A GUIDE TO VISITING

THE ISAAC NEWTON GROUP OF TELESCOPES

FOR SCHOOLS AND GROUP OF STUDENTS

Chris Johnson, March 2000

Contents:

Way above the clouds of La Palma…

Several years ago, astronomers in the U.K. began to search for a site that would provide the best conditions possible in the Northern Hemisphere for observing objects in deep sky. This was why the small island of La Palma was chosen for the telescopes of the Isaac Newton Group of Telescopes. Now the white domes stand out majestically against the island's blue skies and spectacular

mountains. But, as most people ask, where is the island of La Palma and how do you get there?

This booklet is designed to help you to answer these questions - and to encourage you to come and see our astronomers and engineers in action. Whether you are a group of students or tutors thinking about an educational holiday, we'll offer you a warm welcome and show you around these superbly engineered telescopes.

Introduction

Despite recent Hollywood movies, the days of the lone scientist making a brilliant discovery by himself are long gone. These days it requires a team effort from many different disciplines for an astronomer to collect the data he or she requires. These disciplines include mathematics, physics, mechanical engineering, electronic engineering, optics, climatology, computing, software writing, and information technology. A visit to the Isaac Newton Group of Telescopes has much to interest those students wondering what options to take at school, as well as to those already involved in these subjects at A-level or university.

We hope that the information in this booklet will help you to plan such a trip, and to give you some idea of other activities that can be enjoyed here in the superb weather of the Canary Islands. Whether your interests lie in diving into the depths of the ocean, or standing high above the clouds gazing into deep space, this will certainly be a trip to remember.

The Telescopes

Many people wonder why British telescopes came to be situated on Spanish soil on a tiny island in the archipelago of the Canary Islands. But this remote island of La Palma has the ideal conditions that astronomers need.

The main problem the scientists face is light pollution, so an island, surrounded by sea with no other major land mass in close proximity is perfect.

Spanish law protects the dark skies of La Palma so that even the streetlights of the nearest town have to wear a strange type of hat to direct the light downwards.

Although it is a small island, with a surface area about the size of Greater London, its highest point is above 2,000 metres – that's twice as high as Ben Nevis. It's at the highest point of the mountain that the many different national telescopes are situated - at a place called *El Roque de los Muchachos*.

Because of its height, El Roque de Los Muchachos enjoys clear skies throughout the year. Clouds normally stop at a height of 1,300 – 1,800 metres and El Roque is above this.

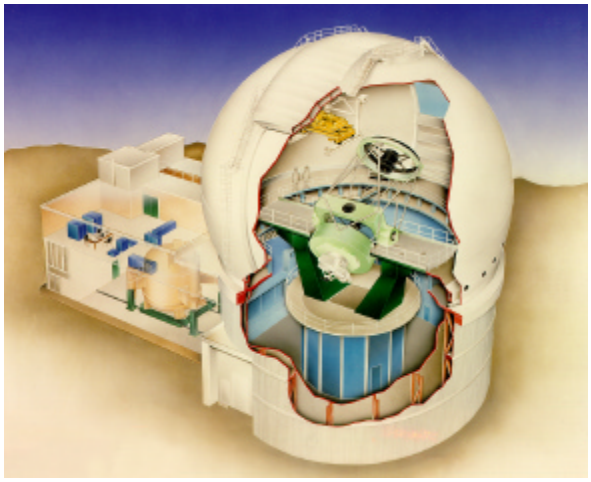
The stable atmosphere provide what astronomers call good "seeing". This is the parameter they use to measure the quality of images they obtain, and which is related to air turbulence. The "seeing" on La Palma is excellent and is one of the best worldwide.

The Isaac Newton Group of Telescopes, or ING as it is always known, consists of three telescopes. Both the British and the Dutch governments collaborate in running them, and the telescopes are named after three of their most famous astronomers.

The largest is the William Herschel Telescope, which has a mirror 4.2 metres in diameter, the Isaac Newton Telescope with a 2.5 metre mirror, and the smallest at 1 metre is the Jacobus Kapteyn Telescope. If an astronaut walking on the moon were to shine a torch towards earth, someone looking through the William Herschel Telescope would be able to see it!

Such dark skies and powerful instruments attract astronomers from all over the world as well as Holland, Spain and the U.K. Over the last decade since the setting up of the telescopes, they have made some startling and quite eerie discoveries. One recent cosmological finding is that the universe will expand forever. There isn't enough mass in the universe for its gravity to slow the expansion, which started with the Big Bang.

It was while using the William Herschel Telescope that scientists discovered the first black hole in our Galaxy. This telescope is one of the most powerful optical telescopes outside the Americas. It can see objects 10,000 million light years away on a clear night. This is indeed amazing when you consider that one light year is equivalent to 6 million, million miles.

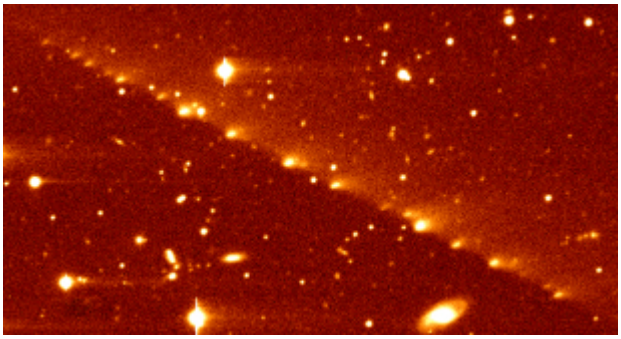


Weighing 200 tonnes, the telescope floats on a layer of oil 0.1 mm thick. It is so finely balanced that the telescope can be pushed around by one hand.

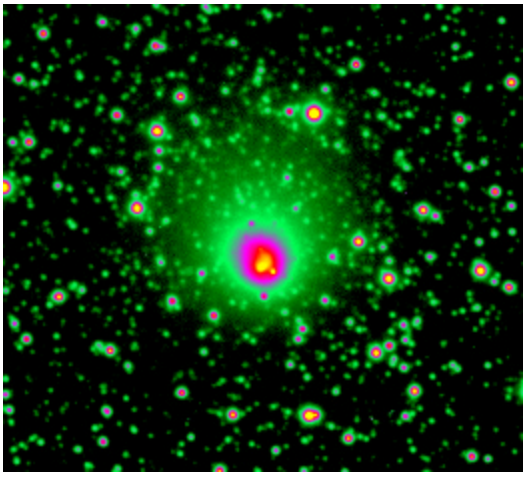
Another recent development is a new instrument called the NAOMI natural guide star Adaptive Optics facility for use with the William Herschel Telescope. This instrument will use a technique called Adaptive Optics to yield high-resolution images of astronomical objects by negating the blurring effect of the Earth's atmosphere.

In an effort to study from the ground objects first revealed so clearly in outer space by the Hubble Space Telescope, it is necessary to compensate for the distorting effect of the air above a ground-based observatory. By using an Adaptive Optics system such as NAOMI it is possible to image celestial objects with greater resolution and, in fact, at less expense than by using the orbiting telescope.

The latest films have helped to heighten interest in comets. Could we be wiped out in the same way as the dinosaurs millions of years ago? Research into the origin and nature of comets may be important for understanding the history of life on Earth. These pictures of the fragments of the Shoemaker-Levy comet about to collide with Jupiter, and comet Hale-Bopp, brightly visible in the night skies in early 1997, were taken with the Jacobus Kapteyn Telescope.



Comet Shoemaker-Levy



Comet Hale-Bopp

The 2.5 metre Isaac Newton Telescope with its Wide Field Camera is at the heart of a new survey to study faint objects. Each image obtained is roughly the size of the full moon. The survey results will provide detailed information on the nature and distribution of stars within the Milky Way Galaxy, faint objects within our solar system, and information on faint objects outside the Milky Way, such as galaxy clusters, quasars, and faint dwarf galaxy companions to our own Galaxy.

The Isaac Newton Telescope used to be situated at the beautiful site of Herstmonceux Castle in East Sussex. As the science of astronomy and astrophysics became more and more complex, it was obvious that darker and clearer skies were needed than could ever be found in the United Kingdom.

So the whole mechanical structure, weighing a total of 109 tonnes, was shipped in 1982 to La Palma and re-erected within a new dome on El Roque de Los Muchachos. The fact that the telescope was dismantled and re-installed at a height of 2,000 metres is testimony to the great British engineering involved in its manufacture.

To find out more

The ING operates these telescopes on behalf of the Particle Physics and Astronomy Research Council (PPARC) of the United Kingdom and the Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO) of The Netherlands.

The observatory itself is the responsibility of the Instituto de Astrofísica de Canarias (IAC) on behalf of Spain.

If you'd like to find out more about all these organisations, these are their websites:

http://www.ing.iac.es
(the site is mirrored for faster access to U.K. users at http://www.ast.cam.ac.uk/ING/)

http://www.pparc.ac.uk
http://www.nwo.nl
http://www.iac.es

The Canary Islands

It may be an idea to combine an educational trip to the La Palma telescopes, making it a two-site holiday with Tenerife or Gran Canaria for activities like diving or caving. The following are the addresses for tourist offices in the islands:

Patronato de Turismo de Tenerife,
Plaza de España, s/n (Cabildo Insular),
E-38003 S/C de Tenerife,
Canary Islands
Tel: +34 922 239 592 – 239 800
Fax: +34 922 239 781

Patronato de Turismo de Gran Canaria,
C/León y Castillo, 17,
E-35003 Las Palmas de Gran Canaria,
Canary Islands
Tel: +34 928 219 660
Fax: +34 928 219 601

PATRONATO DE TURISMO
DE LA PALMA
Avda. Marítima, 34
E-38700 Santa Cruz de La Palma
Canary Islands
Tel: +34 922 42 33 40
Fax: +34 922 42 33 47
E-mail: gestion@lapalmaturismo.com
Web: http://www.lapalmaturismo.com

Arranging a Trip to the Isaac Newton Group of Telescopes

La Palma is still quite a remote island, so you must be prepared for several stages to your journey. The following is to give you some idea of what the journey entails.

There are direct flights from Madrid or you can fly to Tenerife or Gran Canaria, and from there take a further flight to La Palma. Recently it's possible to reach La Palma directly from U.K. but only in some months a year. Ask your travel agency about this possibility.

To La Palma from Tenerife

Flights to Tenerife from U.K. destinations take about 4 hours and go to the airport in the south, the Reina Sofia airport. The cost of return flights varies between £100 - £300 depending on

the time of year you come, which airport you fly from and whether you take a charter or scheduled flight.

Just outside the Reina Sofia airport are the stands for the local bus, taxi or hired coach to take you to the north airport about an hour away. It is then a short 20-minute flight in one of the small Binter planes that take you to La Palma. This costs about £80 and is half price to students. You can hire a coach or take a taxi or bus at the airport in Santa Cruz de La Palma to take you the 10-minute journey into town or to your hotel destination.

There are a few flights from the south airport in small 14-seater planes. They are very infrequent and subject to change. It is worth checking on their availability, however, to see whether they fit in with the days you want to travel.

A cheaper way to travel from Tenerife to La Palma is to go to the port of Los Cristianos in Tenerife and take the ferry, a journey of about 6 hours. This costs about £16 per adult and there are discounts for groups. You will disembark right in the centre of the capital, Santa Cruz de La Palma.

So far, there are no direct flights from the United Kingdom. However, work is under way to extend the capacity of the north airport on Tenerife to take international flights. It may be possible to fly straight to this airport in the near future.

To La Palma from Gran Canaria

Flights are not so frequent as from Tenerife. There are two a day from Gran Canaria and the journey time is 50 minutes. The advantage here is that although you will have to change aeroplanes, you remain within the same small airport.

Please keep in mind that this booklet is intended as a guide only, and some of the information given will change. It may be easier to leave arrangements to a travel agent in the U.K., although agencies in Tenerife or Gran Canaria are helpful and generally speak excellent English. It's always a good idea to make all communications by fax if you can, as you then have a record of your requirements to hand.

Useful Travel Agencies

The following agencies in Santa Cruz de La Palma have employees who speak English, and can advise on up-to-date prices and availability of accommodation, excursions and tours around the island:

Viajes Tanausú,
Urbanización Los Rosales, Local n^{o} 8,
Playa de Los Cancajos,

38712 Breña Baja,
Canary Islands
Tel: +34 922 434 314
Fax: +34 922 434 669

Viajes Insular,
Plaza de España, 2,
38700 Santa Cruz de La Palma,
Canary Islands
Tel: +34 922 411 110
Fax: +34 922 415 644

These agencies will arrange for coaches to take groups of students to the Observatory. There are no local buses that go to the top of the mountain.

Tours of the Isaac Newton Group of Telescopes

Groups of students will receive a warm welcome at the telescopes situated on El Roque de los Muchachos. This means 'Rock of the Young Lads', which gets its name from the rocky formations that look like a group of boys. As you travel upwards and through the clouds, you will go through four different climatic zones with corresponding vegetation. At the bottom, you will be in the sub-tropical area with banana plantations and orange trees, and then you will travel through vast tracts of laurel and fir forest. Above the tree line there is an area of small shrubs and scrubland, while at the very top it is quite arid and bare of any vegetation.

Once inside the domes you will be able to see the precision engineering involved in the construction of the telescopes. When you stand beneath one of the rotating domes, a powerful visual illusion makes you think the dome is stationary and the building is spinning. Many visitors marvel at the work undertaken in establishing such huge and complex buildings so high up. Incidentally, the telescopes are actually sitting on a dead volcano!

Visits last for approximately two hours, and so students will be able to see all the telescopes in the Isaac Newton Group. During the day students will be shown around by an expert guide who will be able to supply all kinds of information about the domes and telescopes, and answer questions. The visit encompasses looking round the research facilities, talking to the astronomers, and watching the engineers at work as they install the different scientific instruments and ready the telescopes for the night's observing.

The telescopes are working scientific establishments and requests for visits and tours must be made well in advance. These are free of charge but you will need to hire a coach to get your group to the top of the mountain at El Roque de los

Muchachos. The tours take place in the daytime. ING has facilities to offer tours to groups of people but regrettably visits by individual tourists travelling on their own are so far not possible.

It is generally advisable to avoid a visit in the winter as the weather conditions at the top can be below freezing, often with accompanying snow and ice. Remember to bring a telescope or binoculars – you only have to go a little way beyond the town's lights to see the thousands of stars that are there. It's an awe-inspiring sight that we rarely see nowadays in the light-polluted skies of the U.K.

For more information about the telescopes or about arranging a tour, please contact:

Javier Méndez, *Public Relations Officer*
Isaac Newton Group of Telescopes
Apdo de Correos 321
E-38700 Santa Cruz de La Palma
Canary Islands
Spain
Tel: +34 922 425 464
Fax: +34 922 425 442
E-mail: jma@ing.iac.es

Accommodation

Accommodation ranges from the most expensive new Parador de Turismo to a pension or a block of apartments with own bathroom and balcony. Prices for this type of accommodation are reasonable. For example an apartment for 2 people in Santa Cruz is about £15 and for 5 people sharing a room it will be £25 per night.

Please see ING website http://www.ing.iac.es/PR/lapalma/ for more information about accommodation on La Palma.

Food

Food and eating out are still remarkably cheap on La Palma. Typical food is grilled meat or fish with 'papas arrugadas' – small potatoes cooked until the skins are wrinkled – and salad. The bars will serve small portions of food or snacks called 'tapas'. These can be any specialty of fish or meat or vegetables.

Currency

The Canary Islands are an autonomous region of mainland Spain, therefore the currency is the Spanish peseta and it has the same exchange rate. Currently the rate is about 250 pesetas to the pound. The banks are very efficient and you can use your bankcard to get pesetas out of the cash machines.

From the year 2001 both the peseta and the euro will be the currency used in La Palma as, in common with most countries in the European Community, Spain will start to phase out the peseta for the euro in 2002. You can find out what the rate is for the amount of euros to the £sterling at your local bank.

Shopping

Visitors are often caught out by Spanish opening times. Shops open about 9 a.m. to 10 a.m. and close again at 1 p.m. They open again at 5 p.m. and you can shop until 8 p.m. Bars and cafés are open all day and often until 2 a.m. when, according to law, they must close.

Clothing

La Palma has a wonderful climate and because of its situation, is slightly cooler than the other islands. You must bring good hiking boots or trainers with a good gripping sole. Remember that you can start off in a T-shirt at sea-level, but will need a jacket to withstand the cool winds at the top of the mountain.

Youth and Student Identification

If you are a student, you should get an International Student Identity Card (ISIC). With this you will be able to get discounts for train, ferry and aeroplane travel, as well as cheaper museum entrances, etc. The ISIC card costs £5. People who are under 26 years old, who are not students, can obtain a 'EURO<26' card that costs £7, which has similar benefits. Contact STA Travel or Campus Travel to find out how to get an ISIC or 'EURO<26' card.

Museums and Educational Activities on La Palma

There are two interesting museums in the capital, Santa Cruz de La Palma. There is the Museo de Historia situated in an ancient monastery within the beautiful and recently restored square of San Francisco. It contains an eclectic mixture of art treasures and artifacts, aborigine culture and anything anyone has thought worth collecting over the years.

A truly amazing sight is to see a huge concrete replica of Christopher Columbus' boat, the Santa Maria, sailing down the

middle of a street in Santa Cruz. This houses a maritime museum and is well worth a visit.

Going from Santa Cruz and through the mountain to the other side of the island will take you through the small town of El Paso. En route there is the official Visitors' Centre which gives information about the national park, the Caldera de Taburiente, and about the history, geology, flora and fauna of the region. They will also issue permits for groups who wish to camp in the Caldera.

At the southern tip of the island is the area of volcanoes at Fuencaliente. It is not often that we get the chance to see the site of a volcano that last erupted as recently as in 1971, creating the Volcano of Teneguía.

Other Activities on La Palma

La Palma is attractive to those young people and adults who enjoy outdoor pursuits, and the wonderful climate encourages this. It must, however, be remembered that the island has a very precipitous terrain and some trails are not suitable for those who are inexperienced hikers. The beautiful national park of the Caldera de Taburiente can be dangerous and you are generally advised to go in with a guide, who can be found through one of the local travel agencies. The guides will gear the length and difficulty of the walk to the age group and previous experience of their charges.

Geology students and volcanologists are fascinated by the fact that La Palma still has the capability of erupting from time to time. The last eruption took place at the Volcano of Teneguía in 1971.

Those scuba-diving aficionados will find that the island is surrounded by huge numbers of different types of fish. Many swim not far below the surface and can be seen with a simple snorkel and mask. All kinds of water sports are available as well as trips and mini-cruises around the islands of the archipelago.

Speleology, spelunking or plain pot-holing. This volcanic island is a paradise for those who enjoy the arduous sport of caving. It's a sport that also attracts those students involved in geology, physics, chemistry and biology, technical drawing and mathematics, geography and history.

All these activities and more can be combined with a trip to see the telescopes and, incidentally, have a thoroughly enjoyable time.

Names and addresses of companies offering activities in La Palma:

Mountain biking

Bike 'n' Fun,
C/ Calvo Sotello 20,
Los Llanos de Aridane
Tel./fax +34 922 401 927,
Web: http://www.bikenfun.de

Bike Station La Palma
Avenida Cruz Roja Local No. 3
Playa de Puerto Naos
Tel./fax: +34 922 408 355
Web: http://www.bike-station.de/eng/

Hiking

Senderos Canarios, S.L.,
Plaza San Fernando, 9,
Santa Cruz de La Palma,
Tel: +34 922 417 284,
Fax: +34 922 412 843,
Web: http://www.lp-b.com/senderos-canarios/

La Palma Trekking
Playa de Los Cancajos,
Breña Baja.
Tel: +34 922 433 001
Fax: +34 922 433 011
Web: http://www.natour-trekking.com/

Scuba-Diving

Atlantic 28, La Palma,
Las Caletas, 25
Fuencaliente,
Tel/fax: +34 922 444 047,
Web: http://www.atlantic28.de

La Palma Diving Center,
Centro Comercial Los Cancajos, Local 227
Breña Baja,
Tel: +34 922 181 393
Fax: +34 922 420 697
Web: http://www.la-palma-tauchen.de/English/

Tauchpartner La Palma, S.L.
Crta. Puerto Naos, 438,
Los Llanos de Aridane.
Tel/Fax: +34 922 408 139
Web: http://www.tauchpartner-lapalma.de/

Paragliding

Club Parapente Balayo,

C/. La Cruz 2,
Barrio de los Quemados,
Fuencaliente
Tel. +34 922 444 034,
Fax: +34 922 444 303,

Palma Club,
C/. Maximiliano Darias,
Montesinos, 32 - ático.
Playa de Puerto Naos,
Los Llanos de Aridane,
Tel. +34 922 411 087

Speleology

Grupo de Espeleología Junonia,
Carretera Martín Luís, 32,
Puntallana.
Tel/fax: +34 922 430 392

Pre-Trip Information and Events

It may be worthwhile planning a day trip to the Planetarium in London or such small telescopes like the Norman Lockyer in Sidmouth, Devon.

The Particle Physics and Astronomy Research Council offer an enormous range of teacher's packs, wall charts and activity sheets for children. "Astronomy and Space in UK Schools and College – a resources guide for teaching" by Kerry Parker and Margaret Penston lists information for different age groups of children and is extremely useful.

The Royal Astronomical Society has a series of excellent leaflets with easy explanations of such concepts as the expansion of the universe, quasars, galaxies and so on.

The Royal Observatory Greenwich, part of the National Maritime Museum and home of the Prime Meridian of the world, has recently established a public inquiry service. They accept astronomy inquiries by post, telephone, fax or e-mail.

Public Understanding of Science
Particle Physics and Astronomy
Research Council (PPARC)
Polaris House
North Star Avenue
Swindon
Wiltshire SN2 1SZ
Tel: 01793 442 030
Fax: 01793 442 002
Email: pr_pus@pparc.ac.uk
Web: http://www.pparc.ac.uk/

The Education Committee
Royal Astronomical Society
Burlington House
Piccadilly
London W1V ONL
Tel: 0171 734 4582
0171 734 3307
Fax: 0171 494 0166
Email: ronw@ras.org.uk
Web: http://www.ras.org.uk/

The Astronomy Information Officer
Royal Observatory Greenwich
Greenwich
London, SE10 9NF
Tel: 020 8312 6735
Fax: 020 8312 6734
E-mail: astroline@nmm.ac.uk
Web: http://www.rog.nmm.ac.uk/

Remember that the world wide web is a wonderful source of information, all in the public domain. Use search engines like http://www.yahoo.co.uk/ or http://www.excite.co.uk/ for items about astronomy or astrophysics.

Magazines such as 'Astronomy Now' and 'Sky & Telescope' have websites you can visit. The latter offers mailing lists with the latest updates on astronomical subjects of particular interest.

http://www.astronomynow.com
http://www.skypub.com

Books

There are so many wonderful books on astronomy that it is almost impossible to make a choice. Some are very expensive and it is probably better to borrow from a library before buying. Have a look first on the internet at booksellers like http://www.amazon.co.uk/.

- 'Reaching for the Stars' (interactive book for younger children), (Kingfisher Books)
- 'Skywatching', by David Levy (Co-discoverer of the Shoemaker-Levy Comet) (HarperCollins 1995)
- 'Images of the Cosmos' by B.W. Jones, R.J.A. Lambourne and D. A. Rotbery. (Hodder and Stoughton in association with the Open University 1994)
- 'Star-Hopping' by Robert Garfinkle (Cambridge University Press 1994)
- 'Visions of Space' (artists' impressions of the cosmos) by David A. Hardy (Dragon's World 1989)
- 'Philip's Atlas of the Universe' by Patrick Moore (Philip's 1999)

Books and Guides on La Palma

Again, the following are just a selection of what is available.

- 'Landscapes of La Palma and El Hierro' by Noel Rochford (Sunflower Books 1993)
- 'Discovering La Palma' by J. J. Santos Cabrera and C. J. Taranilla de la Varga (Editorial Everest 1989)
- 'Canary Islands' by Paul Murphy (a Thomas Cook Travellers Guide) (A A Publishing 1995)

After the Trip

Remember to bring your camera with you when you come to La Palma. It well merits its nickname of 'La Isla Bonita' which means the 'Beautiful Island'.

The view from the top where the telescopes are situated is spectacular. A display of your photographs taken from the telescopes will amaze and interest fellow students. Most local newspapers will be happy to print a photo and take details of your trip for the next edition. Try to get sponsorship from local firms in the area. They will appreciate involvement if you can give them a little publicity on your return.

You can buy souvenirs, posters, stickers and T-shirts of the Isaac Newton Group of Telescopes either while you are here, or through the virtual shop on the ING website at http://www.ing.iac.es/PR/

We look forward to seeing you!

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Chris Benn and Tom Gregory for providing additional information about the WHT. Conny Spelbrink for providing information on what to do in La Palma.