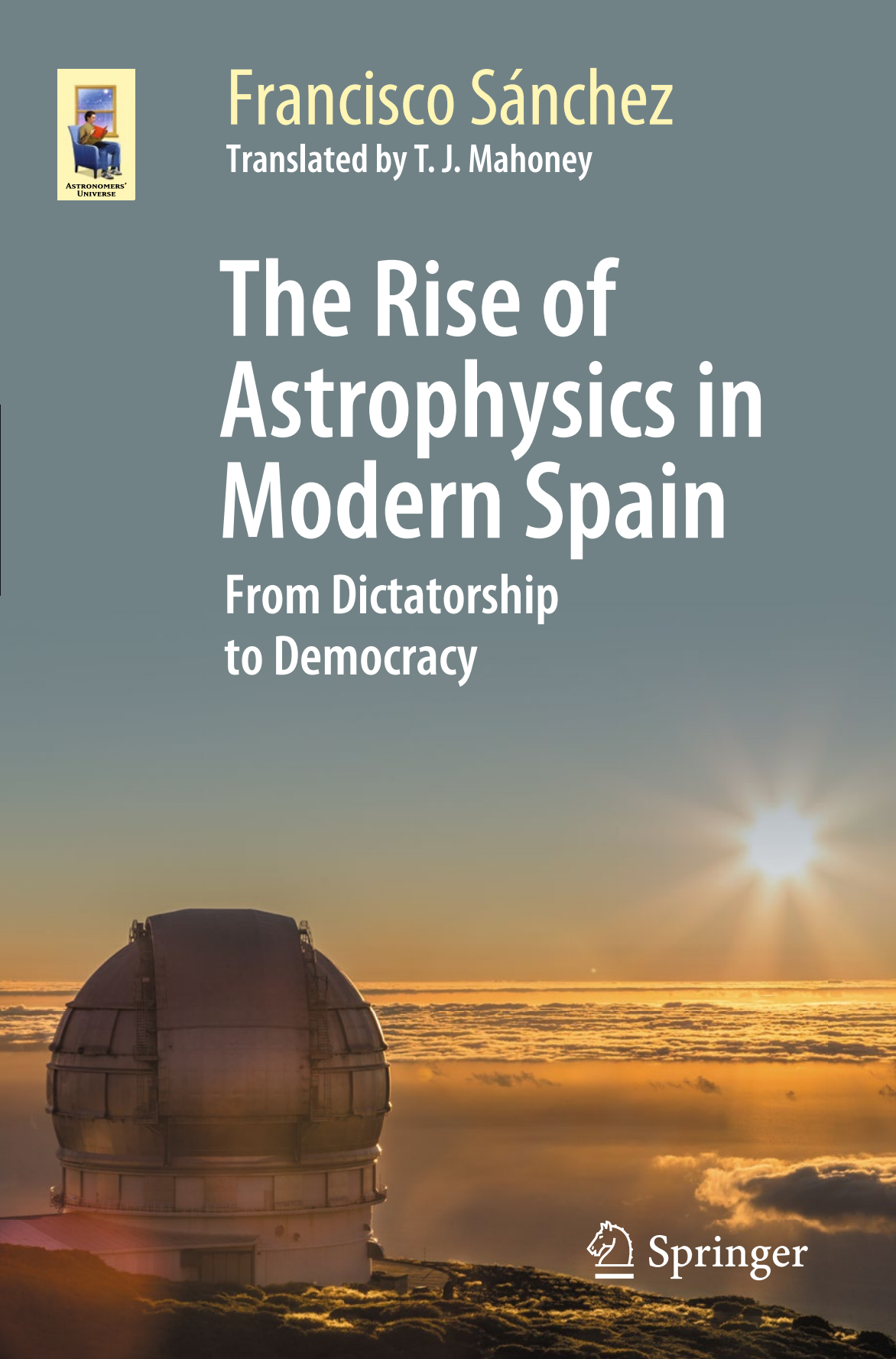
Francisco Sánchez
Translated by T. J. Mahoney

The Rise of Astrophysics in Modern Spain

From Dictatorship to Democracy



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Francisco Sánchez

The Rise of Astrophysics in Modern Spain

From Dictatorship to Democracy

Translated and with notes
by T. J. Mahoney

Foreword by
Brian May

Springer

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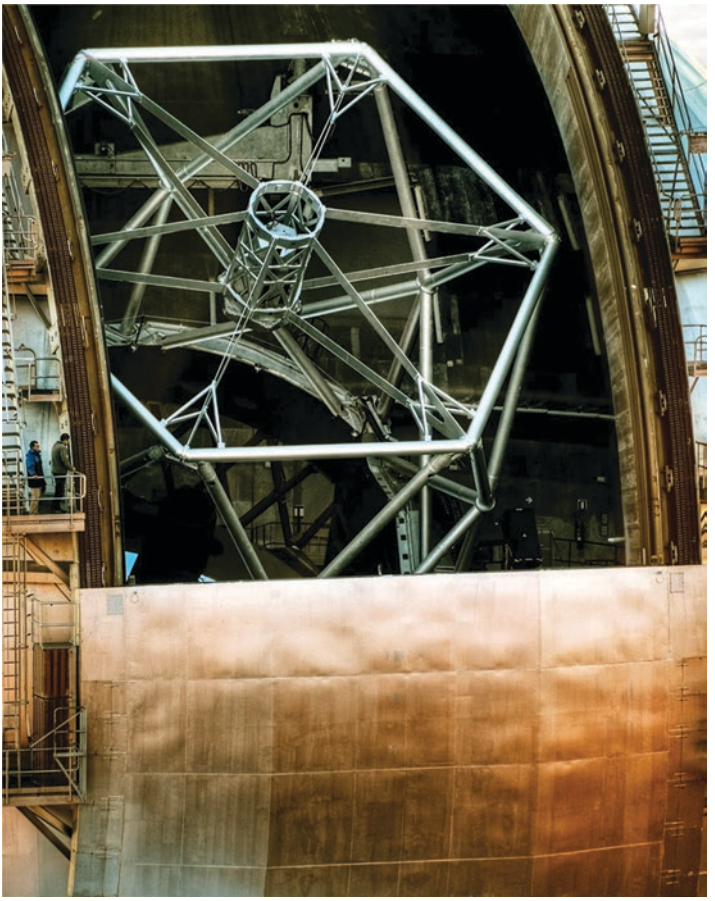

The 10.4-m Gran Telescopio Canarias in the final stages of construction. (Credit: IAC.)

To all who have made possible the miracle
of astrophysics in Spain
To my sister of hill and mountain
4m+2s+b

Foreword

The author of this book, Professor Francisco Sánchez, affectionately known as 'Paco' to those of us who are fortunate to know him well, is a pioneer, a tireless warrior for science, and the acknowledged father of astrophysical research in Spain.

I first met Professor Sánchez in 1971, as a young undergraduate student. Pursuing my chosen subject of the study of the zodiacal light by spectroscopy, I arrived in Tenerife with a vanload of homemade electronic gear, a custom-built Fabry–Perot spectrometer, and the component parts of an 'assemble-it-yourself' tin hut, which was to be my 'observatory'. I was well out of my depth and in need of assistance.

My PhD supervisor, Professor James Ring, head of Astrophysics at Imperial College London, had set me on a course of investigating the motions of interplanetary dust, looking at Doppler shifts in the sunlight reflected from it, seen in the night sky as the beautiful phenomenon of the zodiacal light. Although at its best this diffuse band of light in the night sky can actually outshine the Milky Way, it's still seen by only a few humans—even astronomers—because, to see it, you have to be there at the right time, with dark skies and clear horizons, and you have to be close to the tropics. No chance in London, then, where I was based, so Jim Ring packed me off to Tenerife, acting on a kind offer from Professor Sánchez, who was to keep me under his watchful eye while I set up my gear and attempted to make the observations I needed. So, thanks to Paco, I had the back-up of the University of La Laguna, where Professor Sánchez had recently founded his Astrophysics Department. In those days, of course, I would never have dreamed of calling the professor 'Paco'. His office was at the end of a long echoey corridor in the old University building, and I seldom dared to go knocking on his door. He was already the

revered head of a world-beating organization—and a humble student does not feel he can often disturb such an eminent figure. In those days, my grasp of the Spanish language was almost non-existent, and Paco was also not fluent in English, so this also hampered our communication. Nevertheless, in our meetings he was always kindly and very understanding of my problems, and gave me everything I needed to do my work, including the assistance of one of the brightest lights of his team, Carlos Sánchez Magro, now sadly deceased.

The actual location of the observation site was beyond my wildest dreams. Far above the busy commercial life of Tenerife, in the breathtaking national park area of Las Cañadas, was a volcanic ridge known as Izaña, with views of the majestic central peak of Tenerife, El Teide, and, on a clear day, the whole beautiful island. At that time the astronomical observatory consisted of just a small building to provide support for the French zodiacal light telescope, a Spanish solar telescope, and the foundations of the first dome for a large telescope—a collaboration between the University of La Laguna and Imperial College. I also remember an old military meteorological observatory on a nearby hill.

And it was here that my humble hut was taking shape. In those days, my fellow student and I slept on site, and living and working up there was a life-changing experience—no phones, no postman, and no food supplies except what you drove up with! It was a peaceful and quite lonely life, broken up only by making the journey down to Santa Cruz to visit the post office. But the compensations were glorious. Suddenly, as a city-born-and-bred boy of 21 years, I was waking up every day above the sea of clouds, to deep blue skies, and air that is always crisp even when the sunlight is hot, and the silence of Nature, along with a view that seeped into my soul, has never left me. The sky on a good night is dark, transparent, and matchless in its splendour. I developed a love for Tenerife, the tropical night sky, and all things Spanish, which is still strong in me today.

But enough of me! The Spanish ZL building housed the instruments with which Francisco Sánchez had made his observations of the zodiacal light, beginning in 1964, and already published groundbreaking papers on the photometry of this phenomenon. In fact, the strong connection between the ZL and Tenerife goes right back to the 1850s, when Scotland's Astronomer Royal, Charles Piazzi Smyth, made his famous journey to 'site test' on Mt Guajara, and Teide itself. He set out to test Sir Isaac Newton's theory that observing from a high-altitude site, above most of the turbulence of the atmosphere, would secure much better quality astronomical 'seeing'. Piazzi was able to confirm the theory and also made the first spectroscopic study of the zodiacal light.

For the following hundred years, things were quiet in Tenerife as regards astronomy, but in 1959 astronomers flocked to Tenerife to observe a total eclipse of the sun. It was soon after then that Professor Francisco Sánchez began the titanic and miraculous task of creating one of the world's leading international astronomical observatories and the Instituto de Astrofísica de Canarias (IAC).

Francisco Sánchez, the great dreamer, was heart and soul devoted to promoting the excellent quality of the skies above the Canarian summits in order to persuade European astronomers to send their most advanced telescopes to the Canaries and to recruit young Spaniards for training as astrophysicists with the help of their foreign colleagues. His skills had to extend not only to scientific research and theory, but also to make of them formidable people with the organizational skills needed to pilot the funding and development of a major scientific installation with successive Spanish governments.

As a result of Francisco's passion and tireless powers of persuasion, Teide's telescopes were operational in the 1960s and, in an inspiring international spirit of collaboration, under his baton, Teide grew in the ensuing 50 years into one of the best-known astrophysics research centres in the world, in terms of science, technology, training of astrophysicists and technologists, and outreach. Today, the Canarian Observatories occupy many hectares, and house solar and nocturnal telescopes owned by more than 60 institutions from more than 20 countries. Thanks to Paco's vision and genius, Spanish and international astrophysics now operates not only in Tenerife but also at Roque de los Muchachos Observatory on the neighbouring island of La Palma, which now boasts, among its many fine instruments, one of the most powerful telescopes in the world, the Gran Telescopio Canarias (GTC), inaugurated in 2009.

This book tells the history of this extraordinary expansion of Spanish astronomy, in detail, from a personal and human perspective, and I am deeply honoured to have been asked to write this foreword.

As final personal note, Paco and I became great friends in my many successive trips to Tenerife, during which I came to appreciate him as an outstandingly human being, always dedicated to his work, yet never too busy to enjoy wonderful food and drink in the perfumed air of Tenerife. And he did me the honour of opening the doors of his University to me one more time in 2006 to help me complete the PhD studies that I had begun 30 years earlier. My PhD thesis, *A Survey of Radial Velocities in the Zodiacal Dust Cloud*, was finally published in 2007.

This book tells, in personal and human, as well as technical, detail, the story of the extraordinary expansion of Spanish astronomy under Professor

Sánchez's direction, setting Spain today in the forefront of astrophysical research worldwide. Paco has always believed in science as a key element in the future of humanity. For him people are what counts, and he never tires of repeating this view. That is why he considers his greatest triumph to be the high level of prestige attained by those who have been trained at the IAC.

The history of modern astronomy in Tenerife *is* indeed the history of Professor Francisco Sánchez himself!

Enjoy this unique chronicle of one of the great success stories in the history of the exploration of the Universe!

London, UK 2019 Brian May

Preface

There is no path unless it first be trodden.
What your path? What is your destination?
The goal that so enthrals you today will change tomorrow.
What matters is the quest, the distant glow that lights your way.
There is no path unless it first be trodden.
When years have passed and they bid you look back,
That furrow you see in the distance—black, red, silver, and gold—
Will be a story made by many as they passed through.
There is no path unless it first be trodden.

What you will find in this book is the story (an enjoyable one, I hope) of the origins and progress of the Instituto de Astrofísica de Canarias (IAC, or *El Astrofísico*, as it is affectionately known in the Islands), and of astrophysics in Spain generally. This is not an astronomy book that breathlessly relates the wonders of the Cosmos, rather it is a commentary on the so far brief history of astrophysics in Spain.

The birth and flourishing of this science in Spain have been so rapid and spectacular, and took place at such a critical time in the country's history that the idea slowly gelled in my mind to write it down. I have the advantage of having been a front-row witness of, and actor in, the events described, and I have striven to explain the how and why of what occurred. The story is there for all to see.

You will learn how the concept of the astronomical sky of the Canarian summits as a public natural resource has been successfully exploited to the benefit of science, technology, and even tourism while also laying a rich cultural and economic deposit in the country.

I have tried to tell the story simply and—hopefully—entertainingly by sprinkling the facts with anecdotes and events involving important and well-known personalities. I have avoided overloading the text with data, references, and documentation. There is no cumbersome academic apparatus of footnotes and textual bibliographical citations, although there are bibliographical notes in the back matter for those readers who wish to delve further into various aspects of the story told here. Neither will you find exhaustive accounts of scientific discoveries and achievements. All that is now amply available in great detail on the internet (web addresses are given where you will find all the facts and figures).

Since the events described are interrelated and overlap, the book is conceived as a mosaic of self-contained chapters that do not follow a strict chronological order. I hope, nevertheless, that the overall collection brings the global picture into sharp relief.

You will see as you read on that scientific research is heavily influenced by the political and economic vicissitudes of the moment—even more so in Spain, where wealthy patrons are few indeed. But you will also come to realize that this weakness is always surmountable through constancy. Not all the stories told here are as epic or literary as those related in the first chapters. Some chapters may even seem heavy going because of their densely packed content. This book has been a labour of love, but I have throughout endeavoured to be rigorous.

La Laguna, Spain 2019 Francisco Sánchez

Acknowledgements

A number of people have made this book possible, and I would like to acknowledge their collaboration publicly.

My closest ally is Maribel Arévalo, my companion, my friend, and my love. She sifted through each chapter as I wrote it, giving her honest and pointed criticisms, while consigning the early versions to the wastepaper bin.

The second filter —literary and grammatical—was the philologist Juncal García-Ramos Arévalo, a cultivated and well-read lady of exquisite taste.

Thirdly, I express my gratitude to Casiana Muñoz-Tuñón, astrophysicist, my ally in many battles, a deep and dependable person. Among other things, she prevented me from occasionally committing overheated and inappropriate remarks to paper.

With her dedicated, meticulous, and whole-hearted approach to all that the IAC represents, Mariam Mónica Gutiérrez, a very special person, must receive particular mention. She undertook the delicate and complex task of repeatedly formatting and correcting the text.

Terry Mahoney, with his usual professionalism, took on the task of translating the book into English. He also aptly proposed a number of additions to the Spanish version.

Dr Carmen del Puerto, our resident journalist and former director of the Science and Cosmos Museum, among her many other duties, and currently head of the IAC's Press and Outreach Unit and defender of women in science, supervised the entire production process of the Spanish version of the book, including its attractive cover, designed by Inés Bonet.

To all, my deepest thanks.

Contents

1

Perhaps It All Began with an Eclipse (1959–1961)

An eclipse of the sun, one of the most awe-inspiring and impressive spectacles of nature, has always surprised, excited, moved, and terrorized humanity. I have witnessed them on several occasions. That the celestial lamp which gives us light, warmth, and life should suddenly vanish, bringing night in the middle of the day, is at once unnerving, dramatic, and mysterious! What if the sudden darkness were to last forever? All periods and cultures have sought advantage from such fearsome events. To be able to 'divine' such a happening was crucial and evident proof of possessing direct and special communication with the gods. Being able to predict an eclipse was a powerful accomplishment that undoubtedly spurred the development of astronomy.

Today's scientists still continue to observe total eclipses, which provide good opportunities to make measurements in very special conditions. The few minutes of totality, with the sun's disc covered by the moon, are used the better to observe the solar corona and other celestial objects. There are dedicated amateur and professional astronomers who chase eclipses. That is why, on the occasion of the 1959 eclipse, which was seen in totality in the Canaries, astronomers and astrophysicists from the world over flocked to the archipelago.

I have taken upon myself the task of writing the history of the spectacular birth and flowering of astrophysics in Spain and following the path of the great advances experienced during the latter half of the twentieth century in our understanding of the Universe. On the assumption that the 1959 total eclipse of the sun in the Canaries might be considered to mark the birth of astrophysics in Spain, I have decided to begin the story with that event. The establishment and subsequent burgeoning of this branch of science in Spain is another story that will gradually unfold in later chapters of the book.

F. Sánchez, *The Rise of Astrophysics in Modern Spain*, Astronomers' Universe,
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The Canarian press made much of the eclipse, publishing features days before and after the event, complete with photographs of previous eclipses and the arrival of planeloads of scientific equipment. The islanders have not forgotten that extraordinary celestial novelty.

It is useful to recall some of the events that took place back then. The first two lunar probes were launched by the USSR in that year. The second of these, *Lunik 2*, landed on the lunar surface precisely two days before Khrushchev began his visit to the United States. In January, the bearded army of Fidel Castro entered victorious into Havana. In December US President, General Eisenhower, paid a visit to General Franco and was cheered in the streets of Madrid by more than a million Spaniards. Severo Ochoa received the Nobel Prize for Medicine in that same year.

As a consequence of the Second World War, by mid-century scientific and technological advances had produced powerful and precise scientific instruments that greatly increased our observing capacity of both the macro- and microcosmos. Astronomers were now confronted with a situation in which the resolving power of their modern telescopes (their ability to discern two narrowly separated celestial bodies) was limited by the atmosphere in which the telescopes were immersed. It was now quite evident that traditional observatories (often located in national capitals or in the home town of some patron) failed to meet the conditions demanded by modern astronomy (astrophysics). Not even Mount Palomar, where the Americans had just located their 5-metre reflector, the leviathan of its time, could fulfil these requirements.

The new telescopes had to be set up in very special locations with clear, transparent, and stable atmospheres. For this reason, the most developed countries set about searching worldwide for such rare and exclusive sites. Obviously, a good site would have to be cloudless for most of the year and possess a transparent atmosphere. Such conditions prevail in many parts of the planet but are not, of themselves, sufficient. The goal is to identify a site where the upper masses of air are stable enough for celestial objects to be observed as if there were no atmosphere at all, as if the telescope were located in space. Hence, present-day astronomical site prospection is centred on parameters linked to atmospheric turbulence.

This can be understood simply if we explain that the beautiful twinkling of the stars has the same origin as the shimmering of distant objects when viewed above a heated road or behind the flames of a bonfire. Rays of light, which would normally reach our eyes or a telescope mirror in straight parallel lines, are bent when passing through moving bubbles of hot air of a refractive index different from that of cool air.

HOY, ECLIPSE TOTAL DE SOL

Se iniciará a las 10 horas, 17 minutos y 30 segundos

EL DIA EN LA PROVINCIA

Máximo oscurecimiento: A las 11 horas, 42 minutos y 10 segundos

Científicos de muchos países europeos y americanos se encuentran en Canarias para estudiar el fenómeno

Un reactor estadounidense, llegado a Los Rodeos, efectuará observaciones a una altura de 20.000 metros

Reportaje de Francisco AYALA

Noche en pleno día

Canarias, centro de observación

A1.800 kilómetros por hora, observando el eclipse

Desde San Luis a Tenerife

"Hasta ahora ha sobrado Sol"

Fig. 1.1 The local newspaper *El Día* announcing the total eclipse of the sun seen from the archipelago. (Credit: *El Día*)

LA TARDE

SANTA CRUZ DE TENERIFE

Dragaminas para Noruega

Fueron entregados por los norteamericanos, y llevarán los nombres de «Tyr» y «Gor»

El impresionante espectáculo astronómico de hoy

Antes y durante el fenómeno solar

Noche al mediodía.- Una jornada santacrucera con dos amaneceres

El reactor norteamericano, tras la sombra lunar

LA RECEPCION EN EL PALACIO DE ORIENTE

HUELGA NORTEAMERICANA DE ESTIBADORES

Numerosos buques paralizados en Nueva York y Nueva Orleans

El eclipse de Sol desde el Aeropuerto de Los Rodeos

La noche de un minuto, el miedo, el frío, el reactor norteamericano tras el misterio de los Astros, el ocaso inesperado y la Luna es redonda

Por ALMADI

El señor Abárzuza, en Cartagena

En el despacho del jefe del arsenal se reunió con los jefes del cuerpo de Marina

Ferhat Abbas contesta a De Gaulle

Planes laboristas si logran el triunfo

Separación de las fuerzas comunistas de las occidentales, acuerdo sobre desarme y arreglo en el Oriente Medio

Para abaratar los artículos de primera necesidad

Se han reunido y adoptaron medidas los autoridades almerienses

Una bandera roja en el colegio de Eton

Fig. 1.2 The local evening newspaper *La Tarde* summarizing the eclipse. (Credit: *La Tarde*)

Wavefronts that meet the eye or the mirror of a telescope in this way are no longer plane but corrugated. In sites such as the Canarian summits the stars do not twinkle and their coruscations no longer blur the distant objects beyond them. The performance of telescopes is therefore substantially improved. To further complicate matters, as we increase its diameter, the telescope mirror becomes ever more sensitive to such atmospheric disturbances, and we must be stringent in our requirements concerning the choice of observing site.

The preparations for the 1959 eclipse in the Canarian archipelago prompted many astronomers to recall earlier scientific expeditions that told of the marvels of the sky seen from the island summits. They urged their Spanish colleagues to take steps to ensure that the Canary Islands be included among the sites under consideration for future large telescopes. For this to occur Spain needed to get involved immediately by carrying out astronomical site prospection campaigns on the summits of Tenerife.

The task of bringing this international message to the attention of the government fell to José María Torroja, Professor of Astronomy and Geodesy of the Madrid Complutense University, and Father Antonio Romañá, Director of the Ebro Jesuit Observatory, a major figure in the then recently created Upper Council for Science and Research (CSIC, after its Spanish initials). Both had been trying in vain for three or four years to bring about the creation of an astronomical observatory within the precincts of the Izaña Meteorological Observatory. With the coming of the eclipse, the Spanish authorities (more to save face than anything else) finally allowed themselves to be persuaded, and the Ministry of National Education created—on paper—the Teide Observatory, to be placed under the authority of the Chancellor of the University of La Laguna. Professor Torroja was appointed its director. When it comes to science, our politicians need to be shamed into taking action.

Understanding any story requires that we locate ourselves in the place and time concerned with all the attendant circumstances. While research was forging ahead in more advanced countries, in Spain it languished. University lecturers did little or no research but were nevertheless regarded as demigods (students were obliged to attend examinations wearing a tie, and to stand when lecturers wafted by in the corridor). That was nothing compared to the chancellors, who were exalted beings until, a quarter of a century later, their numbers swelled with the explosive growth of universities in Spain. I mention these details to provide a backdrop to my own entry onto the scene.

I was attracted to research and in my final undergraduate year I was permitted to 'work' at CSIC's Daza de Valdés Optics Institute, a rare privilege at the

time for an undergraduate. How I got the 'job' is a curious story in itself. I went to see Dr Plaza, Director of the Institute, and explained to him my wish to do research. He listened to me, asked me questions, and finally told me that I could begin by reporting to him on the following Sunday morning at eight o'clock in the morning. I arrived to be met by him and another researcher, equipped with picks, shovels, and wicker baskets, who turned out to be the head of the Photometry and Colorimetry Laboratory. They explained that it was necessary to demolish a large Ulbricht sphere in order to expand the laboratory, and that the job fell to us owing to shortage of funds, so would I mind lending a hand? It took us five Sunday mornings to complete the task. So when I am asked what my first job in research was, I always say that it involved picks and shovels.

I graduated in Physical Sciences in June, 1960. In September of that year I was managing three precarious jobs: assistant lecturer in the Optics Department of the Complutense University (600 pesetas a month—3.60 euros); supply teacher at the Ramiro de Maeztu Institute (on call in the common room to give any absentee lecturer's class, be it in physics, chemistry, mathematics, or natural sciences); and 'research student' at CSIC's Optics Institute (unpaid). I had a fiancée in Cáceres whom I was unable to marry—not through any lack of ardour on my part (we had been close for many years and I loved her dearly)—but because not even with all these jobs could I maintain a family. As a recent graduate it was the only way to give my career the boost it needed.

In the autumn of that same year I was summoned to a meeting by no less an authority than Professor Navarro, Chancellor of the University of La Laguna, and Professor Torroja. They were thinking of offering me a post in the Canary Islands. It is not hard to imagine the trepidation and nervousness with which I, a recent graduate in Physical Sciences, felt at the thought of being interviewed by two such august beings.

I recall perfectly the room in the CSIC Students' Residence in Madrid where they awaited me. They began by telling me that an astronomical observatory with future possibilities had been set up near Mount Teide under the supervision of the Chancellery of the University of La Laguna. They ended by offering me a contract to carry out 'astronomical prospection' for the site. When I pointed out to them that the term 'astronomical prospection' was completely new to me, they encouraged me by saying that, with my experience in optics and photometry, together with what they knew about me, they had no doubt that I would learn quickly and could indeed carry out such a prospection. They proposed that I spend two years near the Teide, at a site 2400 metres above sea level, taking measurements to determine whether the summits of Tenerife met the criteria for setting up an astronomical

observatory. But neither of them could tell me, then or later, the precise nature of astronomical prospection, what observations needed to be made, or how. In answer to my hesitancy and questions they promised to provide me with an unpublished report written by Professor Redman, Director of the Cambridge Observatory, who had just spent a month in Tenerife. All this gave me the misguided impression that the matter should be straightforward.

In the autumn of 1960 two further possibilities of employment presented themselves: a naval post involving magnetic mines, and the setting up and running of a control laboratory for the copper industry. For the first time I became aware that making any choice involved rejecting other opportunities leaving aside a disquieting infinitude of further possibilities.

The choice involving magnetic mines was not difficult to turn down; much more painful was saying no to the economically attractive control laboratory post. Even at that time there was much talk of Spain's joining the Common Market, and the copper sector of our country had opted to prepare for such an eventuality. The industry was looking for a physicist capable of establishing and running a quality control laboratory while also being prepared to take on the engineering establishment in order to achieve 'European quality' for its copper. This was explained to me by Professor Durán, who held the Chair of Optics (I was his assistant) and second-in-command of the Nuclear Energy Council. The offer was: 12,000 pesetas per month (72 euros) on signing of the contract, a year's apprenticeship in the United States and Germany with an honorarium of 24,000 pesetas (144 euros), and, on returning to Spain, that same salary, plus a house and car in Asturias.

The Teide Observatory offer amounted to a two-year contract, 4500 pesetas a month (27 euros), living at 2400 metres above sea level, and being stationed at the Izaña Meteorological Observatory of the Air Force (in Spain meteorology was still under military control at the time). After some haggling, they agreed to pay me 500 pesetas (3 euros) more with the added condition that my future wife assist me in my tasks.

The copper option would clearly have been the sensible choice to make: quite apart from such a high salary, it would have meant foreign travel (every ambitious Spanish graduate's dream) and new horizons. But I feared that, after the first few years, the job would settle down to being an office boss in charge of subalterns to carry out systematic analyses of copper samples, signing certifications, and being at endless loggerheads with stick-in-the-mud production engineers. Not a very enticing prospect. Even worse would have been having to give up my dream of becoming a research worker.

The Canarian option was not at all clear. What exactly had to be done and what future lay in store for an observatory that existed only on paper in the

Official State Bulletin were quite unspecified. But the offer stimulated my imagination and held the promise of adventure. It was also quite exotic. Moreover, I thought it would permit me to keep my ties to the Optics Institute and follow up my incipient optical research.

I discussed all this with my fiancée, María ('Mary') Anselma Almeida, and managed to convince her to join me in the adventure, much to the disappointment of family and close friends, and to the fury of Professor Durán, who for years after felt affronted at my turning down the cushy copper job.

Once the decision had been made, we prepared everything in a month, got married on 29 December, and embarked on our honeymoon voyage to the Canary Islands. Our haste quite alarmed our families and raised eyebrows among our acquaintances.

The wedding was splendid and the guests were amply regaled. After leaving the bridal bouquet at the foot of the Virgen de la Montaña, the patron saint of Cáceres, we changed and left on our honeymoon voyage to the Canaries, having spent our wedding night at the Mérida parador and New Year's Eve in Seville, before finally boarding the *Ernesto Anastasia* in Cádiz.

In early January of 1961 we arrived, tired and seasick, at Tenerife after an uncomfortable crossing from Cádiz. Mary had been so seasick during the voyage that she mistook an abandon-ship drill for the real thing and rejoiced in the thought that they would transfer her to a lifeboat so that she could watch the loathed heaving vessel vanish from sight. When we came on deck on the last day, the ship was sailing steadily without pitching; we caught site of the mountains of Anaga. We were awestruck at so unexpected and beautiful a vision; the island seemed to have suddenly risen from the ocean. A bright dawn daubed the admirable and dramatic landscape of the bay of Santa Cruz with brilliant and limpid colours. The jutting rocks of the gorges of Anaga seemed to want to embrace the hull of the ship, and large fluffy clouds, illumined in the growing light, hung from the sky. We never forgot this glorious first encounter, and the rough sea passage faded from our minds.

We had booked lodgings at the Colegio Mayor San Fernando in an apartment for university teaching staff. We took a taxi to La Cuesta, the old road to La Laguna. We passed the neighbourhoods of Vuelta de los Pájaros and Vuelta de las Flores, and stopped at the Mirador de Vistabella. These poetic names accentuated the impressive view that lay spread beneath us: a reverberant indigo ocean with scattered brilliant white clouds, flowers, unknown to us, of riotous colours all around, poinsettias and bougainvillias, which we had never seen before. And all bathed in a brilliant, almost blinding light. After the wintry mainland, we thought that we had reached Paradise.

On the following day we had a meeting with two people who had been employed to help us, and whose contracts were even more precarious than ours. One was Miguel Zalote, a mathematician and meteorologist, who had been discharged from military service after (quite rightly) calling an air force general a fool; the other was Ignacio Izeta, a young chemist, who hankered after a job at the oil refinery, the only industry on the island and the Mecca of all Canarian chemistry graduates. Having cut our family ties and left our homeland behind, we needed the friendship of our new companions more than we realized. They were an essential support to help us survive in our new world. We talked a lot, asking many questions, and they told us a great deal, but all in such a negative and defeatist tone as to put a damper on all our hopes. We concluded that the least of our worries would be the appalling living conditions in Izaña and the lack of equipment to carry out our tasks; much worse were the non-existent observing programme and the abandonment by those who were meant to supervise us. The coolness of the welcome came as a shock to us. Undaunted, however, we put the best face we could on matters and cheerfully concluded that these tidings were merely the exaggerated claims of people lacking in motivation.

After Epiphany, accompanied by Izeta, we were taken in the Chancellor's car up to the Izaña Meteorological Observatory. We inched our way along the dorsal road, crossing the mountains of Esperanza, bristling with slender Canarian pines and laurel forests of a thousand hues of green. The trees began to thin out, gradually giving way to *retama* brush and shrubs, and in the distance the volcano began to assume prominence with its blackish, ochre, and brown lava deposits resting on multicoloured lapilli strata. On reaching the rim of the Orotava Valley we penetrated the cloud layer and, once above the layer, we saw it! There was Father Teide, its snowy peak sitting in state on a throne of lava! It was far more impressive, majestic, and beautiful than we could have imagined.

We approached the tormented landscape of Las Cañadas del Teide, entering a barren volcanic wasteland that seemed to have been ploughed by a Cyclops with huge piles of reddish-brown basaltic boulders, like caramel-coated almonds, and peppered with obsidian bombs of jet-black brilliance. In spite of their centuries of calm, dry petrified rivers of lava seemed still to flow from the summit to form agitated seas on reaching the Cañadas caldera. Close by we could see monstrous agglomerations of solid lava surrounding the Teide, with its ancient overlapping layers. We were overwhelmed, intoxicated, enraptured, incapable of absorbing such a wealth of beauty all at once. The impact of that first view remains with me even today in spite of having

Fig. 1.3 The road to Izaña Meteorological Observatory. From left to right: Mary Almeida, Francisco Sánchez, Miguel Zalote leaning on Chancellor Navarro's car, with Ignacio Izeta in crouching in the foreground. (Credit: F. Sánchez)

trodden that landscape thousands of times at all hours of the day and night, and in all seasons of the year.

We left the Cañadas caldera late in the afternoon, the low sun throwing into sharp relief the outline of the crests that make up the old volcano. Izaña Observatory welcomed us enveloped in a dense fog that almost totally extinguished the dusk, the outlines of the buildings becoming visible only when we came right up to them. A fierce, icy wind almost prevented us from opening the car doors. Two friendly-looking ruffians (so they appeared to my wife) presented themselves. they had black beards and were covered up to the eyebrows with military capes. They collected our things with friendly grunts and took us to one of the buildings, the 'Kaiser's Lodge', which was to be our dwelling at the Observatory. This was no ironic nickname, but referred to an old and dilapidated hunting lodge that the German Emperor had used in Africa and later donated to a group of German scientists at the turn of the century. As we entered that dried, half rotted wooden cabin it groaned under the buffeting it was receiving from the gale. The cold was glacial. It was already night and small lightbulbs with reddish filaments that gave out a dim light flickered to the throbbing of a single-cylinder motor that could be heard nearby. Everything was in half shadow with dark mysterious corners. The

driver had gone, Izeta had left, the Observatory had disappeared, everybody was gone, and we were left alone in our unfamiliar surroundings. In a little while even the electric lights expired. We had to light candles that they had given us for just such an eventuality. Exploring this shadowy world with a small torch merely served to make us yet more apprehensive when we pushed the creaking doors of the few rooms we could enter to discover beds and lumber piled up as if there had been a raid. It had been God knows how long since anybody had lived in that ramshackle cabin.

I shall never forget that night of horrors. Mary and I slept fitfully huddled together, not so much because we were newlyweds but simply to ward off the cold and fear. We could hear creatures, no doubt rodents, scurrying under the floorboards while cold, wet draughts licked our heads. In my brief moments of sleep, I lived and relived a recurring nightmare based on the heaving log cabin in *Gold Rush*, the hapless hero being me instead of Charlie Chaplin.

We quickly became aware that the tools at our disposal for doing astronomical prospection were few and, to make matters even worse, defective and unsuited to the task in hand. On seeing this, the bleak panorama that Izeta and Zalote had painted did not seem to us to be quite so exaggerated after all. Once on site it became abundantly clear to us that nobody knew how to carry

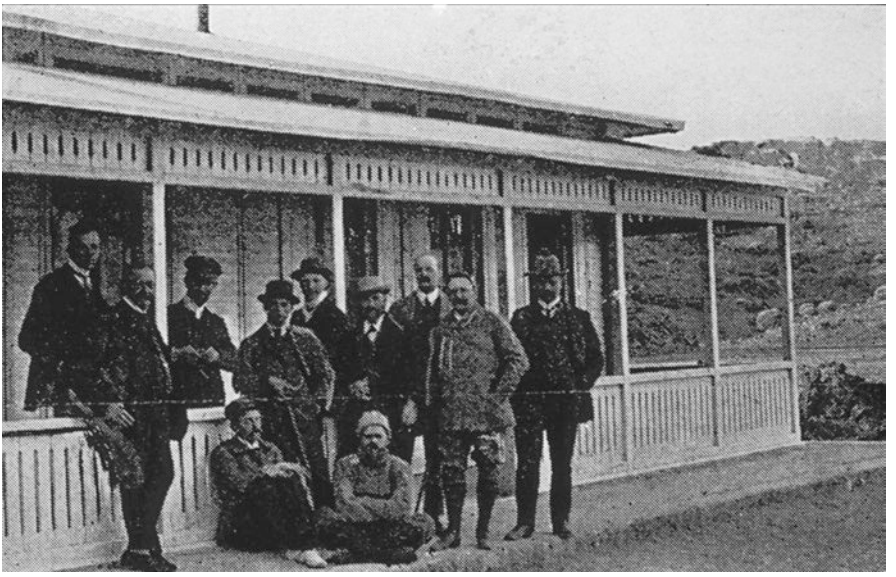

Fig. 1.4 The Kaiser's Lodge in better days when located at Cañada de la Grieta. In the foreground, scientists (doctors, physiologists, and the astronomer Mascart), who came to Tenerife in 1910 to observe the return of Halley's Comet. (Reproduced from Mascart's *Impressions et observations dans un voyage à Tenerife*)

out site prospecting: the tools available were inappropriate, and there seemed to be no genuine interest in remedying this absurd situation on the part of those who had sent us on this wild goose chase.

In the face of this harsh reality my wife and I reached crisis point and were tempted to board the first boat home. Why not? Why should I stubbornly insist on our staying? Why should I set about fixing old instruments and designing new ones to make proper measurements? Why battle with wind and tide against all odds? I suppose it must have been Destiny, that mysterious hand which in Greek tragedy impels humanity to challenge the gods and render the impossible possible. As well blame Providence or Fortune.

2

Izaña (1961–1963)

In daytime under a bright sun Izaña and its occupants took on a quite different aspect and were no longer so frightening. The night of horrors had passed and the beautiful light of a clear dawn chased away our nightmares. The fog lifted to reveal a landscape that was impressive, lovely, sharply defined nearby and limitless in the distance, with the snow-capped Teide above and the sea all round. How different from the flat, open, and bounded horizons we were used to contemplating in Extremadura and Castile!

In the absence of mist and nocturnal darkness, the Kaiser's Lodge, our first dwelling at Izaña Observatory, now looked pretty and bucolic from the outside (if you overlooked its peeling varnish and other signs of abandonment). It must once have been a splendid colonial wooden bungalow. As a building, it had its charms in spite of having suffered years of neglect and ill use. It was first of all a hunting lodge in Germany's African colonies, a gift from Wilhelm II to one of his sons and heirs. The bungalow was later given to a team of European scientists who came to Tenerife to observe Comet Halley in 1910. It was set up in Cañada de la Grieta in Las Cañadas caldera. From there it found its way to Izaña when Spanish meteorologists began their operations there. Today it wears a coat of cement and forms the hub of a military outpost for telecommunications.

Izaña Observatory, located on the summit of a mountain ridge of that name, comprised a scattered group of large, ugly, poorly maintained buildings. It started life, however, as an 'aereological observatory', a base from which to sound the troposphere with balloons and kites; it was then a thriving research centre, well equipped and maintained, in which Spain's first modern meteorologists were trained. It was the cradle of Spanish meteorology and an

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