The time was mid-February 1972, the place a smallish office in the Canberra government buildings. Evening it was, after dinner, the hour of relaxation you might think. But there was no relaxation for Jim Hosie. I could see small beads of sweat on his upper lip. Nor was the meeting an easy one for Taffy Bowen, the Chairman of the Anglo-Australian Telescope Board. The other three of us were angry. Malcolm Fraser, now the Prime Minister of Australia, was angry with the British members of the Board - Jim Hosie, Margaret Burbidge and myself. Margaret was angry with Fraser, while I was just generally irritable, as I usually am when suffering from jet-lag. Besides which, there was no capacity for worry left in me, since I had used up all my store of worry three or four days earlier, when I had resigned from Cambridge University. It is strange to contemplate that the sharply contentious issue of that February evening would be of crucial scientific consequence to me nine years later, in the circumstances I described in the Prologue to this essay. But let us begin at the beginning.

Because the Anglo-Australian Telescope is often said to be the best in the world, it is possible that one day somebody will write its history from the official documents. The most dramatic moments were deliberately omitted from the official documents, however. On formal detail the documents are of course meticulously accurate but on the

problems that caused us the worst difficulties they are bland. The diligent historian will find nothing for instance of the reason for the meeting with Malcolm Fraser in February 1972.

The idea of building a large telescope in Australia may have been mentioned in general terms before Bart J. Bok, but it was Bok's tireless lecturing to specialist and non-specialist audiences alike, up and down the length and breadth of Australia, that caused the idea to become a serious issue. Bok, a Dutchman by birth, an American by adoption, had come in 1956 as the Director of the Mt. Stromlo Observatory - this was when Dick Woolley returned to the U.K. to become Astronomer Royal. Under pressure from Woolley, the Royal Society set up a committee to report on the desirability of the U.K. participating in the construction of a large telescope in Australia. The committee, of which both Woolley and I were members, was chaired by the Royal Society President, then Lord Florey of penicillin fame. Under pressure from Mark Oliphant, the Academy of Sciences did likewise in Australia. Both committees reported favourably on the suggested project.

This was the general situation in 1965 when the Science Research Council was formed. Further negotiations and

discussions on the AAT then passed from the Royal Society to the SRC. Although I cannot fault the SRC's subsequent handling of the project, one might think it strange that the most prestigious scientific society in the U.K. should thus summarily have been written out of all subsequent concern with the telescope. Nor was the Royal Astronomical Society to play any role either, a state of affairs that would surely have been inconceivable earlier in the century. One might say the dismissal of the ancient societies was a reaction against nearly two decades of bungling the construction of the Isaac Newton Telescope, but it was also an indication of the inexorable march of twentieth-century bureaucracy.

In Australia exactly the same shift took place. The Academy there ceased to have any role. Control passed to the Department of Education and Science (DES), a similar but not quite symmetrical situation to that in the U.K. The SRC was one peg down from the actual U.K. Ministry, whereas in Australia the DES was the Ministry. For uncontroversial issues the lack of symmetry made little difference, but in matters of important disagreement our Australian opposite numbers had the advantage of being a long step nearer to the upper levels of their government, an advantage that was to become relevant over the period 1970-73.

Once matters passed from Florey's Royal Society Committee to the SRC, I was out of the picture through 1965-66. These were the years in which I had enough to do in my negotiations with Cambridge University over the setting up there of the Institute of Theoretical Astronomy (IOTA). In 1967, however, while still out of the intoxicating round of committee meetings in London, I came back into the AAT project in a peculiar way. On 15 January 1967, together with my friend Willy Fowler, I watched the Green Bay Packers defeat the Kansas City Chiefs 35-10. On 16 January I returned home. On 24 January I attended a meeting of the Management Committee of the Cambridge Observatories.

The meeting went its usual way. It was all R.O. Redman's business, and as usual Redman played up to his reputation for gloom. I think it was a conscious mannerism, because his inevitably negative prognostications for the future were always given with a smile and in a pleasant west-country accent - if I remember rightly he came from Stroud. Bernard Lovell and Geoffrey Burbidge are the other two westerners in the astronomy business.

It was only at the end of the meeting that Redman relapsed into what sounded like genuine gloom. The prospects for observational optical astronomy in Britain

were plummetting back to their pre-SRC days he asserted. The SRC for some months past had put on offer to the Australians a promise to fund a half-share of the AAT. There had been no reply. With money now available, and yet with nothing being done, the position might even be said to be worse than it had been before.

The Australians had made no reply because Olin Eggen, Bart Bok's successor at Mt. Stromlo, was hoping for a quite different partner, the University of California. Eggen was currently in negotiation with Albert Whitford, the Director of the Lick Observatory, who was himself in discussion with the U.S. National Science Foundation. The Australians through Eggen were simply keeping the SRC's offer on ice until it became known whether or not the University of California could obtain the necessary funds from the National Science Foundation.

I explained this situation to the meeting and also said that if funds were available at the SRC for a half-share of a 150" telescope there was more than sufficient money for a copy to be constructed of the 84" telescope recently built at the U.S. Kitt Peak National Observatory. This would in any case be better for British astronomers, because a telescope sited in the Mediterranean would be only a few hours flying time away, instead of being in

Not so
The U.K. Govt. stopped our negotiations by contacting U.S. State Dept expressing concern and awaiting an invitation themselves
AR

Australia, almost at the opposite side of the Earth.

Whether it was my information, or my jet-lag bluntness, or my argument, I do not know, but the meeting became animated. Redman lost his gloom. Two things were clear. First, that a proposal for a Mediterranean telescope from three professors at Cambridge (Redman, Martin Ryle and myself) could hardly be ignored by the SRC. The second point was that the proposal would need backing from other British astronomers. Hermann Brück, the Astronomer Royal for Scotland, had for long been urging the building of a telescope in the Mediterranean, and his support therefore seemed fairly assured. Bernard Lovell could probably also be counted on as a supporter.

We did in fact make such a proposal and it was indeed considered with great seriousness by the SRC. Neither Redman nor I were invited to attend the meeting (I think of the Astronomy Space and Radio Board) which took place on 6 March 1967. I heard afterwards from Lovell that although Woolley and Hermann Bondi opposed the proposal the arguments given in our formal paper won the majority vote. It was decided that the SRC would ask the Australians to reply by a definite date (around June I believe). If the answer were negative, the SRC would proceed with the Mediterranean project as its first priority in optical astronomy. I have given an account of these events in a

little detail to show that the idea of what some years later became known as the Northern Hemisphere Observatory had been born in this proposal from Cambridge already by the early months of 1967.

Not long after the March meeting at the SRC, Redman came across from the Observatories to my office in IOTA. His news was that the Australians had closed the deal on the AAT, and that the Mediterranean project was off. Although he was then very depressed, he was soon to be asked to join a small working party to make a technical recommendation on the design of the AAT. Through the next few months this assignment occupied his time almost wholly and he was at his happiest in it. The group eventually recommended that the design of the proposed 4 metre telescope at the U.S. Kitt Peak National Observatory should be adopted. Redman and Ben Gascoigne on the Australian side were to be associated with the telescope as optical consultants throughout its construction, an activity for which they always had the greatest interest. In view of Redman's enthusiasm, and of the important role he played up to August 1967, it is remarkable that the SRC never asked him to take any part in further decision-making processes concerning the AAT.

The AAT was far from my own thoughts through the summer of 1967. This was the official beginning of IOTA, the first

international conference was held, the buildings were finished, the computer had to be made to work smoothly and staff to be appointed. It was not until 18 August, when Olin Eggen came to Cambridge and stayed for a day or two at my home, that my mind turned back to the AAT. I was interested in Eggen's stories but not emotionally involved in any way.

A committee of six called the Joint Policy Committee (JPC) had been formed, with three U.K. members and three Australian members. The U.K. members were Dick Woolley, Hermann Bondi and Jim Hosie, and the Australian members were E.G. (Taffy) Bowen, Ken Jones from the Department of Education and Science, and Eggen himself. I remember being surprised that Redman was not among them.

Eggen told me how the SRC offer had come to be accepte When the SRC had set a time limit for the Australian reply he had reappraised his own negotiations with Albert Whitfo of the University of California, and had decided the chanc of Whitford obtaining funds from the U.S. National Science Foundation was not so high that it would be wise to let th British offer lapse. He had gone therefore to John Gorton then the Australian Minister for Science and Education, an had suggested accepting the British offer. A bird in the hand was better than two kookaburras in the bush he and Gorton had decided.

On the occasion of his visit to my home on 18 August 1967, Eggen had just attended the first meeting of the JPC. He told me the recommendation for the adoption of the Kitt Peak design had been discussed and agreed, and that this decision had been the main business of the 3-day meeting. It might seem strange that the JPC's decision to adopt the Kitt Peak design should also have been written explicitly into the contractual treaty between the Australian and British governments, since the JPC's authority on the matter was quite adequate. The further inclusion in the treaty was at Australian insistence, to prevent Woolley (as Eggen told me) from foisting another 'Isaac Newton' on them. There may have been a second reason too. For some years past John Bolton had been campaigning in Australia for the adoption of what is called an alt-azimuth design. By 1967 Bolton had lost his argument, politically but not technically, and the treaty reference to the Kitt Peak design may have been made to emphasise the outcome of that internal struggle in Australia. I mention this point in a little detail, because a day would come when the JPC came close to requesting that the treaty be changed, precisely to permit the adoption of an alt-azimuth design.

Hermann Bondi did not attend the first two days of the JPC meetings. According to Eggen, he turned up at last on the third day with the information that he had just accepted the post of Director of the European Space Research

Organization (ESRO). The upshot was that Bondi would be leaving the JPC, and Eggen told me he had urged to Jim Hosie that I be appointed in Bondi's place. I do not know if Eggen's advice had any influence with the SRC, but I am sure that Eggen must many times later have been angry with himself for offering it. In supporting the SRC's interests I was later to lose Eggen's friendship. The circumstances will emerge with my story.

I described in a former essay (The Quasar Controversy Resolved) how in September 1967 I was approached by Jim Hosie, and how as a result of that approach I became the Chairman of the SRC's Astronomy Policy and Grants Committee, a member of the Astronomy Space and Radio Board, and a member of the Science Research Council itself. I also became a member of the JPC. For the first six months of my association with the SRC the AAT was in abeyance. Beyond a brief discussion with Hosie of the JPC meeting of August, the matter was shelved until the JPC's next meeting, which took place again in London over an extended period from Thursday, 21 March to Tuesday, 26 March 1968.

With the eventual ratification of the treaty between the two governments, the JPC would become the Anglo-Australian Telescope Board, a Board with a permanent Chairman and Deputy Chairman. For the time being, however, the choice of Chairman was informal. To avoid the embarrassment of proposals

and possible counterproposals, Hosie and Jones had suggested that when meetings were held in London the Chairman should be British, and should be Australian when the meetings were held in Canberra. This agreement had the odd effect of putting me into the Chair at my first real encounter with the AAT project, ironically the project I had sought to replace by a Mediterranean telescope a year earlier.

I stayed in London on the night of 25 March, visiting in the evening the hotel where the three Australian members of the JPC were staying. It was quickly apparent that of the three it was Taffy Bowen who was most concerned with the technical aspects of constructing the telescope. Of the six who formed the eventual Telescope Board, Taffy was the only one of us with previous experience of actually building a big scientific instrument - he had built the 210 foot radiotelescope at Parkes, N.S.W. By this I mean seeing through all details, not simply ordering an instrument from a manufacturer, as Woolley had done with the Isaac Newton Telescope and as I had done with the IBM 360/44 computer at IOTA.

Jim Hosie began with a knowledge of the tendering and letting of contracts, but his experience had mostly been inside the U.K. Only Taffy had previous experience of the many subtle problems which arise when contractors from all

over the world are involved. The glass for our mirror would come from the U.S., the optical figuring of the mirror would be done in the U.K., the big horseshoe mounting made in Japan, the main gear wheels cut in Switzerland, the electronic drive and telescope tube both from the U.K., secondary optics in Australia, the TV system and computers from the U.S., the spectrographs from the U.K. and the U.S., and so on with astonishing variety. Correlating such widely scattered activities demanded a wide experience, which Taffy as the first Board Chairman was to provide. If any attempt is ever made to award 'credit' for the building of the AAT, there is no doubt that a large share of it must go to Taffy Bowen. Without him, the telescope would have been only a shadow of what it was eventually to become.

I went over the agenda items for the coming meeting with Taffy. On one of them, described simply as "Drive and Control", he offered only a smile, saying that "I would learn about it when I came to it." On the item dealing with the appointment of a project manager he told me that he had persuaded the same engineer, Mike Jeffery, who had overseen the construction of the Parkes radiotelescope, to apply for the job. This was to prove a happy beginning.

There were three aspects of that long JPC meeting which merit comment in retrospect. The actual appointment

of Mike Jeffrey, on which all six of us were agreed, was to have profound effects to which I shall come in a moment. On the "Drive and Control" issue we agreed by a vote of five to one on an electronic computerised system of a kind already coming into use in radioastronomy, which would lead eventually to a pointing accuracy for the telescope of an unprecedented 1 second of arc. The dissentient voice was that of Dick Woolley, who wanted the old-fashioned system, which could be worse in its error than two or three minutes of arc. At that time the atmosphere on the JPC was bland. To placate Woolley we agreed that arrangements be made to disconnect the electronics if one wished, so permitting old-fashioned astronomers to behave in old-fashioned ways. A year or so later, after Woolley had fitted a TV system to the Isaac Newton Telescope, he would doubtless have voted with the rest of us.

There was an understandable reluctance of skilled astronomers to accept new innovations. The observation of faint objects used to be something of a black art. Imagine stars powdered all over the field of the viewfinder. Somewher usually not anywhere near the centre, is a very faint object, your object. You have to find it, either by remembering the detailed configuration of the stars, or by making reference to what is called a 'finding-chart'. But if you make referen to the chart you will need a light. The dark-adaptation of your eyes will be destroyed, and it will then be some minutes

before you can return to the telescope. John Bolton, when he first crossed the line between radioastronomy and optical astronomy, told me that it took him a year to learn this part of the job. And Margaret Burbidge once said, half jokingly, that she had based her success as an observer on being able to see things twice as faint as anybody else.

Assuming you have found your object, you must now use the fine controls of the telescope to get it to the centre of the field. Only then can your observation begin. You have to set the light from the object onto the slit of a spectrograph if you are wanting a spectrum, or into the optical corrector system if you are making a straight photograph. Once the camera is opened your final job is to keep the object in focus and in its place on the slit or camera, and this you must do for quite a while, for hours on end in the good old days.

Nowadays you simply punch the position of the object into a computer. The telescope moves until the object is bang in the centre of the field. You have no problem staring into a viewfinder situated at an awkwardly-placed position on the telescope itself. You sit in a warm console room, checking the object on a TV screen, and setting your camera exposures effortlessly on the console. A trivial process compared to the tribulations of old-fashioned astronomers. It is perhaps no wonder they were reluctant to have the

younger generation let in on a soft option, with their own painfully-acquired skills suddenly redundant.

The third issue of importance at the JPC meeting of March 1968 was the official agreement between the two governments. This was by-passed quickly by Hosie and Jones with the statement that the Agreement was still being worked on. Indeed at every meeting of the JPC there were light-hearted comments from our two 'official' members on the drafting of the Agreement, so light-hearted that it was difficult for the rest of us to appreciate what an astonishing arrangement was then being concocted. Much later, I was told that, on becoming British Minister for Science in the early spring of 1974, Reg Prentice said that he had seen no more remarkable document.

It is usual for scientists building a large expensive instrument to be limited by their government(s) to the letting of contracts within their own countries. The Kitt Peak project organisers were severely restricted to the letting of contracts in the U.S., while the contracts for the large telescope currently being constructed cooperatively by Canada and France have been let largely in those two countries. The AAT Board, on the other hand, was actually required by the Agreement to call for tenders on an internatio basis.

There is no doubt that this first uncommon aspect of the Agreement was at Australian insistence, to prevent British industry from being awarded the bulk of the engineering contracts. Why those who negotiated the Agreement on the British side, explicitly the SRC, agreed to this procedure remains for me a mystery. If the issue was a sticking point with the Australians, the SRC could perfectly well have let the negotiations fall through, since at that time (1967) a majority of British astronomers would have preferred <u>not</u> to have gone with the AAT project.

I suppose it was said among those who drafted the Agreement that the requirement for international tendering was fair to both parties. This was an illusion, however. There was no way in which there could be effective international competition for those contracts which related to the telescope buildings, since it would have been hopelessly expensive for a building contractor to have operated from outside Australia, and in any case the Australian Trade Unions would not have permitted foreign workmen to have been employed inside Australia. Since the buildings, roads and services eventually totalled a third of all costs, the Australians had a considerable fraction of the money value of the whole project sewn up safely from the beginning.

British industry had always to compete with industry in the U.S., Europe and Japan. There would come a time when

Vickers would submit a good bid for the most important engineering contract, the mounting, only to have it snatched away by the Japanese who submitted a deliberately low bid because they wanted to gain experience in the technology of building telescopes - it was apparently worth £0.5 million to them to be given access to our drawings.

Rubbish!

On that occasion Hosie and I made an appeal to the Board to break our usual rule of awarding contracts to the lowest competent bidder. The Australian members being unanimous that they could not make such an exception, Hosie and I then considered the possibility of referring the matter back to our Minister. We decided regretfully, in view of the terms of the Agreement, that our Minister would have had no case to argue. The only possibility of saving the contract for Vickers lay in the issue of competence. Colin Blackwell of Freeman-Fox would by then be our engineering consultant. We put the question directly to Blackwell in an open Board meeting. There was no doubt, we said, that the Japanese bid for the mounting contract was unrealistically low. Did this imply incompetence?

No, just Japanese efficiency!

I can still see Colin sitting uncomfortably in his chair, wrestling with his conscience. He very much wanted himself to go with Vickers, but such is the high level of morality in the international engineering world that eventually he shook his head and said: "No, the Japanese

are perfectly competent." And of course they were. The mounting was beautifully made, and it was delivered exactly on schedule. The Australians often made unfavourable comments on the inability of British industry to meet their promised delivery dates, and in fairness I must record that these criticisms were usually correct.

Those folk in Australia and the U.K. who paid £10 million in taxes* to provide for the building of the AAT might think the telescope belongs to them. If so, I must correct another illusion. The telescope belongs to the Board, and since by the terms of the Agreement the Board is empowered to "dispose of real and personal property" there is nothing to stop the Board from chopping up the telescope and selling the bits as souvenirs to the visitors who throng the site (Siding Spring Mountain) throughout the Australian summer.

The only power the Governments (the 'Contracting Parties') have over the telescope lies in the appointment and dismissal of Board members, and it is just here that the official documents are at their vaguest. The Australian position was in some degree clarified in an Act passed 1 September 1970 by the Australian Senate and House of Representatives. In that Act (a year later than the Agreement) the Australians at last asked themselves the pertinent question of how the identity of U.K. Board members was to be recognised

---

*Costing was in Australian dollars. The final reckoning made in 1975 was $16 million, about £10 million at the exchange-rate then ruling.

and accepted. The answer contained in the Act was through a signed document from the responsible Minister of the British Government. On the British side, however, I never saw in my eight years membership of the Board any document to prove the identity of the Australian members.

Dismissal from the Board was still more peculiar. There is nothing in the Agreement providing for dismissal or retirement of Board members. On the U.K. side, one actually received a Ministerial letter of appointment which specified Board membership for a stated period, a letter obviously drafted by the SRC and simply signed by the Minister, who was probably unaware that the letter took liberties with logic, as of course one might expect from the SRC. Appointment to the Board conferred title to the telescope. The Agreement is explicit on this point: "The telescope shall be the property of the Telescope Board." Once the title was conferred it could not be taken away after a stated period. One can loan £100 for three years, but one cannot give £100 for three years.

The Australians eventually faced-up to this issue. Realising belatedly the logical difficulty, in their Act of 1 September 1970 the conditions under which an Australian member of the Board might be dismissed were at last defined. Only the Governor-General of Australia is empowered to dismiss an Australian member, and then only for four reasons, physical or mental incapacity, bankruptcy, or financial

peculations associated with contracts let by the Board.

After March 1968, meetings of the Board followed one another at about six-monthly intervals. At every meeting there was a large volume of minutiae which I will not describe here. Rather will I give attention to the three issues with which the Board was mainly concerned:

(1) The larger aspects of the design of the telescope, which absorbed our energies up to the end of 1970.

(2) The negotiations concerning the operation and maintenance of the telescope, which ran as a protracted dog-fight from 1970 until its resolution in the summer of 1973.

(3) The assembly of the telescope in 1973-74, its instrumenta in 1974-75, and the appointment of the first Director in September 1974.

Problems with the telescope design grew on us bit by bit, until in the end there was only a handful of the original Kitt Peak drawings that we could use. The situation began with a proposal from Mike Jeffery to stiffen the horseshoe so as to improve the vibrational frequencies of the telescope (with respect to the servo-systems we were proposing to use). Then John Pope, who had joined Jeffery from the Royal Greenwi Observatory, discovered a miscalculation by one of the Kitt Peak consultants. It affected the friction of the declinati bearings, with the danger that unless the bearing design wer changed the telescope would move in a series of small jerks

instead of driving smoothly.

My experience with engineering, limited to the wartime years from 1940 to 1945, was not adequate for a problem of this delicacy and I could make no sound judgment on it. In principle, however, I have always objected to only half-using somebody else's design. It was therefore in an uneasy frame of mind that I visited the U.S. National Observatory at Kitt Peak. When I told a friend whose practical skills I much respected that we were making some alterations to our version of the 'Kitt Peak design', without asking what the changes were, he said: "I can guess. You're stiffening the horseshoe." Then I knew we were right about the horseshoe.

The telescope's declination bearings became an increasing worry, however. The housings of the bearings could not be changed without unacceptable structural alterations, so that new bearings had to be designed within the fixed volume imposed by the old housings. As the months passed by without Mike Jeffery becoming satisfied that this problem could be solved, there were mutterings about changing the design of the telescope entirely. A telescope review committee in the U.K., of which I was the Chairman, had convinced itself that any new very large instrument which might be built for a British Northern Hemisphere Observatory should be of alt-azimuth design. John Bolton in Australia was just as adamant as ever on this point and our own project engineers were

coming around to the same opinion.

There was a London JPC meeting in August 1970. After it, Mike Jeffery came up to Cambridge. We had a long talk on the bearing problem. I asked bluntly for his opinion about a change to an alt-azimuth design. Since to this point we had spent little money except on site facilities, a change would still have been feasible, although it would have required a clause in the Agreement between the two countries to be changed, which we could not seek to do lightly. I asked particularly about how much time we might lose by switching to an alt-azimuth design. Mike's reply was: "You might not lose any. It might even be quicker that way." Two months later Mike was dead, following an unlucky accident in which he was hit in the eye by the point of a ski.

NO Mike died of a heart attack in Canberra.

As the prospective permanent Chairman of the Board, to be formally constituted in February 1971, Taffy Bowen now approached Ralph Freeman of Freeman-Fox (Mike Jeffery's old company) with the request that Freeman-Fox should undertake a study of the bearing problem for us. At our next meeting Colin Blackwell from Freeman-Fox presented the conclusion of the study. Blackwell told us it was his opinion that a new bearing could indeed be successfully designed, and that it could be manufactured in London by Ransome, Hoffman and Pollard. We then asked Blackwell if he would put this

conclusion in writing, and would join the project as our Consultant Engineer. After conferring with Freeman-Fox, Blackwell agreed to our double request. He was to see us through the bearing problem, through the operation of our mounting contract with the Japanese, and through the final assembly of the telescope itself. His name, along with Mike Jeffery and John Pope, must be added to the list of those who played a crucial role in making the telescope what it is today.

What would have happened if we had gone ahead regardless, without any changes to the telescope at all? Quite possibly we would still have had a thoroughly functional instrument, although probably not as accurate an instrument as the present one. It is the nature of engineering that a design quite far from the best will often prove adequate. The problem for every engineer (and in this case for the Telescope Board) is that, if something really bad does happen, the resulting white elephant becomes a lifelong disgrace. This is why design decisions have to be agonized over so much.

There was no prospect of our being able to make a quick appointment of a new Project Manager. Once again, Taffy Bowen came to the Board's rescue. Taffy had only recently retired from being Head of the Radiophysics Division of the Commonwealth Scientific and Industrial Research Organization (CSIRO). He recommended that Harry Minnett from

Radiophysics be asked to stand in as temporary Project Manager. Besides shouldering responsibility for the project at very short notice, Harry was responsible for an outstanding feature of the telescope, the extreme accuracy of the gearing system. The story is worth telling because it illustrates a genuine difficulty of the decision-making process.

Harry's enthusiasm for accurate gearing, both as a previous consultant to the project and during 1971 when he was acting-Project Manager, was responsible for the Board expending several hundred thousand pounds in lifting accuracy to a level that we could scarcely justify at that time. If we had been challenged by the Public Accounts Committee, it would have been hard to explain ourselves, since we were designing the telescope better than it needed to be for any astronomical application that we could think of then. Infrar astronomy has increased rapidly in importance over the past decade, however. The observation of astronomical infrared sources is possible in the daytime, but during the daytime you cannot usually see such objects visually in the telescop How then can one be sure the correct object is being observe Only if the telescope itself has unusual mechanical accuracy sufficient for one to be certain of where it is pointing at each moment. The AAT has this property, thanks to the comparatively small sum of money spent on Harry Minnett's passion for accurate gears. The AAT can therefore be used to observe infrared sources in daylight, with the consequen

that its cost-effectiveness is significantly higher now than it would otherwise have been.

On this note of technical triumph let me turn to the contentious issue which occupied the Board for some three years up to the summer of 1973. At the August meeting in London in 1970, Olin Eggen first brought up the issue of the eventual control of the telescope, and he did so in a paper which argued that the control be vested in Mt. Stromlo, his own Observatory. It was of course correct to bring up the issue itself, but not to suggest that the matter be instantly settled in his own favour. In view of the problem of the declination bearings then heavy on our minds, we decided the matter would best be discussed in detail at the Board's next scheduled meeting (February 1971).

At that meeting in Canberra it became clear that Eggen's position was a strong one. Ken Jones clearly favoured the Mt. Stromlo solution, and so did Woolley. With so many awkward technical issues on his mind, Taffy Bowen expressed no decided opinion. Hosie was against the proposal, so that with myself still to be counted this gave Eggen a 3 to 1 lead.

My long-standing friendship with Olin Eggin almost dictated that I cast my vote in his favour. Hosie's argument, that one couldn't spend £10 million of public money on an instrument intended for use by <u>all</u> universities, both in

Australia and the U.K., and then proceed to dump it into the lap of just one university, was correct in principle of course, but the principle did not weigh unduly with me. If an organization actually does a good job, even if the situation looks bureaucratically untidy, I am happy to support it. The real question seemed to me to be whether dumping the AAT into the lap of Mt. Stromlo would lead to a good result or not. Regretfully for my friendship with Olin, I decided it wouldn't. If Olin Eggen had played the role of Taffy Bowen, if he had been technically involved with the telescope itself, I would have gladly voted in favour of his proposal. Unfortunately the matter could not be resolved experimentally, by trying both possibilities and by choosing the one that was found to work best. A decision one way or the other had to be made. After much agonising, I deci it would be best if the telescope were eventually operated by a Director and staff independent, not only of Mt. Stromlo, but independent as far as possible of both governments.

My opposition to Olin Eggen's proposals was at first good-tempered, but events were soon to change mild oppositio to hard opposition. At the February 1971 meeting we at last became the official Telescope Board. In this capacity we were called to an official discussion with the Australian

National University (ANU). The Vice-Chancellor, Sir John Craw was in the Chair. Previously I had got on well with Crawford, but now he rubbed me the wrong way. After giving us quite a lecture, he then proceeded to threaten us with Article 4 of the intergovernmental Agreement. Although this Article seemed innocuous to Hosie and myself, Crawford was evidently reading great significance into it.

At the next meeting of the Telescope Board, held in London during August 1971, the issue was held down to shadow boxing, with neither side anxious to press matters to a vote. Woolley was to retire on 31 December and Hosie and I were hopeful that Margaret Burbidge, who was to follow Woolley, would change the voting pattern. I think Olin Eggen and Ken Jones were hesitant to press the matter because they already suspected that Bowen would vote our way, making a 3/3 situation. Besides which, they had what seemed a better strategy, a strategy based on the mysterious Article 4 of the Agreement. The relevant paragraph reads:

"The arrangements for the provision by the University (ANU) of facilities and services for the purposes of construction, operation and maintenance of the telescope shall be such as are agreed upon between the Telescope Board and the University, and the Commonwealth Government shall accord its good offices as appropriate in the negotiations and the putting into effect of these arrangements."

What Hosie and I saw in this paragraph was that arrangements with the University were to be such as the Board wanted and such as the University then agreed to provide. Yet Hosie kept on saying: "There must be something we're not getting." He was right in this, for Sir John Crawford was interpreting the "good offices" of the Commonwealth Government as the right of the Commonwealth Government to impose its will by force on the Board. We knew that Sir John had a justly high reputation in Canberra among politicians of all parties. What we had not quite appreciated was that his reading of documents and situations was everywhere accepted as infallible. If Sir John assured a Minister that a document meant such and such, then it meant such and such.

This then was the situation that had been prepared for us in Canberra in mid-February 1972. This was the situation towards which Hosie, Margaret Burbidge and I were headed as our plane rose on a bright sunlit morning from San Diego Airport on the way to Hawaii, the first leg of our journey to Sydney and Canberra.

Early in that Canberra meeting, Malcolm Fraser, the Australian Minister for Science and Education, gave a lunch for the Board. At the end he made a speech which began pleasantly, but which ended with a wave of the Article 4 stick. He said he wanted to tell British members of the

Board that the Australian Government had spent considerable sums in the support of astronomy at the ANU, and that it had no intention of duplicating those sums by permitting the Board to set up independent operating facilities of its own.

There was no help for it but to reply to Fraser, since with Woolley's retirement I was now the senior U.K. member of the Board. Perhaps because of the greater emotional storm of my resignation from Cambridge a few days earlier, I felt tolerably calm. This was not the time for a riposte I decided. I thanked the Minister for the lunch, digging desperately into my mental file of jokes. I tried one or two. Remembering Bernard Miles' advice always to sit down on a laugh, when at last I got a laugh I sat down. The tension had gone, but from Margaret Burbidge's face I knew that Fraser's speech had cost the ANU a vote. Hosie and I had of course put the situation to Margaret as we saw it, but I had not counted on her vote as a certainty until then. The vote was now at least even, and with Taffy Bowen probably also on our side, this could well be the turning point Hosie and I had been seeking.

For the past year Taffy Bowen had been the official Board Chairman and I had been the Deputy Chairman. It had been Taffy's custom over the three long days of meetings to gain a little relief by passing the Chair to me for either

a morning or afternoon session. On this occasion, however, he seemed glad to pass the Chair more than once, and Hosie told me that a lot of pressure from 'above' was being put on him (Bowen). Before the meeting was over pressure was to be put on us all. After dinner one evening we were called to Fraser's office in the Government Building. Fraser began by repeating more forcefully what he had already said at the lunch. The Australian Government simply would not duplicate its expenditures on optical astronomy.

The only contracts to have escalated seriously in our whole project were those which had been let to Australian companies, especially the building and dome contracts, which together had risen from first estimates of around $A3m to about $A4.5m. The U.K., being charged with a half of this escalation, was being dunned with $AO.75m, essentially because Australian consultants to the project had not been able to get their estimates right on the cost of 'bricks and mortar'. This sum of $AO.75m was larger than any duplication of expenditure there could possibly have been involving the ANU. It was on the tip of my tongue to reply in these openly warlike terms when Jim Hosie came in with a more politic reply. He said it was incumbent on U.K. Board members to make those arrangements best fitted to the difficult problems of U.K. astronomers who would be travelling almost 12,000 miles to use the telescope. Our judgment after careful thought was that an operation independent of the ANU would

best meet this requirement, and therefore it was our duty on behalf of the U.K. Government not to move from our position. It was a much better speech than I would have made. It was then that I noticed the small beads of sweat on Hosie's upper lip.

Fraser saw there was no point at all in going again around the same circuit. He said he would shortly be seeing his opposite number from the U.K., and he would recommend that U.K. Board members be replaced. On the way back to our motel Hosie kept on repeating: "They can't do it. They just can't do it."

Nor could they. Words still mean approximately what they used to do, even in Canberra. A short while later, Fraser did meet with his opposite number from the U.K., and I think it was only then that at last he took a careful look at the by then (in)famous Article 4. He must have seen immediately that it would bear no such construction as the ANU had been trying to give it. By an interesting turn of fate Fraser's opposite number of 1972 is once again his opposite number of 1981. My guess is that if ever Malcolm Fra has another run-in with Margaret Thatcher he will take care to read the documents more carefully beforehand.

It is an elementary mistake to dislike people with whom y

have had a sharp disagreement. Dislike depends on things other than disagreement. Fraser had tried to deal with us in a perfectly straightforward way, by knocking us out with a sledgehammer. It was an entirely acceptable tactic, especially as it didn't work. I had been seated next to Fraser at a dinner four years earlier. From our conversation it was clear that his interests were more in foreign affairs than in science. Viet Nam was then the big issue of the day. Fraser made a remark that surprised me. He said: "There would never have been any trouble if Viet Nam had been a British Colony."

The first step towards settling the contentious issue of the administration of the AAT took place at a special Board meeting in late-April 1972. The meeting was held in La Jolla, California, chosen as a half-way point between Australia and the U.K. Margaret Burbidge made an arrangement for us to use one of the old wooden buildings formerly belonging to the Scripps Institute. My memory went back to 1956, when together with Willy Fowler, Geoffrey and Margaret Burbidge, I had come down from Caltech to argue with George Gamow about element-formation in stars. It had been a good-humoured confrontation between those of us who believed the elements to have originated in stars and Gamow's idea of the elements originating at the beginning of the Universe.

The confrontation before the Telescope Board was of a very different kind. It soon made me wish strongly that I had retired from the Board at the time of my resignation from Cambridge, for I could see that an unhappy situation was beginning to develop. To this point the struggle had been reasonably straightforward. But having lost the struggle it was time for Olin Eggen to retreat. After all, his aim to get a telescope for his own observatory, which two governments were paying £10 million to construct, was surely like a boy trying to raid an orchard. Olin should have retreated with a rueful grin, and nobody would then have thought any more of it. Those of us in the U.K. who in 1967 had wanted something different from the AAT hadn't insisted on continuing the fight when we lost. We had all buckled down to the job of making the AAT a success, and this is what Olin should have done.

It was true that a vote had still to be taken. It turned out we had guessed correctly, Taffy Bowen voted with what had become known in Canberra as the 'British side'. Taffy actually withheld his decision until the other Australian universities began to express themselves. A groundswell in favour of the so-called 'British position' was developing outside Canberra, especially in Sydney, and Taffy gave expression in his vote to this groundswell.

I think Eggen expected Bowen's vote to be against him. It was Margaret Burbidge's adverse vote which surprised him. Olin clearly felt that Margaret had let the side down, quite forgetting the bashing which John Crawford had tried to give us.

Eggen and Ken Jones voted for the telescope to be handed over to the ANU, but two out of six was not sufficient. The vote was official now, 4 to 2 in favour of the Board appointing its own Director to operate and maintain the telescope. We set about drafting an advertisement for the post, with Taffy Bowen obviously thinking a fair number of the world's leading astronomers would be interested in accepting it. He was soon to be disillusioned, however. Following the meeting in La Jolla, Taffy set about making personal enquiries about possible candidates. He was to report his findings at the next Canberra meeting of the Board in early April 1973, when it would appear that the post had become seriously blown-on.

Throughout the first half of the sixties, scientists had never had it so good. By 1973, the job situation had tightened for younger people, but older established scientists were still very picky in their attitudes. It

was now widely rumoured throughout the international astronomical world that the AAT was nothing but 'a can of worms', with the result that most of the people Taffy consulted on a personal basis expressed no interest in the Directorship. Of course the international astronomical world should not have know anything of our business, but the Board's business had been systematically leaked for several years past. The leaks had been obvious at every one of our meetings with the ANU. Bowen had raised the matter at Board meetings on several occasions, but since no one would admit to being the source of the leaks it was hard to do much about them.

The ANU was making things difficult for us at the telescope site on Siding Spring Mountain. In the early days we had agreed with the University to share workshop facilities on the mountain. We had also agreed to make use (for a financial contribution) of the University's lodging facilities there. The agreement had provided for the lodging of astronomers 'using' the AAT. Now the ANU stood on the pernickety point that contractors erecting the telescope were not 'users', and so our contractor's representatives could not be boarded on the mountain itself. They had to drive each day the 25 miles of slow road from the town of Coonabarrabran. And soon there was to be a situation in which the University would make difficulties

over the workshop facilities, even though the Board had paid a significant fraction of their cost.

A still more serious situation developed in the early months of 1973. Taffy Bowen had made an after-dinner speech in 1968 which had seemed witty and appropriate at the time, but which now came home to roost. He had drawn the company's attention to the curious composition of the Telescope Board. For the U.K., only half a real Englishman (Woolley, whose other half was S. African), a Highland Scot (Hosie), and a Yorkshireman. (Yorkshiremen, as Taffy pointed out, do not consider themselves to be Englishmen). For Australia, there was just one real Australian (Ken Jones), an American (Eggen), and a Welshman (himself). This speech was remembered now, and it was being said in Canberra that Taffy was nothing but a bloody Pomm after all. The fact that Bowen had built Australian radioastronomy almost from scratch was forgotten. He was retired now and suddenly vulnerable. Taffy was a yachtsman, expert as in everything else. With his retirement I think he had just one ambition, one castle in the sky. If his fairy godmother could have appeared to give him just one wish, I think it would have been to win the America Cup, for Australia not for Wales.

We had still further problems when the Board next met in Canberra in late March 1973. We would be needing another

Project Manager. When Harry Minnett could not accept that post, except on the temporary basis I discussed above, we had appointed Bill Goodsell. Goodsell's special expertise was in the letting of contracts and in the delicate job of maintaining correct relationships with contractors. There is a fine balance between the mistake of being too friendly with a contractor and the mistake of being too stand-offish. Most important, you have to know the difference between a contractor who is trying to 'swing it', and a contractor who has a justifiable complaint. I had seen a little of this in the building and equipping of IOTA, but these were trivial experiences compared to the many problems which Goodsell found on his plate.

We had decided on a shop assembly of the telescope at Mitsubishi in Japan, a decision that was greatly to help the eventual putting together of the instrument on Siding Spring Mountain. As soon as the main gears had been meshed there was trouble, sparks flying and tiny bits of metal in the air. Uproar. One contractor blaming another, and every contractor blaming the customer for setting the specs too tight. I learned from Goodsell that in such a situation you sit back calmly and wait. The last thing you do is try to be helpful, in which case you will as likely as not end up by letting all the contractors off the hook. Nor do you storm around in a rage, setting everybody's nerves even

more on edge. Our trouble with the gears turned out to be quite simple. They had been made a little too tightly. As soon as they were freed up a trifle, everything worked as it should.

For personal reasons, Goodsell was leaving now, and we had the problems of the actual erection of the telescope coming up urgently on our hands. We decided against advertising the post again, and appointed Hermann Wehner from our staff as the new Project Manager. Hermann had been with us from the beginning. He knew every aspect of our past business, the design problems and the letting of contracts. Wehner was to have a torrid time of it for the next twelve months, but by then almost everything would be in position and the way would be clear for Ben Gascoigne to begin commissioning the telescope.

But now at the beginning of April 1973 the bell was tolling for Taffy Bowen. Several times during the late-March meetings Jim Hosie had said darkly that 'they' were out to get Taffy, and at the end Taffy himself explained to me privately that he would indeed be leaving the Board. The circumstances were peculiar. Taffy had been offered the job of Scientific Attachée (Counsellor) at the Australian Embassy in Washington D.C., at a salary which (as he explained) no retired man could afford to refuse. Once he had accepted

the job, he was immediately told that it would be impossible for him to remain on the Board. It was said to be too far from Washington to Canberra. Taffy had responded by pointing out that it was farther from London to Canberra. The reply was that the Board Chairman could not operate from Washington, and Taffy had said his retirement would very likely lead to my becoming Chairman, and that I would have to operate from London. His arguments were unanswerable, and the fact that they were not accepted is surely proof that 'they' really were out to 'get him', as Jim Hosie had guessed. So too is the fact that Taffy's membership of the Board ceased almost immediately. He was given no bridging period, so I left Australia in April 1973 as the acting Chairman of the Board.

Taffy's retirement from the Board was not the only Australian change. Already at the late-March meeting Ken Jones had been replaced by Hugh Ennor. The Australian Department of Science and Education had bifurcated into two separate departments. Ennor, who had been No. 1 in the previously combined department, now stayed with Science, while Jones who had been No. 2 moved over to Education. Unlike Taffy's removal, this other change was therefore necessary.

Paul Wild was quickly appointed in place of Bowen. I had a long talk with Paul at Sydney Airport just before

leaving Australia. He told me he was unhappy about accepting the appointment, because he felt that by doing so he was being disloyal to Taffy, who for many years had been Paul's boss at the Commonwealth Scientific and Industrial Research Organisation. I replied to this understandable reluctance by saying that letting the telescope go hang was hardly the best tribute to Taffy. Whether this point had some influence with Paul I don't know, but he did join the Board, and eventually he was to replace me as its Chairman.

From Paul Wild's reaction it is clear that the feeling in Australia was that Taffy Bowen had been summarily dismissed from the Board. After rereading the Australian Act of September 1970, I cannot feel this could have been quite true. There is no way that an Australian member can be so dismissed. Rather do I think that Taffy must have been given the choice of either resigning from the Board or of resigning from the job he had just accepted at the Washington Embassy. I think it was more true to say that he had been cleverly levered off the Board.

The bell was also tolling for Jim Hosie. His place as the Director of the SRC's Astronomy and Space Division had been taken by M.O. Robbins. Normally Mac Robins would have replaced Hosie, just as Margaret Burbidge had replaced

Woolley. In the present highly critical situation I felt it desirable, however, that Hosie should continue a little while longer. If he were to go, there would be three entirely new members of the Board. With Margaret Burbidge also a recent addition, this seemed too inexperienced a body to go into the final phases of assembly and commissioning of the telescope, even assuming our problems with the ANU were over, which they weren't.

I wrote to the Chairman of the SRC in these terms, asking that Hosie's membership of the Board be extended for a short further period. Since the SRC itself had used precisely the same argument in asking me to stay on the Board through the past year, and in circumstances less difficult than they were now, I did not think my request would be refused. It is indicative of the bureaucratic state of mind, perpetually in search of perfect tidiness, that it was in fact refused. Although neither of us could believe it in April 1973, Jim Hosie had seen the end of his connection with the AAT. I think it was the project nearest his heart. He was not to suffer much longer. Within a few months more he would resign from the SRC, to appear again only at the inauguration of the telescope.

I had a straightforward problem on my mind as my plane left Sydney Airport. This was after the meeting there with

Paul Wild. All I had to do until the next Board meeting in July 1973 was to work, since unlike all others connected with the AAT I was no longer in receipt of a comfortable salary. On this occasion there was no difficulty in taking time off Telescope Board business, since for the next few weeks Australia would be in the throes of an election, and when Australia is in the throes of an election nothing happens throughout the length and breadth of that continent. The assembly of the telescope would continue it is true, but all other matters affecting the AAT were glacially frozen.

My intention was to spend May and June in the United States, and since I would be visiting a number of institutions there, I planned to do what Taffy Bowen had attempted to do before, to look around for a potential Director of the telescope

It is important to emphasise that a telescope when completed is not yet a research instrument. The construction is said to be 'complete' when the telescope will drive accurately and its optics are functioning correctly. At this stage it will take beautiful pictures of astronomical objects, so that to the casual observer the instrument appears to be finished. But a great deal still remains to be done before the professional astronomer can get down to serious work. The light coming into a telescope contains an enormous range of information, but in a highly complex tangle which

has to be unravelled by various forms of auxiliary instruments attached to the telescope. Such auxiliary instruments are not easily constructed. Indeed it had previously been the practice for several years to elapse in their design and manufacture, several years after the telescope appeared to be finished. The AAT Board had attempted, however, to cut the time required for the eventual instrumentation of the telescope, by ordering a set of 'bread and butter' devices, spectrographs, photometers, TV system, to become available in the later months of 1974. The problem with such instruments is that effective performance requires delicate adjustments to be made. This last stage is no easy job and quite a number of telescopes around the world have failed at just this point. It was precisely to deal with this final stage that we needed our Director.

I was at the Lick Observatory, Santa Cruz, California from 5 June to 21 June 1973, and during this time I had talks with Joe Wampler about the instrumentation of the AAT. Wampler, together with his friend Lloyd Robinson, had produced a remarkable device known familiarly in the astronomical world as a 'Wamplertron'. It was not a comparatively simple auxiliary instrument of the kind which the AAT Board had been concerned. One of its remarkable properties was that it had permitted the Lick 120" telescope on Mt. Hamilton to work effectively through the bright sky created by the city

lights of San José. Something in my conversations with Joe Wampler suggested that he might be interested in the Directorship of the AAT. If so, our problems with instruments would be over, since for Joe the 'bread and butter' stuff would be easy. Moreover, he would have no difficulty in constructing a Wamplertron for the AAT, and so putting us immediately into the world class of research telescopes. After leaving Santa Cruz I wrote to Wampler to ask if there was a chance of his being interested in the job. He replied to say that he might possibly be so. I had his reply by the time of the next Board meeting, which was held in London in late July. A shock and a difficul decision awaited me at that meeting.

I knew Australia had a new government with Whitlam as Prime Minister. What I didn't know until Hugh Ennor told me was that when Whitlam arrived at his new office for the first time he found a note from John Crawford on his desk, a note asking that the whole question of the control of the telescope be re-opened. So far from the ANU affair being finished, it could be just beginning.

The Board asked me if I would become its Chairman for the next two years. This was the difficult decision. Every rational argument I could think of suggested refusal. Brian Flowers, the SRC Chairman, had not agreed to my request

about Jim Hosie, so why should I have a conscience about also refusing? Before giving an answer I had a long talk with my wife over the phone. She reminded me that we had left Cambridge precisely to get away from this kind of situation. And hadn't I done an extra year already, beyond what I had promised? Yet the position of the Board was truly desperate. It had three wholly new members - Ennor, Wild and Robins - Margaret Burbidge had been a member for just over a year, and in Eggen it had a member who was strongly opposed to the appointment of a Director. If I left, it would have a fourth new member. It had a telescope being delivered and requiring assembly, and it had a new Project Manager to do that job. As if this were not enough, it now had the Prime Minister of Australia on its track. On any objective assessment, the situation was now worse than it had ever been, which I felt made it impossible to refuse the Board's request.

After a long absence I had been hoping to spend some time at my home in the Lake District, but if I was to do this job at all I had to be on my way immediately to Australia, to face whatever political music was being played there. So the second week of August 1973 found me

travelling to Canberra again. Hugh Ennor had set up a meeting with the new Minister for Science, and at that meeting I had my first stroke of luck.

Bill Morrison and I hit it off straight away. His interests I could see were in diplomacy and foreign relations - he had studied languages at one of our two ancient universities, and had given himself some first hand practice in Russian by driving an old car to Moscow. He told me that after receiving Crawford's note, Whitlam had asked him in, shown him the note, and said: "This is hot. It's yours." Then Bill had taken a few soundings in universities outside Canberra and had come to the conclusion that the interests of Australia generally were really the same as ours. I saw the politics were over at last. The note to Whitlam had been the ANU's last throw. Olin Eggen must have seen it too, for on 23 August he resigned from the Board. He would be replaced by Bob Street, also from the ANU, but with Bob's appointment relations between the Board and the University were to change gradually but uniformly for the better, and in the end things were to straighten out into a sensible shape.

My run of luck continued. Indeed it was to be a run quite unprecedented in my life. Joe Wampler came over to Australia in November 1973. His assessment of the AAT was

very positive, and in December 1973 he was appointed its first Director. Although Joe did not take up the job until September 1974, in the interim he and Lloyd Robinson built a copy of the Wamplertron in the Lick Observatory Workshop. The AAT Board were much in debt to Don Osterbrock, the Director of the Lick Observatory, for this extremely helpful cooperation. Within six months of Joe's arrival in Australia, the simpler instruments which the Board had planned for so long were mostly operating, and together with those instruments there was now an advanced Wamplertron. By early 1975, the AAT was a world-class instrument, already a powerful tool of astronomical research.

But this is to run on a little hastily. The date 27 April 1974 is an historic one for the AAT. On that night the first photograph was taken by Ben Gascoigne. The time had now come to inaugurate the telescope, since by tradition telescopes are inaugurated as soon as possible after the first satisfying pictures can be obtained. The date fixed for the occasion was 16 October 1974, and it was to be a Royal Ceremony. We were told not to worry ourselves about it, because the Australian Government would be handling the whole situation. Would they though? I knew our telescope building and it had taken me many months to learn it. The place is a veritable maze. The building and dome cost $A4.5 million and you can build quite a maze for $A4.5 million. The protocol chaps came up from Canberra and took just one

look around. They were pleasant and ingenious fellows but they knew this was not their occasion. Inevitably we had to take the responsibility.

The brunt of making the detailed arrangements fell, as many other things did, on the broad shoulders of the Board's Secretary, Doug Cunliffe. Doug had served the AAT project from its beginning, for seven long years now. Like Taffy Bowen he was a keen yachtsman. Unlike everybody else connected with the AAT he was invariably cheerful. Looking back over the years, I can see how much he played a crucial role in difficult times. His good humour more or less shamed us all into trying not to lose our tempers, although we did not always quite succeed. Among the many who contributed to the AAT, Doug Cunliffe stands high.

The sixteenth of October came at last, as all the important dates in one's calendar eventually do. I noticed John Gorton among the guests. His political party was in eclipse now, and he seemed surprised that I should be looking for him. But I remembered he had started the whole thing, with the sudden acceptance of the British offer which had brought Redman with a gloomy face to my office in the spring of 1967.

The many guests had long ago seated themselves around the telescope on the big upper dome floor of the building.

Paul Wild, his wife and my wife, had shown them to their seats. Paul had arranged for a chamber-music group to play through the waiting period. Although a musical performance had been infinitely far from our minds when we planned the dome and building, it was remarkable how good the acoustics were. Taffy Bowen and Jim Hosie had joined the present Telescope Board immediately in front of a specially erected dais covered with spring flowers.

Down below I stood just inside the building, together with the protocol specialists and the political dignatories awaiting the arrival of H.R.H. Prince Charles. The weather that day was the joker in the pack. Outside a gale was raging. The vehicles arrived at last and there came a dash from the protocol chaps to open the car doors. Naturally, they were bare-headed, and I watched in a kind of fascinated horror as everybody's hair instantly stood on end. My turn came next. Move forward, bow, shake hands and make a little prepared speech of welcome, I told myself. But every syllable was blown clean away in the roar of the wind, so that I was instantly reduced to the grimaces of primitive man.

Somehow we forced our way back inside the building and into the waiting lifts. It was then I noticed the clever chaps had equipped themselves with combs. I didn't have a comb, so it was with a hair-style straight out of the forest that I bowed the Prince onto the dais. The ensemble played

the National Anthem and then we were seated. I looked around and remembered a remark from my old friend Bent Strömgren. Strömgren had visited Australia in the summer of 1973 in his capacity as President of the International Astronomical Union. He had paid a visit to Siding Spring Mountain. When I took him to the upper floor of the building, his immediate exclamation had been: "It's the most beautiful telescope I've ever seen!" And in truth the scene there had an uncanny aesthetic quality. The AAT was the first large telescope built with a dome that is rather more than half a sphere. From the outside the effect is not remarkable. Inside you instantly have the impression which Strömgren expressed so well.

The speeches made that morning are a matter of record and I will not repeat or describe them here. When the ceremony was over the guests made their way downstairs to a buffet lunch, while the Board showed Charles over the telescope. With the inspection over, and the questions answered as best we could, it was now our turn to go below. The lunch was on a floor which carried only a little equipment oil pumps mostly. The floor was really a luxury, included in the building to get the telescope as high off the ground as possible.

The time came at last for departure. The wind outside had lessened. We made our way through the entrance door

into the open air. A moment more and the official cars had gone.

In a deeper sense it was the time for departure. Joe Wampler had been seconded to us by the University of California for a term of two years. Before his term even reached its half-way point, he would have all the bits and pieces of the telescope functioning effectively. Nothing now could interfere with the success of the AAT.

I know of no more beautiful setting of a telescope anywhere in the world. Siding Spring Mountain has a flat top over which you can walk for more than a mile. After we had seen off the many remaining guests, my wife and I made our way to the far end of the long summit ridge. Throughout the Warrumbungles National Park in which Siding Spring Mountain stands the wattles were everywhere in blossom, and there were wedge-tailed eagles gliding overhead. We sat down and looked towards distant horizons, knowing this was the real end point of our former academic life. I would be with the Anglo-Australian Telescope until the late summer of 1975, but the final months would be in smooth water, without the drama of the preceding years.