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PROJECT FOR THE HISTORY OF RADIO ASTRONOMY

Transcript of Interview

Transcribed by Pamela M. Jernegan 22 April 1979

Interviewee: S. J. Parsons

Interviewer: W. T. Sullivan, III

Date: 19 September 1978

Place: John Baldwin's Home in Cambridge to Warwickshire

Ambience: telephone

Tape 116B

WS Okay, ~~could we begin, if you~~ could <sup>you</sup> tell me what your background training was and how you first came in contact with radio astronomy?

SP Right. I'm an electrical engineer, graduating in 1939 from Birmingham and going into the Army more or less by accident in late 1940, where it was discovered I knew something about cathode ray tube graphy, which I'd had a special interest, and was also interested in radio work generally. This caused me to be sent on the same course that Hey had joined. In fact, I think he was on the one immediately before me and we were both invited to join the research group which was then being formed.

WS This course was for training in basic radar techniques?

SP Yes, it was. And there were people from all the scientific disciplines, but I think most of the people who went into research were either physicists, mathematicians, or engineers - there were a few engineers, but most of them were physicists. A few, however, were biologists. There was a great vogue for exploiting the newly synthetic biologists of the day, and they did a good job, I must say.

WS Now this would be right at the beginning of the war, then.

SP 1940 and the beginning of 1941 <sup>well</sup> when this group was set up, and there were two problems. One was to get scientific people into the field to try and put the radar equipment into good order. There were lots of operational problems arising, and it was felt there was a need for scientifically trained people actually in the field. As far as we were concerned, it was concerned with anti-aircraft artillery work.

WS Right.

SP And there were similar arrangements being made for the RAF and for the Navy. It was a three-~~pronged~~ pronged attack, <sup>to</sup> improved the operational efficiency of radar equipment in all three services. And it was purely accidental that people like Hey and I landed up in the Army side.

WS Right.

SP I was in uniform, he was a civilian. He'd been pulled out of teaching and I was out of industry.

WS What level was he teaching at?

SP Oh, nothing very special - school teaching.

WS I see.

SP And the history attached to that ~~which~~ is of some interest. He was one of the brighter chaps at university, as I understand it, but there were no jobs in the early thirties, and he graduated in 1930.

WS Which university was that?

SP Manchester. He worked under Lawrence Bragg at Manchester on crystallography, got a research degree, but there was no scope for him afterwards, so he had to go into school teaching. And the war to him was a great relief, <sup>from</sup> from the hum-drum teaching in which he'd never been really interested.

WS Right.

SP I was much younger, nine years younger, and it was the beginning of my professional career, so to speak. But I, too, found it an exciting world, I must confess.

WS All right.

SP All right, you go ahead next.

WS Well, okay. I don't want to go into great detail about what you did during the war, just the flavor of it, but in particular, it was in early 1942 when this supposed German jamming occurred in the radars all along the coast. Were you involved at all in trying to figure out what was causing that?

SP Yes, there was genuine jamming in the <sup>[German warships]</sup> Schambert + Greiseman period of going up the Channel.

WS When those ships were going through the English Channel.

SP That's right. And that was the start of our jamming watch. And we were much involved, and I was personally in that, in setting up the station we had at Dover, which then continued until almost the end of the war.

WS So the Germans had transmitters on the French coast?

SP That's right - they had a number of them, and we were able to locate them with simple DF techniques.

WS And then what - send bombers?

SP No. We didn't locate them with that precision, and they weren't sufficiently serious - we found ways and means of overcoming it.

WS I see, so it was quite natural then when you got this interference in February of 1942 that it was just some new jamming?

SP No, <sup>that was</sup> ~~was~~ thought            to be the case by anti-aircraft command, but this was all over the country. And particularly I remember, in the central east coast that it was noted. And it was purely by deduction from the bearings reported

SP (Continued)

by the batteries. In which I was especially interested because my special responsibility was the calibration of the radar equipment, and things of this kind came to me. And we thought at once that ~~that~~ looked like the sun, and it was Hey who said "If so, this is something we've been looking for or thinking about for years". He said in one of his books that there ~~had~~ been attempts for fifty years before to detect radiation . . .

WS So even at this stage, he knew about these attempts to detect the sun?

SP Yes.

WS I see.

SP But ~~we~~ we collected all the data and we deduced ~~it~~ <sup>that</sup> it was most likely the sun and not jamming. This is recorded. And there was a memorandum which incorporated this that went around on a very limited distribution, as far as I can recall, but nobody would believe it.

WS I see.

SP Because they couldn't detect it in subsequent occasions, you see.

WS But you had gone to the trouble to see if there was optical activity on that day, had you not?

SP We did later.

WS That was only later.

SP Yes, it was later when there was a little more time to consider it afresh.

WS I see, so you couldn't make the argument that you don't find it normally, because there's not usually a really active group.

SP That's right. We weren't able to spend any real time on it. It was at the back of our minds, particularly

SP (Continued)

Hey's, I think, that this must be followed up when we had the opportunity, but there were ~~several~~ much more pressing things.

WS Oh, yes, of course, to say the least. But in any case, you say the military people were reluctant to believe it?

SP And the one or two people with whom it was discussed, I think Appleton was brought in at that stage and several other people and they didn't believe it. Well, I wouldn't put it as strongly as that, but they were skeptical.

WS They were skeptical, yes. In any case, did this have an effect at other times - was this effect seen, did it have any operational importance?

SP No, that was the only time when it did.

WS Just that isolated incident.

SP That's right. Mind you, I think there were many occasions when it could have done, but it wasn't recognized. You see, we were plagued with problems of poor performance and on many occasions it could have been that sensitivity was in effect reduced by this <sup>background</sup> solar noise.

WS Right. Okay, well, that brings us to the end of the war. Can you describe to me how the transition took place to working on other than wartime projects?

SP Now, it's difficult to describe exactly how it arose. We were still very busy <sup>on</sup> the performance of our equipment, we were busy planning for the Japanese war - we were beginning to take an interest in it.

WS Right, as of course, one didn't know how long that was going to go on.

SP That's right. Yes, at that time, it looked as though that might go on for some considerable period, and a few of us, myself included, were preparing to go to India

SP (Continued)

to carry on some of our other work. I was beginning to work on field army detection methods, for example, the bursting of shells, detection of shells in flight and so forth. This led us back, really, to the limits of performance of the equipment. And this in turn led us to look back at this ~~period when, the~~ 1942 period, when there'd been what we believed to be solar radiation limiting the performance of our equipment. And by then we'd learned a great deal more about relatively high power aerials - high gain aerials. We knew how to build Yagis for the lower frequencies, and it was more or less as an experiment to see what we could achieve with the older equipment, which had been really superseded by the Centimetric equipment, that we built some large Yagis. It was then that we discovered that we were getting cosmic noise in a big way.

WS So your purpose then, in going back to this older equipment was not to measure the sky noise, but what exactly was it then?

SP We wanted to see what the limits on the performance were . . .

WS Whatever they might be caused by.

SP And whether in fact this earlier problem in 1942 really was solar radiation. If we were going to get 12DB or more power gain, we ought to be able to see rather more of the sun than had been possible in 1942. And of course, what we got firstly, was fluctuations which were obviously ~~related, were~~ extraterrestrial - obvious straightaway by rotating the equipment, and we quickly found too, that we were getting ~~radio~~ signals from the quiescent sun.

WS Right, now this was at 5 meters, I believe.

SP That's right.

WS Let me go back a step. Did you at all learn about Jansky and/or Reber's work in 1942 when you had the sun detection?

SP *Later than* that, I should think, ~~no~~, *No*, I think Appleton then said that . . .

WS Pointed that out.

SP . . . about Jansky.

WS Because you said that Hey knew about the unsuccessful solar attempts and so he must have known, also, about the success of Jansky and perhaps also <sup>that</sup> Reber had published a couple of things in the late thirties.

SP <sup>don't</sup> I think he had at that stage.

WS Yes, he had in 1939 in Proceedings of the IRE and in 1940 in Astrophysical Journal.

SP In 1940, yes.

WS But it probably wasn't as well known as Jansky's work.

SP No, it wasn't. That's true. We knew about Jansky, about Reber, by the time we were taking it up seriously.

~~So . . .~~

SP Mind you, there were one or two other pointers in this direction. You see, now I recall that ~~Eastwood~~ *Eastwood* have you made any contact with ~~Eastwood~~ *Eastwood*?

WS No, now who is he?

SP He was in 60 group, I think it was, of the RAF, during work on the performance of the Chain long-range detection station. The RAF had Chain and *Ohl*.

WS Right.

SP And he eventually became chief engineer of Marconi's, Director of Engineering ~~at Marconi~~ Marconi English Electric, and President of the IEE. During the war, he had experience of two sets of phenomena that *Included them* with ground based equipment, *and* This was anomalous propagation when they got very long range performance *that but*

SP Continued

also sometimes at great increase in clutter from the sea.

WS Right.

Tape 117A

WS ~~Continuing with Parsons on 19 September 1978. Okay,~~ ~~we're back in business,~~ you said there were two effects, one was the long range propagation . . .

SP Yes, and the other one was unidentified objects, which were thought mostly to be birds. We had a lot of trouble with birds *of* . . . various kinds.

WS Flocks especially, I guess.

SP Yes, that's right. And they ~~began to~~ they were detecting thunder clouds as well, <sup>under</sup> ~~under~~ certain *circumstances*. This was the beginning, therefore, of radio meteorology.

WS Right.

SP And because of this and the beginnings of thinking that we had ~~had~~ about extraterrestrial sources of one kind or another, we got together and talked about these things.

WS What time are you talking about now?

SP We're talking about 1944-45. There'd been interchange between the various services on the problems when we were getting near to the limits of performance. It related, too, to the jamming problems that were arising. When were we being jammed, and when were there unexplained causes of . . .

WS Right, when was it natural and when was it the enemy?

SP Yes. And of course, <sup>with</sup> the passage of time ~~that~~ <sup>things have</sup> ~~become~~ *become* got a little bit hazy, but we gradually got together on these things, and it seemed there was a need to establish what these extraterrestrial <sup>sources</sup> ~~sources~~ were, when they were really extraterrestrial, so with very little money and

SP Continued

with no official backing, we started investigating it. Well, we hadn't gotten any money, there was no deliberate financing. Of course, in the war, there was no such thing as a budgeting of expense, if we needed something to explore a probable or potential need or an idea that might improve performance of equipment, it just happened.

WS Yes, you didn't apply for a grant.

SP No, one didn't have to. Only if it meant modification of the equipment, but ~~then we wrote a~~ <sup>Robert Post</sup> recommended it and it was done over night.

WS These are what we call the short-scatter echos, I believe? ~~was the same?~~

SP Yes. I didn't have anything to do with that work at all.

WS But you say Eastwood was the one. ~~the one.~~

SP Yes, he did quite a lot of work on that. And this is how he came in contact with it.

WS And of course, these turned out to be reflections from ionized meteor trails?

SP That's right. And that is what put us back into looking at it, of course. *My role in all this* was more especially the optimization of the performance of the equipment, the design of the modifications, and a certain amount of the actual watching, the experimental work.

WS The observing, yes.

SP What I'm trying to say is that the theoretical aspects of it were primarily Hey's and Phillips' with his mathematical background. And we used to meet together very frequently and discuss these things and if there was an idea that we ought to be doing something, if we altered a pulse length or we altered an aerial . . .

WS Right.

SP I would go out and do it.

WS So you were really the hardware man.

SP That's right. Absolutely. And I used to rush from one thing to another, when we began to get competition, like the Americans started looking at the moon, for example, a bit later, we thought we would have a go, but we found it impractical with our resources. We did a few calculations on whether we thought it was possible; I would lengthen<sup>ed</sup> the pulse of our transmitter (~~these were~~ purely radar measurements) to the limits and decided that we probably wouldn't get anything back. And we didn't!

WS Indeed. Now this would be in 1946 or so? These lunar radar attempts?

SP Yes, could be 1945-46.

WS I hadn't heard about the fact that you had tried.

But you didn't expect a signal, you say, from basic calculations.

SP That's right.

WS Well, I might ask the more general question, which I had in the letter also, namely, do you agree with Hey's description of the group?

SP Yes, I think that is a fair statement.

WS ~~It seems like~~, Phillips also said that it seemed to him to be a fair statement of the way things were done.

SP If we could go back a little though, you asked the question "whether <sup>I</sup> you thought that his account was ~~very~~ inaccurate, ~~and~~ misleading or incomplete." Now, I don't think that, but I think it was, it doesn't represent his outlook of those years. It's more egotistical than he really is. I was surprised in that book, the way he kept referring to "I did that" and "I did this". . .

WS Yes, I saw a strong flavor of that also.

SP Because that wasn't him at all. I think the essence of what we did was that we worked remarkably well as a team. And my feeling was that we were, I thought in the few years afterwards, that this was perhaps one of the more important examples of what we thought was the new way of doing research.

WS Yes, team work.

SP Team of people getting together with different backgrounds.

WS Yes, you say you thought this around 1950 or something like that?

SP Yes. That's right.

~~WS Yes, well . . .~~

SP I had the feeling that Hey had altered this in his more recent write-ups. Because (this is <sup>a</sup> very personal view) I think he's been a little bit disappointed in some ways because I don't think there's much doubt that we triggered off the enormous developments in radio astronomy. It would have happened <sup>[any way]</sup>, and I don't think there's any doubt about it, <sup>[but we triggered it.]</sup>

WS But the group made several basic discoveries, there's no doubt about that also.

SP And we had the right access to the people who were influenced by it. Appleton played a part in that, although at the time he caused a great deal of annoyance.

WS Which Hey very diplomatically describes as you saw in the book.

SP Yes, at the time we felt very bitter about it, because he never did a thing. But in retrospect, he did a lot in that he brought it out into the open. He had ~~the~~ ~~power~~ the power in the scientific establishment to get over that here was something new and vital going on. And it might not have been very effective without it.

SP ~~Continued~~

But on the other hand, I think he was very silly and petty to want his name attached to things he hadn't done the slightest thing on.

WS Yes, except for a few phone calls or something.

SP That's right. Absolutely.

WS ~~Talking about it.~~ Yes. So, but going back to what you were commenting on-Hey's disappointment - do you mean disappointment that the group is not recognized . . .

SP <sup>He's not a Fellow of the</sup> Royal Society.

WS Something like that.

SP And I think he jolly well should have been. I made one minor attempt to try and do something about it. But I wasn't strong enough to do it, and I can't understand why he wasn't. He was a very unassuming man, and he wasn't pushing <sup>ing</sup> enough - that's why I see this change in talking about "I" - he would never have done that, in the early days-it would have always been "we".

WS Yes. ~~And~~ Perhaps this is why he doesn't want to talk to me, perhaps he feels he's gotten a bad shake, although you would think that would be a reason to talk, too. I don't know.

SP ~~Reason~~ Since then, my university has given him an honorary degree, an honorary <sup>B.Sc.</sup> ~~SP~~ which Birmingham has, because he did quite a bit of work in recent years in backing up their efforts in a similar field. They're doing work on radio-meteorology.

WS I see. But this is work in the 1950's or 60s.

SP Oh, later. Sixties and Seventies.

WS Well, let's just go down these questions on page 2 here. When you were working in 1945, '46, '47 on what we now call radio astronomy, if someone asked you what kind of work were you doing, what would you answer?

correct?

SP I was an electrical engineer. I would not have said

I was a radio astronomer.

WS Right, I didn't think so. But you were an electrical engineer. Did this change at all towards the late '40s?

SP No. I was more than an electrical engineer; I would say an engineer, *a*

~~WS No, because you were . . .~~

~~SP . . . degree.~~

~~WS Right. How else . . .~~

~~SP . . . An engineer/physicist.~~

WS ~~Physics engineering~~. Also, over that period of time, you were writing papers about your results. Now, to whom were you addressing these papers? To other people that we would now call radio astronomers? Or were you addressing them to radar engineers?

SP The world in general;

~~WS The world in general.~~

SP The scientific world. They wouldn't be readable to people who were not scientifically minded, but we felt we were opening up ~~the~~ the frontiers of physical knowledge. I genuinely believe that, that these were exciting, new discoveries, it wasn't to prove any particular theory or fill in any particular gap <sup>of</sup> knowledge. But we happened to get into an area where we were discovering new things almost every day. And that was very exciting.

WS Right. And you felt this at this time? This is not something in retrospect?

SP Yes. Yes, we positively did. Now, neither I nor Stewart, nor Phillips for that matter, had any ideas of being professional research workers. ~~So~~ this had just come out of our wartime activities. And we didn't think, I think this is true of the other people, I don't know if Phillips told you this, ~~that we never thought~~ of the idea

SP Continued

of publishing it to enhance our status, <sup>to</sup> prepare the ground for a post-war career, but I suspect that Hey did. <sup>but</sup> He wouldn't communicate that to us. I think he really saw it as filling in the gap ~~s~~ of his nine lost years of teaching.

WS The scientific career that he had wanted to have, yes.

SP That's right.

WS Whereas you were more engineers, <sup>at least</sup> or you were more of an engineer. Phillips did tell me that when he went back to teaching himself, in 1948 or something like that, when the group disbanded or at least changed its nature, <sup>that</sup> ~~and~~ he now really regrets that decision. He thinks that was the wrong thing to do, that he should have gone to work for Ryle or something like this, you know.

SP Yes, I would have thought that he should <sup>have</sup> done that.

WS But he did it for various personal reasons.

SP Yes, he married one of the girls who worked on the analysis.

WS On the data that you were taking? ~~you were~~

SP That's right.

WS I see.

SP And unfortunately she died ~~only~~ about ten years ago, I believe.

WS I see. Okay, now the question #9 here about data acquisition and reduction. I gather you weren't so much involved in that as Phillips.

SP No, he was the man who did that. As a matter of interest, we had a number of girls who had been selected for their <sup>maniacy</sup> - they were really ~~predictor operators~~ selected predictor operators, you know the predictors that we used for anti-aircraft work <sup>were</sup> manually controlled

SP Continued

in the early days. And we had special psychological tests for the sort of girls who could do this work adequately.

WS I see.

SP And he had three or four of them who did the analysis because, of course, we had no computers available, and it was all done by long hand involving very difficult equations ~~which were~~.

~~SP~~ lots of approximation.

WS Well, you had computers, but they were female.

SP Absolutely.

~~WS Now these~~

SP It took us six months to do things which nowadays would be done over night.

WS Right. Let me just get ~~the~~ straight these predictor correctors, this was for predicting what exactly?

SP Oh, the predictors on the gun sight predicted the future position of an aircraft ~~and~~ from the present position.

WS And one could calculate quickly enough?

SP The machine did the calculations for you.

WS But you had to punch in the right things.

SP You didn't punch it, it was a matter of following an aircraft and by virtue of the course which was <sup>calculated</sup> by the machine (an electro-mechanical device), it would <sup>then</sup> ~~show~~ up what the future position would be.

~~WS~~ . . .

~~SP~~ In relation to a shell's performance.

WS The girls were looking through a <sup>sight</sup> ~~sight~~ and tracking the plane?

SP Right. That's absolutely right.

WS I see.

SP ~~Now you see~~ <sup>I</sup> the later stages we <sup>fed</sup> ~~put~~ in the radar data — ~~and~~ Indeed in those early stages, by daylight they were feeding optical data and by night they would feed in the position of the aerials of the radar equipment. And that was done on what we called ~~mag-slips~~ — ~~There are~~ an electrical ~~position~~ transmitter.

~~WS~~

~~SP~~

. Now the girls

had to follow that, and their purpose or at least their skill really boiled down to resolving or eliminating the jitters of the operators who were following with the radar equipment.

WS Yes, I see.

SP And so getting out a true course for the aircraft. Now the sort of girls we used on that fitted the requirements for doing <sup>our</sup> ~~our~~ analytical work. It arose because ~~we were~~ ~~doing~~ another part of our <sup>establishment</sup> ~~we~~ were doing work on predictors. And we found the girls they brought in from gun sites were very appropriate for doing our analytical work.

WS To do a lot of intensive mathematical work.

SP Yes.

WS Now you made a comment before we put the tape on ~~about~~ ~~this might be a good chance to put it in~~, about the fact that the radio astronomy effort, as we would call it now, was only a small part of the group's effort. Do you mean a small part of even what you four people were working on?

SP Yes, a small part of what we four people were working on.

WS What sort of other things were you working on simultaneously during those years?



SP I, for example, was working on the *error* introduced by *diffraction* over screens. We used screens on gun sites.

WS Ground screens.

SP That's right. And I did a lot of work on the errors produced by these screens. This led to a very interesting piece of work on the *Fernal* zones *of* *over* the screens.

WS Right.

SP And the fact that ~~was~~ I could predict the errors that would be caused by them, *And* we had screens, too, to eliminate ground clutter.

WS Right, right.

SP This was one of the things we introduced during the *B-1 raids*. Because ~~they~~ <sup>it</sup> were <sup>at</sup> very low angles of <sup>right</sup> ~~site~~ you see. These applied even with the American SCR584 automatic-following radar equipment, because they ~~always were~~ <sup>really like</sup> ~~may seem like~~ flying bombs, there's no doubt about that, coupled with proximity *Fuses* *of* (which we also worked on), but the screens were necessary and they started introducing errors. I did a lot of work on that.

WS Ah, yes. What would be another example of things that were worked on?

SP I was also concerned with the calibrations of equipment and we had contacts throughout the United Kingdom with all the gun ~~site~~ <sup>site</sup> ~~electronics~~. We had to organize calibration test programs.

WS So your primary effort, then, was very much the same as *during* the war although, of course, not as pressing.

SP Yes, thinking about it, I mentioned a bit later on I was also concerned with field army radar; we were looking into making rapid strides in the use of radar for spotting of field artillery, in other words, to do flash spotting.

WS Right.

SP In checking the accuracy of gunnery, the traditional way was to do it by spotters who took visual bearings from different places ~~when~~ the shell burst. We adapted coastal centimetric radar equipment to do these observations, and I did a lot of tests on the accuracy of them.

~~WS I see. Now.~~

SP This was going on at the same time.

WS Then the military, however, was willing to let you spend a <sup>certain</sup> fraction of time on this because once again, it did affect the performance of low frequency radars and . . .

SP That's right. I don't think they realized the intensity of the effort we were putting into it. Well, perhaps they did at certain levels and accepted that this ~~was~~ could be of some importance. Moreover, at that time, the military effort was winding down. ~~just about then.~~

WS Of course. Well, Phillips made the point that there were a lot more people than things to do, ~~so~~ although you're saying a bit of the opposite, that you had more than enough things to do, ~~it was just a matter of . . .~~

SP Oh, yes we did. There's no doubt about that.

WS How much modification of the radar's was required to use them for either meteor radar work or radio astronomy?

SP Comparatively small. One must be frank about that. They were important, but not overwhelming. The basic needs were already there, namely, of turntables with sufficient accuracy. I ~~could~~ <sup>had to</sup> go into the possibility of more accurate tracking methods ~~of~~ <sup>reducing</sup> the random errors in them and this sort of thing. Then we came up against insuperable problems - without redesigning them. I tried various devices, but didn't make improvements. But we couldn't do anything fundamental, so we made the best use of what we had available. But at the same time,

SP Continued

I ought to mention that a lot of materials started coming back from Europe and there were huge dumps of radar and radio equipment . . .

~~Right.~~

SP Of various kinds. And we used to take a ~~look~~<sup>look</sup> down to these and had carte blanche to collect whatever we thought was useful. And it was by these means that we were able to make the conversions we needed. So we didn't call for any supplies ~~for~~<sup>of</sup> new materials. There <sup>we started</sup> was cannibalization of equipment. This was how Lovell on his story.

WS Okay, we come down to that point. Hey, as you saw, described this, visit that you and he made to Manchester. Can you tell me what your recollections of that visit are?

SP Yes, I think we ought to go back a little bit on that.

WS Okay.

SP Because he left something out. Or he didn't express it in the way that I recall it. And that is that Blackett and he published a little paper; I thought it was in Nature, but he . . .

WS No, it's in the Proceedings of the Royal Society.

SP You've seen it?

WS Yes, yes, I have. 1941 or something.

SP Well, I don't remember because I never kept a copy of ~~it~~<sup>it</sup>. They did some calculations in this which purported to show what ~~the~~<sup>the</sup> echoing area of a cosmic ray is.

WS Exactly.

SP And we ~~idea~~<sup>idea</sup> made an effort to check this and thought they were an order of magnitude out. And so tactfully, I remember this well, we sat down together and worked this out, and Hey then decided to write a letter to Blackett

SP Continued

saying that we don't think you're right about this; ~~and with~~ The present performance of equipment, you are very unlikely to be able to detect cosmic rays. ~~with~~<sup>with</sup> ~~available equipment, what is~~. ~~And~~<sup>And</sup> a much better ~~composition~~<sup>composition</sup> would be for you to look for the beginnings of radio astronomy that we have been working on. And he told them about ~~some~~<sup>meter</sup> ~~circuits~~ and so forth, which were the obvious correlation with cosmic ray ~~tracks~~<sup>tracks</sup>, if ~~any~~.

WS Right.

SP So Lovell then came down and had a chat with us.

WS So this letter was sent, and this was the reason Lovell came down, as you remember?

SP Absolutely. We told him that his cosmic ray <sup>work</sup> wouldn't ~~work~~<sup>work</sup>. That bluntly, <sup>was what we said</sup> it was put a little more tactfully than that, but that's what it amounted to.

WS Right, right.

SP Lovell then said, well, ~~he~~<sup>he</sup> wondered where he could start. He hadn't got any equipment. And it was said that we thought we could find some old equipment which we would persuade the anti-aircraft command to release to him, because <sup>they'd</sup> been very helpful to us. General Pyle took a great interest in our activities. And, quite without real authority, we were authorized to take some operational equipment up to Manchester. Which is what we did. We went and had a chat <sup>first</sup> with them first to discuss what should be done, and my practical ~~team~~<sup>team</sup>, ~~so to speak~~<sup>so to speak</sup>, ~~they~~<sup>they</sup> prepared an early ~~Mark 1~~<sup>Mark 1</sup> ~~radio~~<sup>radio</sup> anti-aircraft <sup>radar</sup> equipment, with a vertical looking aerial system, which I personally drove up to Manchester.

WS I see.

SP <sup>And</sup> Installed it in the yard in the ~~city~~<sup>city</sup>.

WS So Lovell had no person who really could gather such a thing together and get it working, it was essentially you that did it.

SP No, no. We took up an actual working piece of equipment and handed it over to him. And it was then later, of course, that he found great difficulty with the ignition and electric trains and one thing and another.

WS Right, and moved out to Jodrell Bank.

SP Yes.

WS But I forget now, he probably talks about <sup>the</sup> ~~it~~ in his book, did he then try to do solar observations in Manchester?

SP I think his main interest was on meteors initially.

WS That's right. No, you're right, it was all purely meteors. So essentially you said, cosmic rays may not make a big enough ionized trail, but meteors look like the way to go.

SP That's right. And this can start you off into this field. Now this is another of the things that upset me, that Lovell never in his early book, I don't think at any stage later on, ever made any reference to the help he got from us.

WS No, he doesn't.

SP We took a rather poor view of that.

WS Yes, he apparently keeps a very accurate diary, <sup>[which he's used often]</sup> these historical books he's written. He's written two on Jodrell Bank now, one that goes up through 1957 and one afterwards, so he has an awful lot of detail, but I don't think there's any mention of this.

SP Stewart, who was our meteor specialist, went and spent some time at Jodrell Bank with him. I went there once, but Stewart went several times. This was before they had the big dish built.

WS Oh sure, this is long before that. Are you talking about Stewart did this in the early fifties now?

SP No, in the forties.

WS In the forties. Sure, and the big dish didn't come along until ten years after that.

SP That's right. ~~Was~~

? ~~But~~ In the forties, he got ~~one~~ an ~~MZ~~ PI which was Canadian equipment, I recall, and I went there. But Stewart went and passed on a great deal of help from our <sup>earlier</sup> ~~aerial~~ work. He picked up where we left off.

WS Exactly. And ~~you~~ really carried the ball.

SP That's right, he's a great publicist.

WS Yes, yes.

SP And this is the difference between he and Hey.

WS That's right. Well; a couple of scientific points.

Phillips has told me about this fluctuating source that was found in Cygnus. Do you have any particular recollections about that and what you made of it at that time?

SP Yes, I well recall that. It was with some excitement that this was noted. We all went and looked at it, <sup>so to speak.</sup> ~~As to~~ <sup>As to</sup> the cause of it at that time, we thought, well, ~~this~~ ~~must be the~~, we've got a similarity in this area <sup>to</sup> a number of suns.

WS Exactly.

SP And that was about as far as it went. We thought it can't be the general level because the general levels are static, so to speak. We never thought of the idea of two distinct sources; <sup>if I</sup> remember rightly, the <sup>current</sup> theories are that there are two complete galaxies . . .

WS Well, actually, there's one galaxy, but there are two regions outside of the galaxy from which the radio radiation comes. But that was way along the line, <sup>And</sup> they're only a couple of arc minutes apart, <sup>so</sup> it was a point source as far as your beam was concerned.

SP That's right. Absolutely.

WS But in any case, your Nature paper makes it clear that you feel it's intrinsic to the source.

SP That's right.

WS And I was wondering, do you remember if the possibility was discussed at all about propagation effects anywhere along the path?

SP I don't think so. No, I can not recall that we ever thought on those lines at all. We were puzzled by it; that is true. And I remember we weren't in a position to give any satisfactory theoretical explanation for it. And that this, we felt, was a gap.

WS Right.

SP Most of the other things we did, we were able to back it up with a little bit of theoretical analysis.

WS Right, <sup>that</sup> made more sense. But why was this not followed up? ~~Requires~~ <sup>by</sup> a lot of monitoring to try to understand it's nature.

SP Yes, well, we hadn't the resources at the time, the human nor the time resources, nor for that matter, the equipment to go very much further. And, of course, we were closed down soon afterwards. That's really what it amounts to.

SP We couldn't follow up any of these things that one might have done.

WS Yes. But what I'm getting at is that a lot of time was ~~spent~~, well, maybe it's not as much as I think, in mapping the sky, . . .

SP Because that was something that could be done with the equipment <sup>at that time</sup> ~~at that time~~ ~~at that time~~ Cygnus was just one aspect of something that could be done with that equipment.

WS Right and of course, there might be other sources around.

SP Yes, and we were looking for other sources. That was the whole point; I think you're absolutely right, we thought there ought to be others that were of a similar nature.

WS Yes, sure. That's a very reasonable thing. Do you remember at all any discussions about the nature of this galactic radiation that you were picking up?

SP Oh, yes. There were a number of discussions on this, and of course, we were in contact then with all sorts of authorities of different kinds like Fred Hoyle. We used to go to meetings of the Royal Astronomical Society, and there were several important meetings with big men like ~~Alfred~~ ~~Alfred~~.

WS Right.

SP I remember him particularly on one occasion when he and Fred Hoyle were at the same meeting and Fred Hoyle got up and said "Now, ~~Alfred~~ was talking absolute rubbish." It was ~~awful~~ ~~awful~~ I didn't realize how rude scientific people could be.

WS Yes, well, not all of them, but some of them can.

SP Yes. So there was a lot of discussion with the theoretical physicists.

WS This is all prior to 1948 you're talking about?

SP Yes, this was in my time.

WS Which extends to what date?

SP I finished sometime in 1947 or so.

WS ~~In 1947, I see.~~

SP ~~Yes.~~

WS Well, we'll come to that. But what did you make of this radiation yourself, or what did the group make of it?

SP You mean whether it was interstellar or . . . ?

WS Yes, and what its mechanism of emission might be.

SP Well, as far as I was concerned, we didn't. It was a case of what the theoretical physicists were telling us the possibilities were.

WS So you were just going to make the map and let them figure it out.

SP That wasn't the end of it, of course. I mean, one would expect to be carrying on to elucidate it further and indeed, to plot the map much more accurately. I think the most ~~striking~~<sup>striking</sup> thing was the lack of correlation between the optical ~~patterns~~<sup>picture</sup> and the radio picture.

WS Right, right.

SP There was only a rough correlation, and of course, going back, I think ~~also~~ Jansky's measurements were less detailed than ours.

WS Sure, much less resolution.

SP But this was a very importance difference - what were the differences? Why were they? And we got involved in everything from ~~red dwarfs~~ to ~~the~~ the whole ~~cosmic gamut~~ of ideas that were circulating at that time on the differences between the different stars.

WS Did you have any contact with traditional optical astronomers?

SP Oh, yes. Certainly.

WS Can you remember which ones?

SP We had close liaison with them; indeed, I was going to Brazil in 1947 . . .

WS Oh yes, for that eclipse?

SP Yes. In fact, I built some special equipment to do solar observations during the eclipse. But it was ruined by the disaster of the optical people being killed, except for Hunter.

WS I didn't hear about this.

SP Oh, yes. This was very important. The Admiralty ~~was~~ <sup>controlled</sup> ~~with their~~ Greenwich Observatory.

WS Right.

SP But we'd had a lot of contact with them - there was a man named Newton at the observatory at that time, and Hunter who was a very nice fellow. He became the senior man there for a time, I think, afterwards. But we discussed all these things with them and we got them interested in this radio approach to astronomy. I was just trying to remember who the Astronomer Royal was at that time.

WS Was Woolley? No, he wasn't there. ~~John, before him?~~ Spencer Jones?

SP Spencer Jones, that's right. Now, he wasn't terribly interested, but his assistants were. And this expedition to the eclipse of 1947 was planned, and we were invited to organize radio observations of the sun. So I built some special equipment and we were going to do it at meter wave lengths. And I jacked up the performance by using Dicke techniques, in effect, improving the signal to noise ratio.

WS By using what kind of techniques? Dicke?

SP <sup>Oh,</sup> Dickes. We used to call it Dickes.

WS Switching.

SP That's right. Which I was doing electrically, rather than by mechanical means. So I built a special receiver, essentially one of our radar receivers but with enormous modifications in the recording facilities. And we built it all so that it could be dismantled easily for transit.

But we decided that without the optical people there, I carried too much responsibility ~~for~~ <sup>[J.A.]</sup> the disaster. And ~~the~~ Carroll, who was ~~the man from~~

SP (Continued)

~~the Admiralty and he was~~ scientific advisor to the Admiralty, ~~he~~ was going to go with me after the optical people had left. They had more elaborate things to erect than we had. And he agreed that in the circumstances, perhaps we'd better abandon the whole thing. This is just to illustrate that we were closely associated with the optical people.

WS Right, but now, just to finish the story, so these people left before you and there was a plane crash?

SP They crashed at Dakar. <sup>[13 Apr 47, - 1 week before eclipse]</sup> And killed two of the principal scientific people, and the third one, who was a Dr. Hunter, ~~he~~ escaped with minor injuries, but it destroyed the most important part of the equipment, too.

WS Right, and so you didn't go.

SP We didn't go. And so this is anti climax, but I just felt it would illustrate . . .

WS Well, it was an interesting story, I hadn't heard it before.

SP It's recorded in Nature. <sup>[159, 666-7 (1947)]</sup>

WS I'm sure it is at that time, I just never heard of it.

The optical people you said that they needed to go, you just couldn't go yourself. Was this because you wanted to have their data?

SP I wanted their support, really.

WS But not to run the radio equipment.

SP Yes, but setting up my radio equipment without the optical people with me at the time was a bit of a hazardous occupation in that they would ~~know they would~~ have all the astronomical data that I would . . .

WS As to where to point the thing?

SP Yes, absolutely.

WS And times and so forth.

[I'd]  
SP Yes, and they'd have been overtasked. It had got to be set up. I would be working with no assistance, you see. Because they were going to provide all the technical assistance.

WS And, of course, in fact they'd have nothing to do if it were overcast, also.

SP No, precisely. But then they could have got me set up. And if there'd been a patch in a cloud, they could have confirmed things. But I could do my measurements whether it was overcast or not.

WS Right. But do you remember at all if you were interested in trying to correlate, or planning to correlate, the radio with the optical?

SP Oh, yes, we were. We wanted to try and establish whether the radiation came from the chromosphere or what.

~~WS Right, right. You say . . .~~

SP We were looking really for whether the continuous level of radiation from the sun, which we could now detect, of course, . . .

WS The quiet sun, you mean.

SP That's right, the quiet sun. ~~Whether this, whether it~~ was associated with the chromosphere, and if there were flares or anything else at the time, ~~What effect the~~ screening by the moon would have.

WS As an aside, are you aware of the Russian experiment at that same eclipse where they had ~~it~~ on a ship, ~~they~~ <sup>had</sup> a <sup>bedaim's</sup> array or something like this, and they made some measurements at ~~the VHF, and the way they tracked~~ ~~the sun was to~~ the ship was at anchor, tied up to a dock, ~~and~~ they moved the entire ship around, and so they had someone telling the captain how to rotate it, ~~and~~ <sup>in order to</sup> have this antenna track the sun.

SP I hadn't heard of that. That same eclipse?

WS That same one. They were in a bay off the coast of Brazil.

SP Well, that didn't come to us . . .

WS Well, it was only published in Russia and didn't come to light in the West until several years later, I don't think.

SP That's interesting. Well, it was soon after that, of course, that I came out of it ~~was~~ *altogether*.

WS Right. But let me go back to the visit of Ratcliffe that Hey mentions to your group. Do you remember that?

SP Well, we knew Ratcliffe well, because when we started he ran the radio school, and we'd had contact with him over the years from time to time. Now, I don't remember him coming specifically towards the end of the war.

WS But it wouldn't have been that big a deal since he was well known to you.

SP Not at all. He was in touch with us anyway; we were in frequent contact, well, not frequent, but occasional *contact* throughout the war.

WS ~~Correct~~ Now you weren't directly involved in the meteor radar work, but I was wondering do you have any recollections of the *Giacobinid* ~~how is it pronounced~~ meteor shower?

SP ~~Giacobinid~~ *Giacobinid*, yes. I had a lot to do with that. I built the photographic equipment.

WS I see, could you tell me about that then?

SP Well, it's very simple. Let me go back a little bit. Stewart had been involved in the other work in AORG with doing photographic recordings of predictor dials, and he'd helped out in devising equipment for the operational studies on gunnery practice in relation to radar. He had designed a camera for this use and we decided that

SP Continued

for the purposes of monitoring the forthcoming *Giacobinid* ~~meteor shower~~ shower, we couldn't do what we would like to do; we couldn't record adequately, <sup>?</sup> ~~the~~ *the* ~~pieces~~ from a different type of equipment for which Stewart had designed the camera. So I took this on and altered it radically, greatly improved its performance by larger aperture lenses. And at the same time, I applied brightening display system to the radar equipment. So that when there was a signal, it brightened up according to its amplitude, you see.

WS I see. It was easily recorded.

SP That's right. ~~And this enabled us,~~ We didn't know what we were going to get, we just wanted to record as well as possible. But one of the results of it was that we were able to get a record of the movement of the meteor in range, and from this, deduced the radiant velocity.

WS Right.

SP And that, I think, was one of the worthwhile results of that study.

WS Indeed. Were you involved in the astronomical analysis, so to speak, of that?

SP Well, yes. Only in so far as I went through the film ~~in that~~ my camera (because it had become my camera) and I spotted these useful records and calibrated them and was able to work out the velocity.

WS I see.

SP That part, I personally did. [ANRIS, 1947]

WS And that resulted in a paper, first I think in *Nature*: Hey, Parsons, and Stewart - is that correct? [Notice article was by Stewart, rec.]

SP My part was really that bit of the equipment and ~~the~~ deducing ~~of~~ the velocity.

WS Was that the only paper in which you ~~was~~ <sup>were</sup> involved in some radar work that was published?

SP In relation to radio astronomy, yes.

WS Okay. Well, I guess unless you can think of some other things in terms of the effort, then we come to the end of the story, as to how the group came to a halt.

SP Well, that is really very simple. It basically was the end of the war.

WS But you went on for two years after the war. And you were getting very good results.

SP Ah, yes, but you see, we were living without any proper mandate.

WS But a little bit on the sly, you mean . . .

SP Absolutely, yes.

Tape 117B

WS Right, now if you could say that again, please.

SP The future of AORG was being discussed at high levels in the Ministry of Supply, <sup>and</sup> it was then called, <sup>indeed</sup> the Ministry of Supply <sup>has</sup> may <sup>have</sup> already changed <sup>its</sup> ~~this~~ name, I can't remember. But it was decided that the radio or the radar side of it was no longer relevant to operational research. In point of fact, we had never been following the rules. ~~Our~~ <sup>your</sup> little ~~ones~~ had been making technical innovations rather than the operational research . . .

WS Yes, I see what you mean.

SP But we'd been tolerated because we produced useful results all along the line. ~~And~~ <sup>and</sup> towards the end, however, when we'd gone into radio astronomy, this was not directly relevant and other people were now beginning to take it up, and it couldn't be justified from the point of view of public expenditure.

WS Right.

SP So the future of the individual<sup>s</sup> was at stake. Hey wanted to stay in government work. He became the head

SP Continued

of the AORG in point of fact at that time. We'd had <sup>[as head]</sup>, by the way, Arthur ~~Schwend~~ <sup>Schwend</sup> whom he mentions in his book - another important personality, Celant, who became the head of operational research in Canada afterwards, and at the time when it closed, we had a lesser personality, a man called Sargeant who didn't really understand what we were doing at all.

WS And this is what year when it closed?

SP Let me see, it would be, I think, the year I finished, 1947. As far as the radar side, and indeed, the radio. There was a radio or signal part of the establishment <sup>as well</sup>, and I think that closed at the same time.

WS Right.

SP And so we left. I was offered a job in the scientific civil service, as it was called. As a matter of interest to you, I did not follow it up for two or three reasons. One, because I felt I would never be really successful in the peacetime civil service, ~~and~~ <sup>we</sup> had cut too many corners. We'd achieved success by being different from orthodox behavior. <sup>Moreover</sup>, I was not mathematically inclined, <sup>well</sup>, <sup>to the</sup> extent of being able to do all the necessary electrical work, but to succeed in this particular field of endeavor, one needed to be a good mathematical physicist, <sup>whereas</sup> I would tend to be the technologist behind the scenes.

WS Right, you felt more radio engineer than a radio physicist.

SP Absolutely. And finally, there wasn't enough money in it. There was more money <sup>potentially</sup> in industry. It's not the case today, but . . .

WS There's not much money in radio astronomy these days.

SP Probably not.

WS So what did you do then?



SP I went into industry. And to begin with, I made television cathode ray tubes, and converted them to mass production.

WS You got into the early years of television.

SP That's right.

WS ~~OK~~ Hey makes the point that because of the increasing international tensions, I guess he's referring to the Berlin blockade and so forth, that this is the reason that the military finally clamped down on this radio astronomy effort. Do you agree with that?

SP I'm not sure that that's right. I think they were looking for results in other directions, yes. Oh, I think it was in the reorganization that we'd been allowed to drift along doing useful scientific work, but not directly related to the defense effort. I think that's essentially what it was about. And also, let's face it, many of the major personalities had gone off to other fields. <sup>They were</sup> Going back to the universities, ~~they were~~ becoming heads of atomic energy establishments, and this sort of thing.

WS Well, one last question that comes to mind, did you have contact with other radio groups at that time, for instance Ryle's group or correspondence with Radio-Physics in Sydney?

SP Yes, indeed, we did. Quite a bit. Of course, Ryle had hardly started, and I felt that they were all starting as a result of the stimulus given from our group.

WS ~~That may be true~~, Well, I'd have to look at the dates. It was all sort of simultaneous, and many discoveries were being made. You hit upon three of the biggies in ~~three~~ very different fields, whereas the others were concentrating more <sup>on the same</sup> in the first year or so . . .

SP That's true.

WS Okay, that's just about it, unless you have any other comments that you wanted to make.

SP I don't think so.

WS Okay, thank you very much.

SP *One more or* why I didn't feel inclined to persist in that area, and this was perhaps my naivete at that time. I thought petty jealousies in the scientific world, were deplorable.

WS Yes.

SP I saw the most dreadful plagiarisms, and all this effort to rush into print as soon as possible. We got to the stage where if we discovered anything, "now, can we write a letter to Nature?"

WS Exactly.

SP And ~~the~~ the way I saw other notable people trying to steal ideas was absolutely deplorable. Now I realize this is just human nature, it's just as bad in other fields.

WS Just as bad in the television industry as it is in science.

SP Yes. And it's still as bad in the scientific world.

WS You just somehow expected more of science?

SP That's right. Absolutely.

WS Okay.

SP That's been a long business for you; I hope it's been worthwhile.

WS Thank you very much.