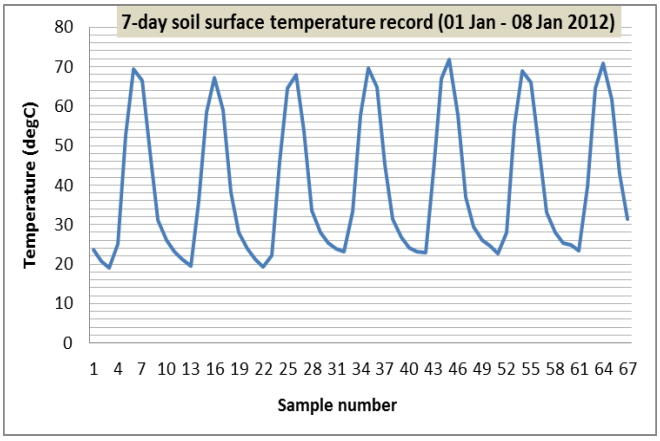
Report on the RSSAf Field Expedition to Gobabeb, Namib Desert

In late April 2012, Don Cowan (President, FRSSAf) and Marla Tuffin (MRSSAf) of the UWC Institute for Microbial Biotechnology and Metagenomics led a 22-strong UWC-NASA team, under the banner of the Royal Society of South Africa, on a 7 day field expedition to the Namib Desert. The NASA team was led by Dr Chris McKay, a world-recognized astrobiologist from the Ames Research Centre at Moffet Field, CA, under the auspices of the NASA global outreach program, *Spaceward Bound*. The core team was strengthened by participation of Prof Ed Rybicki (FRSSAf) from UCT and Prof Brian Jones, a visiting scientist from Genencor International.

The team was based at the Gobabeb Training and Research Centre, ideally sited some 60km inland from Walvis Bay and in a critical climatic region where the western fog and eastern rainfall zones intersect. The Centre is led by Dr Mary Seely, a renowned scientist who has worked on the biology of the Namib for more than 30 years.
The research program focused on the microbial ecology of the gravel plains of the northern Namib Desert. Understanding the structure and function of the desert soil ecosystem in the context of water availability is of immediate relevance due the predictions to imminent climate change. There is also rapidly growing interest in shallow uranium mining across the gravel desert (including within the Namib-Naukluft National Park), and desert habitat rehabilitation has become a priority.

The different faces of the Namib. Left; the bare gravel surface of the western zone. Right: Desert productivity following summer rains in the eastern zone.

The experimental objectives of the 7-day program included the recovery, down-loading and relaunching of iButton arrays which have accumulated a 12 month record of the soil surface and shallow sub-surface microenvironment across the 120km east-west transect. iButtons are capable of recording and storing accurate temperature and %RH data every few hours over a full annual cycle. We noted that surface soil temperatures regularly peaked at around 70^{o}C for much of the summer period.



A parallel study involved the microenvironment and microbial ecology of specialized sub-lithic habitats (hypoliths), found on the undersides of quartz pebbles in the desert pavement. Hypolithic communities are dominated by photosynthetic cyanobacteria, and develop in response to the favourable environmental conditions of the sub-surface, particularly where surface conditions are too extreme to support macroscopic biological structures (such as soil crusts). Hypolithic samples recovered from sites across the entire 120km E-W transect will be used for detailed phylogenetic comparisons using the latest methods of molecular ecology, including Terminal Restriction Fragment Length Polymorphism analysis and ultra-deep (454) DNA sequencing. Such studies aim to develop and understanding of how individual micro-organisms and complex structured microbial communities adapt and evolve under different water availability regimes.

An up-turned quartz rock, clearly showing the hypolithic cyanobacterial crust

Despite the intensity of the scientific program, all members of the team found the time to climb the nearby dunes to observe and photograph the incredible beauty of the desert sunrise and sunset.

Left: Sand ripples in the early morning sub. Right: Two aging professors atop a dune!

Don Cowan, President RSSAF

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