

The First Stone of the Extremely Large Telescope

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26 May 2017

President Bachelet, Ambassadors, Ministers Céspedes, Rebolledo and Williams, Members of the Congress, Senator Giannini, State Secretaries, Council President, Council delegates, Mr Astaldi, Mr. Sammartano, Mr Marchiori, Mr Diaz, Mr Alliende, former Directors General Woltjer, van der Laan and Cesarsky, Director General designate Barcons, other distinguished guests, colleagues and friends, it is a pleasure to welcome you at this historic occasion.

It is unfortunate that the very unusual inclement weather prevents access to the platform on Cerro Armazones, so that we gather here in the Paranal Residence.

Let me start by taking you back about 150 years. In 1865 Jules Verne's published a famous book entitled *The Journey to the Moon*. It turned out to be uncannily prophetic, describing an Apollo-sized capsule with three persons on board, launched by a monster cannon located near Tampa in Florida, very close to Cape Canaveral. All at the initiative of an American gun club, with a key role for, yes, a French scientist.

It is probably less well-known that the story also describes the construction of a giant telescope at 4300 metres on Longs Peak in Colorado, in order to be able to see the capsule orbiting the Moon. Verne calculated that this needed a telescope with a main mirror of 4.8 metres, which was fully 2.5 times larger than that of the largest telescope at the time, Lord Rosse's Leviathan of Parsonstown. A bold step! Verne mentions that the telescope tube was 84 metres long and that the entire system was built in a single year. The site had of course to be in the United States for reasons of national pride.

It took a century before Borman, Lovell and Anders orbited the Moon in Apollo 8 in December 1968. And it took eighty years before Verne's giant telescope was built, not in Colorado but instead on Mount Palomar in California, with a improved design. This is the world-famous 200 inch telescope, often referred to as the Big Eye, inaugurated in 1948.

Only 40 years later technology had already advanced sufficiently to gain another factor of two in mirror diameter, and today a dozen fully steerable 8-10 metre class optical telescopes are in operation, including the world-leading Very Large Telescope here on Paranal. It is a distinct pleasure to recognise Lo Woltjer who initiated the VLT project and got it funded and approved, Harry van der Laan who selected Paranal as the site, placed all the major contracts and designed the successful collaborative model for instrumentation development, and Catherine Cesarsky who brought the VLT to full operations. Riccardo Giacconi had a key role during construction, but could not be here today.

Nearly twenty years have passed since first light of the Very Large Telescope, ALMA has been constructed in Chile, on Chajnantor, by an international partnership and is operational, and technology has advanced again. Today we officially start construction of the Extremely Large Telescope. Its dome will have a diameter of 85 metres and a height of approximately 80 metres, so that Verne's telescope tube would fit. However, the ELT has a segmented main mirror with a diameter of an astounding 39 metres. This is a jump of a factor four to five larger than any existing telescope! The collecting area of the ELT primary mirror is nearly 1000 square metres, which is larger than that of all 8-10 metre class telescopes in the world combined. Jules Verne would have liked it!

A revolutionary telescope needs an excellent site, and the choice of Cerro Armazones was the result of a world-wide site selection process, chaired by Rene Rutten, who is here today. The Chilean government generously extended the land donated to ESO in 1995 towards the East, so that it now contains both Paranal and Armazones, and ESO can operate the ELT as part of the Paranal Observatory. The first discussions on this topic were with President Bachelet during her previous term. The process was completed under President Piñera, with key preparatory work done by Ambassador Rodriguez of the Ministry of Foreign Affairs and by ESO's previous representative Tarenghi, both of whom are here. Since then ICAFAL, also represented here, prepared the giant platform and a new access road, so that today we take the next step, again with President Bachelet. I am sure that the location of the ELT in Chile is a justified source of national pride, just as in Verne's story.

The Chilean government carefully protects the quality of the night skies and realises that the international observatories provide training and employment for many Chileans: telescope operators, technicians, engineers, astronomers and administrative staff. Chilean universities have developed internationally competitive astronomy programmes, and some have started engineering programmes for astro-technology, creating capabilities and know-how that will benefit Chilean society more generally. ESO is proud to be associated with this impressive growth of capabilities, which is also reflected by the fact that the President of the Chilean Academy of Sciences, Maria Teresa Ruiz, is an internationally acclaimed astronomer, who will also speak today.

Almost exactly a year ago, ESO signed the largest-ever contract in ground based astronomy with the ACe consortium, consisting of Astaldi, Cimolai and the nominated sub-contractor EIE Group, for the construction of the giant dome and the 3000 tonne telescope structure. Today's event marks the official start of the construction of the telescope structure and the dome of the ELT.

Today also marks the connection of Paranal and Armazones to the Chilean electrical grid. The Chilean Government has helped ESO to find a solution for the supply of power to the Observatory, through the Comisión Nacional de Energía, la Superintendencia de Electricidad y Combustibles, and the Ministries of National Assets and Foreign Affairs and our consultants from MegaRed. The connection to the central grid in Paposo is managed by Grupo SAESA, and I am very pleased that its leadership is here today. The grid connection will reduce costs, provide

greater reliability and stability, and will also reduce the Observatory's carbon footprint.

It has taken 18 years to get to this point, thanks to the efforts of many people all over the world, including former Italian delegate Nanni Bignami who unfortunately passed away very suddenly two days ago.

Roberto Gilmozzi initiated the precursor 100-metre diameter OWL project, Riccardo Giacconi allowed it, Catherine Cesarsky oversaw the careful process that resulted in the start of a full design study in early 2007 for what was, by then, a single European project, and Jason Spyromilio led the extended design effort, carried out with industry in the Member States.

In the years that followed it was possible to convince the 15 ESO Member States to commit significant additional funding for the ELT Programme despite the financial crisis. I am very grateful for this support, which was provided because of the enormous scientific return and ESO's track record in delivering quality. The key authorisation for construction was granted in 2014 under Council President Barcons, who is now the Director General designate.

Two other giant telescopes are planned, the Giant Magellan Telescope on Las Campanas here in Chile, and the Thirty Meter Telescope in the northern hemisphere. Together with the ELT, these telescopes will open a new era of discovery whose implications may well go beyond astronomy. The cooperation between these three projects to address technological challenges is yet another example of international

collaboration for the sake of science. I am pleased to acknowledge our colleagues from GMT and TMT present here for this joint endeavour, as well as for providing the framework of a stimulating and healthy competition from which we all benefit.

The size of the primary mirror of the ELT, and the revolutionary telescope design which includes built-in adaptive optics to correct for the turbulence in the atmosphere, will make the ELT the world's biggest and sharpest eye on the sky for the foreseeable future. This giant leap in capability is as large as that experienced by Galileo when he first turned his telescope to the heavens!

The goal for its use is not that of Verne, to see details on the Moon, or the goings on in the Moon Village proposed by the European Space Agency, or to watch all of Middle Earth, but instead to study the deep Universe, to resolve the light of nearby galaxies into that of its constituent stars, and above all to image and characterise the rocky planets that we now know orbit most stars. It is in fact possible that the ELT will find evidence for life on other worlds. It is ironic that this would be done from the magnificent desolation of the Atacama Desert.

The ELT construction effort is carried out by a large team with staff from across ESO, led by Roberto Tamai who works closely with ESO's top management. Many team members are here. Roberto will make sure that the construction will stay on schedule, so that what was once a dream becomes reality.

The ELT will no doubt produce discoveries that we simply cannot imagine today, and it will surely inspire numerous people around the world to think about science, technology and our place in the Universe. This will bring great benefit to the ESO Member States, to Chile, and the rest of the world. For this reason we seal the ELT time capsule today for all mankind.