inside left:** "Albatross and trawler" photo: Supplied; **Inside right:** "SKA" photo: Supplied; **Back:** Photo by Keesstes on Pixabay

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