

Institute for Chemistry and Biology of the Marine Environment
Carl von Ossietzky University Oldenburg

Report

**Research Internship at the
Department of Biological Sciences,
University of Cape Town, South Africa**

8th October 2018 – 30th November 2018



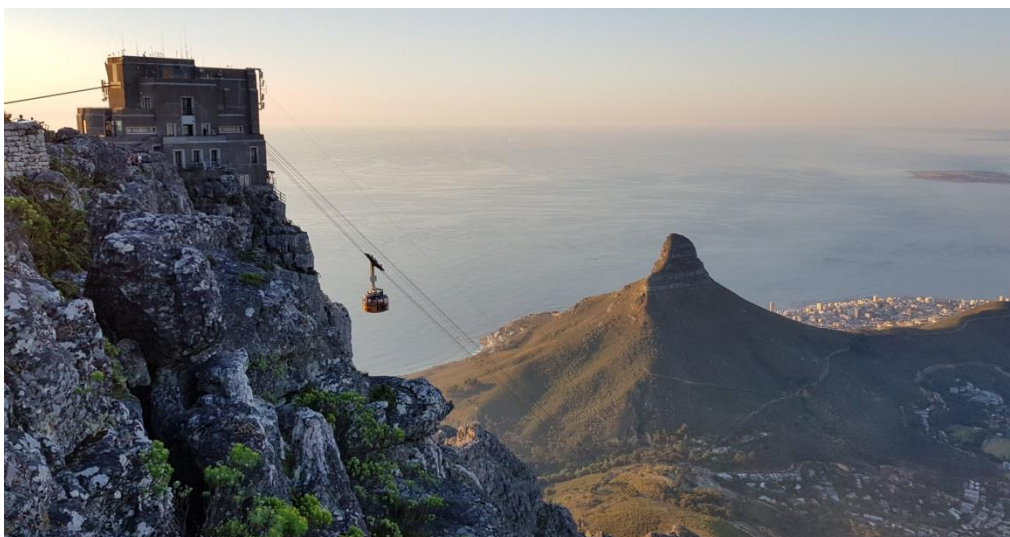
Study Course:
Marine Environmental Sciences M. Sc.

1. Introduction

As stipulated in the curriculum of my master's degree in Marine Environmental Sciences, I spent 8 weeks in Cape Town, South Africa, to complete a research internship at the Department of Biological Sciences at the University of Cape Town (UCT). Dr Deena Pillay, my supervisor at UCT, is doing research in tidal systems by looking at the ecology of benthic communities and how global warming is affecting the food web structures there. It was a great opportunity to gain insight into the research being done at the South African Coast. Additionally, it was an interesting intercultural exchange which gave me the possibility to gather impressions of the challenges and opportunities South African society is facing.

While my task was to do literature research on the Metabolic Theory of Ecology (MTE), the overall interest was to predict possible changes in the local biocenosis and interactions between grazers and plants under the aspect of global warming. Besides the computer work, we had weekly meetings with researchers from the marine research department during a presentation session each Friday. The aim was to get insight into everybody's research by holding short presentations and exchanging critical feedback, thoughts and ideas. During the 7 day visit of researchers from Sweden and New Zealand, we organized an excursion to the Langebaan lagoon, which is located 130 km north of Cape Town on the west coast of South Africa.

In this report I will briefly give an overview on the marine research being done at UCT in the Biology Department and my research on MTE. Finally I will elaborate on the excursion to Langebaan lagoon and my experiences in Cape Town.



View of the Table mountain cable car and lion's head from Table mountain lookout

2. Marine Research at the Department of Biological Sciences, UCT

Each Friday researchers and students of the department meet at the “Marine Chatteries” to listen to presentations about ongoing research or plans on future projects. For instance one student is currently working on mapping the shelf regions around the Western Cape with camera footage and with an identification programme for corals, sponges, urchins and other benthic organisms. Since funding is very scarce for basic research in South Africa, projects like this are invaluable for establishing an understanding and a data base of the region. The Department of Agriculture, Forestry and Fisheries is in close collaboration with UCT and some of their employees are part of the research groups here at the institute.

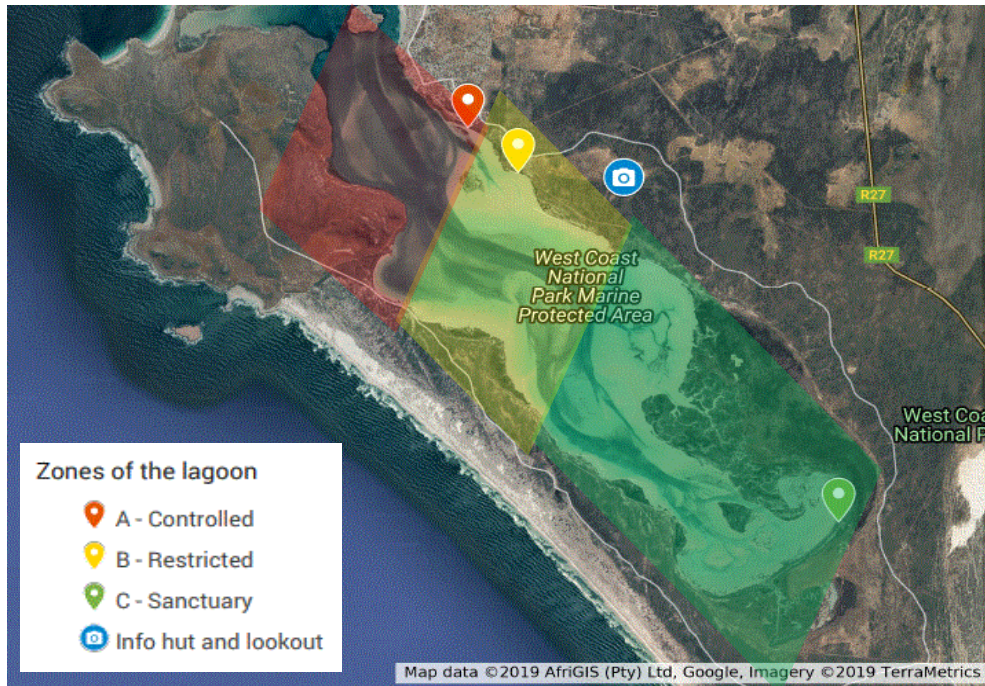
A master’s student supervised by Dr Pillay is currently completing her thesis on the effect of bioturbation by sandprawns (*Callinassa kraussi*) on the water quality in the Zandvlei estuary. This particular estuary is located in False Bay, east of the Cape Peninsula, and is characterized by high density housing. Therefore, high organic pollution and eutrophication due to unauthorized inlets of waste water present a significant problem in the area. This leads to an extensive growth of algae. The sandprawns live in a net-like system of about 1.5 m deep channels in the sandy sediment. The pelagic algae attach to the inner walls of these tunnels and can then be grazed off by the prawns. According to this student’s findings, this leads to a clearly measurable reduction of chlorophyll in the water column. Exciting discoveries like this may lead to improved water management solutions in balance with nature and society.

Bio engineering is also a point of interest in the Langebaan Lagoon located 130 km North-West of Cape Town. Here the bioturbation and sediment solidification by the sandprawn *C. kraussi* and the seagrass *Spartina maritima* have shown to affect the macrofaunal richness substantially. As an extension to this research, Dr Pillay is planning on collaborating with researchers from Sweden and New Zealand to investigate the fauna’s response to environmental stresses like pollution, bait harvesting, temperature rise and eutrophication in the lagoon.



Sandprawn
(*Callinassa kraussi*)
at Langebaan lagoon

In the greater context of bio engineering and global warming, his interest is to find out if on a small scale the Metabolic Theory of Ecology (MTE) would hold true, and if so, for which systems or organisms this would be the case. My task was to gather literature on experiments that tested the MTE in a simple set-up in micro or mesocosms. Weekly meetings with my supervisor were held to discuss my findings so far and which research criteria to use when going through available literature.



Modified Image of Langebaan lagoon in Google Maps, labels indicating our stops in the different protected zones

3. Excursion to Langebaan lagoon

During the first week of November, Dr Candida Savage, University of Otago, New Zealand and Associate Prof Agnes Karlson, Stockholm University, Sweden visited UCT. They are international partners of the marine research institute at UCT and came to discuss plans on future collaborative research as part of the networking program on global change and marine ecosystems. As part of their schedule, a day trip to the Langebaan lagoon was organized. The lagoon is part of the West Coast National Park and is about 15 km long. We stopped at 4 different sites along the lagoon to examine different habitat characteristics of a fully protected area (Zone C), a lookout, a limited recreational area (Zone B) and a multi-purpose recreational area of the lagoon (Zone A).

The most southern part is strongly protected and the public only has access to the beach on wooden platforms that lead to a bird lookout. Here one can observe the flora and fauna of a saltmarsh. Besides a species of the already familiar succulent halophyte *Salicornia* also found in the Wadden Sea and its saltmarshes, there were other succulents, grasses and kinds of heath (*Ericaceae*).



Bird lookout in the saltmarsh of Zone C

The second stop was at a small cottage serving as lookout and a tourist information point about the flora, fauna and history of the lagoon. Each spring, the entire park explodes in different colours during the spring flower bloom. This is always an exciting moment because each year the combination and diversity of



Lookout and tourist info hut in Zone B

flowers and colours varies due to different reproduction rhythms and climatic conditions. From the lookout one can observe nearly the whole lagoon with its shallow beaches and white sand dunes.



View of the lagoon from the lookout during spring (September 2017)

The next stop was only accessible through the private property of a very friendly couple, who have owned and lived in the place their whole life. This might explain their love and passion for the nature surrounding them and why they are very cooperative when it comes to Dr Pillay enquiring to visit the nearly

untouched beaches with his research group. We were greeted with lots of love and listened to their observations of decreasing bird sightings over the past decade. This had also been found by Dr Pillay and colleagues, which is probably a cascading effect of the seagrass loss in the area. The abundance of seagrass dependant invertebrates had drastically decreased close to extinction in some areas of the lagoon. This means, an important part of the bird's prey is gone. In contrast, sandflat species and burrowers have increased in abundance, like e.g. the sandprawn. At the beach we waded into the water to see if we could find any sandprawns or other invertebrates. We found several hermit crabs and exoskeletons of dead sandprawns. On our way back out we got lucky and spotted a bull ray swimming around us before disappearing again.



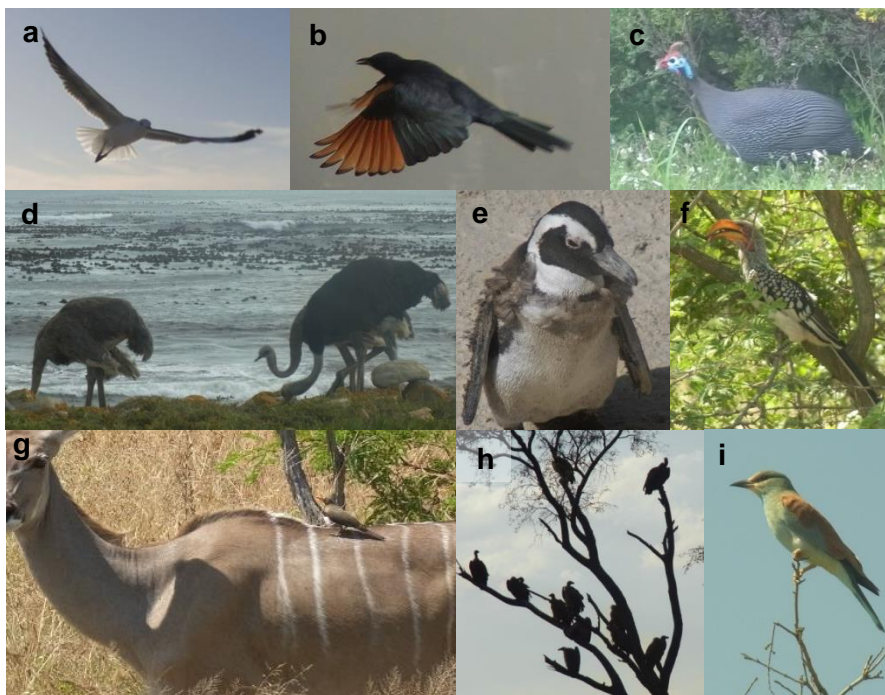
Third stop, Zone B, a private property at the beach



Hermit crab (a), Bull ray (b), holes of the sandprawn (c), hermit crab (d), washed ashore compass jellyfish (e); all found on site B

Our last stop was a public recreational beach, which was occupied by several kite surfers, other swimming guests and a couple of bait collectors. We decided to dig into the sediment to find sandprawns. Here the density of sandprawns was already very high and every dig was a success. This is not surprising if we consider that densities of about 200 individuals per m² are possible. We found hermit crabs as well as mussels and lugworms within the first centimetres of the sediment. The seagrass patches were much smaller or even non-existent compared to site B. The striking observation was though, that sandprawns seem to prefer the stressed or disturbed locations and are much more abundant in those areas than in the protected sanctuary in zone C.

During the whole trip we encountered wildlife ranging from zebras, over ostriches, tortoises, a cape cobra, an impressive spider all the way to bright red and blue poisonous grasshoppers. The diversity in bird species alone was over and over again a surprise and not just exciting to watch for ornithologists.



A small example of the vast array of bird species found around the Western Cape (a – e: seagull, red-winged starling, helmeted guineafowl, common ostriches, African penguin) and in the Kruger National Park in Mpumalanga (f – i: Southern yellow-billed hornbill, red-billed oxpecker on a female kudu, vultures, Madagascar bee-eater)

4. Cape Town – Between mountains and two oceans

During my stay I have been living in one of the student dorms as a guest of the warden in charge there. Therefore I did not have to worry about accommodation costs and also the food costs were carried on 4 shoulders. I had a visitor student card which allowed me access to the main buildings and library as well as the



The UCT Rugby grounds in front of upper campus with Devil's Peak in the background

Department of Biology building. Additionally, the card gave me access to the “Jammie shuttle” service, connecting all campuses of UCT and hence allowing me to move around the main suburbs of Cape Town for free. To get to the upper campus from my dorm, which was located close to lower campus, I could either take the shuttle or go the 1 km by foot. It was a beautiful walk up the very steep foot of Devil's Peak and took maybe 25 min. But after office hours and during semester break it was not advised to walk but to take the shuttle instead due to incidences of robbery. Once getting used to the safety rules, one can concentrate on admiring the breath-taking scenery of this city. The mountain range of Table Mountain National Park is always in sight, offering a wonderful background to the city, beach or port scenery you are finding yourself in. I have not one day felt satisfied with the amount of photos taken of the mountain. Every now and then the mountain really shows off when it slowly lets the table cloth of clouds flow down on its sides. Our weekly hikes up Table Mountain or Lion's Head were always accompanied by photo shootings of various flowers we had not seen yet or animals that we managed to spot. In this context it is also very interesting

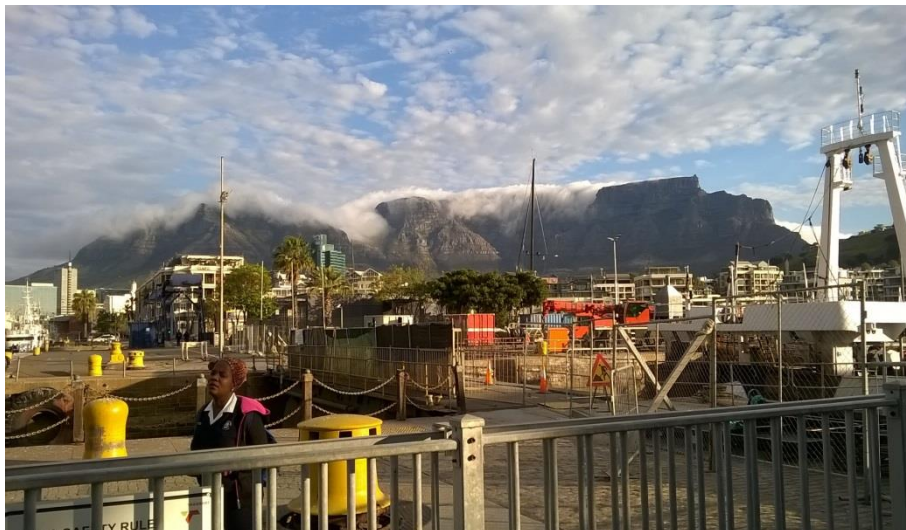


Table Mountain and table cloth seen from the V&A Waterfront



bugle lily (*Watsonia sp.*), king protea (*Protea cynaroides*), red disa (*Disa uniflora*) (from left to right) all found during hikes in the Table Mountain National Park

to watch how the vegetation is changing with increasing altitude. Even just a hike up Lion's Head to about 670 m above sea level leads you through immense changes from little trees, fynbos, heath and succulents to flowers like lilies and proteas. Additionally the seasons will change the picture of course, summiting in the bloom of the huge king protea, South Africa's national flower. South Africa marks the point where two world oceans meet. The Atlantic and Indian Ocean are both influencing the coastline of the Western Cape. The Benguela current on the west coast flowing north and the warm Agulhas current coming down the east coast have formed a very diverse marine life in the Cape. The kelp forests (*Ecklonia maxima*) along the west coast are a vivid example. Since they prefer the cool and nutrient rich waters coming from Antarctica they can only be found up until Cape Agulhas which is roughly marking the border between warm and cold waters.

Apart from the Mother City, I also travelled down to Cape Agulhas, the most southern point of the African continent. It is a very small village which is characterized by fish and chips and tourism. A beautiful board walk leads down along the rocky shoreline to Point Agulhas,



Point Agulhas, most southern point of Africa

where the Atlantic and Indian Ocean meet. After a very quiet stay which I used for nature walks along the rocks of Agulhas and the sandy beaches of Struisbaai I continued to Franschhoek, a very important wine region right after Stellenbosch. The wine regions of the Western Cape appear in general very "posh", not showing any hints of the harsh poverty and unemployment at least 25 % of the people are facing in this country. This region in particular still has the French flair which remained from the first French settlers, which again explains the name Franschhoek. The drive from the coast into the hills of the Western Cape started off with smoothly rolling hills of golden fields as far as the eye can see.



Point Agulhas

After a while the hills got steeper and I passed big dams and reservoirs which are the drinking water supply for the farm lands and Cape Town. I had to climb a proper mountain pass which is called Mont Rochelle and on its saddle point one can finally enjoy a superb view of the Franschhoek valley. The main thing to do here is of course wine tasting. Apart from the classic tasting of different red and white wines, I also tried a food pairing on two occasions. The first included the pairing of 3 red wines with different kinds of biltong and droewors, which is a kind of dried meat, like beef jerky. At the last winery, as a finish, I tasted red and whites with different kinds of chocolate pralines. Another nice twist to the wine tour was that it is partly conducted by an old colonial tram. My personal highlight though was a cheetah outreach, which was at the Grande Provence Wine Estate. For a small amount of Rands I could encounter and stroke one of their 2-year-old male cheetahs called Toby. Their aim is to fund the supply of Anatolian shepherds to the farmers to guard their livestock from wild cheetahs. This way they hope to reduce the number of cheetahs being shot by angered farmers. The 12 male animals held there will not be released into the wild again, because they are all hand raised or at least too habituated to humans and would not be able to survive in the wild.



View of Franschhoek valley with its vineyards during a wine tasting tour

Back in Cape Town I attended the end of semester seminar of the Biology department which invites researchers and workers in the field of biology from across the country to come and speak about their work. We heard from students, professors and rangers about their projects and daily work. One presentation I remember quite well because it was very impressive to me. Edmund C. February, an Associate Professor at the Biology Department of UCT did not just talk about his research in botany but gave an insight into what it meant to grow up as a black man during Apartheid. This was an invaluable talk to help understand South African history and society a little bit better. Recounting his story is of course close to impossible, but the impressions I got and the immense respect I have for him I would like to express nonetheless.



Close up encounter with Toby at the Cheetah outreach at Grande Provence



Associate Prof. Edmund February, January 2018

(Source: www.biologicalsciences.uct.ac.za)

He had always been a rebel; he did not even finish his school and had, understandably, an incredible anger against the inequality of society and the oppression by the white government when he was a young man. His passion had always been the mountain. From an early age on he used to go on hikes and climb in the Table Mountain range. He explored the mountains and walls, found new routes that nobody had taken before and gladly climbed up terrifying walls. This was the only place in the world he felt free. But a lot of areas were restricted for him. They belonged to the Mountain Club of South Africa and they did not accept black people among their members or in their climbing territory. Against all those odds and with a hell of a lot of hard work he managed to finish college later in life, graduate in biology, then in botany, become a successful researcher on vegetation resources and boundaries, climb new routes as a pioneer on mountains all over the continent, later all over the world, become an Associate Professor at UCT and finally also the first black member of the Mountain Club of South Africa obtaining even the gold badge. Up until today he kept his passion for mountains and puts it even before his job as a professor and researcher. But one thing has definitely changed: his immense anger was replaced by an unbelievably positive attitude saying, 'I know you're angry, but let's get over it and move on! We need to forgive, but not forget so we can learn how to do better!'

Of course, there are still many reasons why we should be outraged. Apartheid has left all people of this terribly genius system as victims. Poverty, unemployment, hate and extreme crime rates with a record-breaking 50 murders per day are shaking up the whole country. Even after such a short period of time I could list too many occasions where I could feel the division and racism nearly physically. Living in a white bubble is possible and comfortable, which I also experienced during my visit in Mpumalanga the previous year; leading an almost “western” life behind high walls and high voltage fences. On the opposite, you find the townships with highest unemployment and crime rates. About 45% of black South Africans live in poverty. Around 100 stabbing, mugging and shooting victims every weekend alone in Khayelitsha, one of the biggest townships in South Africa, show how wrong things are going. We spent one Sunday afternoon in Khayelitsha at an outdoor party in front of a mall. Everyone brings their own drinks but buys freshly fried meat from the braai (BBQ), pap (maize meal pudding, like polenta) and chakalaka (tomatoes and beans) there. It was a fun experience. As soon as night falls, you better be on your way out of there to avoid getting hit by one of the gangs that keep the township the unsafe place it is. Also the alcohol is responsible for a lot of escalations among the young men which leads to them ending up in hospital in most cases. No matter how poor or how little people may have, the basic values and wishes are all the same. Nobody wants to get hurt or live in fear of being stabbed or shot for a mobile phone. There is a lot of frustration, that the crime, inequality and bad education are not really being dealt with. Even today, the people from the townships who are employed are usually domestic workers, skilled and unskilled manual labourers or security workers. Our house keeper is from Gugulethu, another township in Cape Town. She got robbed a few times when coming back home from work in the evening. And even though she knew exactly who the perpetrators were, she did not open a case, because it would not lead to anything but maybe a week of jail for them. Afterwards they would go on as before, maybe even seeking revenge. Even though improvements can be noted like government housing which helps to reduce the number of families living in informal settlements and shacks, there are



View of Table Mountain and Twelve Apostles with table cloth seen from Lion's Head summit

still 70% of the township residents living this way today. University is one of the few settings, where true interaction and dialogue is taking place. But in private it is rather rare. Here you only interact as part of everyday life's encounters at the supermarket, the fuel station etc. I have had a quite distinct experience by living with a black non-South African friend. Even the racism against other Africans was at times marked by violent assaults and murders. Apartheid did a very good job in dividing not just skin colours (whites from Indians, from coloured, from blacks) and tribes of the same country and language but nurtured also xenophobia against people from other African countries. Restaurants are the best example of the division that lies so deep still today: black and coloured people are the service staff while the guests are in 99% of the cases white. The government under Jacob Zuma, who succeeded Nelson Mandela, was not helping to relax the tensions among the groups, but rather turned the racism the other way around. Extreme groups of blacks like the EFF are stirring up more hate and revenge notions towards the white. And the white feel disadvantaged because black South Africans are being empowered and preferred to meet the quota under the new black government. It is a very tricky situation and overcoming such a powerful racist system in just 25 years is impossible. Looking back will only create more pain. Looking forward and evolving seems the only right thing to do. And there is so much potential! The universities are fighting to get more black South African students not just to enter University but also to graduate successfully. I have met several alumni from UCT who are now successful advocates for the young generation of South Africa. One of them is Sakhe Mkosi, who obtained a degree at the University of Oxford and won the 1st prize of the Geneva Challenge on employment in 2017. There is a strong and open-minded generation growing. They just need to get a chance to develop. And this is where the main problem lies. The chance for a black South African to successfully go through University is very small. The affordable primary schools are still based on the Bantu Education Act which does not



View of Cape Town from Lion's Head, Table Mountain disappearing under the table cloth while a dassie and a man are sitting nearly next to each other on the edge

prepare them even nearly sufficiently for University. Generations of black people have systematically been isolated from the white and privileged people by schooling them only for certain kinds of labour, a certain social level. The waiter would only ever be able to be a waiter, or a gardener, or a cleaner. Still today, most black South Africans cannot afford to go to any other school but the old Bantu school in the township which has hardly sufficient funding, qualified teachers or resources. Of course there are exceptions to this scenario, but they only confirm the norm.

Politics have never felt so immediate like here in South Africa. People look at each other still in terms of race. Everyone is carrying the weight, the fault, the associations and expectations of the whole race one seems to represent wherever one goes, both black and white. The big gap in wealth is visible on every corner and hard to witness. Yes, there has been happening a lot, e.g. in terms



[Demonstration against President Jacob Zuma in March 2017](#)

of student protests, decolonisation and transformation in universities. But still, there is some way to go. The same generations who had been indoctrinated for decades are still living today, having passed on most of their behaviours, customs and beliefs to the younger generation. On the other hand, we can see the deep hate flourishing in parts of the young white generations, because of a fear they might get killed or their land might be taken back by the “blacks”. It is outrageous what is happening in the far extreme corners of the country. People are on the edge and I could feel this tension at many occasions. I had to think about certain things to say twice because I could feel how heavy each word and its meaning weighs.

But after all that, I have also met a vast number of very positive families from South Africa, black and white, diaspora from Zimbabwe, Senegal, Guinea Bissau, Brazil, Austria and Kenya. They are mostly full of hope and love for South Africa and sometimes even key drivers of change at Universities and in businesses to move this country forward. Cape Town is after all a melting pot, even if it seems a bit of a western bubble compared to the rest of South Africa. It is a very important strategic city for southern Africa and it will hopefully enable the people to keep moving forward and overcome the traumas of the past. In fact, it also is very exciting because history is being written everyday by each new protest, law

passed or decision made. Nevertheless, South Africa is a beautiful country from the point of view of a tourist but I am struggling to imagine living there for good. I always try to grasp and understand a culture and its people as best as possible. I am eager to hear from all sides of the equation and I always ask for the motivation in their doing and their beliefs. Here I have not even come close to a feeling of really understanding how deep the issues still are today and how to deal with them in any way. So, this is why talking about my experiences in Cape Town could not only be reduced to the sights and beautiful views I captured but had to reflect a little bit on my rollercoaster of emotions I went through while experiencing this place and its people.

Coming back to mountains, I would like to close this report mentioning my favourite experience of this trip. My first and only hike all the way from the cable car base to the top of Table Mountain on the India Venster trail was the most breath-taking hike I have ever done: the steep beginning with high steps, the rock climbing, being whipped and swallowed by clouds and wind, watching the vegetation change from dry shrubs to lush green bushes and proteas and finally reaching the flat top in a totally different climate. And of course, again and again the view of the city, the Table Mountain National Park and the wavy coast. Cape Town is a one of a kind City between mountains and two oceans.



My first hike up Table Mountain; breath-taking.