

# Astronomy in Chile

In the past few years the Chilean Andes have become the chief centre for observational astronomy in the southern hemisphere. But during recent months astronomers' excitement at the possibilities given by the clear skies of the Andes has been tempered by the sober considerations of international politics.

If and when present plans mature, Chile will have an even greater concentration of large optical telescopes than California. Major observatories are being constructed by at least five foreign groups—the European Southern Observatory (ESO), the Carnegie Institution of Washington (CARSO), the Cerro Tololo Inter-American Observatory (CTIO) operated by the US National Observatory based at Kitt Peak, Arizona, the David Dunlap Observatory operated by the University of Toronto, and finally, a Soviet observatory.

Three of the groups are basing their activities on mountains in the foothills of the Andes within 50 miles of the town of La Serena which lies on the coast about 300 miles north of Santiago. The European consortium of France, Germany, Holland, Belgium, Sweden and Denmark (which Britain refused to join several years ago) already has several small telescopes on their mountain, La Silla. This station is directed by Dr Bengt Westerlünd, the well-known Swedish astronomer who worked for several years at the Mount Stromlo Observatory in Australia and who has made important contributions to the study of the Magellanic Clouds and the structure of the southern Milky Way. A 140-inch telescope is now under construction for this observatory.

A few miles from La Silla is Las Campanas, the mountain which has been selected by CARSO (which in the northern hemisphere runs the Mount Wilson Observatory as a joint operation with the Palomar Observatory of the California Institute of Technology), and a forty-inch telescope is being constructed there. An ingenious optical system will enable the telescope to photograph fields about 3 degrees in diameter down to magnitude 22—this will be of particular value in studies of the large and small Magellanic Clouds, which are each about 5 degrees in extent.

The Carnegie Institution has made strenuous attempts in recent years to fund a 200-inch telescope for its CARSO station. The latest attempt, a joint proposal with the National Research Council of Canada to the Canadian government, was recently withdrawn, chiefly, it seems, because of disagreement among Canadian astronomers about the

advantages of a Chilean site compared with Mount Kobau in British Columbia. Despite this setback the fact that the trustees of the Carnegie Institution have committed themselves to the expense of developing such a remote site points to their determination to make Las Campanas into a major observatory.

The third group near La Serena is the Inter-American Observatory on Cerro Tololo, directed by Dr Victor Blanco. At present this is the largest of the observatories in Chile. Two 16-inch telescopes, a 36-inch and a 60-inch telescope are in routine use by a staff of about six young astronomers and by a steady stream of visitors from the United States. The building and dome for a new 150-inch telescope is nearing completion on Cerro Tololo. It is expected that the telescope and mirror will be ready in two or three years' time. A small Soviet station is on Cerro Catan, nearer the bright lights of Santiago than the western astronomers' mountains.

What has led to the activity in Chile? There are three potentially good areas in the southern hemisphere: South America, Australia and South Africa. Of these, Australia has the worst sites. The best sites for astronomical observatories are usually found on mountains 6,000–8,000 feet high around latitudes 30 degrees north or south. Australia has no high mountains at this latitude and although it has a dry climate, the cloud cover seems to be on average higher than other continents.

On the other hand, there are excellent sites in South Africa—although Cape Town, which houses the southern branch of the Royal Greenwich Observatory, and Pretoria, which is the site of the 74-inch telescope now operated jointly by the Radcliffe trustees and the Science Research Council, are not good. The Cape is too low and has mediocre seeing, and the sky at Pretoria is too bright for much important work on faint objects. Moreover, the cloudy season in Pretoria occurs during the southern summer when the Magellanic Clouds—one of the chief reasons for observing in the southern hemisphere—are overhead. These factors, together with the British decision to join with the Australians in building a 150-inch telescope in New South Wales, has led to the recent plan to concentrate the South African telescopes at a site near Sutherland in the Karoo.

The sites in the Chilean Andes are all excellent. They enjoy remarkably long periods of "photometric" sky conditions and the size of the seeing disk under the best conditions is already an astronomical legend. It is likely that equally good

conditions can be found in South Africa and no doubt one of the considerations which influenced the Europeans, for example, to go to Chile was the internal policies of the present South African government.

Politics has, however, now entered the astronomy scene in Chile. The recent election of Dr Allende's Marxist government, with its declared policy of nationalizing foreign-owned businesses, must be a source of concern to the astronomical groups, particularly the Americans. But there is no doubt that the astronomers are an asset to Chile. Their activities are innocent and they occupy land which is otherwise useless. Moreover, all the groups have arrangements whereby Chilean astronomers have access to the telescopes for a fraction of the time. If this opportunity is used wisely it will enable a relatively poor country like Chile to have a leading place in one of the most exciting fields in modern science.

There is little danger, however, that the Chileans will nationalize telescopes. It is understood that representatives of both CARSO and CTIO have talked with Dr Allende since his election and have been assured that their presence is welcomed by his government. A more dangerous threat to the plans for large telescopes in Chile lies, however, in the attitude of the US government which may well refuse to go ahead if the large American investment in Chilean industry is lost.

That is why this week's announcement that the Carnegie Institution will be building a 100-inch telescope at Las Campanas is good news. It will be built with a gift from Mr and Mrs Crawford H. Greenewalt of Wilmington, Delaware, in memory of Mrs Greenewalt's father, Irénée du Pont, which will be supplemented with funds from the institution and elsewhere.

The telescope itself will have a long focal length of 730 inches combined with a large field of focus about twenty times that of the 200-inch Hale telescope. A broad complement of instrumentation to go with the telescope is already being planned by the Carnegie Institution, and a great deal of the control of the telescope is going to be automated.

The David Dunlap Observatory of the University of Toronto is also to build at Las Campanas by agreement with the Carnegie Institution and the University of Chile in Santiago. The Canadian telescope is comparatively modest, however—a 24-inch reflector—but its capabilities will be boosted by the quality of the site and the instrumentation that will also be provided.