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# COUNTRY LIFE

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Big  
Mouth  
returns  
to the Karoo

Corbelled  
houses get the  
laser treatment

What makes  
STEYTLERVILLE tick?

**13** Ways to  
conquer  
the Overberg

+ Kogelberg  
birding hotspots  
Paul Cluver cycling trails

Summer Stunners  
from CHEF LEON NEL

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# As Safe as Houses

When the Taliban destroyed the Bamiyan Buddhas in Afghanistan, a laser-scanning project began to digitally preserve worldwide cultural heritage sites. It's arrived at the corbelled houses of the Karoo

WORDS AND PICTURES STEVE MOSELEY

**I**t was in the vast emptiness of Karoo scrublands on a sub-zero morning that I first met Bob and Herman. Standing motionless, they seemed unaffected by the icy wind, unlike the rest of us. I admired them from close up. They looked the same, wore matching colour combinations and had a similar mien but, to be honest, seemed somewhat lacking in personality.

Their only movement was a smooth turn of the head as they eyed the surroundings with a penetrating gaze. Neither said a word, but for a continuous hum emanating from somewhere inside them.

They were, for all intents and purposes, identical twins. "We'll just let them boot up and calibrate and we're good to go," said Carl Grossmann, chairman of the African Conservation Trust (ACT).

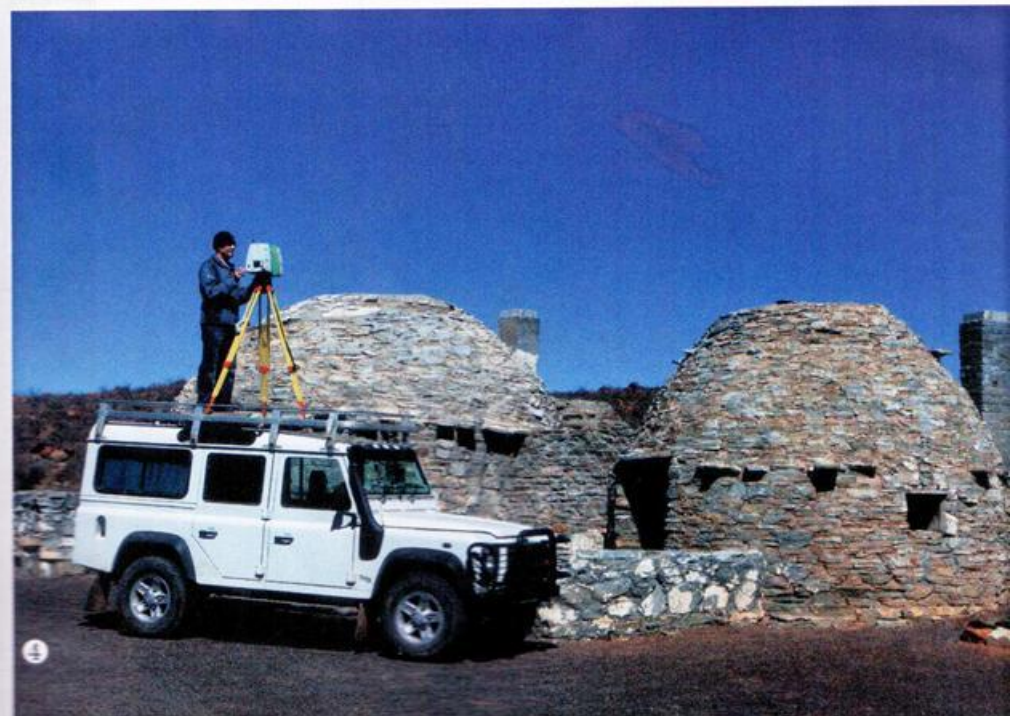
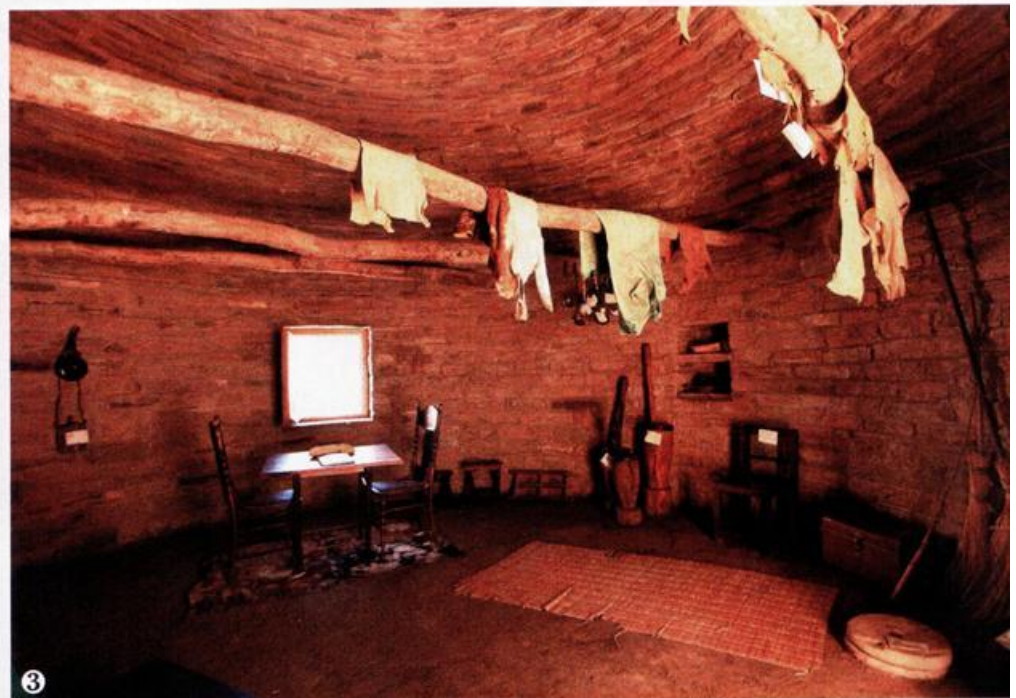
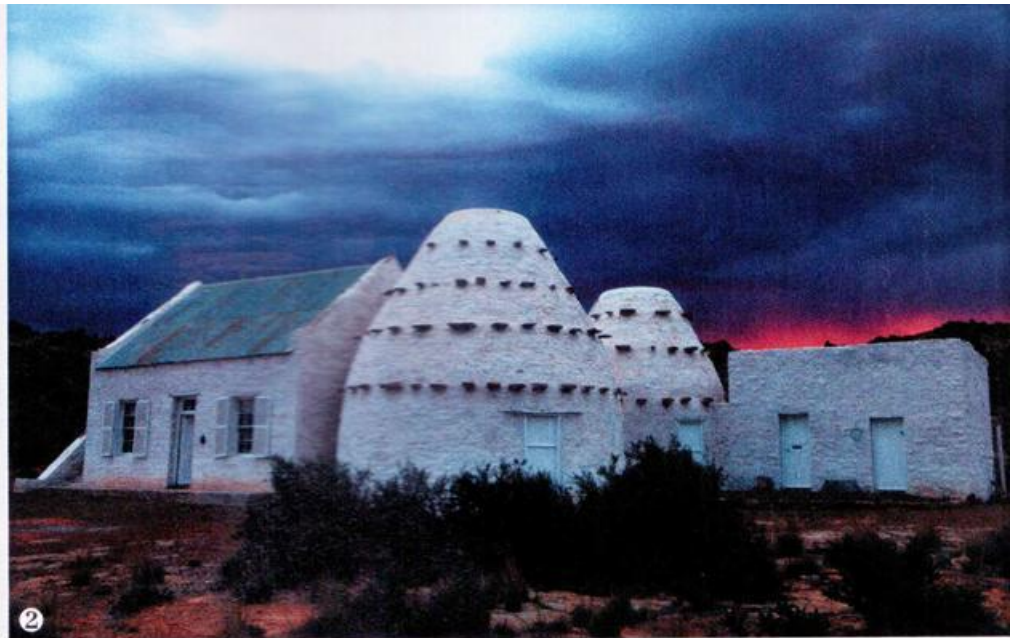
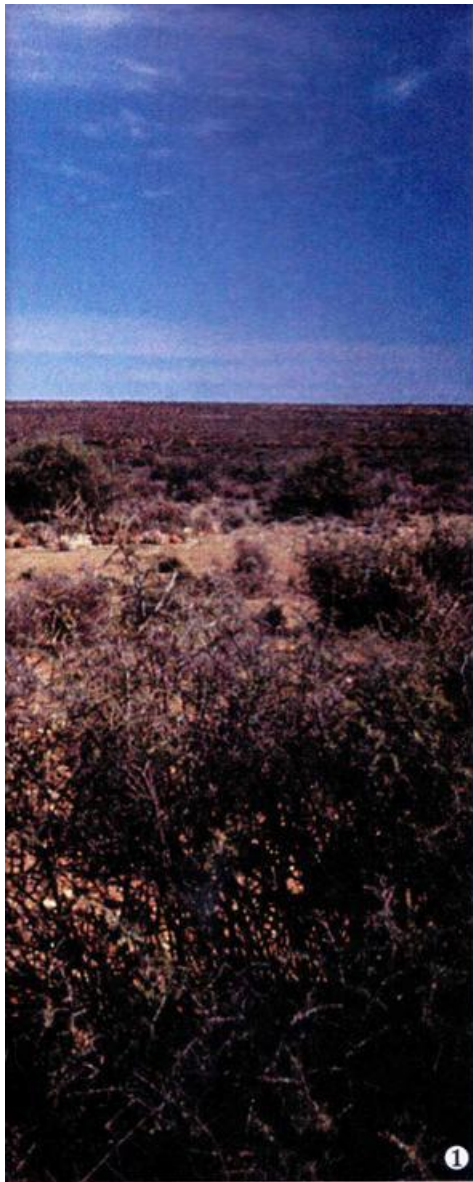
Bob and Herman are two high-tech laser scanners belonging to the University of Kwazulu-Natal, and named after two late professors of the institution. Carl and his team were using them to scan some of the unique beehive-shaped corbelled houses that only occur in remote locations around Loxton, Carnarvon, Williston and Fraserburg. Constructed entirely of flat stones, these buildings were the homes of

farming pioneers who ventured into this treeless area during the 1800s.

The project is part of the CyArk 500 Challenge, which aims to digitally preserve 500 cultural heritage sites from around the world within the next five years. "This is the first CyArk 500 challenge project submitted from South Africa and we were fortunate enough to receive a grant from CyArk to enable us to proceed," explains Carl.

CyArk was founded in 2003, the catalyst for its formation the Taliban's destruction in 2001 of the famous 1 600-year-old statues in Afghanistan, the Bamiyan Buddhas.



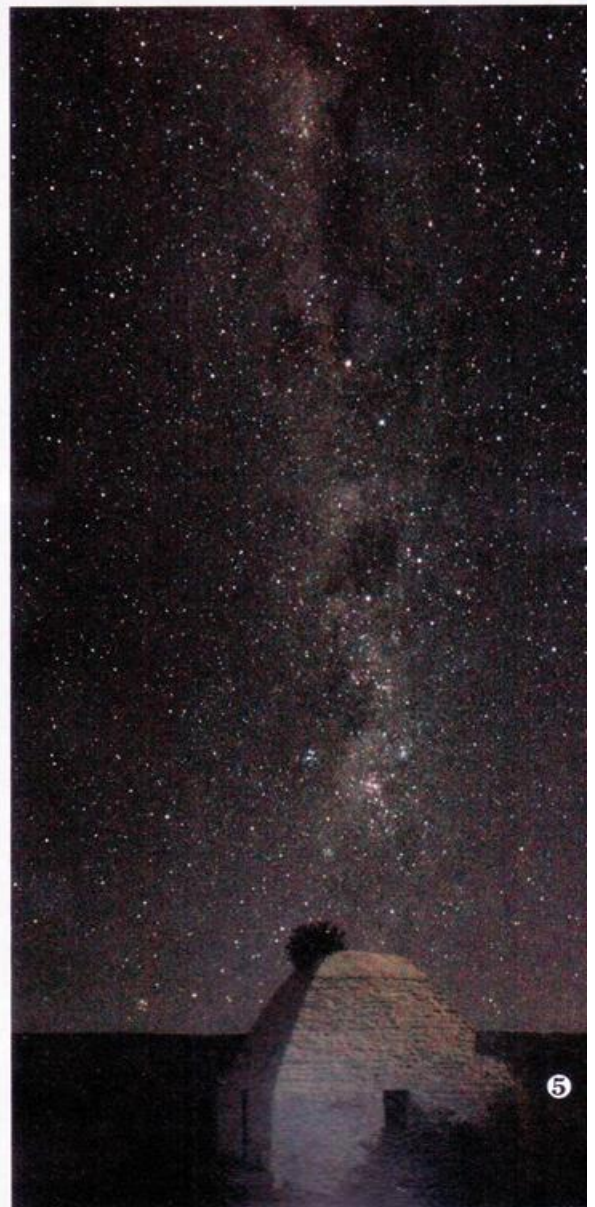
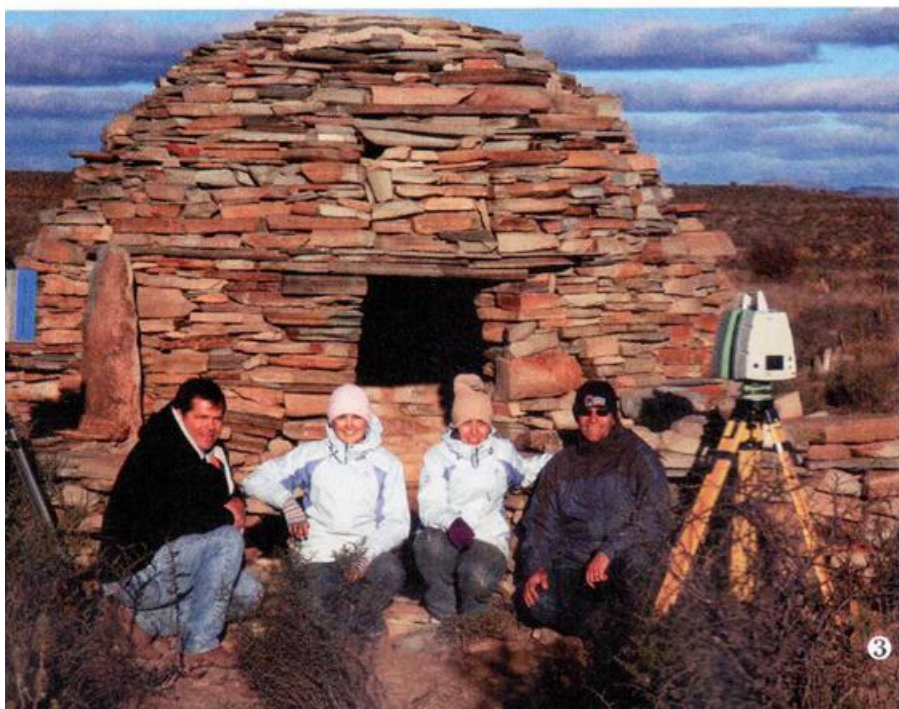
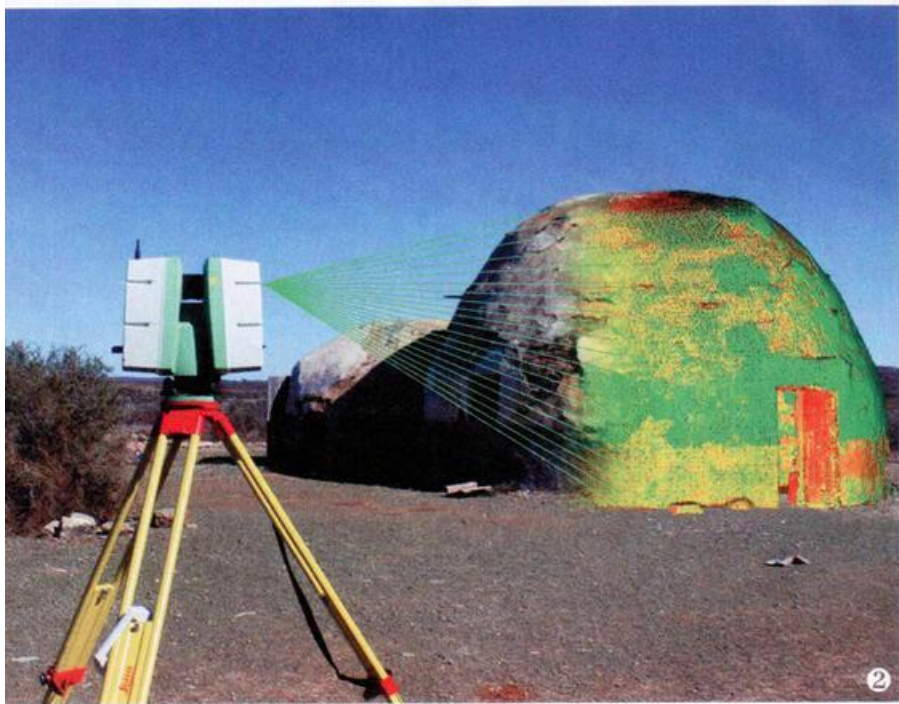
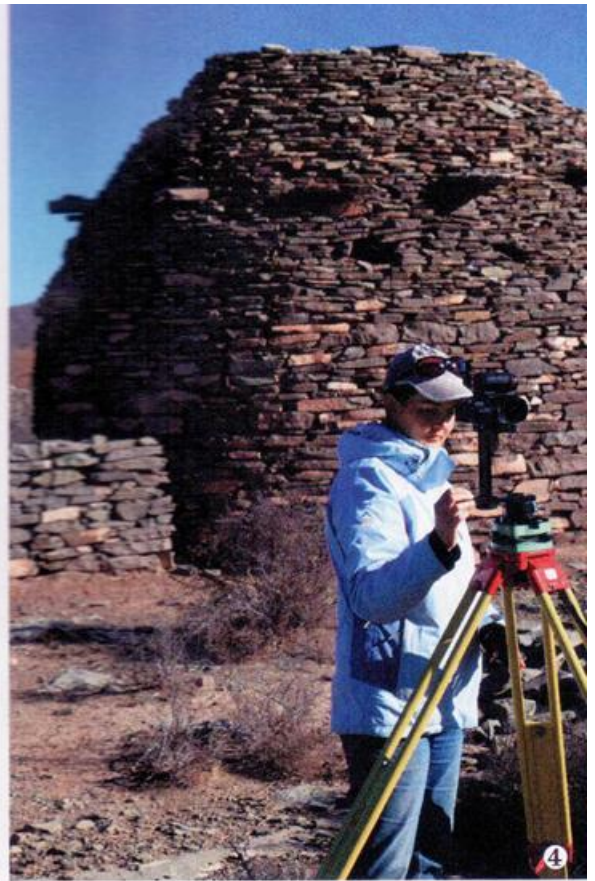
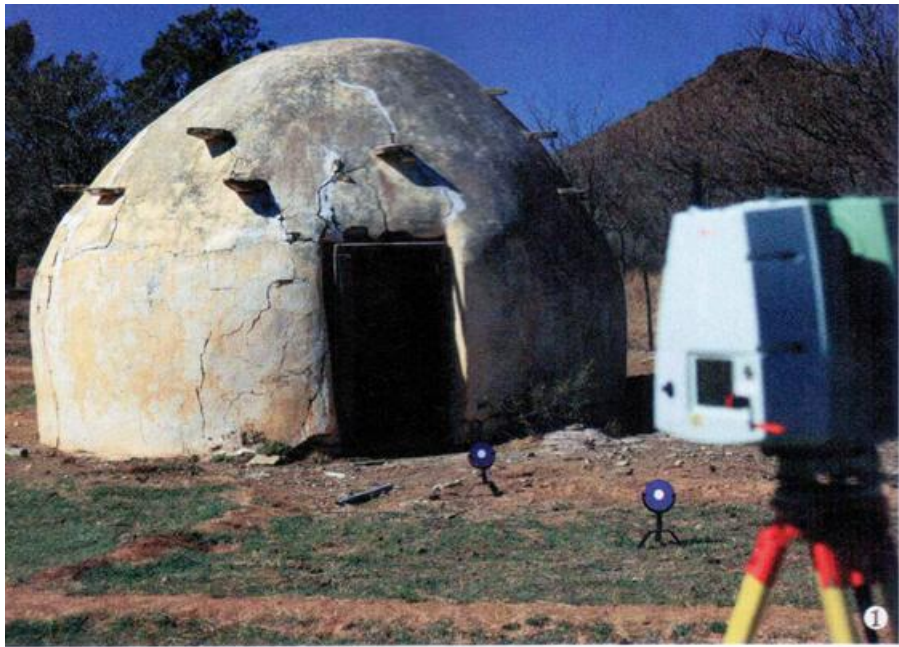


1. The corbelled houses of the Karoo form an important part of the history of the region. This one at Lanklaasleegte outside Williston has wagons similar to those that would have transported pioneers to the area. 2. The corbelled houses at Stuurmansfontein in the Carnarvon district are well-preserved examples and show how, as the family grew, the home developed from a single dome to two domes and, later, had more modern additions as traditional building materials became available. 3. The interior of the corbelled house at Carnarvon Museum preserves some of the meagre belongings used by pioneers in their everyday life. 4. Carl Grossmann uses a vehicle to elevate the laser scanner to scan the top of the corbelled houses at the farm Rietpoort, between Loxton and Fraserburg.

Based in the USA, CyArk operates internationally as a non-profit organisation with a free, 3D, online library of the world's cultural heritage sites before they are destroyed by natural events, human conflict, or the passing of time.

The data will be kept by a data storage company called Iron Mountain, in its secure







off-site record-storage centre in a converted mine shaft in Pennsylvania. This way these important sites will be available to future generations.

"The decision to choose the corbelled houses for digital preservation wasn't a hard one," Carl explains. "We feel they are a priority because of the threat to their long-term existence. Most of these dwellings occur on private land and their condition relies greatly on the landowner's interest in preservation.

"Then there's the ever-present threat of fracking, and the possibility of uranium mining in the area. These could all pose their own associated threats to the structures, many of which are already in a weakened and neglected state. Once these buildings collapse there is no one to repair or reconstruct them as the art of corbelling has died out, with no known local artisans with this skill."

I had guided the project team to a small collection of corbelled houses on an isolated farm an hour's drive from my home-town of Loxton. Embraced by the utter silence and incredible space of the Karoo, we could all appreciate the lonely, simple lives of the famers who had called this home.

Constructing the dwellings and stone kraals must have taken years of sweat and calluses, but all that remains of any habitation here are shards of pottery

and rusted metal bits embedded in the traditional ash heap.

Once Bob and Herman were booted up, the fascinating if somewhat drawn-out scanning began. Once complete, the twins would have captured, in comprehensive detail, every nook and cranny of the structures, both inside and out.

"Each scanner can record, through its rapidly spinning green 'eye', up to 50 000 points per second," explains Michelle Dye, GIS (Geographic Information System) specialist at ACT.

As I would learn over the next week of scanning, the procedure would follow a repetitive pattern. The position from which a scan takes place is called a scan station and there will be several in and around each corbelled house. Before any scanning can begin, small round targets are positioned at fixed points, at ground level or elevated on poles, around the structure.

The position of these is then programmed into each scanner so that it 'sees' them from every scan station. The targets then form the common points through which the various scans are correctly orientated and tied together during the software processing stage. Once programmed, the scanner swivels through 360° at each scan station, recording everything it sees around it.

"All laser scans are stitched together using the common target points and this creates what we call a point cloud of many millions of individual survey points," explains Michelle. "The resultant 3D model is accurate to about 2mm to 5mm

of the actual subject. Once we have the complete 3D model, any measurement data can be extracted as well as cross-sections produced at any point. Through this process, comprehensive data that will enable the rebuilding of each corbelled house surveyed will be preserved in digital archive format."

Once the scan at each scan station is complete, the laser is removed from its tripod and replaced with a digital SLR camera to take a 360° panoramic-sphere set of high-res images. This imagery is then draped over the 3D laser model to produce an exact 3D colour image.

"Because the camera is set up in the exact position as the scanner, an individual colour pixel in the image can be matched to a single point of the laser scan," explains Michelle. There are by-products of the whole process, such as virtual tours from the imagery and digital fly-throughs that can be created in the model. "They're a bit like taking a magic carpet ride through antiquity," Carl quips.

Thanks to Bob and Herman, digital replicas of some of the Karoo's corbelled houses will be preserved for posterity. However, according to Carl more needs to be done. "Although this funding allowed us to record nine corbelled houses, it is imperative that we record the entire known collection of this vernacular architectural style," he says. "There are only about 136 house sites in total and this would place them on the critically endangered list if they were mammals." ■

Map reference G3-4 see inside back cover

1. One of the scanners doing its thing from what is known in the industry as a scan station. The scanner will be moved to at least ten scan stations inside and around the corbelled house to cover every millimetre of the building, so a comprehensive image can be produced. 2. An artist's impression of the Leica ScanStation C10 laser scanner taking corbelled house architecture into the future. 3. The project team (from right to left) Carl Grossmann, Kira McDougall, Michelle Dye and Francios Stroh. 4. Michelle Dye, GIS specialist at ACT, prepares to take a 360° panoramic-sphere set of images to be used to drape over the 3D laser scan, which was taken from the exact spot. 5. Beneath the legendary night skies of the Karoo, many corbelled houses stand abandoned and isolated, far from the present-day homestead.

### Did You Know?

- No one is certain exactly when the corbelled houses of the Karoo were first built, but it is thought to be between 1811 and 1815, with the majority following from 1825 to 1875.
- It is not known who built them or even how this difficult building technique reached the area. Did some building genius – making use of the only material available (flat stone) – discover the technique that evolved with the megalithic builders in the Mediterranean 4 000 years ago?
- More likely, considering similarities to constructions in Southern Europe, is that a craftsman from Portugal or France erected the first building in the Karoo and impressed locals gleaned the know-how and followed suit.
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