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LEADERS OF NATIONAL LIFE

Professor Maurice Wilkins FRS

Interviewed by Steven Rose

C408/017

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**Part 1**

**Digitised from Tape 1 [F1169] Side A**

*This is on the 23rd of February, and it's an interview with Maurice Wilkins for Paul Thompson's National Life Story Collection.*

*OK, so it doesn't need to pick up me, it needs to pick up you, and I think that's probably just about...*

Well it needs to pick up you if you say anything don't you?

*Well, I'm not going to say very much.*

No, but it's...

*It'll catch me, I'm watching the signs here.*

Well, oh yes, I see, you can see the...

*Yes.*

Well, you see, what I would like to have done, if this is agreeable to you, is to start off with the family background, and discuss some of the main features which seem relevant to my life and development, and this is really a sort of rough free run of this autobiographical family background and history thing, which I'm now sort of beginning to work on.

*Yes, that seems fine.*

And then, and I thought well it would be very interesting to have your opinion about what sort of angles here seem to you of interest. Is that...would that make sense?

*Yes, I think that what Paul would like us to do is obviously to start with your family background and childhood and things like that. And take it on from there.*

Yes.

*But obviously we want to take it right the way through to present times.*

Yes, quite, quite. Well, I think the reason why I am interested in the background, I suppose everybody sees the background somehow contributing to the life which comes later. But for an autobiographical study, which I am interested in, the real question is, where motivation in doing it is somehow that one may be able to learn lessons from history. Now as people normally say is, that it is precisely what can never be done, and presumably the reason for this is that, I forget what people have said about it is, that people do have some degree of objectivity towards what happened in the past in historical situations, but so far as the present is concerned they have an almost entirely sort of subjective reaction to it; they're caught up in the present, and so although they may have learned the lessons of history very well they're incapable of applying them effectively to the present. I imagine that's the case. Do you think that's...general idea right?

*Yes, I'm sure that that's also true. I'm sure that's true.*

Now the other difficulty of course about all this is that one can be objective of course about other people's lives very much, but it's much more difficult to have any reasonable degree of objectivity towards one's own. But I think that if one is not going too deep into problems which reflects sort of psychological stresses and strains in oneself, that one may develop some degree of objectivity and be able to treat oneself as one would other people. And in fact in this whole exercise, I mean I was rather stimulated to do it because I had done one of the Royal Society Biographical Memoirs on John Randall, you know, my own boss, and I quite found this interesting, and other people found what I had written was interesting, they seemed to think that I sort of brought the person out and all that. And so what they want always is, not only the person's scientific life but the background which the Royal Society I think very

rightly sees as contributing to that life. And so that this...the fact that I could do it for somebody else, I thought well I can do it for myself! [laughs]

*Of course.*

Now, the...there is one thing which strikes me about all this is that in relation to the Thirties scientist movement, which we will discuss later on, that reading books like Wersky, I always find it very difficult to read them because I think, I suddenly realize what it is, I think that it all...it has no life in it; it's all the sort of facts about all these people doing this and that and so on, and having this or that idea, but none of it really seems to come to life, because I don't think he seems to be dealing with the underlying attitudes and feelings which have motivated the development of the ideas. And so that I think in the same way in this whole type of exercise, what I am interested in doing is trying to get clearer what the general attitudes are, rather than the particular thoughts which people use to express their attitudes. Because you can set down the thoughts by themselves, you may not bring out clearly what those thoughts really meant in that context. And so...but anyway, that's some general remarks, so that I would now... Oh there are one or two other things I would say here that, in our family background, it seems pretty obvious, that what we are, our sort of attitudes and style of living and thinking and so on, depends very much on our cultural environment, our family attitudes, our cultural inheritance and so on. And here I would like to make the point that I personally feel inclined to think that there is a definite sort of genetic component here too; things like special abilities and so on, or musical ability, or draughtmanship or something like that. And I feel here, this is treading on dangerous ground about this thing about inheritance of things like intelligence. But what seems to me that the real reason one is so...feels so strongly about this thing about genetic inheritance of intelligence is, that these data then are used to pre-judge people and categorize people and no longer treat them as human beings with potential. I mean that is the dreadful thing about it, and I don't think that the biological theory of inheritance of intelligence or something in itself is necessarily a bad thing; it is what...it's the potentiality such rather simplistic biological notions have for misuse which are really serious things. And so I personally would do this exercise on the basis that it may well be - there's no necessarily great evidence - that

in my family background there has been some inheritance of certain intellectual abilities and attitudes and so, but one...obviously one can't prove it, because it's all mixed up with the question of cultural inheritance. Well so much for general remarks.

*Your were born in Ireland, weren't you?*

No, no, New Zealand.

*It says Dublin in your...in the 'Who's Who' thing that I've actually got, and that was what surprised me.*

Really?

*Yes.*

No, it says...well, what, the current 'Who's Who'?

*No no, an old one.*

Well it was always Pongaroa New Zealand I was born.

*Doesn't say...it didn't say it in this thing that I've got here, and that's what puzzled me.*

Strange. My parents are from Dublin.

*That's right, that's right.*

I've never seen that error anywhere.

*Oh no, it says 'both of Dublin', I just assumed it actually meant that...*

Both the parents, ah, right, yes, yes.

*OK, yes, well that's what it was; it doesn't say where you were born, so I just assumed that that meant Dublin.*

Oh, are you sure it doesn't say Pongaroa, New Zealand?

*No, promise it doesn't.*

Oh, that's rather stupid isn't it?

*Well...*

Yes, I'd say! OK. Well now, first thing I've been delving into here is, Great Grandfather, William Mortimer Wilkins, about whom I know, as a human being and his general characteristics I know very little indeed. This is the exasperating thing. We do know quite a lot about things he did when he got into the sort of Army as a surgeon. Now I have found...he left notes about all the battles at which he was at in the Afghan wars and other wars, and I found it very interesting reading up about the Afghan wars and these things. But, from the point of view of what relevance this has to my life now, you might say well, what's the point? But I think there is some relevance, and...but inasmuch as William Mortimer, with a silhouetted portrait looking very grand on a horse, with the Gazny [ph] fortress behind, so-called impregnable, this did form a sort of somewhat grand image in our life in the family, and...ah yes, we look back and the ancestor who had been an army surgeon, and one thought well this was a little bit grand and respectable and all that kind of thing. And so...but I wouldn't say that this necessarily has had a very important effect on anybody. But what was interesting was to read up about this, and to find why people went into the Army of Surgeons. Oh I might mention that he was the son of...his father was a tallow-chandler in a I think not very grand street in Dublin, and he made a marriage to someone called Creethorne [ph], whose family owned some property, and they moved out of the tallow-chandlers' street in Dublin to a, I gather a somewhat grand house at the end of a tram line called Whitehall I think was, and...but it seems that they didn't have very much money. Thirteen children. And so...two of them at

least became army surgeons. But it's interesting to see why...I think this is a sign that people aren't very well off, that it wasn't a very good career, unless you had money already, I've been reading up about this, you had a right of a captain, but you were given a sergeant's pay. And of course all the officers at that time could have quite a good life in the Army, and so if you came from rather modest surroundings you might have quite a good time; you might have 20 or 30 retinue behind you, as an army regimental surgeon, carrying all your bags and the medical bags too. And of course officers regarded war then as a dangerous sport, and there are some very interesting accounts you can read about lives for army surgeons at that time. Of course the privates had a hell of a bloody life, cooped up in buildings in hot climates, and only let out for brief exercising and fighting. And of course the reason they did that was because it was bloody starvation here in England, with unemployment and so on. Now that was a dreadful life. But the...I think the real thing is, how relevant is all this interesting stuff to my life. But it is interesting, it connects up in a way, that the first Afghan wars, well pretty disgusting war of retribution after the British had suffered the most ghastly defeat, and lost their whole army from Kabul, evacuation from Kabul in the middle of winter. And so the British had to get out the remaining forces and have some retribution. But it all arose out of the Russian threat again you see, so you have Russian threat every century again, of people going into...or the reverse, the Russians feeling threatened. So this is the same old thing again, history repeating itself. Now, the...oh, the one interesting thing about William Mortimer was that he brought back seven Afghan sheep and presented them to the Zoo, which I thought indicated he had scientific leanings. But the Zoo people tell me that army officers bring all sorts of stuff back, live and dead, and in fact it was their main source of specimens from all over the world, during the nineteenth century, was from these army officers. They didn't have anything else to do, you see, and it was...so they'd start collecting things and sending them back. But...so that's a bit exasperating, don't know any...practically nothing about him. But at the age of 55 when he got back to England he married a 19-year-old girl in...Sarah Middleton, in Kent, but we don't know much about them at all, except that she apparently developed into a woman of considerable general force and good sense. Because her daughter I spoke to a lot, my Aunt Lizzie; I used to go round and visit her when she was bed-ridden near us when I was in my early teens. But he died, left her at the age of 35 with five children to

support. And that was the background where there were considerable pressures on these children to survive, and apparently three of the men worked very hard, and got to Trinity College, Dublin. George became...professor of Hebrew apparently finally; my grandfather William, who became headmaster of the Dublin High School; and my Aunt Lizzie, who was one of the first nine women who got a university degree from the Royal College of...or University of Ireland, I forget the exact title. I must check up on this, because I don't know how long that institution lasted. There were nine women in that year apparently. But where they got the idea of women in higher education from I don't know. You see there was no sort of signs of very sort of enlightened interest in learning and women's emancipation or anything. So that is a mystery. But it was undoubtedly there. And William as the headmaster of the Dublin High School, he...he's been commented on for encouraging Jews to enter the school, which gave rise to a certain amount of grumbling from... These were all Protestants incidentally, the whole family were Protestant. And also I think fairly free thinkers. But anyway, he had a liberal and enlightened attitude towards what kind of people ought to go into his school. And the other brother, Charles, died after smallpox, and they set up a prize in Trinity College, Dublin, for women students. I had the idea it was for women students doing Mathematics, but I'm not sure about that. So there was very definitely a sort of a...fairly enlightened views then about education and who should get it in the family. Well on the other side, my grandfather William, the headmaster, he married into a family where there was quite a lot more money, and...the Huttons [ph]. And one of the Huttons there, who was a librarian at Trinity College, Dublin, he was a great follower of Comte, and made a sort of moderate made a sort of moderate name for himself writing about these things. Now I want to look into Comte more, because I think it's very easy for us to dismiss all this rubbish from the [laughs] enlightenment, because obviously in many respects it was rubbish, but I think that there are important positive elements in Comte. I mean...do you feel that's reasonable yourself?

*Oh yes, oh yes. We certainly shouldn't dismiss...[inaud].*

I mean a terrible...awful mixed bag of things. But I think there was a very positive side there. Now, on that side of the family too, Anna Swanage [ph], who was a

leading intellectual woman of Gladstone's time, and in fact apparently had breakfast with him - I looked up her various books in the British Museum - that she was the lady visitor, or one of the lady visitors, to the Queen's College, which F.D. Maurice had set up as a branch of King's College. And...of course the reason F.D. Maurice did that was because his sisters had been governesses, and he knew first-hand from the family the dreadful position women were in, because they were expected to earn their living the only way they could, by educating children, and yet they had practically no access to any education themselves. It was an extraordinary position. And so, this was set up by 11 staff, men staff from King's College. Now this Anna Swanage [ph] was interested in education of the masses generally, and of course this was done for two reasons: a) they had humane feelings about the needs of the masses, and b) they were frightened that if you didn't civilize them with some education they would form dangerous mobs [laughs]

*Quite so!*

And so...it was the two sides. Public libraries, all that sort of stuff. And one is conscious of this a little bit when you see these television interviews of people in their 90s and above from...from the East End of London recently, and the fact the...they said they never saw the upper classes, they never entered the East End. And this division between the groups in society. Well, my theory is - it's only my theory - that my Uncle Maurice, son of William, got his name from his mother, through his mother, because Anna Swanage [ph] was her mother's cousin. But I can't prove that, but I like to think that I got my name indirectly from F.D. Maurice, because in many respects he was an enlightened and progressive person. Now, my grandmother, Mary Hutton, she spent, I think it was one year at Newnham College, Cambridge, and she...it's interesting you know, these things get blown up in families a little bit, that I used to have the idea that she got a degree at Cambridge; there's no such thing, but I think she spent a year, I think it was a year and not just simply one term, there. And so she was an educated woman of a sort. But that...her whole background of philosophical cultural ideas is interesting. She was a Unitarian, which I gather means...often meant that people were interested in the critical analysis of biblical text, and were interested in the comparative...comparisons of various religions. So that

although the emphasis may have been primarily on Christianity one was also very actively interested in Buddhism and other Eastern religions. And I think that that was an important influence on my father, who took a medical degree in Trinity College, Dublin, that he grew up in a particular Dublin scene, which is interesting, one which I haven't been into enough yet. But I think what I do realise is that there was a cleavage between the cultural philosophical scene and the political scene in Dublin. Because I suspect that the Protestants you see were representing the connection with the British government and the governing classes over there, and it would have been the Catholic lot that were going to form the basis of the revolutionary political movement, which so far as I know, my family had no connection or feelings for at all. But from what I can make out, they had lots of contact; my father spent a lot of time staying with...peasant types, Mrs. Fagins, Fagin was the name of one woman. But I think this was on a basis of...to see, that he wasn't sort of educated...he wasn't pushed on grand tours of Europe and things like that, which his father and uncles had done, but he was left to run, sort of ragamuffin at the sea, at a place called Skerries, living in Mrs. Fagin's cottage with her various friends. And I think the...from what I can make out the attitude towards the poorer Irish people was, that they were very good people, they were very amusing people, and very worthy people, but you didn't take them...you didn't have any great thought about why they were poor peasants and such like. You see I don't think there was any political consciousness there. But what there was, was an enormous interest in health generally, in health of mind and body, exercise, fresh air, good nutrition, and also took the form of vegetarianism. And so that the...and a certain amount apparently of Buddhism. But I think this faded out in my father's life as he got older. But the...I want to go into this more, about the nature of this Dublin culture there. Now...James Joyce, in 'Ulysses', he refers to William Wilkins, exposing himself at the window of his house in Market Street, and the one theory is that William Wilkins did Müller's exercises. I haven't looked up Muller's book of exercises yet, but undoubtedly this was one of the things that my father was very keen on, and so I would guess that what happened was that with the fresh air you see, open windows, and get your clothes off, I mean...that he was notorious for appearing...

*[inaud]...yes.*

Yes, well, I mean it was a joke; whether he flashed or not, it was a joke. And so I suppose a little poetic licence on the part of...but I don't know. But they certainly...this was the...the general interest. And also a great deal of climbing, or walking up the Wicklow Hills, a great deal of...well my father had a year off as a teenager, with some complaint which I think he probably spent mainly at Skerries, someone suggested at the seaside, and he got very interested in bird-watching, and I think he got a lot of interest in the Nature, you know, with a big N. And all this Wicklow mountain walking, and athletics generally, gymnastics, quite different from me, he realized at an early age [laughs] that he couldn't expect me to follow in his footsteps there. And the cycling was the big thing. But certainly these young men, as medical students and keen cyclists - of course cycling was a very respectable, somewhat upper class thing then, and you had the university cycling club, my father was secretary of it - and active in lecturing about health and exercise, that they apparently were well into...they were a pretty wild lot in a fairly sort of harmless manner. And they...there were some big landowner or aristocrat that they knew that they didn't like, and so a group of them apparently got his boat, I don't know how big the boat was, and pulled it up over the lawns and everything, and put it in the middle of the living room, and closed everything up neatly. And apparently they were suspected of doing this, but it was clear, it seemed clear that they couldn't possibly have done it, because they were all in their beds in Dublin you see the next morning. Well the thing is that they did it by the fact that they were extremely good cyclists and they were able to cycle 100 miles or something and back there. Now I think this is a sort of indication that they were certainly not members of...of the...with reverence for the Establishment, in some respects at least. Now...now let me see, where we...where I go from there...

*When did they go to New Zealand?*

Ah, yes. Good point. Yes, that was 1913, almost immediately after getting married to my mother. And the mother's...that side of the family was very different. They had a...they were presumably German background. My grandfather on that side was a Plymouth Brethren, which is I think one of the most extreme forms of Christianity

there is, and a very straight-laced man, who was in the Dublin Police. Now, we as children got the impression that he was the...what do you call it, a chief constable or something?

*That sounds very grand.*

Yes. But we found in the family album a photograph of him on point duty... [laughs] ...apparently, but he was looking rather grand, and my mother said, oh well this was when the...the King or the Queen or someone came to Dublin. So, I think the truth of the matter is that he did have a...he was somewhat up the hierarchy in Dublin Council, in the Police, and...these things get a bit magnified. Oh, talking about this magnifying things, and undue pride in families, it is worth considering what happened to the army surgeons.

**End of part 1**

## Part 2

### Digitised from Tape 1 [F1169] Side B

.....worth considering what happened to the army surgeons, that as the general pattern was about ten years, for five to ten years of hospital mate, which meant you were right at the bottom of the ladder, and you had no sort of privileges as an officer at all, and you just picked up experience on the job, and often, if there were a lot of wars, in Britain you had practically no qualifications at all. But William Mortimer did get a...he must have passed some exams here at the Royal College, that was standard thing. And then you spent ten years at a lieutenant level, as an assistant surgeon, and then it was only after about 15, 20 years, you became a proper regimental surgeon, at a sort of captain level. So that a lot of your time, you had a pretty thin time, pretty low down in the hierarchy. So he followed roughly the usual pattern. But...yes, I think I was referring to this partly from the economic pressures which drove people out, you see. Why did people with medical qualifications go into the army? Well one was that you could get into the army that way with very little qualifications, less than William Mortimer had. I am told that there was an excess of doctors in Britain at that time, and certainly one of the surgeons whose memoirs I read, said that he had been warned that being a doctor was a precarious situation; you didn't even get fees in from patients. And so you at least got a regular income out of the army.

*But that wasn't why your parents went to New Zealand?*

Yes, but I'm getting...I'm getting to the economic motive, why people went off to the other side of the world.

*Yes.*

This is what I don't know enough about, how much economic pressure there was to clear out of Ireland. But there was a lot of emigration going on, because two of my mother's brothers went to Canada - I think both of the brothers went to Canada - and...I think I might mention that the whole sort of...Whittaker, that was the name of her side of the family, they were much more limited in their general outlook and

conventional... And my mother was rather a sort of...a very sensible woman, with very good judgement about many practical situations, but she had no sort of, what you might call physical or cultural enlightenment, and so in that respect the marriage was not a very good one, because I should think as things developed they were not able to form a very creative sort of dialogue between them. But...

*He went off to practise as a doctor in New Zealand?*

Yes. Well, they chose New Zealand, I think they...they were probably attracted by New Zealand because he was interested in mountains and nature and all that, and so New Zealand was probably known to them as being a very new country. Mind you I suppose Canada was new too, but... Anyway, they went. And...yes, he started as a GP near Wellington for a year, as quite a young man. And we have quite a lot of information about his life then, because he wrote long letters back to his mother in Dublin. And I have been through these letters, and got a lot of additional information in it to what I had already got from my parents, and sort of telling us about things and what had happened there. And...so that was the first year. But I think he didn't like it very much - well I know he didn't like it very much, because it was difficult to get the fees being paid in this area, and... His original attitude was, well if people don't pay their fees that's their problem. I think he was a bit like his mother, who was rather an impractical educated lady, very interested in 'rule of the Caldiz' [ph] and all this sort of thing, but no idea about...well, lost any money she had by being too ingenuous about his handling. But after a while one finds at the end of the year he is drawing up black lists with the local grocer or someone, and reluctantly in the end employing an agent to collect fees. I mean I suppose he had no alternative. Because he got a little bit of money sent out from his mother, who hadn't lost all her money at that time, but not much at all. And he had one child, this was born there in the first year, in New Zealand. So he then went to...I wonder if we can have a break now, can we, just for a minute? Because I'm just sort of... [Break in recording]

*OK, let's go.*

Now after one year in Petoni as a GP, and having difficulty with collecting the fees, and not liking the environment very much, my father moved to...what's called the 'bark blocks', a very remote area north of Wellington, at a very small place called Pongaroa. And apparently coming out on the boat, there would have been somebody from Pongaroa on the boat who said they need a doctor there, they hadn't got one. And...but he got more reports on what Pongaroa was like, and so that they...he went up there, and there was some kind of local committee of the farmers and other people, and so they would pay some money, and he'd get his fees. So they moved up there. And this was a very wild and remote region, without proper roads, and there are all sorts of stories about the drama of trying to drive through the mud, and the terrible bush fires: he was almost killed after he'd been there only two weeks by being taken by a man up through the fires to find somebody who had been injured, and of course there were a lot of severe injuries with axes and things like that in these remote farms. So after they...I think they were there only for about three years, and...

*That's where you were born?*

Well I actually was born just after they'd moved out; they moved to a larger town called Pahiatua, not very far away, which had even a railway to it, and a hospital. But in Pongaroa there was a sort of blacksmith and a saddler and a general store, and a so-called nursing home - well a sort of private house - and no dentist at that time. And although my father very much liked the wild living there and the informal way, he certainly...he wrote and said well, it's no place to bring small children up, because there's no sort of educational facility there. But as a GP he was active in propagating for fresh air and exercise and vegetarianism. And also anti-vaccination. And it's interesting to find out just how well established the scientific arguments were for vaccination at that time, but in New Zealand apparently there was no strong case for vaccination, because there had been no really dangerous smallpox viruses [inaud]. But anyway, he...[break in recording] ...did your parents have, and...

[Interviewer talks about own childhood]

*Oh well I was...I mean my parents...my grandparents were immigrants who came from Russia and from Poland.*

Oh, Russia, they were Russians, yes.

*And became...my maternal grandfather was a cabinet maker in the East End of London, coming over in 1904, and my...they lived in Brick Lane, which is an area of course which is now sort of taken...this seemed to be another way of immigrants to come in, so it is now largely a Pakistani immigration area.*

Oh is it? I see.

*And so my mother was born and brought up there, in conditions of really rather considerable poverty.*

Your grandfather was a cabinet maker, your mother was the next generation?

*My mother was the next generation, yes, she was born and brought up in England.*

What about your father?

*And he also was born and brought up in England, but his father was a tailor. He had also come over from Poland.*

Yes. So they were both sort of skilled craftsmen?

*Yes, yes, both sides of the family, that's right, that's right. But my father was then brought up in an orphanage, because his mother died when he was very young. So he was brought up in a Jewish orphanage. And then...my maternal grandfather made relatively speaking a financial success, and began to run a small factory.*

What, cabinet making?

*No, he was actually at that stage making wooden planes, wooden tools for cabinet makers, planes and...*

I see, so that he was sort of enterprising and going into special lines.

*Right. Then...my father went to university, he was trained as a chemist; came out from the orphanage and went to QMC as a chemist.*

And who paid for that?

*...then graduated. I'm not sure actually; he probably got a scholarship.*

Really?

*And he graduated at the depth of the Depression, and got a job briefly as an organic chemist, found it very difficult with a Jewish surname to get an organic...to get a proper job in industry as a chemist. Became a schoolteacher. And then married my mother in the mid 1930s; I was born in '38. And then became a volunteer and went into the army before the start of the '39-'45 war. So, he went in as a private and ended up as a major, and came out after the war. And for a time he worked as a full-time anti-Fascist organiser after the War.*

But what name was he using then?

*Rose.*

When did he...did he change his name?

*Yes, it started as Rosenberg.*

Oh, I see, yes. There wasn't much of a change.

*No no...[inaud]*

Yes, yes. Oh, so...so the army was quite...from the career point of view, was...was quite helpful then?

*Well I'm not sure it really was, because those that didn't go into the army that stayed at home sort of managed to become quite financially successful.*

Ah, yes, but even so, in the army he did...do well out of the army system.

*Anyhow, so that's me!*

I see. What about the rats eating the food? I mean that sounds as though you were very poor.

*No no, that was my mother's experience back in...back in Brick Lane.*

Oh, I see.

*When she was a girl. Her grandparents were running the shop, which is the first thing they did when they came here.*

Before he got on to the making the tools?

*That's right, yes.*

Yes I see, yes. So it was a shopkeeper thing.

*That's right, he was running a tool shop.*

Yes, I see. Yes, well, as I said you see, my...the Wilkins' started as tallow-chandlers and they were in shop-keeping, butchers, in St. Patrick Street.

*Anyhow, we've got...[MIC NOISE]...we've got you as far as being born in this little village in New Zealand. What we have to discover is how you ultimately managed to get back to England again after all of that.*

Yes, well I wanted to...yes, but I need to deal with the New Zealand situation, because it was a very formative period. I mean New Zealand was very isolated, with sheep and cattle stations, linked by mere tracks, and a telephone system, very advanced in that, they had to. And practically no roads in the winter. And it was a very wild place which appealed to my father, sort of like the Wild West. And it had lots of challenges of...forest fires; he was almost killed in one, and the wind and the mud, and the...you know, it was like the four elements of the ancient Greeks. But after some three years he found the cultural isolation a bit oppressive, and he saw the children's education point of view, because now he had the two children, my sister Ethne [ph] being two years older than I was, they moved to a small town called Pyartowa [ph], and had a hospital job there. And this was a very happy time, because, although I don't have any memories of it you get all these family photographs, and you can see me and my sister running through sort of long grass in the fields and everything, and playing on large lawns, and in some house they were burnt [ph], because they were rather hard up at that time. And we apparently had a very good time indeed. And my mother said that up to the age of three I was a very cheerful child, extrovert, and then she said something happened, she didn't know what, and I got like what I am for the rest of my life... [laughs] ... So I don't know what happened. But evidently...

*You didn't have a younger brother come along at that time?*

No no I didn't...no...no, that was much...the younger sister was much later than that. But before the end of the War apparently they had a story about me going past some shop where there was some display of military things, I think it was recruiting or something, and there was some photograph or a model of a big gun. And I could barely speak, and they always quoted me as saying, "Big gun, shoot German" you see. Now, apparently this was the picture, that I was very interested in these machines of war, and I got...

*What a militarist little character!*

They recounted this, yes, quite a lot. Although you see, my father was a sort of Buddhist, he would never touch a gun in his life. And I was a very peaceful little boy, wouldn't think of punching anybody, nothing like that at all. And he got into the...he was interested in preventive medicine my father, so he got into the school medical service, and was in charge of one of the divisions there. And then we moved to Wellington, which was the capital city, from the age of three-and-a-half to six-and-a-half I was there, and we had a very happy time there. We had quite a nice house, a nice garden. And we had many visits to the sea, picnics in the bush as they call it, the forest, the mountains; there were parks, there was an enormous view over the great bay, and a great port, a wonderful place there. And music. And I was very happy with my sister, and we had lots of excursions and so on. But I was looking through my father's letters to his mother of that period, to see what they said about my character. And one thing they said was that I was very perverse; they often told me this, that when I was small that if they wanted me to do something the best way to get me to do it was to ask me to do exactly the opposite. Now, I was thinking about this the other day, that it is not a lot of it simply being bloody-minded, you could put it more kindly by saying I was interested in exploring alternatives. And you see this is part of science isn't it, finding alternative routes to ways of understanding things. The other thing, he often said that I was apt to get lost in thought, and they had to shake me to...for instance at meal times, they'd say, "Look here you are, here's your food" you see, "stop just sitting there thinking". But he said that although I was dreaming and abstracted, I would also be at times exceedingly practical, and he referred to some models I made of little Plasticine pigs, with the tail and its ears and every little detail on it; he seemed impressed by that. And I used to go round the house carrying what must have been picture books, because we had no knowledge of reading then; my father had educational theories that you should learn everything first-hand, and not second-hand from books until you were older. And I...

*When did you learn to read?*

Oh, well that was not until seven or so, and my sister didn't...she picked up reading herself before going to school at about the age of seven or eight. And...but he was all against pushing children into reading too early. And we had loads of illustrated children's books sent from Dublin by my grandmother who had been at Newnham in Cambridge, educated lady and all that, and she sent these things out which were very helpful to us. History, geography, astronomy, biology, all sort of things, and I would be poring over these books apparently. And he also refers to my interest in certain abstract questions. Apparently there had been discussion about God was everywhere you see. I know Buddhists don't believe as God, but maybe he was more of a Unitarian, and he was discussing the idea of God. And I said but it's ridiculous to say 'God is everywhere'; the only way in which God could be everywhere would be parts of God! [laughs] You know, [inaud] the place! And he wrote this in a letter back home. But my interests were mainly scientific and mechanical. That we had lots of building bricks for children, very good ones sent out by that grandmother again; we had a telescope there from somewhere; and...anything mechanical interested me. And for example, on one occasion he said that I was standing in the garden watching a sea-plane over the harbour landing on the sea and taking off again in the spray, whereas my sister would be playing with her dolls. But I'll come back to this question about my sister's interests, because - well actually I can deal with it now - that although she was interested in all these feminine things, my father was also very keen on getting her interested in mathematics and geometry, and she apparently was very enthusiastic about it. Although later in life she was completely out of mathematics, and I imagine the schools knocked it out of her. But she couldn't have too much of it apparently from my father. And my sister was apparently interested in fairies and witches, whereas I, he said at that time, I was very interested in wild animals, and he said that if there wasn't a lot of savagery in a story I wasn't satisfied! [laughs] And so this mild little pensive little boy, pouring over books apparently, was very interested in violence - in theory at least. And I was interested in soldiers and guns and cannons, machine-guns, submarines. And I was taken to military tattoos, where I remember the Maori taking artillery to pieces and re-assembling it all and firing a gun, finding this fascinating. And my father commented on the fact that I was much more interested in warfare than he'd ever been. I remember sort of climbing on artillery in public parks that had been captured from the Germans, and we have a photograph of

that. Our next-door neighbours apparently on one occasion made a present to me of what used to be called tin soldiers, and apparently I would spend hours and hours with these in the sandpit we had in the back garden, building forts and trenches and castles, and making battles with these things. I think we used to have some with motorcycle and side-car with a machine-gun on the side-car - you see I can even remember the details of these things. Whereas my sister was into princes and princesses and romances and weddings and composing music. A book she had was entitled, 'And Then She Died'. And so, a difference of interests. But, she used to claim that she would count up to 500 before sunrise every morning she was so interested in numbers and mathematics and...areas, you know, the area of a rectangle; all these things she was getting before she could even read. And we saw an eclipse of the moon, and we had a solar eclipse too, which I think may have been the one which...where the [inaud] was outside, probably the one which was used to test Einstein's relativity theory by bending light.

*Oh yes.*

I think it was probably that one. And we knew all the names, both of us knew all the names of the planets and the stars, and we had a star globe, and a globe of the earth and all the names of the countries. So all these things we were sharing a great a many of them. And we did a lot of things together, inventing stories and plays, and dancing together with music and mouth organs and gardening, and digging up the worms, and raiding the kitchen for sugar lumps and so forth. So we had a very close and friendly life, and my mother said that my sister was really very good to me as a small brother. But when she went to school in Wellington, that was the first separation, because I was too small they thought to go to school, and she enjoyed school very much.

*So she was how old then?*

She was seven or eight.

*So you were five, six?*

Yes, yes. And I remember very vividly going on a walk with my father, the two of us, and he had given my sister a book entitled 'Myths and Legends of Ancient Greece and Rome', you see, so she was beginning to read. And so she was going on a walk clutching this book. And we were climbing over something, I saw this book there, and I immediately saw, well here's a separation between me and my sister now you see; my father is part of this whole thing, that she is developing a life separate from me, whereas previously we'd been extremely close. I think you can get an indication of how close we were that he, one day I think he said how we were laughing together about certain words. One was 'propaganda' we thought was a ridiculous word, and we were rolling about laughing at this ridiculous word.

*I thought it was a word invented in the '39-'45 war.*

No, it...no, it's had different meanings at different times. And you see 'propaganda' was used a lot by my father in education of school children of parents, for better health styles. And so this was constantly used in the home. The other word which I'm a bit surprised, was 'vitamins' - well they called them then vitamins. I was looking it up. But I think that Hopkins had done something decisive in 1912 or something.

*It was about then, wasn't it?*

Yes, he's very early. But my father was right into new scientific things in nutrition. So you had these two children, rolling around laughing at these rather sophisticated words, not really knowing what they meant. And we had a very good life at the seaside, sharks and fishing I remember; long walks over the hills with my father to a lighthouse on one occasion; picnics in the bush, and all kinds of things. Trap-door spiders in the parks, and a professor of zoology took us there; hedgehogs; and music and sunshine. We had a gramophone; my father got into recorded music in a big way. This was a revolution you see, the gramophone then. And to be able to have music in your home, without having to play it. And we used to go to sleep with our favourite music. I mean all the memories there were...practically all were happy ones of...New Zealand honey, and cream, and eating raw beans in the garden and things like that. A few unpleasant things, but on the whole extremely... Yes, I remember one thing

which shocked me was that, one of the few mistakes my father made, that we went to a big store where there was a raffle for a magnificent model yacht, and you bought your ticket and all that you know. And after we'd been round the store, I said to my father well... He said, "We're going home now". And I said, "Yes, but we've got to take the yacht haven't we?" Well he had to explain to me you see, that we hadn't bought the yacht. And I was in a terrible state, because I assumed we were going to buy the thing. That was one of the few slips; he had great understanding of children, but.....

**End of part 2**

### Part 3

#### Digitised from Tape 2 [F1170] Side A

*Second side of the Maurice Wilkins interview.*

I need to say a bit more about my father's professional life here, that when he'd been a GP he'd been lecturing the First Aid classes and converting patients to better nutrition, and exercise and fresh air and things like that; anti sweet eating; apparently the state of teeth was awful in New Zealand, and he correctly attributed it to eating sweets. But as he was interested primarily in preventive medicine, the school medical service was what attracted him most, and so he got into that, as I think I actually mentioned earlier, a lot of educational work there for prevention of illness.

*So he was an early public health doctor really in a lot of ways.*

Yes, it was an aspect of public health. But he ran into some difficulties there, and my mother told me after he'd died that he was sacked from his position because he antagonized the millers, who were working on white flour, whereas my father advocated brown bread. And so I was interested in finding out more about this, and I got information from New Zealand through New Zealand House. And looking through these things, I see that the man in charge of all the medical services in New Zealand then was a man called Valentine. And as soon as I read this name, which I'd completely forgotten, in the library, immediately I had a feeling of bad vibes.

Whereas there was another name I saw, was Hunter; and I immediately thought, ah! good chap, Hunter, somehow. And it turns out that Valentine I think - well at least he was primarily interested in treatment, he was in charge of hospitals for a long time, and I think he was quite likely to be...well he very definitely, say some of the histories, that he was unfriendly, uninterested in preventive medicine, and so he wouldn't have got on with my father. And Colonel Hunter was an excellent man. And...so I think that was probably part of the tension. But my father also had a wild friend from Dublin who came out, who was wilder than he was, and who went round giving lectures. There was a lot of this lecturing work you see, to the public, and to parents, and mainly schools. And my father said that this chap Rafen Creedy [ph] used to say,

"White bread is death!" you see, which was obviously a slight exaggeration. But that was his style, he was a very wild chap. And I found in the library a biography of Truby King, who was a big infant health man, and a great propagandist, did a lot of good work about it in New Zealand, about infant care, where he says...refers to a Dr. W., and says something must be done about this Dr. W, who is a fanatic for vegetarianism and brown bread. So that must have been...I think almost certainly must have been my father. And so, although my father in many respects thoroughly approved of Truby King, so I don't know what came with that, but he was obviously antagonizing some people. And after three years he resigned. He said that it was because of the children's education they wanted to come back to Britain, but my mother had this other story. I think probably she exaggerated, because I read his annual reports as director of school hygiene, and he was not being at all wild in these, not in the way he was writing to his mother in private letters, and...about vegetarianism, he was very thorough and sensible and inviting...non-provocative. He did have a certain amount of radical things going through it; I mean in his first report he was saying they really ought to pay the hospital staff and not just have honorary hospital staff, so that school children who didn't have much money could get treatment in the hospitals.

*You were a vegetarian as a child?*

Yes, yes.

*The whole family presumably.*

Yes, the whole family, until we came back to England, and then you see cooking vegetarian food was more trouble, and we began to slip. Because we were under great difficulties when we came back.

*You aren't vegetarian now, are you?*

I...I've been going a bit that way. Yes, I don't care for meat all that much, unless it's very good meat! [laughs] And another point he made was that he was saying that the

families of schoolchildren have a lot of distress if they have inquiries into their financial state. So he was interested in these whole questions about the economics and politics of treatment of schoolchildren, and he wanted to... New Zealand had a very good plan for the infants up to the age of two, under the influence of the great Truby King, who was knighted I think soon after then. But he wanted...my father said well this ought to be extended from the ages of two to six, until the children are going into school. Good ideas, but...I don't know whether...I think maybe my mother exaggerated, because he was...did have some trouble with the brewers in the moderate league, but then I find that the Government said there ought to be an inquiry into the health aspects of alcohol. And so my father didn't start that one up I think. So...and when he talked about diet he was very tactful. He said meat once a day only; lots of milk, butter and vegetables and fruit and wheatmeal bread; there was nothing very extraordinary. I mean, he seemed to be fairly sensible about it. Anyway, the thing is, we left New Zealand.

*When would that have been? How old would you have been then?*

I was six-and-a-half when we left New Zealand. And I think at that stage we began to go through...

*It's interesting how vivid all the New Zealand memories are for you there.*

A lot of them are very vivid, yes, and...like the trap-door spider, with his little trap-door. I didn't know who the man was who took us round there until I read my father's letters, and he said it was a very nice old man, Prof. so-and-so from Victoria College, so it filled in the picture more. And...I think when we were leaving, symptomatic of what was going to happen was indicated by all the great shopping expeditions we had to make as a family, and how terribly bored I got standing there in shops while my father and mother discussed what they were going to buy. They were stocking up all sorts of things to go back to England with. And the thing is, as children we were no longer protected from the great outside adult world within our comfortable little family life, idyllic existence we'd had. We were now being forced out of the country, or being...going out of the country, and all these things were impinging on us. But

the journey itself was interesting. Flying fish were extraordinary; going through the Panama Canal was very interesting; when we stopped in Colon, with all the palm trees and exotic tropical stuff and the black waiters in restaurants and things like that. And...what was the nature of an egg sandwich in Central America, fried egg between two pieces of bread. All sorts of interesting things like that.

*It was just a continuous boat trip was it, or you stopped...*

Yes, yes. Continuous. The coal wasn't much good on the boat, and that was one reason it was rather slow. I remember my father taking me to see the radio operator. He was always doing things like that. If we travelled by train as children he'd always make sure that we got up on the footplate of the steam engine and had a look inside and everything like that. Very good like that. And once when I was ill, I have a very distinct memory of this indeed, I wasn't very ill but I was lying down and feeling a bit miserable in the cab, and my father borrowed a revolver from one of the ship's officers and gave this to me. I was absolutely fascinated by this piece of refined mechanism, fascinated! It was always clear in my mind, the cabin, the porthole, lying on the thing, and this...what do you call the thing that rotates in the revolver and so on... But finally we arrived at Southampton. I was very impressed by the enormous liners like the Mauritania. And the special gramophone my father had, we were standing on the land and we saw this coming down, this package case from the crane.

[inaud]

Well it was inside the box, yes inside the box. But the...then we had to go to Dublin to see all the relatives again, because the family, my father and mother had been away for ten years. And this was moving into a strange world of where my parents had been before they came to New Zealand. They talked about this, but now I was actually in it. So in a way I was being a bit separated from my parents, who were at home in this thing and it was totally new to me. And I found it rather restrained. And my father had to take a diploma of public health to get into the school medical service in Britain. And strangely enough he took this at King's, here in the Strand. And so he had to...we were stuck in London for a year, in a rented house, and not very nice, and

all sorts of things started going seriously wrong. That I remember going to school with my elder sister; she took me for the first day at school. It may have been it was only one day I had. And I remember going into this enormous room with parquet wooden floor, and all the children running and shouting about, and I was bewildered by this, sort of holding my big sister's hand, because...

*I think everyone remembers their first day at school.*

[laughs] Yes, yes! But...she of course knew what schools were like. But then she got ill, seriously ill, and so I didn't go to school any more. My mother then got...she apparently got pregnant on the boat. My sister was conceived on the boat going out, and now this third child was conceived on the boat coming back. And so there was a new baby girl that was just a damn nuisance that separated me from my mother, who was stuck up there in the bedroom with a nurse that was brought in to help look after things. And so I was very much on my own. And my sister went to various hospitals, she was badly treated, got terrible bed sores. And very seriously ill indeed. And I remember visiting her, either in Charing Cross Hospital down the road there, which is now pulled down, or in Great Ormond Street. She was certainly in both hospitals. And I have shocking memories of seeing her there...here. She had very nice blonde hair which was shaved off; and I remember touching the bed and she sort of shrieked with pain, because the slightest vibration of the bed, she'd had all joints, knees and thighs opened up with operations to let infection out, some sort of...they called it general septicaemia, I don't know what they call it now. You see there were no antibiotics then you see. And we had no immunity to all kinds of things. I got all sorts of illnesses; we both of us got all kinds of illnesses. It was a dreadful time. And her legs were on pulleys and weights up in the air. It was...I remember these very shocking experiences I had visiting her in hospital, but I don't remember at that time any kind of actual distress except the memory of shock. But I was taken away from...yes, I went to...yes I didn't go to the school any more, so my parents must have realized I was very unhappy, so they got me a dog, you see, a terrier called Jack, and I used to go out on long walks on Streatham Common, it was all down that Norbury and Streatham region, quite good for walking by myself with the dog. But after a few months the dog started getting ill! [laughs] And it got mange. Finally the dog had to

be exterminated. And then my father bought me a blank cartridge pistol, I remember that, something to cheer up this poor boy. I can only infer the unhappiness from the fact that they gave me all these things you see. And then some other boys at a playground stole it from me, and I remember coming home one evening, and I was very upset, and my father said, "What's the matter?" and I said some boys have taken the pistol. I remember him springing up you see, he said, "Where are they?" you see, walking along and picking up a little switch or something like this in his hand you see, and I thought, oh, my father's going to sort this out. And he did; he went up the boys [inaud], and they were looking at the pistol, and he said, "Give it back", and that was the end of it. But I had all sorts of distressing experiences. You see we'd been told that Boy Scouts were marvellous humane people. And I was having a solitary walk once along a very narrow path between two sort of allotments or something; just room for one person to walk along. And a Boy Scout in his uniform was coming the other way. And so, when we finally came facing one another, instead of being a nice Boy Scout he had a little stick you know they used to have. What did he do with this? Well he pumped me in the tummy, like that, rather aggressively. I was absolutely horrified! And, you know, my whole world, what my parents had told me were the good things in the world came crashing down.

*That's where your disgust of uniforms starts!*

Yes. [laughs] Maybe. But my parents did sometimes tell me things like...that a good banana's always got brown spots on it, and in banana countries that's the way they eat them. It isn't actually true, [inaud] of banana countries! But I began to steadily be a bit sceptical about my parents at that age. And the new baby, yes, that was an awful drag. And then I got all sorts of illnesses as I said. We moved to another house, which was even worse: darker and colder and more miserable. And I remember being taken to the headmaster of my school with my mother, and they discussing what was the matter with me. Evidently I was really miserable and nothing would come right. But my grandmother, the educated Newnham old lady, she came to live in London, and she used to take me out quite a lot. We used to go up to London and go to museums and things. I don't remember most of this, but she was quite a nice person. Except one thing I do remember very clearly. There is a thing in the First World War

where the port of Zeebrugge had a lot of German warships in it, and apparently the Allies went over and sank a lot of boats across the opening of the port, and so the Germans couldn't get out. And they made a model, show of this, model boats and explosions and lights and colours and bangs and everything, in some museum. And I remember seeing this and being absolutely fascinated by this thing. So you see this constant feature of being fascinated by war. Now...we went to the great Wembley Exhibition, I forget what year that was, that great Empire Exhibition. They had Wild West things and people from all parts of the world; that was interesting. But I think what struck me, thinking about it recently was, that I was always being told things then by the parents you see; I was back in the Old World, the small boy from New Zealand, who knew New Zealand...my way around a bit, but here I was back in this other world, and they were always telling you, 'this is the way it is', this, that and the other, that I was no longer exploring and finding out things for myself, or with my sister, with the support say of my father, and the family. But we had all these foreign things now were being...we were told 'this is the way the world is'. And so it was a very different atmosphere to live in, and in a way I had an alienation from the family, which I hadn't felt before.

*Perhaps that happened...I mean that's clearly partly to do with the geography of moving back, but isn't that also sort of to do also with growing up, older, and having the younger sister as well?*

Yes, certainly...yes, that's true, yes. But I think this geographical factor was a special thing, because they were back in their old world again you see, which they knew, and I didn't know.

*Yes, it was all strange.*

Yes, so it was...they were being taken away from me, with their familiarity with this other world which I didn't know, so I couldn't share it with them properly. But things then relaxed a bit, that my father got a job in Birmingham, and I remember being told we were going to Birmingham. He said it's the workshop of the world, and in Birmingham they make everything from a pin to a steam locomotive! [laughs]

Something like that I was told. And I thought, well this sounds quite an exciting place. And...so we were in a better house there; more comfortable, a reasonable size garden. We were a mile from a very large natural park, Sutton Park, about four miles across, just woodland and open heath and so on. Very good for children on bicycles and so on. I was sent to a little private school quite close round the corner that wasn't too bad. The baby sister was a bit of a pest, as I was expected to play with the baby sister, which was really rather unfair on both of us. But I think we had a lot of pressures on the family then, because my sister was in and out of hospitals with a series of operations, went on for years, I don't know how many years. I remember she was in an open air orthopaedic hospital, about ten miles from our home, run by nuns. And we used to drive over there on Sunday to visit her, and because...

*So your family had a car, you father had a car by then?*

We got a car after a bit. At first in Birmingham he was riding a bicycle, in and out through all the slums of Aston. And I remember being in a bus once overtaking him, and there he was, sort of riding his bicycle along the tramlines and everything, heavy traffic. But yes, we managed to buy a car; it was very exciting when I was at the school once, in the playground, and a boy ran up to me and said, "Your parents...somebody to see you". And I went down there, and my parents were sitting in this car, it was a great surprise you see. And they said, "We're going for a drive". Yes, we...yes, and my sister would lie in bed there with the snow around her in the open air; and this open air thing was taken too far I think. They killed an awful lot of babies I think off with Truby King's ideas about influenza in the open air, I've heard some stories about that. He was a good man, but some of his ideas were wrong. So I went to school, and...yes, but finally my sister came out of the hospital. She was disabled, she could hobble about and walk at about one mile an hour, in a sort of clumsy manner, with a splint on one leg, and she went to school. But we never were able to form a close relationship again. Occasionally we'd start being very friendly with one another, and suddenly there'd be a blow-up of temper. And so there was some sort of neurotic thing was created there. So that, although all our lives, I mean she died, what, six years ago or something, we had a very limited capacity for any sort of intimate relationship, which I think was a great loss to me, and I don't know quite

what the consequences of that may have been, because it was such a good relationship when we were small children. And the fact that she went into languages and poetry, and all the mathematical interests apparently went from her, we didn't have much in common there. Except music mind you, which sort of joined us together. Life gradually began to get better. We had an annual summer holiday in Welsh boarding houses at the sea. I had quite a few friends at school, some very good friends, and we used to go out cycling in this Sutton Park and things like that. So I wasn't a solitary boy at all, but I was solitary in my hobbies, because I developed very special hobbies, leading me towards science, and none of my friends had anything like the degree of interest I had in that. And my father was very good in helping to set up a workshop at home, a little wooden building in the garden, and giving me tools and things as he had been given by his mother; it wasn't his father who gave him tools, his mother gave him tools, she was the good one on that. And I used to...I think it was racing cars was my main interest; I used to make model cars, very interested in the world's speed record was a big thing at that time. And round about the age of ten I got specially interested in aeroplanes. Two aspects to this. First of all there were the model aeroplanes that flew, you know, with twisted rubber in them and propellers. I used to make all these, every bit myself. There were simple books on this at the time.

*You couldn't buy kits in those days?*

Well maybe you could, but I was never interested in kits, I always liked making my own things. My own children are very much like that too actually, always...they are a bit perverse some of them too, they always want to do things their own way. And sometimes make things very difficult by insisting on doing things their own way. And so some of that has been inherited culturally - or at least probably culturally...ideas, but... But I think I got great excitement from seeing these aeroplanes climbing into the sky - not that they did climb very well, I had some disasters going into trees and things - but it was great fun making them. But that interested me very much, the thing...sometimes you could get them to take off the ground, run along the ground and rise up and take off.

*I made rocket engines.*

Ah! Oh, well I made one too! [laughs] I'll tell you about my...oh yes, we must exchange rocket engines then! The main interest was real aeroplanes. Now we were fairly close to the, what was then called the aerodrome at Birmingham, and we were on a route where a lot of aeroplanes fly north towards Manchester and Liverpool, come right over our garden. So it was a very good opportunity of seeing aeroplanes there with a pair of binoculars. And I used to buy 'Flight' every week. And recently I went to the British Library to look up the back numbers of 'Flight' magazine - it was very interesting, I'd never seen these things since the age of ten or twelve - and reading these again. And it was a very exciting time for aeroplanes, because they were making enormous progress, great records on them: greatest distance; I don't know whether they'd flown round the world then, but to South Africa, Australia and all these things. Distance, records of height, weight carrying, endurance, and of course speed was the most exciting thing of all. And of course flying aeroplanes had two aspects: the commercial aspect and the airlines were beginning, and mail, air mail, and of course for the British Empire, Empire Communications. And I was a small boy swallowing all this, thinking aeroplanes are a good thing you see, because the passengers, it's all modern, and all this, and communications in the Empire would be a good thing. And the second aspect was the military aspect. And I found this even more fascinating, that I think it was the one thing I saw in 'Flight' magazine, an illustration of a Gloucester Gorcock [ph], a photograph of this thing, and it said, 'Probably the fastest single seater fighter in the world'. And those words really sort of hit me! And I would...as a boy, came back, the excitement of this, this single man there, having all this power, 450 horse-power or something, going at 150 miles an hour, you know - not fast at all now, but then, concentrated power, and the beauty of the thing. Most impressive. And I think this is very similar to...I've seen hydrogen bomb designers on television interviews, and a very interesting one recently, where they were being very open about the designing one of these bombs of concentrated power, and when it worked, that they would get such a great - they use the word 'high' - out of this. And I think this is basically the same thing as the single-seater fighters. And the other thing, the Interceptor! that was the new thing you see, very exciting. And there was the other side, the beauty of the sailplanes as they were called then, the gliders, lifting on...with no power at all, natural forces, that fascinated me too, quite a

lot. There were the two sides. That was peaceful and ecological as people like to say now, and so on; there were two sides. And when I looked at these 'Flight' magazines, and saw the names of the aircraft and the shape of them, and the discussion of it, all came flooding back to me. And the names of the pilots, I remember all these, Captain so-and-so, who had the world speed record at one time. All these heroic figures.

*So models were all tissue-paper and balsa wood.*

Yes, yes, or silk.

*You didn't have balsa wood, or did you?*

I don't think balsa would have come in. No, you had...some sort of pine I think it was, and you had birch wood, strips of birch, and...what's the name of the...ah, something or other spruce, yes, that was the main piece made out of, something or other spruce, I forget the name. And, you had piano wire too. I swear one bought all these things, I forget. But Birmingham was very good for materials, and I used to go round scrap yards you see, and I would buy lathes, or bits of lathes, and build up these things there. I remember I think some of the scrap yard people were a bit puzzled by this small boy coming in and buying bits of machinery. But they were very helpful, and...it was a good place. And another thing...yes, what I do remember very clearly is, the fact that the aeroplanes were good, because they were good from a military standpoint. They were so much better than bringing the army in to subdue unruly tribes, that you just bomb them from the air, the villages from the air. I swallowed this lock, stock and barrel you see, that all this was a good thing. And in fact looking up the 'Flight' I found there was one chap, and Air Force man who gave lectures on ethics of bombing villages, and said this was the most humane way of applying military force to these people. But his idea was to have delayed action bombs: you dropped these on the village, so no-one could use the village. I don't think anyone actually did this at all.

*Of course, and that is the time when J.B.S. Haldane was also writing, explaining that chemical warfare was humane.*

Yes, yes.

*And of course the whole business about air war, do you ever read H.G. Wells?*

Oh yes, a lot.

*'The War in the Air' and all that sort of thing.*

Yes, I was...found H.G. Wells very stimulating, and I think that he stimulated a lot of my interest in science, and the flying certainly. But you see, I remember this thing about the villages; and the French were doing it in Morocco: there were all kinds of cases, a great list of them which I have from 'Flight' magazine. I remember that. But what I don't remember, which I think is a bit significant, that I don't remember all the discussion round about 1928 by Sir Samuel Hoare, the Minister for Air and so on, about how the bomb, in another war the bomber will always get through, and how the armoured manoeuvres they were having, testing the fighters against the bombers; they didn't have radar.....

**End of part 3**

## Part 4

### Digitised from Tape 2 [F1170] Side B

.....the RAF manoeuvres they were having, testing the fighters against the bombers. They didn't have radar then you see. And which demonstrated to a large extent bombers would always get through, and also how worried they were, the quotations from them, about how all civilians would be under attack, the whole population would, in the cities at least. I don't remember any of that. It was all right for me presumably as a small boy to think about World War I. And I remember going to a film called 'Wings', which was fascinating, I think I went three times to the local cinema to see 'Wings'. Dog-fights between these fighters and Germans.

*So it was the fighters which were the romantic thing, not the bombers really...*

Yes.

*Yes.*

Yes, yes, you're right. The bombers were slow and heavy, and the...it was the fighters that were exciting. But I would...I have no memory about this bomber will always get through thing. Presumably it wouldn't have made me very comfortable, to a small boy, to think it was another war, we were all going to get blown up in...in the cities: this would be very unromantic, wouldn't it? And I think, you see it's the same sort of thing about attitudes towards reality, that...in New Zealand as I mentioned this thing, there was a fire at one stage in a street close to us, and the buildings were all timber, the houses where families lived, largely for the earthquakes. But after the fire, the chimney stacks were still - made out of brick - were standing. Because you apparently had to use bricks for that. And I remember being taken there by my parents, and seeing the army people blow up the chimney stacks. And I came back from this, and I would think, 'Why doesn't something exciting ever happen to us? Why isn't our house burnt down?' you see, this kind of thing. (both laugh)

*Then discovered roast pork!*

Yes, but you see later on I realized, after this disaster with my sister almost dying, she was very close to death apparently, and had blood transfusions I think my father gave blood, and I have some idea this was one of the very first ones, though I'm not sure, I can check up on that. And...I mean that was something very exciting. [laughs] You see, this is how these romantic people, so interested in technologically interesting things, they don't see the damaged humans afterwards do they? Like the man who came to talk in the Physics Department about hydrogen bombs, and showed all the buildings being knocked out; he didn't show any effect on human beings. So I think I see this in my own history to some extent. Oh, at that time, I was at school, was still at a little private school; I went to King Edwards High School, which was infinitely better place at the age of 12. But I wrote a little story, it was some school exercise I think, and...I suddenly realized, it was rather interesting, it was called 'Radium Island', and it was all about the adventures of some explorers who wanted to mine the radium of this Pacific island, and how they had a wonderful seaplane you see, with wonderful machine-guns on it, and there were some other chaps, the baddies, who were...had some old boat; yes, and they had an old aeroplane too which wasn't much good. And they had a lot of blacks helping them, and of course there was lots of fighting and the machine-guns and the good aeroplane won. And at the end the radium island explodes in the sea and disappears. And I was thinking, oh, that's rather strange in a way, it all links up with the Pacific islands and the H-bomb tests...

*A degree of continuity about all of this.*

Yes, I've never thought about it before. I think the thing about the blacks was that in New Zealand we had very little contact with Maoris, but my family was always very good about these things, and they told me a lot of poppycock about how the Maoris had never done any fighting until the Europeans came [laughs]..quite wrong. But I think...and the Chinese are very good, they had Chinese laundries over there. So this sort of thing about the not very nice blacks was I suppose got from Rider Haggard and things like that, and certainly not from family.

*You were a Rider Haggard enthusiastic as well as an H.G. Wells enthusiast?*

Yes, yes. The...yes, these explorers with their guns, and...

*'King Solomon's Mines'.*

That's right. And he has a hand grenade, at a critical moment he hands it up and says, "I'll blow you all up" you see, if you take on...

*I know he predicted an eclipse.*

Did he?

Yes.

I see. [laughs] Oh, that's science. Yes, that's probably another reason I liked it.

*And Kipling?*

Yes, quite a bit about Kipling, but I don't remember...Kipling was interesting about the animals, but I don't remember...it wasn't so technological, Kipling, was it, you see. I mean Boots and all that stuff. Very interesting, but not much, is it? Machines weren't there I think much. So that didn't come into it. But I...going to...how long have I been on this? I'm quite all right for the moment, but...

*Well, we've got about another sort of 20 minutes or so.*

I see; oh well, I can finish this and get up to Cambridge then. So I can possibly go a little bit slower, to...not to rush it too much. So I was then sent to a really decent school, where they had very good teachers, and where they fed the boys, and my sister went to the corresponding girls' one.

*This was your older sister, not your younger sister?*

Yes, the older sister, yes; the younger sister...I don't know what she was doing then, she may have been going to some school. But they fed the bright boys into Oxford and Cambridge, and so one was slotted into the educational ladder by going to that school. And it was in the middle of Birmingham, and we were about six or seven miles out, and we had to go on a steam train to get into the middle. And...had quite a good time; there was a gang of us on the trains, and we used to try to get one compartment to ourselves, which we often could, and so we could make a lot of row and generally mess about, and throw the light bulbs out of the windows. And disconnect the steam heating pipes: that was very interesting. What we liked to do was to disconnect the steam heating pipes, stop at a station, jump out, close the door, and get into another compartment, and then when you got to the next station you would see some respectable grown-up person go up to the door of this compartment, open it, and then - mits! [ph] - a cloud of steam had come out you see! [laughs] This was great fun. And I used to...yes, I had an invention which was to use some of my mother's hat-pins to poke through the...from one compartment to the next, and hear the people give squeak in the next thing...[both laugh]

[inaud]

Well there were a lot of things like that, but generally got other people to do it you see. And I had a very wild friend called Philip Marples [ph]. He ended up by being expelled because he burnt the...set fire to the headmaster's study; he was one of the school myths. And he was great fun. And funnily enough he was one of the sons of a very respectable and very good mathematics teacher at the school. And this poor teacher apparently, to make enough money to live for his big family, he had to catch a special train up to Manchester on Friday night to do extra teaching in Manchester. They had a hard time that family. But...sometimes I was in the same form with Philip, and I remember one thing I invented was ink bombs, by folding up pieces of paper and then taking the ink-well in the desk, pour the ink into the thing, folding it up completely, and then I would give it to Philip and he would throw it at somebody he didn't like! [laughs] And so that was the way we divided things up. I didn't have really any trouble with bullying at school, because although I was a fairly quiet boy, and not at all strong, there was a big bully who did the round of the boys in our form,

and on one occasion he started on me, and I saw very clearly that if I couldn't deal with him then and there, my life would be a misery for God knows how long, because he would pick on me, and I couldn't fight him normally. And so that this very clear thought in my head, I pulled out every bit of strength I had, grabbed him round the neck, and he was so surprised that I was so determined, that he didn't attempt to fight back. And after a while he said, "OK," and I let him go, and he never tried again. And so fortunately I didn't have to do any other fighting in school than that. We had expeditions with this...boys together into Sutton Park on bicycles; we had fireworks. Now the rocket car I made was a toy car, and I fixed a rocket to the rear of this car with some paper and paste, and laid it on a flat roof and set light to it. And it went off, whoosh! like that...

*Gunpowder?*

Oh no, I bought a little rocket.

*Oh right.*

I took the rocket off the...I didn't make it myself. I did make a certain amount of gunpowder, but I think I...I don't know, I had mixed feelings about the danger there I think. And so I bought this one. What sort of rocket car did you make?

*Oh it wasn't a rocket car. I was interested in making rocket fuel. I mean I was a chemist, different you see. Sort of you clearly had this sort of direction towards physics, I had a chemistry shed in which I made explosions and all that sort of stuff.*

I see, yes, yes. Yes, they were surprised here in the college, he's told me about the shed where he did chemistry! [laughs] Yes, I think I didn't feel properly at home with the carbon and saltpetre or whatever it was, these mixtures. Yes, chemicals weren't quite the thing for me, you're right, it was more sort of physics. And...yes, and we would go on our bicycles sometimes to the aerodrome, and one of the boys knew some of the engineers who did maintenance on the aircraft, and we'd sometimes get in the hangars and walk around and look at the aeroplanes close-up, that was interesting.

But there was one wonderful thing about being at King Edwards School, and that was that the games field was on the opposite side of Birmingham of where I lived. And so it was not possible for them to have compulsory games.

*Oh, you lucky person!*

Exactly! That was a great thing.

*Oh yes!*

And so...and in the gym - I didn't really gym much at all, the physical jerks and things and so on - that I knew the gym instructor, who was a very nice friendly man: he was probably a bit bored with doing the ordinary classes. So after five minute gym he would set the rest and say, "Well here's a ball and you have your game", and we'd sit down in his little room and have all sorts of intellectual discussions! [laughs] Very nice man. And I had a similar thing actually in the physics class later on, that I had a very good friend called Bob Cooper, and the teacher was called Hare [ph], very good man. And some of the practical stuff was very boring, and so when he'd set up the class all doing these practicals, he'd then come up to Bob and me and say, "Well how about a nice discussion about Chinese philosophy?" at which point hours were spent discussing all kinds of things like that. And so I had quite an interesting time at school. But the big moment was when, at the 'O' Level thing, that I was talking with someone from the Sixth Form, and I discovered the Science Sixth existed. This thing I didn't know, that apparently you could have all your classes were on science! You didn't have to waste any more time on languages and Latin and French and...history didn't interest me much; all these boring things; art was really rather a bore in school. That was fabulous! It was heaven on earth! And of course I got into the Science Sixth then. I did physics and chemistry, and mathematics, and...I didn't do any biology, and I think the only biology I did at school was elementary biology below O-level.

*That's like me too.*

Beans on blotting paper or something. The chemistry I think was very dangerous, the amount of hydrogen sulphide they had around in the labs. But...I didn't find chemistry very interesting. I did later on when it came to electronic theory of valency and things like that, it started getting interesting. But physics I found...

*Weren't you interested in chemistry?*

Well, it was all these boring things about quantitative analysis and...the practicals were such a bore, these things, and qualitative analysis and all...

*But all the chemicals you could make. I mean...[inaud – both talkinh]*

Yes, but I didn't have a feeling for it you see. It's what you have a feeling for. I was very interested in physical things, gear wheels and lenses and things like that. But no, chemistry was more like messing in the kitchen you see; it didn't appeal to me. And...so...I remember going through a holiday in the north of Ireland with my uncle who was a headmaster up there, near Belfast, and I took J.J. Thompson I think it was, 'Elementary Textbook on Electrostatics', and I knew nothing about electricity at all, and reading this in the train and the boat. And the concepts I could...it was non mathematical concepts where I could...fascinated me that book. Then I started getting on to astronomy. We had astronomy books, old books which my grandmother had sent out to New Zealand, and we had some sort of telescope there at home, I forget just what, an ordinary terrestrial telescope, and I started looking at things. And so my interests moved over from things in the sky, flying machines, moved over into astronomy, and I was very interested in things up there. And I must have started astronomy properly...I ordered a three-inch refractor objective lens from London somewhere, and then I made all the brass parts myself in the workshop on the lathe, which wasn't very easy but...

*The school workshop?*

Oh no, this was at home.

*Oh, you had a home workshop.*

Well I was building up this thing, a treadle lathe, with bits and pieces you see: the treadle from one scrapyard, the head stock from another thing, the slide rest from somewhere else you see. And assembled all this machine. I don't know quite where I learnt about these things. My father wasn't up in metal work at all; he was very good on woodwork, but he had no background in metal. I don't know quite where we got it from. But anyway, I gradually built things up on my own. So I could turn the brass. The threads were the difficulty of course because I didn't have a screw-cutting lathe. But, I managed to make a...if you were very skilled you could make a thread by hand...

*With a file.*

Y...but in the lathe; you had a chaser, you had to move it along exactly the right speed, you didn't...couldn't jump and wobble. And I found I could...it was good enough, the things would screw together just about, they were good enough. And I remember also borrowing from the school, they had a solar spectroscope at school - I don't think they knew really what the hell the thing was. This goes on the end of a telescope and you can look at the sun, and in a particular wavelength like the hydrogen line, one of the visible lines in the hydrogen spectrum, you could see the edge of the sun, and you could see solar prominences coming out of the sun. And I remember seeing this. And it worked more or less the first time I stuck it on the end of this thing. And it was a terrific experience seeing that, the sort of thing you saw on the photographs in all the books.

*Yes, oh I've seen them in photographs, yes.*

Yes. Fascinating. And...but microscopes, I was no good at them at all. I had a little old thing that I think my grandmother had had, and I found everything I looked down the microscope it was just a bloody mess, and I could never get interested in preparing slides. So that was completely out. I liked looking at the moon, that was a very good object, and reading about Mars and Lyell's theories about the canals on Mars, and

being inhabited and so forth; reading books in libraries. And then, through Philip Marples I was introduced to a curate called Wright, who was a very strange character, and he was interested in science generally. And in his parish he set up a great science fair, a great exhibition with dozens of stalls, all sorts of things, and he got...television was on show then. I thought it was no good at all, I thought it was an awful thing...what the hell we were mucking about with that for! I failed to see that if it got better it would be some huge thing [laughs] And I had a little stall with scale model racing cars and things, and aeroplanes that I had made, and some of these were stolen which I suppose was rather a compliment to...to that. But Wright made reflecting telescopes, made the mirrors; he ground them himself. And so he was helpful to me and lent me a cast-iron tool, with the right spherical curve on it. But what he didn't do, which I think was rather bad, tell me that there was a standard book called 'Amateur Telescope Making', written by the director of the Armagh Observatory. I found that out afterwards, and my opinion of Wright went down with a bump. Because he wanted to be the grand man who told me everything, and not for me to get direct access to the book. But anyway, he did help me a lot, and I made up to nine-and-a-half inch reflecting telescope, really quite a big thing. And I had a blacksmith friend nearby, a real old-fashioned blacksmith, and I used to get him to bend big pieces of iron for the stand for the thing, and the big sort of motions of...following the movement in the sky and things like that. And he used to say...he'd say, "With your brains and my brawn, we can make anything"! A good chap he was. But...so I was reading a lot of H.G. Wells' short stories, that was the main thing. I didn't read so many of the longer ones; the short stories I found very exciting.

*Like 'A Modern Utopia'. I re-read H.G. Wells recently actually; have you read any of him recently?*

Oh yes. I read...you know, for 'Science for People', they had a little thing about books that stimulated you in your early life. And so...I couldn't think of anything at first, and I thought, what about Wells? So I wrote about his short stories. And...

*They are worse written...when you re-read them...*

Oh yes, he's not a good writer in that sense. No. But I still find there's a magic about those things, that some of the...the psychological atmosphere, these...miserable little shopkeeper, hen-pecked old man there, who finds this wonderful magic world looking in through the crystal such-and-such. Looking into another world of strange creatures, the time machine, all that. I found this very...still very exciting. And...at that time, I have a school essay I wrote, in which I...really teenage stuff, about...just enlightenment, ideas about science was going to bring all these wonderful benefits to human beings, what a good thing science was. And also how science was going to be a more or less complete philosophy of life. Bernalism in a way! [laughs] But I think I was...yes, I was interested in the idea of pure science and all these elevated ideas and intellectual skyscrapers and so forth as well.

*But no politics?*

No, there was no...except that everyone should be benefited, certainly that was stressed. No. The politics you see, this will come along shortly. Because, one day, one of the headmasters of the school which my father went to as a school medical officer, a Mr. Manton [ph], a very imposing man. He lived near to us, and he called on my father one day and I met him at the front door, and they were talking about me. And my father was saying, you know, he's doing this and that, he's making telescopes and all that. And so, Mr. Manton said, "Ah, he should go to Cambridge, to Cavendish Laboratory under Rutherford" you see. And I'd never heard about Cavendish Laboratory, or...possibly Rutherford, I don't know. And so...I thought well, it sounds all right to me! Mr. Manton must know! And so that was it, that I...yes, "Do research in the Cavendish Laboratory", that's what he said. And I thought, research! And so that gave me a clear direction. Mind you, if they'd talked with the physics teachers and the headmaster and so on, I mean they would have put me on that track anyway, but I heard it first from Mr. Manton at the front door, on the front doorstep like that. And the...our headmaster heard about my telescope making from the physics teacher, and the physics teacher visited us at home, and...a very good chap; there was another physics teacher, Hare [ph] of Chinese philosophy had retired, and we got a more sort of eager beaver science man there, but he was helpful. And I remember having to go to see the headmaster about something, and he started a lot of guff, "Oh, how

wonderful it is, we've got this young Herschel" you see! Because I knew that Herschel made his own telescopes. And so...a lot of talk like that. But then...I had to get scholarships to go to Cambridge. My sister had already gone to Oxford, doing German.

*She was more or less recovered then?*

Well, she...she was walking about, yes. She was disabled from a walking point of view, but she had no more illnesses at all. And she'd done very well at school, and she went to Somerville at Oxford. I don't know whether she got a scholarship, but she was certainly a drain on the family, and we didn't have much money. I remember one summer we didn't have enough money to go to Wales, and we had to stay at home. And my father used to do locums, and he used to drive quite long distances, right over to Coventry in the winter apparently to do locums to make more money. So we were quite pressed on the money side. We weren't starving of course, but I mean... So, to get to Cambridge I need to get scholarships. And I came unstuck in going for a County Scholarship. I went to the interview at Warwick there, at the County Education Committee. I don't know what it was. But I was obviously very interested in physics and science, and they turned me down, apparently on the grounds I was too interested in science! And their line was that my interests were too narrow, and I ought to spend another year before going to Cambridge. And I was very annoyed and upset about this. But in actual fact I think this was very fortunate, because if I had gone up to Cambridge then I think I was too young in all sorts of ways to have got the most out of it, and I thought...

*So that was what, when you were 17, something like that?*

Yes. And I...or 18, I think, I got much more out of it by going up in...yes, 1935 when I was 19, so it was 18 or 19. And so really it was a colossal piece of good luck. But the other thing was that...oh yes, I remember going to the headmaster after that and complaining, saying I didn't want to spend another year at school; school was boring, I wanted to go go to university. And he said, "You're a silly goose". And I thought, well look, last time you were thinking I'm a Herschel... [laughs] ...now you're calling

me a...I thought it a bit hard to be called a silly goose: he had no sympathy! But he was right. And that year, I spent a lot of...I had been told by the Education Committee, you must broaden your interests. And I had a wonderful time broadening my interests, because my friend Bob Cooper [ph] had very wide literary interests, and I had another friend, Keith Gilbert, who was into political things, and I...yes, Keith Gilbert was into Shaw and socialism, Wells' 'History of the World', and so he was introducing me to political ideas and also in relation to science to some extent as well; he was into other things like the Cambridge University mountaineering club, and went to the Alps. I knew nothing about that sort of world at all. He went up one year before me to Cambridge. And he took me out to Italian restaurants, a world totally unknown to me. And so it broadened my interests. But Bob Cooper, he stayed on the extra year too, but he didn't get to Cambridge unfortunately, but he had to go to Birmingham and it was a come down, didn't like it there at all. And in Birmingham I spent a lot of time in the public library, broadening my interests, reading all sorts of things. I mean I...architecture, Le Corbusier, you know, 'a house is a machine to live in', all these ideas about social technological things; philosophy, I remember reading Schopenhauer and finding it fascinating: I didn't know what it meant really [laughs] read mountains of things like this. And then we discovered the very good collection of.....

End of part 4

## Part 5

### Digitised from Tape 3 [F1171] Side A

*Interview with Maurice. This is still on the 16th of March, and it is now the first side of the second tape.*

Yes, I think the reason that I still did physics chemistry and mathematics was that I was going up to take scholarship exams at different groups of Cambridge colleges, desperately trying to get enough scholarships to be able to pay enough of my way there. And so I didn't have the opportunity of broadening my interests in school, but I did that outside school. I was determined that when I went back to that Warwick Education Committee [laughs] that they wouldn't be able to say that I was too narrow. Actually I think they were wrong, because I was into chamber music a lot, with my father's influence, and the gramophone; I mean, quite a considerable knowledge, because he had a very big collection. This was his great enthusiasm then in Birmingham, nutritional research in the slums of Birmingham, and chamber music. And so I was into that in a big way. And I had done quite a bit of general reading, and I was interested in Welsh mountains, and climbing on holidays and things like that. But on the whole I think that they did me a great kindness by stopping me rushing up to university. Now...yes, I said I was...yes, with Bob Cooper, my friend at school...yes, he had a lot of literary interests. And...yes, I had the music interest I mentioned, and I used to listen to a lot of gramophone chamber music, and there were concerts in Birmingham that we would go to sometimes. And...it must have been on one of these expeditions to Cambridge to sit a scholarship exam, because there were different groups of colleges that had exams at different times of the year. And...did you go to Cambridge?

*Yes.*

I see, so, oh well, it probably was...

*Yes I was, I got a King's scholarship.*

I see. Well, more than I ever did. And I made the acquaintance of Redman, who is the Director of the solar physics observatory there, which was the only big observatory at Cambridge. And I think what I must have done was, walk out the Madingley Road or whatever it was, and rung the front door bell at the solar observatory. I think that's what I must have done, because I was then invited by Redman to his home to tea, and at that tea party I met the great Birch, who was a remarkable physicist from Bristol who had made all kinds of very important technological advances in physics on diffusion pumps and...

*Couldn't have been bad, for an 18 year old. You must have been quite impressed.*

Exactly. Well now, the thing is that he was into making...with new techniques for getting the right curve on telescope mirrors, using a new thing from Zernike [ph] interference test. And...so I think Redman must have been a very nice man. And...mind you, but on the other hand, I suppose that when a schoolboy - I didn't have a school cap on, because one bought a hat to go to Cambridge you see, almost like a grown-up - turned up and said, "Can I see round, I make my own telescopes?" I thought, well maybe he was a bit... Anyway... [inaud] Anyway, he was very nice. And I remember finding this so exciting, and writing a letter to somebody saying how that we were 'bandying technicalities over tea-cakes'!

*What a pompous lad!*

Well you were right at that age. But Birch invited me to Bristol, and as a schoolboy I went to Bristol there, and visited him at the Wells Laboratory, and he showed me all his equipment and techniques, and I learnt the way of preparing Zernike [ph] little discs for getting a wave of light to interfere with the main wave, and used this technique at home myself. But an indication of how green I was in many ways, I remember we went out to lunch, and Birch took me to some restaurant which seemed to me rather sort of posh and overwhelming, and I wasn't used to going to such places, because our family had been rather short of money, we didn't go round that sort of thing much, and stayed in Welsh boarding houses. And I was bewildered by the waitress and the menu. And I remember, he ordered, and then the waiter or the

waitress said, "What would you like?" and I was so...I just said, "Well I'll have the same as him" you see. And I felt an awful fool. And so here I was you see, on the same level of discussion about...more or less an equal so far as making telescope mirrors with this Fellow of the Royal Society and all that. And on the other hand, I was bewildered by the, you know, elementary sort of social sophistication. And I think this was one reason why it was desirable that I didn't go up to Cambridge too early. And in fact when I did go to Cambridge I had a series of awful nose infections and things, and I think that the separation, the first time I'd ever lived away from home, except for going to visit relatives like my uncle near Belfast. And so I think it would have been a psychological strain on me. And in the same way, when I went, during the middle of the War, across the Atlantic with the other Manhattan project people, I got severe illnesses then, and was in hospital in Berkeley, and I think that these probably were, you know, the sort of lowering of the immunity thing which people now accept. I was frightened of leaving home. But when I went to Cambridge I soon found - or Redman probably told me...

*Sorry, which college were you in?*

John's.

*John's, yes.*

I went there partly because my friend Keith Gilbert was there, but he told me it was a good college for physics. That, I had to do physics, because Redman told me there was no proper astronomy degree there - which I would like to have done - the only way to do astronomy at Cambridge is to do a Maths degree, which was certainly not for me, it was too abstract, and I was more a sort of craft person who found the science, it was dealing with one's hands with the physical world that was interesting. And so he said, "Well, you'll have to take a Physics degree, and then you can do things like solar physics and so on". This is the route for an experimental physical scientist, into astronomy. And so I started doing a Natural Sciences Part I, and was advised by my tutor, Worley [ph], the polar explorer, quite an interesting man, that I

ought to take some new subjects, and so he made me drop chemistry and do mineralogy and geology, which was quite interesting in a way, but...

*That's the sort of strength of the Cambridge system I think, where you're made to sort of change various subjects in the tripos.*

Well it was good in a way, but I found the palaeontology the most colossal bore. But maybe we could get on to that one next, because that's the end of my notes. But...I think that really it was a very fortunate thing that I was turned down by that scholarship committee. And they may have seen it themselves, that...they probably knew that lots of boys and girls didn't go on after their first higher school certificate exam straight to big universities like Oxford and Cambridge, but they get more out of it...

*So which...let's get the chronology, which year did you finally then go up to...*

1935.

'35.

Yes, that's the year I went up. And so then I was...in December of 1935 I was 19. So I didn't go up very early. But even so, I did find it somewhat overwhelming, being away from home.

*But at least you had a family which had got a Cambridge background to it, so you must have known a little bit what to expect.*

Well, not really, no, because my grandmother had...no, they knew nothing about Cambridge, no. My...she was dead by then, and so they had no idea that...my father said his mother had been to Cambridge, he knew nothing about anything like that. And so we had no knowledge at all of Oxford or Cambridge, we were ignorant provincials utterly. The only university he knew was Trinity College Dublin. And so that...I was completely on my own there.

*It sounds from what you're saying as if your father was a tremendously important influence in all this period, because...*

Oh, extremely, yes extremely. But I think the thing is, I...in my autobiography, I want to...I'm getting this a little bit clearer, I want to go back to people like F.D. Maurice, that there was a social concern, a concern with sort of moral values and social justice, and education, and all these things. There was a big sort of current running through the family there. And that Anna Swannig [ph] you see, this relative that I'd traced down who was connected with F.D. Maurice, I mean she was typical of this thing. And she was a Unitarian. Now Unitarians had...they had Buddhist and Hindu stuff read out in their churches apparently, and they were very concerned with poverty and injustice. So these people linked up with the Chartists and all that sort of stuff, which of course collapsed, as you...when [inaud] came out! [laughs] But they were a very strong current then, and this sort of thing is still continuing now. And I think that, just what forms these sort of ideas are going to take, what is appropriate at the present time, is of course the big question, isn't it? I read an article today, two things in the newspaper which I thought were relevant. A man who made a documentary film about some miscarriage of justice in the States. He said if you sit a person down and interview them and let them just talk for at least two minutes, he said they would certainly reveal just how crazy they are! So I thought, well how does that apply with my situation! [laughs]

*Oh well, at least they're crazy Maurice, at least they are crazy. I'm going to stop this tape now.*

Yes, I think that's a good idea.

[Break in recording]

*...1989. [loud tone]*

We got to the...had I got up to Cambridge? I was just going up to Cambridge.

*Yes, yes yes, you've actually indeed arrived in Cambridge; I've played back the last little bit just to check out what we were doing.*

I see. Oh gosh, I've got to sort of start to pull myself together and speak at a reasonable level now.

*Just to be on the safe side, we are indeed recording. Why don't you say something into it, and I'll check it for volume?*

Yes, I'm going up to Cambridge...[Break in recording]...personal life. Now obviously this separation is very artificial, and they run together, but I think it hopes to sort of deal with the facts and get them down and see how they connect. I had contact with research workers in Cambridge before I went up to Cambridge, because we had been up for scholarship exams. I had contacted Redman at the solar physics laboratory. That was...yes, and he put me on to Birch at Bristol, because with my telescope making Birch...

*That's right, you said something about that.*

I said something about that, yes. And we visited the astronomer [inaud] I think he was called, Ellison, who had written a book on making telescopes, amateur telescope making, and we visited him while I was a schoolboy at the Armagh observatory. We've said that before. And when John Fremlin, who was a research student in the Cavendish before I went up, and I visited him when I was up for a scholarship exam - I never did any scholarships incidentally. And I knew him because my elder sister had been friends with Celia Fremlin, John's sister at Oxford, so I had that introduction. When I spoke with Redman, the solar physics man - at that time I was interested in doing astronomy - he advised me to take a physics degree and...because there wasn't any proper sort of astronomy teaching in the degree course other than doing the Mathematics degree, and I didn't want to do that. I remember driving up to Cambridge from Birmingham, that somebody living in the area and who had also gone to my school was driving his son up there, and so I was rather pushed into being driven with them, and I remember being rather resentful by the fact that I had failed to

get scholarships, and it was a bit difficult financially to get there, that I had the impression that this son was simply going to Cambridge because his father had been to Cambridge too, and they had enough money for him just to sail into it. It was the first time I'd been away from home, apart from going to stay with relatives in Ireland, and I remember the very large buildings there that I found it rather frightening, and I did get some illnesses which I refer to. But the sense of vocation so far as sciences was concerned was very strong with me, and these large buildings were, you know, sort of rather like temples, academic sort of temples, very very impressive places. And when I went to see John Fremlin in the Cavendish, in his laboratory there, it had a certain feeling of being a very special place. I won't say it was a sort of holy place, but it was something of that nature. But it gave me quite an uplift to go in, finding myself talking with an active research worker in a real research laboratory. On the other hand, I was very concerned with science being for human benefit, and I may have quoted a schoolboy essay I wrote about that. And one thing comes back to me there that my keenness about science while I was in the sixth form at school, I think I didn't mention the fact that they had a science library at the school which hardly anybody bothered to go into, and I got interested in this and was asked to take it over, and I did a big advertising campaign in the school and took all kinds of interesting illustrations out of books and put them on notice boards, saying 'Come to the science library', and it was absolutely crowded out. And another interesting memory there, that they had A.V. Hill's book, 'Living Machinery' there, and I remember it making the most awful impression on me, that I thought it was terribly dull, and I thought you won't have machinery which wasn't made out of proper machine parts and all these sort of soft bits of stuff inside living things. I was repelled by the softness, which is interesting in relation to my interest in biology later on.

*You were only interested in the rigid bits of biology later on! [laughs]*

Well no, that isn't really true. I found the rigid...I got onto the rigid bits, that's perfectly true, because I couldn't avoid them, but I've always found the rigid double helix really sort of a fearful bore. I mean the interesting thing about the double helix I hear now is that it has all these kinks in it and rings and things, and interesting things happen at the bends. I mean all these people who quoted Olby and said how

wonderful this helix is, it's a fine thing, but it was a means to an end. At Cambridge, undoubtedly being an undergraduate then, you had remarkable privilege and access to people. I mean each student in a college had a large living room, a separate bedroom and a little kitchenette as well. Those standards of course have disappeared now for a long time. And in lodgings too, one always had...one never had a bed-sitting room to my knowledge; I don't think...I think it was probably against the regulations then. But I think the really important privileges were the access to people. I might just say the choice of college, well I chose John's because I knew Keith Gilbert from school who was one year ahead of me, he went to...he did Physics at John's, and he said there were lots of good physicists there. And it was reasonably big, I didn't want to go to a very small college because it might reduce direct contact with scientists. Now, Worley(ph), the tutor there was a polar explorer, and he was an interesting man, and I remember the polar bear rugs he had in his office and in the waiting-room outside. And he I think gave me some interesting advice from time to time. I remember going to see Harold Jeffries, who'd written a book with the grim title, 'The Earth', Joe Physicist just knocking on his door and going in with some question, God knows what it was, I can't remember. And as...with supervisions, to have one leading scientist to one first-year undergraduate was a remarkably privileged position.

*It's and amazing system, isn't it, yes. Because that was still there when I was at Cambridge.*

Was it? Oh yes. Very good indeed I think. And I had Oliphant for example, and I remember he used to belch a little bit after dinner in Hall, when we went to see him. But I remember many of the things he said about Faraday and electricity, and how to think about physics. I'm fairly certain we had Cockcroft a bit too, but Cockcroft was so sort of, kind of faceless personality that you barely remember. I remember going to a meeting in the college, where Eddington was speaking, in a not at all big room, and asking a damn silly question there, and people sitting on the floor. And Dirac was about, driving his sports car, but I never had any contact with him. I went to first year lectures from Rutherford, but I don't think there were very many of them because he got ill and died. Many of the leading staff I found were friendly, and...well some were not, who would lock the lecture room door if you were late. But I found lots of

friendly attitudes. And I learnt a great deal from some of the supervisors, and I had a cosmic ray man called Carmichael, and he gave me a lot of confidence by explaining that when he read physics papers, and would come to a page in mathematics he would just skip that and go on reading what came afterwards and try and guess what the mathematics meant.

*I find that deeply encouraging, because I've been doing that for a very long time!*

Yes, well I found him very very encouraging, and I've always tried to say things like this to my own students, because otherwise one gets intimidated. Little things like that can be very valuable. It was the kind of thing which one would pick up if one was serving an apprenticeship, but of course one didn't have the same degree of continuous contact which one does with apprenticeship. Bernal of course was strongly opposed to lectures at all in universities, and I think he was right, he advocated apprenticeship. And in many ways I think that the three years I spent there was a sort of tiresome interlude between doing my own...playing about with science, because as a schoolboy it was only playing about, messing about, and in no sense was I doing research in astronomy, I was just making instruments and enjoying making them. But quite apart from that, in a sense it was contact with real science, and then later when when I started to work for the PhD it was real science. And I think that this was epitomized by, I think he was called G.F.C. Sirs [ph], very famous practical experiments in physics, which I thought were deadly dull; a strange old man who was post retirement, and they let him go on. I think he had a very bad influence on physics teaching there. But he was very enthusiastic, and he took me to see the Cambridge Scientific Instrument Company once. But I think practicals I continue to - and I share Bernal's very strong aversion to practical classes there. And why on earth universities go on with as much as they do I can't understand. I mean, learning to, you know, the techniques is important, but most students don't really need to learn most techniques I think in practical classes. And...it really served...gave me general advice; when I came up he said, "You've done physics, chemistry and maths, you ought to broaden and change something", and he suggested I drop the chemistry and geology and mineralogy; so I did three subjects, physics, geology, mineralogy and half maths in Part I. And...but I did find some of the palaeontology sort of endless

kind of theory which I really did find pretty damn depressive, and never got... I mean the shells and things were beautiful, but what the devil this meant scientifically was never very clear to me. I think maybe it was bad teaching, I don't know. But mineralogy I got swamped with hundreds and hundreds of damned minerals. But I got out of that one nicely, because, when I was at home in Birmingham I rang up the City museum, and I said I had a problem, I had been looking at all these hundreds and hundreds of pretty crystalline minerals in my practical classes, and I couldn't keep any of it in my head. And they very kindly fixed me up with a room, a separate room in the museum, with spare collections of minerals which were labelled, and I then spent very happy hours indeed, sitting in peace and quiet, behind the scenes in the museum - it was rather exciting to get behind the scenes in a museum - and going through the textbook. And I got real pleasure from that. And I think this illustrates another thing; you can't sort of do this in a forced feeding in the universities. So that was interesting. Minerals and crystals have this aesthetic quality about them, which it takes time to absorb. So, the other side of mineralogy was the sort of crystal physics and molecular structures of crystals and so on; they got on to that a certain amount, but I don't think that was very well taught. On the other hand I think that it was linked up with the crystal physics, and people like Bernal, so that it was a fairly lively subject in some respects. I remember reading Lyell's 'Geology', and finding that very stimulating, 'General Principles of Geology'. I also was elected to the Natural Science...

*A bit archival of you, wasn't it really, reading Lyell in 1936?*

Well, he brought out a lot of fundamental principles which I think I hadn't taken on very clearly. You know, that basically, that the same processes which operate from day to day, had been operating for thousands of years...

*Uniformitarianism.*

Yes. And he put it across very well, it was very readable. I don't know quite...I picked it up somewhere in some bookshop; I don't think anyone told me to read it, but it was good. Of course he was at this college, wasn't he, and the women wanted to go

to his lectures, and the college barred them because they said it would lower the intellectual tone of the college.

*Amazing.*

To have the trivial presence of women there. I have a feeling he left in disgust after a few years, couldn't take it! [laughs] But...the Natural Science Club was a small undergraduate club, who gave...the members gave papers in each others' rooms and moved around. I met Andrew Huxley there, Dick Synge and others, so that was rather a select thing. And I also knew Jack Allen, who was a low temperature physicist in the Mond, and we met him largely through a summer holiday when we did a grand tour of Europe in 1937, in some...another student had an aunt who had a fairly big car, and we drove round, my first visit to the continent, through France down to Switzerland into Italy, round Austria and back through Germany. And so we had to fill the car with four people, and Jack Allen, who was a Canadian, he was one of them. So I got to know him, and I remember at one stage, I think after my second year, I spent some time working in this group there, when they were on liquid helium. I was told it was taking readings off a meter, but it was very exciting to be sort of in a lab actually doing something.

*Real research.*

**End of part 5**

## Part 6

### Digitised from Tape 3 [F1171] Side B

.....exciting to be in a lab, actually doing something.

*Real research.*

Part of research, yes. I hadn't the vaguest idea really what the research was about; I had general ideas about liquid helium, of course fascinating stuff. I just enjoyed being...because I didn't know these people. Well that was Part I natural sciences. Then I got on to Part II, and I elected to do the crystal physics special section there, and not the nuclear physics, partly because I saw the nuclear physics being done by, what were then were large teams of people, like half a dozen or so, and I didn't want to be doing research on that scale in teams, and so I avoided it. During that time, in my second year, I was...oh yes, I had a bit of a breakdown and couldn't work; I think I come to that later on, but I got over that. But I got...that may have contributed to my only getting a 2-2 degree, and...maybe I would only have got a 2-2 anyway, I don't know! Then after that, I remember wondering what research I would like to do, although I couldn't stay at Cambridge. Maybe that wasn't clear then, I may not have known the result. But I remember Cockcroft very sensibly saying to me, well if you don't know what field of physics you'd like to do research in, go into the library here, that was in the Mond lab, look through the journals, and find what papers seem to interest you. And so I started flicking the pages over, there, and after a while I found papers from the Philips lab, in I think a Dutch journal, about electronic processes in solids, and luminescence, and I started feeling this was interesting. And I think the reason I...I have a fairly clear memory, the reason I found it interesting was that I...you had the crystalline solids that I knew something about, but you had these electrons buzzing around, movement, dynamic processes, doing all sorts of special things you see. And I think that this - I like to flatter myself by thinking I showed some good insight then, because solid state physics was not a popular subject at all at that time - that it was the complicated, lively movements I think, the possibilities of varieties of movement, and the fact that they were buzzing about. Whereas what Bernal was doing, although I greatly admired Bernal, this static structure of X-ray

diffraction of TMV struck me as deadly. And I had incidentally lost interest in doing astronomy at that stage. And so, then, after my 2-2 and I realized I had to leave Cambridge, I then suddenly realized that there were other universities, and I investigated somebody in Leeds, somebody in Newcastle, and none of it was very interesting, and then finally being...from my home in Birmingham, Oliphant had gone to Birmingham, and I rang him up one day, and he remembered me from my first year, which was fortunate, and said, well, there's an interesting man called Randall here, who's looking for a research assistant, come over and see him. And so I got fixed up with Randall for...for good or for bad, it was rather...well anyway, I got a great deal out of it, but I also had certain difficulties at times.

*What, even then?*

Yes, from a...at least... [laughs] ...yes! But I wasn't very easy myself. Now, I remember incidentally...

*So you were doing a PhD with Randall there?*

Yes, in the Birmingham.

*But, sort of, presumably employed as a research assistant.*

Yes, well you see this was one of the...he said that I would be employed as a research assistant, but I would be working for a PhD at the same time. And after about six months of work where I was doing photographic technician work on his photographs for work he had done before I came to the laboratory, slogging away as a technician and also making endless pieces of equipment in the workshop and so on, I finally said look, I'm supposed to be working for a PhD. And we had a bit of a show-down. But he then said that this equipment you're making is going to be used for the research for your PhD, and...actually he was right. Making a monochromator or something. But, I think he was rather exploiting me. And if he'd been able to teach me any photography it would have been a bit better; he wasn't, he knew nothing about it, so I had to sort of struggle and pick it up for myself. Now...anyway, I...yes, it's interesting that, when I

saw on the Cavendish notice board that Bragg had been appointed to the Cavendish chair to replace Rutherford, I had an awful sinking feeling what a dreadful, you know, downgrading this was, because I felt that...well I suppose that Bragg's contribution to physics was very very important, but somewhat indirectly, all these damn structures and things. But what you might call the general intellectual level of the Rutherford stuff, one felt was just a totally different category. But, maybe that was the beginning of...well physics I suppose in Britain had passed its peak already at that time. I mean in the Thirties the Cavendish lab was probably still the peak place in the world, but it was beginning to go down. It was going into a new era of course, because Rutherford had this idea that every physicist, you had to make all your own apparatus with your own hands. Well of course this was no longer possible, with the sophisticated and large-scale technology that was becoming necessary. So that he was being slightly pushed to one side as an old fogey, and so, and times were changing, and it was the big machine people in the United States like E. Lawrence and so on who were beginning to take over. It was sad in a way, because I think Rutherford had a very good...he thought you couldn't really have a proper feeling for the subject unless you did everything with your own hands, and there's a lot of truth in it.

*Well there's a lot in that.*

Oh yes, yes. He was no fool, Rutherford. No, one respects him for that.

*Having spent this morning training chicks precisely because I believe you shouldn't get out of touch with doing something with your own hands.*

Yes, well it's this whole question of whether one should have technicians helping one, or how many you have, or whether you should try and do everything with your own hands. It's an important question. Well now let me see. Scientifically, yes, that's the end of my being in Cambridge. Maybe I should go on next to Cambridge Scientists' Anti-war Group then, because that's still science, but a special aspect of it. I simply run through the ordinary career science element there. My contact with that again was through John Fremlin, and was lucky to be introduced to this little élite group. I'm not sure if I was the only undergraduate member, but there certainly weren't

many; there were lots of research students and staff there. And they used to meet for lunchtime sandwiches in a basement in King's Parade, I used to go there. The Woosters were there, husband and wife; Wooster was secretary of the Association of Scientific Workers. He was a crystal physics man; I thought he was a very dreadful, dull scientist, but he was sort of on the right side of the fence politically. There was a Christian Scientist - Christian Pacifist - called Yates from the Cavendish. Most of them were left-wing, but Yates...

*Yates was a statistician or something?*

No I don't think so, I don't think so. No, I have a feeling he was an experimental physicist, but I'm not sure.

*Because there's something magical, the 'Yates Correction', isn't there, which is statistical.*

I don't think that would be him. No, I think the interesting thing...the reason I mention it is, it was a mixed bag; you can have a Christian Pacifist in that group all right, with the open communists like Bernal and the many communist sympathizers of course, like John Humphrey, Dick Syngé were there; we met Miss Dorf, who had come from South Africa and who married John Fremlin later, she was there. I don't remember the names... I don't know that Needham, he may have come along, I'm not sure. But it was...it was very interesting as an undergraduate to be sitting in on these discussions with these highly intelligent scientists at different levels in the university. I remember John Fremlin, I sometimes used to meet with him in the evening in Lyons Tea Shop, and have long discussions with him there. He said that he once brought his typewriter into Lyons Tea Shop, it was a kind of...place where anybody could go and... [laughs] ...behave as you wished. Well the group, before I came to the group, it had been going for some years, and began as an education and propaganda group, through non university people, going round the country, and Bernal giving lectures, and John Fremlin I think was brought it, and others to fill the gaps where Bernal couldn't keep all those commitments. They went to meetings organised by peace groups, women institutes, trades unions and such-like. And they were mainly

concerned with, as scientists, making clear what the horrors of war would be, and the effects of science applied in war, and the dangers of Fascism. I think these were the two main lines.

*Was that the time when they were doing all the air-raid precautions stuff, or did that come later?*

Yes, it was leading up to that, yes, it's coming to that. There was some big air show where they distributed leaflets, and I forget whether they got into some sort of hassle with the police maybe at one of those things.

*You don't mention Haldane amongst the group.*

I don't know that he was directly there; yes, he certainly interacted with it, and I mention one of the interactions there, but I think he may have gone to London by then, I'm not sure. But he certainly had contact. They had correspondence in 'Nature', on science and war; there was quite a lot of general propaganda in education. And it was an interesting idea, that these scientists would use science to help to stop war, and I think it was John Fremlin who, or Renet Fremlin who said, I think it was John was the one who first suggested they actually did these experiments on the air-raid precautions. And...so it was nice to get away from the idea that science was being misused in war, here the peace movement would be using science positively to stop war for peace. Baldwin of course had been impressed by the air manoeuvres in the Twenties, showing that fighters couldn't keep the bombers from getting to cities, and so that the civilians would be in the front line; the bomber would always get through. And so, everyone was convinced that cities and civilians would get bombed. They were especially worried about gas attack, and so the Government was using these simple free gas masks. And the group did experiments on those, testing the government gas masks, and they did get some improvements made, and they pointed out for example that they remove gases but they wouldn't stop arsenical smokes.

*Were you involved with those tests?*

No, I wasn't involved in that, no. No, that was a bit...probably a bit before my time, or at least I had nothing to do with it. But I was involved in the gas-proof room tests. And there they had quite a big room, somebody's room in Trinity College, where about a dozen people sealed themselves up according to the government recommendations of sealing a room, sticky tape and things, and they liberated carbon dioxide in the room, and someone, a physiologist or someone who was used to methods of measuring carbon dioxide concentration, then measured the rate at which the carbon dioxide leaked out of the room. I suppose they made a suitable allowance for the generation of carbon dioxide in the room from the number of people there. But I remember it got very hot and smelly in the room during the day, rather boring. Haldane of course came along afterwards and said, the idea that the rate of leaking out of a room will be equal to the rate of leaking into a room, isn't true; and of course he was quite right, that it leaks out through all the sides, and top and bottom, whereas it's only going to leak in through those walls which were exposed to the exterior atmosphere. And so they had to make an adjustment there. But the principle was a good one. And...of course they came up with the result that, after a gas attack, after some hours, when the concentration outside had gone down low, you'd be safer outside than inside the room! Not very important, but...it was a meaningful experiment. Now...yes and then I was...I was actually given the job of doing the incendiary bomb experiments; I felt very grand, I was put in charge of those experiments! [laughs] I think I was third year Physics then. And a story came from Spain, that if an incendiary bomb was dropped on the top of high tenement buildings, that it would burn its way through a succession of floors, the incendiary bomb would get to the bottom of the building, and then set the whole block alight. And they wanted to test this. And so I found out...got floorboards and joists and things, and made a bit of floor about...say five feet square, and put a plaster ceiling on the bottom. And then they said you make thermite) with...they got some magnesium for me, and a bit of thermite to ignite the whole thing. And...I couldn't get it to burn through the floorboards at all, it was very disappointing indeed. And...Gary Werske irritated me by putting this in...the photographs I gave him in his book, and then saying that I hadn't been...succeeded in the experiment. In actual fact, the results I got were perfectly correct, and it was only during the War, in Birmingham, when there were houses being burnt with incendiary bombs, that I saw it myself, that you could go into

a room with an incendiary bomb in the roof space above the ceiling, and you'd get no trace of any fire; the whole roof could be ablaze, but the incendiary bomb insulates itself with a layer of magnesium oxide from the floorboards, and it doesn't burn down through it, the Spanish story was a load of hooey apparently. Because I was in one of those fires I remember in Birmingham, that having seen how a whole roof could burn, I then was in another house where there was an incendiary bomb in the roof, and I said, "Oh the thing to do is to get water up there quick, and let's smash a hole in the ceiling". And so I smashed a big hole in the ceiling, and then went out of the building, and found that someone with a hose had managed to get enough water in through a hole in the roof to put the fire out... [laughs] ...let it go quickly...[inaud]... And so...yes, so, it was an interesting time. Yes, and then was this amusing time that the dreadful Wooster came up to me afterwards and said, "Well do you know Wilkins, whatever you do after you graduate, don't on any account take up experimental science, because obviously you're not cut out for this sort of thing!"

*Because you'd got the wrong result! [inaud – both laughing]*

And so...actually I had no respect for Wooster's [ph] research. He was very [inaud]

*I'm glad you share my view of him!*

You knew him did you?

*Slightly, yes. I also had that feeling later.*

A very limited person, and...they are very worthy people, who perform useful functions in organisations, but so far as imagination or any ideas are concerned, they're dreadful. Yes, I was very tactless with him, because he'd brought out his wonderful new book on crystal physics, and on the...what do you call the paper on the outside of...

*The dust jacket.*

The dust jacket, they'd taken a wrong Fourier diagram out of the whole thing. And I point out this conical refraction, I said look, this is wrong. I don't think he liked that.

*No, I suspect not!*

But...in fact I don't even know if he corrected it. But...let me see...Cambridge scientists' anti-war group. Yes, the incendiary bombs. The other thing we studied was high explosive and shelters, and they were advocating the use of deep shelters, saying that if there were going to be aerial attack you should have deep concrete shelters and not the...all these surface things the Government was interested in. And the Labour borough of Finsbury had a plan for a very deep shelter, they were supporting those. I think in the event, they were a bit wrong on that, because I think the Morrison and Anderson shelters were in fact not at all bad; I mean they wouldn't take a direct hit of course, but they did protect a lot of people, and it would have been extremely expensive to have got a lot of deep shelters. But, you know, there was some sense in it nonetheless. So, the other thing...I think the general level of damage which people thought that aerial bombardment was going to make, was seen to be rather exaggerated, at first, because early in the War the damage wasn't on a high level. But I think that, by the end of the War, when the size of the bombers had gone up, the weight they could carry and the number of bombers went up, I think the attacks on German cities were quite as horrific as anything which people had forecast, in fact possibly more so when you consider the fire storm in Hamburg. I don't think anybody envisaged a fire storm; I mean just killing people very indirectly by having no oxygen left in the air. So I think on the whole, the general viewpoint of that group was sound. Now...Bernal of course was right that science needed large-scale planning, and in the War of course it was large-scale planning, and the Manhattan Project was a striking example of that, which I was engaged in. Now, on the whole business about were they right in opposing rearmament of Britain, well I'll discuss that later on in the political section. I mean you see, the nonsense of keeping these things separate! [laughs]

*Right. Bernal wanted to do his autobiography in these three stripes you know.*

Oh, what were they?

*He wanted to have his biography in a book which was in three colours in parallel stripes, which was white for science, and red for politics, and purple for passion or something like that. He'd got this planned printing design.*

How were the stripes going to be on? The same page?

*I think they were going to be on the same page, you know, like those children's books where you measure up the people...[inaud – both talking]. I'm not sure, I envisaged it like that anyhow.*

Yes. Yes, but...

*So we're now on to politics?*

Yes. Well mind you...yes, maybe we ought to get on to the politics. Yes, the other things are art and culture and personal lives [laughs], which...[inaud]

*You want to do them then?*

Well, let's...no, there isn't very much purple in the personal...

*Dreadful. You're going to disappoint this archive, which includes a lot of purple in it.*

No, no, it's rather funny, it's the other way around. Oh, shall I go straight on to the politics then?

*Whichever, yes, if that's easy.*

The...well no, it's not easy, but I think it's the most important. I think this is where I really do feel concerned to try to get some points across, and in the projected autobiography, I've actually written three-and-a-half pages of the Cambridge politics

section already! I think I can actually get it moving. I think this is the most significant aspect of my whole time there. Not that I did anything of any importance at all, but, you know, what I saw going on then, the times. And I think special interest to me is, the need to rebut these apparent claims which are often made now, which I think are gross distortions. Well, the first thing is that all the Cambridge communists were spies. A whole lot of people, as soon as you say Cambridge, communists, in the Thirties, they say, 'Oh yes, the spies'. Well that's the first point. And the second is, that the left were the appeasers of Fascism. A lot of Tories talk like that these days. I think...I will deal with these two points. Well the first point is easy enough. I'm not quite sure how many years earlier, before 1935 when I went up, Blunt and all these other people in King's College were...something like five or more years wasn't it? I'm not sure, but... They were in the arts, and these people took jobs in security organisations, in the Government. Because presumably you couldn't be a spy, at least not easy, if you were not...didn't have a job like that. And...I think the whole situation, I know nothing about that period, it all seems totally foreign. I mean I think all this spying thing is a load of sort of unpleasant, childish rubbish which I find very distasteful. In the late Thirties, the whole left-wing movement in Cambridge was a very large-scale and open and public campaigning and so on; it's the total opposite of this secret sort of individual acts of so-called spying.

*Did you ever join a party, either the Labour Party or the Communist Party, or...?*

Oh the Labour Party, I don't think anybody joined the Labour Party; sort of more or less half Cambridge joined the Communist Party! [laughs] So I mean...or if they didn't join it they were sympathizers or...what's the term, 'close' to the party.

*And so you did?*

Yes, oh definitely, for a while. Mind you, somebody pointed out to me, you've got to be careful what you say these days, because the Murdoch Press may be going through every word and trying to make a headline out of it. But I think one has to get the historic record clear, that the membership of the Communist Party was very...was...well, it's just more common that anybody joining the Labour Party.

Mind you, as I've said in print, it was the right place to be at that time, there wasn't anywhere else to be.

*Yes, I think this is true, that...*

That's why one of my objections to Gary Werskey's book, in that he doesn't understand that at all.

*Oh?*

He sees the Communist Party very much as, with the eyes of the 1960s I think and not with the eyes of the 1930s.

I see.

*That's my impression.*

Yes, yes, I must say I find his book rather difficult to read. I can't quite make out why.

*So how long did you stay in the party?*

I think I may still have been a member up to the beginning of the War or something. I know that at the time of the Soviet...Nazi-Soviet pact, that Gollancz wrote a pamphlet saying that, you know, you simply cannot wave anti-Fascist flags, and you can't go along.....

**End of part 6**

## Part 7

### Digitised from Tape 4 [F1172] Side A

*Side four, on the 1st of June.*

On the spy question, none of the people I knew was in a position to be a spy, I'd never heard of such things. There were lots of mainly scientific people rather than the arts, whether that had got anything to do with the Blunt and the other phenomenon I don't know. I think it was totally different atmosphere then. So much for the spies. Mind you, I might say that fortunately I never heard anything about spying in the whole of my career, although...no, I did once, some years ago hear some physicist who had been taken out to dinner by somebody from the Eastern Bloc once, and was a bit worried about it, but that's the closest I ever got to anything! [laughs] Nothing in California at all, thank goodness. Now the second point, the left were the appeasers of Fascism. I think this is the most gross untruth, that the left had a very clear view of Fascism, one as culturally barbarous and two as war-making. I think you are very clear on that. And they were very strongly opposed to appeasement, because if you understood the nature of Fascism you saw that appeasement wouldn't get you anywhere. I mean Hitler wanted to have wars, and he was going to have them. On the other hand, there is of course much evidence that so-called respectable Tories of the time, I think Halifax was one of many, were interested in doing a deal with Hitler and arranging an anti-communist war against the Soviet Union, and the evidence I think is even stronger in the case of France. I think after...recently more of this has been coming to light hasn't it. And so, if there were any appeasers they were on the Tory side, on the right wing side, and not on the left. I'm ignoring of course the right-wing Mosleyites and people like that, I mean they weren't the important ones. It was the respectful ones in the Tory Government that mattered. Now, on the other hand there were certain complications which may have helped to give the impression that the left were appeasers, that the left did, and the Communist Party in particular did lead the anti-war movement, and in that anti-war movement it of course included Christian Pacifists. And they did oppose British rearmament, they did describe the horrors of war, but as I said, they saw the Fascists as being the people who were interested in starting war. But being opposed to war, one could get that a bit mixed

up with being an appeaser. And then there's also the Oxford 'we won't fight for King or Country', the Oxford union thing.

*Yes.*

Now, I believe this is 1932, which was a year before Hitler came to power, but that certainly created a lot of...drew a lot of interest at that time. But somebody was pointing out, George Barnard, do you know the statistician?

*Mm.*

At Essex. You see I knew him when I was at Cambridge, and he was a leading party member there, open member, and he was saying that the King and Country was to be taken literally, and it didn't mean that these people wouldn't have fought for other war aims. But certainly, my memory had been that it was a general thing that one was just going to take a pacifist line full stop. But...

*Was that your line?*

Oh, I wasn't a pacifist full stop, but...but I think this...that Oxford resolution probably did confuse the whole situation, and helped to give worries to this idea that the left in the Thirties were, because they were against war, were for appeasement. Though in Cambridge there was nobody...there was a small minority of Christian pacifists, but the great mass of people there were - who were interested in politics - were...definitely saw that you had to meet Fascist war intentions with force, either the threat of force or with the use of force. Of course they were trying to get the anti-Fascist alliance between Britain, France and the Soviet Union, and of course they failed to achieve that. So that, one could say that that was the reason the War came about. So I think that it's very important to emphasize that point about appeasement. The general background to the late Thirties was of course the General Strike in 1926, and the Depression in the early Thirties, and as the Communist Party in particular emphasizes with the contradictions of capitalism. But more widely it was recognised that you had...the slogan was 'poverty in the midst of plenty', and the burning of food

mountains and starvation, malnutrition, not only in the Third World but in Britain itself. And that movement as a doctrine, my father was one of the people in that, so I was acquainted with that. And so, capitalism wasn't working very well, and I think this needs to be kept in mind very much, that it certainly encouraged people to look with favourable eyes towards the Soviet Union, the example of the Soviet Union. And then they made a list of all the celebrated people who went to the Soviet Union and came back and wrote books about it saying it was...what a wonderful new civilization it was. But certainly there was a very strong impression, positive impression at that time. There were some people like Malcolm Muggeridge who as you've heard about more recently who was an exception, as the collectivization and other sort of...sort of brains of the...they were very sort of heavy policies carried out by the...under Stalin. Russian films had a big influence on people.

*On you?*

Oh certainly, yes. But I think to some extent the Soviet Union was sort of...it was a model, definitely, and contributed to the enormous sort of hope and optimism in that movement, which I think must be emphasized. I'll come back to this again. It certainly was a remarkable era of progressive thinking then. The Margaret Gardiner...did you see that thing on television at Christmas?

*Yes.*

You see, she brought this out, not so much on a political side but more the...sort of the artistic cultural side as suitable for Christmas Day or whatever it was. And you had this unity of art, medicine, science, films, anti-Fascist pro-left, Picasso, Henry Moore, writers, poets; we even brought the surrealists and Freud into all this modern movement. Earlier on of course in the Soviet Union you had people like Isadora Duncan going over there, all the experimental art in the early days, but of course by the late Thirties the experimental art and writing I think had all gone out, which rather sort of bewildered me, I sort of...

*So you were a consumer of all of this?*

Well there was a general feeling, one was caught up in it, yes. But I think I...the fact that the experimental art and writing had disappeared, this sort of...proletarian art and culture I must say I don't quite know what was going on there! [laughs] I didn't...pursue this point. I mean it was like the trials, one didn't pursue that point, but that was even more difficult to deal with. The idea about science of course at that time is just being held back by the contradictions of capitalism, like the 'poverty in the midst of plenty'. And when we got socialism, then science would be...all its powers would be unleashed and it would bring untold benefits to humanity. Now that of course links up with Bernal. So, maybe I should say a few words about Bernal. Now first of all I want to emphasize that I found Bernal enormously stimulating, and a very positive force to my own sort of general education and development, and yet on - and I don't like to in a way say anything which is denigrating him, but I think one has to see that he was a man of considerable contradictions; a very positive side and also some very deplorable weak sides - that, first of all he gave me a - and many others of course, but especially appealed to me, I had always been very interested in the positive value of science in terms of social benefit, and he brought this across in a very powerful imaginative way; I would say with great rhetoric, I mean rhetoric in the positive sense of the word. I mean he had a charismatic quality about him then. But I think the weakness and contradiction probably arises from the fact that he, just as he'd been a Catholic earlier on, he was sort of switched on in one different position of faith, that his attitude towards science was a sort of faith, which really lead into scientific weaknesses. In spite of being very imaginative, and extremely intelligent, he had peculiar sort of blocks I think there, and couldn't...and got stuck in a rather sort of...dismal sort of scientific...rut.

*I thought you were going to criticize his womanizing; I didn't...*

Oh, I'm not interested...well, I would; it's a bit childish I might say.

*He was a bit all over the place.*

Well, yes, quite, well...I...

*Joe Needham, we were talking to him once, and he was looking for a word, and he said, "Yes, well, he was polyvalent [ph]" he said. [laughs] I like that word!*

Well, I...I think myself, why...you know it's the old Don Juan business about why do people have to be so...buzzing around like this, hopping...you know, one woman after another, and I feel in a way it probably did sort of illustrate the man's weaknesses, that he lacked certain maturity. And you know this 'Flesh and the Devil' book.

*Yes.*

I mean, it's real teenage stuff, isn't it? It's positively embarrassing.

*Oh well, yes.*

And...his scientific stuff, scientific stuff. You see, Haldane did some of this speculation much better, so I think Haldane in some ways was a much more mature person. And...you see, although Bernal had these very broad cultural interests in art and history and so on, he...he wrote that kind of trivial stuff, and he couldn't see the way in which science was, in a way bound to have the negative side; you have a lot of power being generated, unleashing all these forces. I mean, what sort of...it's the nature of things, that anything powerful is going to have positive and negative effects. And I think he certainly failed to see the complexities of what we might call the human dimensions of science. Although he does sort of touch on these things a bit; he doesn't pursue them enough. And I think people would say well, don't blame him for seeing the environmental crisis coming up. But I think in answer to that one would say, a lot of environment crisis was obvious even in the Thirties; people were talking about pollution and environmental damage then, and the crisis had begun. And...I mean, it was so easy of course to see that science had negative power when applied to war, but he should have managed with his extraordinary imagination, why couldn't he see the negative...for instance in terms of peace too, and not only the distortions of capitalism.

*You know it's 50 years since 'The Social Functions of Science' this year, isn't it?*

Yes, well one reason I'm talking like this, I had to sweep through a lot of this you see, to write the article for him...about him, on this; try to put him in a sort of perspective now. And I think one has to see that he was at that time an enormously powerful and progressive force. But one...with many people, their value increases with time, whereas a great deal of his stuff has just dissolved away, collapsed completely, because he was just on the wrong track. It's...it's very sad. But to go to a meeting and hear Bernal give a talk, by golly! Did you ever hear him?

*He was really too damaged...so I..*

Was he, yes, yes. No, but it was a little bit like...in a way probably it's not the right thing to say. People say that when they heard Mosley talk, he gave wonderful talks, and afterwards they couldn't remember what he said! [laughs] It was a bit like that with Bernal, but that's not being fair, it's not being fair, because I think there was a real intellectual content in what Bernal said. But the charisma aspect was a bit like that. But I think the whole...with Bernal it all went together; it was intellectual content, real sort of political wisdom I think, I don't really feel that he was weak on that, as some people have suggested. And the charisma, all went together, and it was a remarkable thing, and he was an amazingly stimulating person, amazingly so. But... Well, those are some things. Let me see, yes my politics going up to Cambridge. I got them from a school friend, Keith Gilbert, reading Wells and Shaw (I may have said that before). And the...I don't know whether Keith Gilbert was a member of the Party...it's quite...you know, I just didn't know, I mean he could have been, he could not have been; all kinds of people were, it really didn't make any difference. But he was going along with these general lines of thinking, the very strong popular front, anti-Fascist, progressive, and largely pro-Soviet movement. Very hopeful it was, and I think one must stress this. The fact that they made certain mistakes in relation to the Soviet Union doesn't mean that the whole thing didn't have an enormously positive feeling about it. Spain, of course the war in Spain was a rallying point, the whole thing. The fact that the government was democratically elected, it didn't get mixed up with the fact that there'd been a violent revolution there; the violence was coming

from the other side. The war in Spain epitomized the whole anti-Fascist theme. And the Communist Party was the main leadership in all this, they had the intellectual analysis, and led the clearest thinking and...in the whole thing. And in Cambridge there were many working class students in the Party, like George Barnard for example, with very fine minds, very good personalities, and Arthur Horner [ph] was another friend of mine - that's what the three-and-a-half pages was about. Lost sight of him, he disappeared somewhere in the Soviet Union finally. And part of this was the very extensive scientist movement, as I said, the ASW, and they had editorials in 'Nature' which Bernal was supposed to be writing, and it was...this whole movement permeated the scientific world; there were a few people like A.V. Hill and a few people standing out against it somewhat; although A.V. Hill of course went along with helping the refugees from Nazism. But it was very influential in the... You've just got to look at the back numbers of 'Nature' at that time, as I did recently. And then this...the refugees from Nazism from the universities were arriving in England, and one got the news from Germany. And you had academics generally, and all kinds of do-gooders and Quakers and liberals and all sorts of people, all wanting to help on that. And so in a university like Cambridge you got direct contact with the...you knew what was real facts of the situation in Nazi Germany. And as I said, there was a very extensive medical movement, poverty and malnutrition, McGonagel Boyd Orr and all kinds of people. It was very extensive, I've been reading up about that a bit. And the BMA didn't like it, that...being pushed by these people to show the extent to which people didn't have enough money to feed themselves properly. And I must say, I really feel...I hadn't realized how much my own father had done in this thing, and I have quite a feeling of pride about that. Because as his son one saw him beavering away all the time and talking about it, but it's only when you get outside it afterwards, and you go to somebody - I've mentioned this, that somebody at the London School of Hygiene and Tropical Medicine, who was doing a PhD thesis on this whole movement, when I went there she said, "Oh" she said, "you mean your father was E.H. Wilkins?" And I said, "Yes". She said, "Oh, really!" you see. He wrote all those letters; he did all of that. So I thought, oh golly, well he did write a lot. And they were well written things too. And... Yes, so it was a wide movement. And of course students, we went up to London to go on marches and...attend rallies in Hyde

Park and things. I remember shouting, 'Scholarships not battleships', walking along through the streets.

*That's a good line!*

But you know, it just comes into my mind this afternoon, while I was writing these notes down, another thing I'm pretty sure we said, 'Baldwin wants war'! Now that one seems to me much more questionable. And I'd forgotten it. I wonder whether one wanted to forget that. I'm pretty sure that...you see, this was the...the Communist Party, they somewhat I think overdid things really. But in some senses maybe Baldwin did want certain sort of...but on the other hand, I feel it's probably rather misrepresenting it. And, the greatest impression on walking through these streets was the way you see all the peculiar metal polished bits of brass lying in the tarmac of the road. Have you noticed that, walking down...

*Foot after foot after foot you mean, yes.*

Yes, yes. You never see it normally crossing the road, you get over. Try to look at it. [both laughing] New view on the world. Yes, the Daily Worker, editor, J.B.S. Haldane. That was a very interesting phenomenon that. And all those wonderful articles he wrote on popular science in the...

*On being the right size, yes.*

Yes. And so it was a very wide movement. But then we come to the...some of the weaknesses you see. The problem of the trials. Well I remember being put out by the trials in a great [inaud], it did stick in one's throat, and so one didn't know what to make of it all. So weird these confessions you know. And some people have said, oh well, you know, we didn't believe everything we read in the newspapers; there have been so much newspaper propaganda against the Soviet Union that you couldn't...that couldn't explain it all away. But, there is no doubt that people, they had a lot of evidence in front of them, and they said, 'We simply can't make out what's going on', and they put it on one side. And so that was a mistake, undoubtedly. But I certainly

remember being worried and puzzled by it. About dialectical materialism, my general feeling was that most of the communists in Cambridge didn't understand it, and now, having been in to Hegel more I think I do see some pretty good sense in some of this, which I don't think anybody actually brought out much at the time. There was a small proportion of communists I knew who were real addicts to it and just jabbered away as though this was going to solve all problems, but they were a minority. I...I think...it's a difficult subject and I think it probably wasn't understood properly.

*Did you read the Engels book?*

Which one?

*'The Dialectics of Nature'. Because Haldane had brought it out about that time with a special introduction.*

No, I think I probably didn't. I did read some of his stuff, which you...some of these things seemed all right up to a point, but it never...they never seemed to me to get terribly far. But I think one could sense that dialectical materialism was a sort of dynamic philosophy, and one could see in this way how it was contributing to the whole sort of movement. But I...I've got very mixed feelings about dialectical materialism, and I think on the whole it probably wasn't all that important in the movement of that time, is my kind of feeling. Now other doubtful things. I must say I used to be puzzled that the Soviet Union gave so little help to Spain, because we had the policy of non intervention which one was campaigning against all the time. That was one thing which used to worry me privately, or puzzled me. But I think now one begins to see that like the Soviet-Nazi pact, that if they in the Soviet Union were scared stiff of there being a ganging-up of Britain, France and Germany against them, they would have been very careful to not to be seen as trying to export communism from the Soviet Union. I've seen this argument put recently in an article, and it seems to me to make good sense. It would be very understandable, they would be most concerned, to keep a non-aggressive image in the West. And that may have been the reason, but it seemed to me pretty ghastly that here is the great powerful Soviet Union, and didn't send much to Spain at all. And, I don't remember other people

being much puzzled by this; maybe I didn't discuss it much, but it used to worry me a bit. And I think this is probably the reason. Another thing, about these Russian films. Interesting thing that, I was very impressed by, say, 'Potemkin' I remember that in particular. And it was only recently that, a few a years ago, I saw 'Potemkin' again, and I was really rather horrified by - well, I was very impressed by a great deal of it - horrified by the thing where you have these horrible officers in the ship, and the sailors then come to the officers and just chuck them over the side, as though they were just...well I was going to say just dogs, but of course you can't speak about dogs that way any more can you! (both laugh) And so...we're all God's creatures.

*Oh I don't know, I think they had their come-uppance those officers when they got tipped over, I didn't feel too sorry about them.*

Yes, but I think it rather shocked me, because I had had no such feelings when I was an undergraduate and saw 'Potemkin' first. That was what. Well, I mean I think it was understandable that they chucked them over like dogs. But, I think that there was a certain...I think, looking back at it now, there was a certain sort of violence and brutality in the...which undoubtedly existed in the Soviet Union.

*Yes, sure.*

And which I didn't recognise when I saw 'Potemkin'. I think it's a [inaud –both talking]. And one didn't want to see these things. And of course, everybody at that time, or at least so far as I know practically everybody failed to see that, in the Soviet Union you would get this immensely authoritarian, centralized government with Stalin, and of course all the mis-use in the bureaucracy.

**End of part 7**

## Part 8

### Digitised from Tape 4 [F1172] Side B

...the mis-use in the bureaucracy, one failed to see that. But I think one shouldn't blame people too much for failing to see the weaknesses of a planned economy and bureaucracy. Although you might say that people were a bit simple minded to think that all this planning was going to lead to good results. Well, that's the political business. Well I don't know whether...do you want me to run through the art and culture and personal life, and have done with that?

*No, let's talk about personal life.*

Personal life, all right. Personal life. Oh yes, going up to Cambridge at first, and I said, the great big buildings like citadels. I remember my coming out of exams and my eyes were all gone myopicky, because one had been looking so close at things for hours. And certainly the first term it was a strain for me having left home, I got some rather weird sort of nose and sinus infection, which troubled me. I didn't know what to do with all the marmalade and bread and milk they delivered in my college room, and I remember one day thinking that, obvious thing, is I will make bread and milk, which is nice to eat, and then I'll put marmalade on top of it.

*Sounds sensible.*

So I did all this, and it was absolutely ghastly, it gave me a shock. I knew nothing about looking after myself and cooking. I think, tell every undergraduate student now they should learn two things, learn to cook and learn to type. Because this gives you some capacity to look after yourself. Anyway I had to move into lodgings because it was cheaper; college rooms were too expensive. But I remember when I came back after my first term I was home at Christmas, standing in front of the fire, coal fire there, feeling, 'now I am grown up' you see; I've come...been in the big world outside, here I am back at home. So I got some sort of confidence then. And that summer I went with Maurice Cunningham, who was a philosophy student, I think son of a Cambridge mathematician don there. We went round Ireland on a so-called walking

trip. And then I moved to Corn Exchange Street, much closer to the Cavendish, and I remember there, I forget which year it was, maybe it was the second or third year, they had indicators behind the door inside, with all the names of the people; there were about five names in that building. And you indicated whether you were in or out. And I would sometimes come home and I'd find everyone else was out and I was the only one coming in, and it would make me feel miserable [both laughing] And so although I had quite a few friends, some of them very good friends in Cambridge, I tended to be rather lonely. And the other thing was that, right from the beginning I noticed there were many people, students, in Cambridge who seemed much cleverer than I was, and that gave me a bit of shock! Because when you're at school often, it's not so difficult to be the cleverest boy in the school. I won't say I was, but I was...near the top anyway. Did you have any experience like that?

*Oh yes. I mean certainly going to Cambridge was a remarkable experience from that point of view.*

But did it make you sort of come down a peg in your own estimation to some extent?

*Oh yes. Oh yes, I mean it was the first time, as I think I said to you sort of when we were talking about this last time, because I'd come from this rather closed-in North London Jewish culture, and went up to King's, and I was surrounded with people who were sort of clever and assured, and had a hell of a lot of money, and knew their way around the world in a way that I certainly didn't. It was a whole combination of things which I think was a bit striking.*

Yes. I think it's an interesting thing that, I don't think some of those things worried me so much; I think knowing my way around the world has worried me in other contexts, but I don't think it worried me at that particular time. Because one was rather protected. I think it was just that some of these other people seemed so damn clever.

*Oh that was certainly true.*

That was the worst thing from my point of view. I think maybe one had so much freedom in Cambridge at that time to fall into your own little group of left-wing students, that what the rest of the world did, and the rich people, they were often ignored completely; the money...

*Your group seems to have been a sort of a bright and clever and politically active group.*

Yes. Politically active; a lot of them working class people. And George Barnard, you know, his sister is principal at...what was it, Bedford and something. I mean they were...

*Oh, Dorothy Wedderburn?*

Yes.

*Oh really? I didn't realize that.*

And their father was a carpenter from Walthamstow.

*Is that Dorothy's background?*

Yes.

*Well I never knew that.*

Yes. Damned good people. I mean George is an excellent chap. And the...and this Arthur Horner [ph] chap, I don't know what his father did, I think he dug up the roads or something. And...you know, we all sort of...we had our own life. And this was very good in a way. These awful people with their Bentley cars and their...and special way of dressing, and the balls and all the other social things, we could ignore it completely.

*All the names you've mentioned are men; are there no women in your life at that time?*

Ah, now we're coming to it! Yes, well, you're right, there were no women! [laughs]  
One of the things was, it was ten-to-one ratio of students.

*Sure.*

Whereas it's more like three or four to one in Oxford. Now...yes, I went to...so I went on a grand tour of...by car of Europe in the summer of 1937, yes. Yes, it was when I did Physics Part II I started having this breakdown which took the form that, I found I couldn't work any more, I just couldn't make the effort to read or think. And this was rather sort of dreadful because one knew one had to get on and work. And my supervisor complained that I was writing popular science for left-wing youth newspapers youth newspapers, and things like that, and asking him if he'd write something about cosmic rays, whereas I ought to be damned well getting on with my work. Of course he was quite right, I was in the third year. And so, my word, he sent me to see a psychologist in the Psychology Department called Bannister. So we talked about this, and I think he was probably right, that the cause of it was general anxieties. My father had to...was short of money; my sister was using up a lot of money in Oxford, she had to be flown to Hamburg in the last...before her German degree exam. And she was severely disabled, and she had a lot of sort of high life and sherry parties in Oxford, and tended to use money; and needed money because of her disablement, one felt she was rather sort of neurotic generally. Whereas I was the good, sensible, dependable son and didn't do silly things like that, didn't need money. But of course I did need money to keep me going there. I hadn't got all that much in the way of scholarships: I'd got some, and got one from the Fishmongers Company, after a lot of attempts. And he had to go out and work in winter, drive a long distance to some locum - why he had to drive so far I don't know, to earn more money. I think maybe Bannister was right, this played on my mind, and made me feel too anxious about the whole thing. But, fairly soon I was back working, but every now and again it would come on again, and I couldn't work. And I'd think, 'Oh my God, better go and see Bannister and have another chat with him again'. [laughs] So it was no very

great...mental breakdown is the term people use. But it did...it was unpleasant. But I think the main thing about my life there, which doubtless contributed to this as well was, that all this life was, as you might say, in the head. Politics was in the head, the...oh, I'm talking about the art and culture, yes, that was in the head. I had got some friends, but I was a bit lonely, and the...yes, I put a note down. Did I ever get drunk in Cambridge? Well the answer was no. There was no dancing, there was no singing, there was no loving, there was no swimming. All these bodily things you see, nothing, it was all in the bloody head. All this sort of improving the world, and science...

*Gosh. How did you ever stop yourself getting drunk? I remember getting incredibly drunk...*

I don't think I had any opportunities! The people I was with didn't drink much. Some of the parties I was at, yes, people got drunk, they looked rather stupid, but most of the people I think they didn't bother to drink very much. I remember some story about some communist who had been to Moscow, and what a good time he had there, wonderful parties, and full of fun and jokes, and there were people roaring, rolling about on the floor laughing, and they were all just drinking milk. That was the sort of story, you know: good people having a good time, they didn't need to drink alcohol. There was alcohol. No, I don't think I had much opportunity. Oh, there was one...yes, one girl that I fell in love with, and so I invited her to tea in my room and said, "Oh, I've fallen in love with you" or something. And, I didn't know what to do about it. She didn't, so it was the end of the matter! [laughs] It's pitiful. My one contact with...yes, one day I was running out of my Corn Exchange Street rooms, round the corner to the Cavendish, late for a lecture, and as I came round the corner I went smash into some shop girl or something going the other direction. I don't think she was university, you know, you could tell the difference. Town not Gown. And so I said something, "Oh, I'm awfully sorry" or something, dashed on to my lecture. And I had all this vivid impression of the scent and the clothing and the soft body and all that, and that was my only contact... [laughs] ...of that picture, in three years. So you might say no wonder I couldn't keep working all the time. And it was a very one-sided existence. But that links up you see with the art and culture, that some of my

friends, and I get through this fairly quickly, at school my great friend Bob Cooper, who was a great iconoclast, and I always liked getting, you know, a way to solve all the problems of the universe, and Bob was always coming along with very sophisticated arguments, very knowledgeable about the weaknesses in this. But we were good friends, we spent a lot of time going and looking at the Pre-Raphaelites in the museum. He got killed on his motorbike. Well, Joyce and kinds of literature I got partly in the home environment with my sister. I'd been very interested in Wordsworth and Coleridge at O-level, but I never read any poetry afterwards, but I mean certainly it had made a big impression on me then, so there's something to be said for doing English O-level. And music I got from my father on the gramophone, lots and lots of chamber music; and at Cambridge I had an old gramophone from home. And as well as classical music, I had records, Duke Ellington and various things. Films were the big thing, at the Cosmo. The Marx Brothers, first time I saw them I couldn't make anything of it as anything new, but then you get familiar with it and of course it was enormously enthusiastic, that. The Russian films; 'Citizen Kane', the first time I saw it at some other cinema it made a big impression. But then I used to go to the Arts Society, and there was a character called Pargiter [ph], who was secretary of the Arts Society. And we used to have very interesting times going round the botanical gardens and the Fitzwilliam Museum. And the interesting thing - he knew about all these things - the interesting thing was, he said Cambridge was so much in the university life, that it paid no attention...no university people were ever in the botanical gardens. Did you ever see...did you ever go there?

*No.*

Didn't know it existed. Exactly you see. Most people they didn't know it existed. Very interesting place. And lovely plants. And also the Fitzwilliam Museum. Nobody there. And so, it was very good going round. So, it was a broader approach. At the Arts Society I remember Herbert Read coming up from London and telling us about surrealism as a way of life, and so I...one of my typical silly questions, I said, "Ah Mr. Read, you have travelled on the train up here to Cambridge, can you explain to us how you did this in a surrealist way?" [laughs] Well, made a silly point has

made a silly question! I don't know what he said, but...it wasn't entirely a silly question.

*Not an entirely silly question, no. I would like to know the answer to it.*

Exactly. I mean I think the surrealists did have some rather silly sides to them. Used to go walks on the Gogs with Pargiter; I used to go on walks on the Gogs with lots of people [inaud]. Did a bit of painting on my own. Maurice Cunningham in the first year, he was very sophisticated about painting and knew Patrick Heron and other people, so we shared some of that. Yes, I think the...some of the walks were good, with Maurice Cunningham and his girlfriend going up the river, all the way up to Ely Cathedral, that was a magnificent walk.

*Yes, a great walk.*

And, well Gog...they are Gog Magog Hills aren't they, they were good to walk on. And... But in a way this was a special kind of physical experience where you were again somewhat intellectualized. And I could go into this more with the families I knew in Birmingham earlier, the Manson [ph] family for example, they were great ones for going for walks you see. And you have a walking stick, and you put your head back like that, and you walk, walk walk! you see. We are the educated middle class! We are going for a walk, full stop! You see. And so all the light in the sky and the clouds and everything was...you were again somewhat cut off from ordinary humanity in this walking phenomenon. Whereas I suppose if I'd got into the dance halls and gone on the dance floor and so on, it would have been a bit different. But one of my troubles in life was that all my girlfriends were nearly prize winners in ballroom dancing or something like that, and I wasn't any good at it! [laughs] One of life's difficulties! But sadly, at Cambridge, it was a very acute problem. Well I think I've got through the lot of that personal life on culture, politics and so on.

*I was amazed at that last bit!*

Which last bit?

*You moved through that very sharply! [laughs]*

Well, it isn't worth...not much to say, is there?

*Oh yes it is; this is a tape about you, it's not a tape about life in university [inaud – both talking].*

Oh yes, yes, it's me, yes. But, it's...that's the way it was.

*Well it was good timing, because we're practically coming to the end of this tape anyhow.*

But I think I want to, in the autobiography, I want to go into this much more, the whole business about the people who want to change the world with their ideas, and what a human being really is. And these are sort of rather subtle and elusive questions. But I think the thing is, I mean why did some of this Soviet Union thing go wrong; why did post-War planning and all these architects who made these great mistakes and everything; why did all this go wrong, you see. And it's...

*Oh there are people who would say that was Bernal's fault.*

Well I think Bernal is a...actually this probably puts it in a way, that, here was I, sort of caught up with all these intellectual notions, Le Corbusier, and a house is a machine to live in, and so on, and the only contact I had was bumping into a girl going round the corner! Now, you might say, Bernal was caught up in all this intellectual stuff about planning, and yet what was he doing? Hopping from one bloody bed into another! You might really say, well, it was the same thing, that he was not capable of working out proper relationships with a woman. And suddenly I could connect these two things. You think that's sensible, or does it sound nonsense?

*I don't know. It's very interesting actually. I have this...Hilary has this feeling that Bernal divided his life into...his women into two: there were his scientific colleagues,*

*like Dorothy and so on, with whom he had a non sexual relationship, and then there was anyone, any of his political comrades with whom he had sort of...he was sort of committed to bedding as rapidly as he possibly could, so far as I could see.*

Why did he feel this compulsion?

*I don't know. I mean I don't know. But there are all those things in his archive which are sealed and not to be opened till the year 2042 or something like that.*

Oh that's just another aspect of the childishness.

*And all these papers have been excessively weeded by the scrupulous, what's she called, Brenda Swann, who was sort of the archivist who clearly was one of his lovers at an earlier stage.*

Well I don't know, you see so many people I've known have been rather in awe of him for this, and...I always somehow felt, however naïve I was, that there was something which wasn't quite right there. And...you see, what was his name, the...Crowther. Crowther once spoke to me about Bernal being vain, and saying that he never had really good quality scientists in his lab, which is partly true, up there at Birkbeck, yes. That he liked to be the brightest of the lot. And you see the Dorothy Hodgkins and the brighter people didn't stay with him all that long.

*Oh that's interesting.*

And...I mean there may have been something in that. Well he certainly did have...certain indications of vanity weren't there?

*Oh yes. Anyone who preserves all their birthday cards from the age of six and every single sort of item of sort of childhood paraphernalia like that, and then depositing them in their archive I think has a certain degree of vanity about them.*

Weird fellow.

*It's amazing. I only looked at it, because we had to do a chapter for the 'Festschrift' which Francis Aprahamian was going to edit, or the 'Necroschrift' rather, which then Francis has never succeeded in publishing, so that's when we looked at the archive. About ten years ago now.*

I see.

*Francis has sat on it ever since! Anyhow, anyhow, we have to have another session on this when you come back after...it's Corsica or Sardinia or somewhere you're going off to.*

Corsica, yes. Yes, well I think the...I don't know the Manhattan Project would take very long; I don't know. But, the...

*Well we'll see. We've got Manhattan, we've got the double helix, we've got sort of...we've got the whole of the Sixties and the Seventies to go.*

BSSRS.

*BSSRS.*

I see they've got another 'Science for People' out by the skin of their teeth.

*I haven't even been sent a copy of it, so I haven't...*

Oh I've only just got it in today, so...

*Oh, maybe mine's coming.*

Maybe yours...they put my article about faction...television faction right there at the front. But they were hoping to do one you see on science communication generally, and that was supposed to be a contribution in that. But they...

I may have let my subscription run out, which is embarrassing, but sort of possible.  
Anyhow, shall I turn this tape off now do you think?

*Oh, you've been recording that?*

This will be the end of this tape, and when we start again after the summer  
presumably - when do you come back by the way?

*End of August.*

OK. When we start again in September, we'll have a new tape, so this is the end of  
Tape Two.

**End of Part 8 [end of Reel Two, Side Two / F1172 Side B]**

## Part 9

### Digitised from tape 5 [F1173] Side A [original on Reel 3 Side 1]

*Just to say that this is now being recorded on the 16th of November 1990. It's the third tape, and it's Maurice Wilkins who's going to be talking, and this is Steven Rose putting the ident on.*

*OK, so we're going to start at the time of your involvement with the Manhattan Project.*

Have we done the radar bit?

*Yes.*

Quite sure? We've done that?

*Yes.*

Yes, OK, well, I mean the Manhattan thing started when I heard that Oliphant was closing down the radar, magnetron and so forth work, because the problem had been cracked, and was building up a group on the experimental study for fission bomb. And so as soon as I heard that, my thinking was, he was going to be doing more research and I wanted to do big war research, so I went straight down and asked him if he had any openings. And he said he hadn't, but that he would bear it in mind, he might have something. And very soon afterwards in fact he did, and so I moved over into that area. And it was trying to study means of evaporating uranium metal itself, so you didn't have to have the fluoride around. And I didn't get anywhere with this at all, largely because the vacuum procedures were very unsuitable, the types of pumps they had in Britain weren't suitable, that type of problem. And he said, the excuses I'd make for being an utter failure on it. And, I hadn't been there very long before they had...the decision was that the whole group would move over to Berkeley, California. And so this was a very interesting opportunity to get away from the blackout in Britain, and the various constraints of the wartime in existence. Yes, and some

bombing of course. And so we finally arrived up in Berkeley, and met Klaus Fuchs and Peierls in New York on the way, because I knew them both in Birmingham, and so it was interesting to see them. But they went off...I think they went to Los Alamos I think it was. And the group that was in Berkeley was under Lawrence, and Oliphant. And our problem was to try to improve the mass spectrograph method of separating the 235 isotope. But the problem to a large extent had already been solved, because they had a big factory over at what was called 'Dog Patch'; I think it was Oak Ridge, I'm not sure. I never went there fortunately, it was rather an unpleasant place. And so we were concerned with refining the production methods of mass spectrograph procedures. And I was evaporating...how much do you want me to go into detail on this stuff? Should I briefly say what I was doing?

*Yes.*

OK. Evaporating the metal, couldn't get anywhere, because all the crucial materials would interact, say, an oxide would be reduced, and so that you've got uranium oxide coming out, not uranium. The idea was to get uranium, pure uranium vapour. And so after there being no success for a while, Lawrence came in one day and suggested that I should try and do it by sputtering. And so I set something up, and I couldn't get it working very much, and I remember him coming in one day and asking how it was going, and he took over the controls, and you saw the great big figure of a man, who was so used to working on these enormous machines, sort of like a racing car driver, he took hold of these things, he turned the volts up, and he turned them up, and all sorts of sparks and bangs and things. And he started again. And finally, he got a really big current going through, and there was a lot of uranium being evaporated. So it was a very exciting experience to see how he could handle equipment. And so it was then taken down the hill on one of the equipment...the old...I think 32 inch cyclotron down the hill, and we worked shifts on that, generating the uranium by this sputtering, and separating the things in the magnetic field. I think one of the things which stood out most about it was the very pleasant feeling of working in a team of about half a dozen people; there were some very nice people there. And you'd take over from the previous shift, because there would be three shifts a day, and you'd

exchange notes, and you'd go on from where they left off. And it's always stuck in my mind, the pleasant thing of working in a small group together.

*This was what, '42, '43?*

Yes, I forget which year, yes. One or the other. And...yes well that thing didn't...that was all I did, so that if people were to say that I disgraced myself by helping to make the atom bomb I could say I did no such thing. But I can't deny that I was trying to be some help.

*Did you know what the project was about?*

Oh yes, we knew the general nature of the project, yes. The men working in the machine shops and so on there, they didn't, and after the truth came out at the end, I remember some chaps in the workshop saying that they'd got the feeling they were working on some new sort of submarine or something...[laughs] I mean it...

*So what was your feeling when the bombs were actually dropped finally?*

Well this is a good question. I think I've got to be honest about it and say that I don't know that I was all that much horrified at first; well rather it was mixed feelings, because I certainly had some of the feelings of the other scientists that, here we were, been working away on this, it was a great challenge, and the thing had worked. So you did get some feeling of personal triumph, or triumph for the community of scientists and physicists and so forth. That was in the morning, and I remember going down to see Ken Simpson, who had been a philosophy teacher in some university, and he had been working on vacuum pumps there; a very good chap. Of course the vacuum pumps were about, what, ten times or possibly more, twenty or fifty times bigger diameters there than what I had been using in Birmingham; that's one reason one couldn't make progress on it using the traditional type of British pump, because of the high degree of out-gassing, the main problem. And I remember seeing him and his wife sitting in their house, and he said oh, he said, "It's black Monday". And so, I began thinking about it a bit more then, and I...

*This was after Hiroshima, or...?*

Yes, it must have been, because I think we didn't know about the testing in the desert I think, that was kept separate; because the different parts of the project were kept separate like that. I mean top people like Oliphant would be going down to Los Alamos, but the smaller fry like myself and the majority of the scientists would be...I mean for security reasons would get compartmentalized like that. And so, I think I cottoned on to the idea it really was black Monday very much. But I think it...I certainly wasn't going round throwing my hat in the air like some other people at Los Alamos. Although I could see it was easier for them to slip into that mode, because they had been personally involved in actually making the bomb, whereas we we really on the side. But, I think what it does show I would say, well my overall comment on the whole business of course is that scientists ought to take much more...pay much more attention to considering the long-term implications of the work they're doing, and not to jump to conclusions about their ability to have any say in matters like that. And that was the main criticisms I make of the scientists on the project: they hadn't thought the whole thing through, they were just...I mean sort of, the immediate reaction to the whole thing about the war with Hitler and... Which of course had got some sense to it; one can't say it was stupid. But I mean, the real thing is, what are the long-term consequences of the whole thing. And the many sort of risky and...years of nuclear deterrents which we...well, we're still living in that to some extent now, even if the cold war is to a large extent over. And I think the...I feel one has to be honest, that I didn't immediately, when the thing went off, think 'Oh goodey!' It wasn't as simple as that. But I began to...I think I immediately sympathized with Ken Simpson's point of view. His thing, he was saying, 'Well I hope the damn thing will never work'. I think there's a lot of sense in that, clearly. But I think this whole problem of the close involvement of professional people, scientists or others, in their particular projects which are very exciting, it is a very severe problem, and one sees it of course in the weapons scientists of post-war in the Lawrence Livermore Laboratory. People have read about this, and some people have been very frank about it haven't they? The high that they get.

*But you didn't stay there, you presumably came straight back.*

No no no. I...well, it was about a month or so after that. Pretty sort of nauseating celebrations of Americans, navy people going mad in San Francisco and all that, I found it wasn't...a bit different from the British style. And I think there was...there were people killed there, drinking and general rampaging, I don't know. I didn't go out in San Francisco thank goodness at night. Although maybe that bigger nightmare being the VE night, I forget, I think the defeat of Germany wasn't the thing that made the bigger impact, I think it was the defeat of the Japanese that was the big impact. Yes, so I certainly felt I had to...certainly didn't want to stay in the bomb business. And so I was thinking about what I might do, and then Harry Massey, a very helpful and good man on the project, it was he who handed me Schroedinger's little book, 'What is Life', and said, "Well I know you're wondering what you're going to be doing; you might be interested to read this". And that was what set me off on the biological thing.

*Ah, so you were a Schroedinger enthusiast. Aha!*

Yes, well I think it was a very persuasive book, because he was writing in his structure of the gene you see; the the aperiodic crystal was...it was like a...it was solid state physics you see, which had been my area, solid state defects and crystalline structures. So it was similar type of thinking. The fact that he wasn't thinking in terms of macro-molecule is trivial really, he was considering...but he was working in terms of an arrangement of atoms, coding a genetic message. And he summarized the elementary biology about cell division and so on I think in a very suitable way for a physicist like myself who had no background in the area. I didn't understand any of the stuff in the later chapters about time and other things, too high brow and didn't interest me anyway. And so...yes, the funny thing was actually, that Randall had got the chair of Physics at St. Andrews University, and wrote to me offering me a lectureship. And so I wrote back and said oh no, no thank you very much. But then he wrote to me again after I had read the Schroedinger book, and he was going into biophysics. And so then I said yes. Because it fitted in with my plans; I had to stay somewhere. But there wasn't anything that I could see that was going on in Berkeley

then, although if I'd been more in the picture I suppose I could have found out about Stanley's work on viruses.

*Or Kelvin. Well, perhaps not...*

Well Kelvin wasn't quite up my...wasn't sufficiently my tupe of physics, no. But the Stanley thing could have been, and... Anyway, I didn't get on to that. And so I went back to St. Andrews, and it was a great shock, great cultural shock, coming from a very exciting sort of cultural centre, pre-hippie days in San Francisco, to stuffy little St. Andrews, exhausted, with the whole British people exhausted by the boredom and hard work of the war years.

*So this was what, '46 we're talking about now.*

Yes, yes. And...I'm trying to think whether there's anything else on the Manhattan Project. Nobody ever approached me about anything of a secret nature I'm glad to say. So I've no experience of dealing with spies.

*What were your politics at that time, because I mean, clearly they were of the left, because they had been before, hadn't they?*

Oh yes, well you see at Cambridge you see, the Communist Party was the intellectual leadership and the political leadership of the whole popular front movement.

*Sure.*

And so I had a whole lot of friends. And I had been in the party myself. I remember some little sort of red piece of thing with...like an old-fashioned driving licence I think. And in fact it would be a rather odd person who...well, you'd find a few sort of people, slightly odd-balls, who weren't in the party... [laughs] ...but it was the sort of natural thing. I mean you had the war in Spain, and there the Communists...so far as the British were concerned, the Communist Party was a leading element.

*So when did you leave?*

Oh, well I think I...it was after the...Gollancz brought out a book about the...yes, it was the pact with the...the Nazi-Russian pact.

*Oh, so it was already before...1940 that was, wasn't it, or 1939.*

It was...yes, it was...no, just a minute, that was...no, that was the beginning of the war, that was before I went to California. Yes, that's right. Now, I just read Gollancz's pamphlet, and I thought, God Almighty! you know, I can't go along with all this stuff. I'm not saying that Soviet leaders did the wrong thing there, but I mean it put the Communist parties in the Western countries in a real fix.

*But you never got tempted to rejoin when sort of so many people in the party, and after the war were...*

No, no. But I mean I kept up...you see Eric Burhop was open...always open about his party membership. And I met him in Berkeley you see, because Dick Makinson [ph], another Australian in Cambridge who was a friend of mine, he had told Eric Burhop that I was there, and so Eric looked me out in Berkeley and said "Hello, I'm a friend of Dick Makinson's [ph]". And so we became friends there. And I met Dave Bohm at the same time. And on one occasion Eric Burhop and David Bohm and myself went and stayed in a Californian friend's log cabin up in the sierras. Interesting...three people.

*Interesting trio, yes!*

Yes, quite! [laughs] Yes, I had one very fine day, when Eric wasn't very well, or something, and Dave and I went off to climb Mount Pyramid; we had a terrific day getting up the side of that mountain, and were a bit lucky we got down the other side before it got dark. It was a bit foolish really, but anyway we did make it. That was...an immense experience. And of course I've known Dave Bohm since that time, although for a while I was out of touch when he first came back from Brazil to this

country. So...yes, I saw somebody writing today, he was a New Internationalist, describing someone who said that they were socialistic, not socialist! And so I think possibly if you would say what was my current position, I have often felt, well, you've got to sort of state your position in some sort of terms and say, 'Yes, I'm a socialist'. But at the moment, you know, with all the sort of, 'what do these terms mean?' I might well say that...more that I was socialistic.

*Ah yes, but at that time, in the Thirties and the Forties and the Fifties, one knew much more clearly I think what the terms meant.*

Certainly in the Thirties, but I don't know about the Fifties. It was...because...well '50...when did the...Stalin died in March '53. I can always remember that, because that was the date of the Watson-Crick thing on the double helix coming out.

*Oh, the same day?*

Well not the same day, the same month.

*The same month?*

The same month.

*I didn't know that.*

And also I think it was Queen Elizabeth the II's Jubilee or something you see, down on the Embankment down there. They got a tree growing. And it's rather interesting walking past this big catalpa tree that grows very rapidly in the middle of London, and thinking golly, you see, in '53 the DNA thing started up very much at that time, for many ways, not just because of the X-ray structure and that, but other things as well. And, the way it sort of all spread into such an enormous thing now, permeating the whole of biology.

*But when you came back you were at St. Andrews, and you were sort of not in the party at that stage?*

Oh no, I...no, after the Gollancz thing, the... But, you know, one was working... I remember there was a thing called the Society of Visiting Scientists in London, wasn't there, have you heard about that thing?

*Oh I don't know that one.*

Yes, people used to make jokes and say, 'Why would anyone want to visit scientists?' I mean, it was for people coming from abroad of course. And quite a lot of things went on. So I only spent a year in St. Andrews; I mean I couldn't stand the isolation there, because my marriage, my rather sort of hurried marriage in Berkeley had blown up.

*You haven't said anything about that yet, so if you want to say something.*

Well, nothing special. It was...I mean...

*You got married while you were actually in Berkeley?*

Yes.

*Your wife was American?*

Yes, and she was in the civil rights movement, very energetic. And so, this was very...useful for...one could get in on the American political scene. But that didn't work out at all. And so, I was in St. Andrews and determined to get out as quickly as I could, and fortunately...but I couldn't fix up anything interesting elsewhere. And then one day Randall came to me and said he'd been invited to take the chair here at King's College and...well I don't think I necessarily waited for him to ask me whether I'd come with him... [laughs] ...I said, "Well, OK, I'm on too; get me to London", which seemed the best place in Britain of all. The only other thing I'd been to, one

possibility, I went to see A.V. Hill, I might mention this, you see, that A.V. Hill, when I was a schoolboy I remember in the science library there was that book called, 'Living Machines', or 'Living Machinery' I think it was. And I found this utterly boring, didn't attract me at all that type of biophysics. And anyway, there was no possibility of my going to work with A.V. Hill, for various reasons. And...well, I think one reason was that he knew that I was working with Randall, and so he was a gentleman, he couldn't steal me.

*Wouldn't approach, yes.*

One point. But I think the whole approach to my linking the physical and the biological sciences was so utterly different the way his mind worked, from the entrée into the whole business via the Schrödinger thing, thinking about the structure of the gene in physical terms. It was infinitely more greater intellectual interest. Mind you, if I think I had known at the time how the whole thing would degenerate into a rather sort of limited...well it has gone a bit sort of A.V. Hill type, with all these Richard Dawkins and other people, hasn't it?

*Yes it has.*

You see, so that it...I think in many ways it has not been the immense sort of intellectual synthesis in a way which one had a sort of vague feeling one was looking forward to. Nor the type of intellectual achievement of the union of the disciplines that somebody like me [inaud] might think in terms of. It hasn't been like that; it's been sort of rather a dreary sort of...you know, these dreadful structural molecular biologists, you know what I mean.

*[laughs] You must be one of the few people who is a molecular biologist who would say that molecular biology has been dreary!*

Well, there must be others too I think. And the...

*That's because there weren't new laws of life, or laws of physics emerging.*

Well that's part of it. Well, I don't mind so much about not being new laws, because when I went into solid state physics I didn't expect any new laws. I remember a technician once saying something to me about, he said, "Do you think you're going to find any new laws of physics?" And I said well no, quite frankly I don't think we are. But we may have quite an interesting time nonetheless! [laughs] All these interesting properties, which one couldn't foresee. I mean that was before transistors, and all those things. And I mean, the whole area was...very elementary and didn't have much prestige within the whole area of physics at all. But it seemed interesting to me, and I had a good time in it. But anyway, that was the...I wanted to say that about the way molecular biology's gone. And the scientific interest was that when I was a schoolboy, there was an amateur astronomer, and then I had to get down into physics anyway, because they didn't do non-mathematical astronomy at Cambridge. But anyway, I was quite glad to get into physics, and lost the interest in biology, as though one was coming down to earth from the sky so to speak. And of course coming into biology was getting more directly involved in what you might call human problems. And I suppose getting into the more sort of social aspects of sciences is a further stage there. Yes, after the War, the American scientists of course who had been working on the bomb started setting up organisations and doing a lot of public education about the dangers of the bomb, and so the British were...did a certain amount in that direction too. And I remember giving some lectures to members of the public. But I found that on the whole that these things, you got very poor attendance. You'd spend hours travelling out in the winter to some little village hall, and you'd get a small number of people in the audience. And I'm afraid I couldn't take it, and I gave this up, whereas Eric Burhop you see...

*Oh pulled in hundreds, yes.*

Yes, parents being Salvation Army people.

*Oh, is that what it was?*

Yes, that's what it was you see, it just came out in a different form. And so, he had the energy and determination. As you say, he did hundreds. God, he really was a worker! But...no, I just caved in on that one pretty soon. But I think that in any case, I...well anyway, I felt that I...I got interested in the biology and the physics, and got my nose down on the bench, and didn't get it up very much for quite a long time, because I got interested in doing science. And it was an extremely exciting time then, at the beginning of this type of structural molecular biology.

*Who suggested the DNA project? Was that Randall, or was that your suggestion, or how did that work out?*

Well, the...yes well lines get crossed on these things you see. Randall...it is a historical fact that Randall had been written to by a biologist in the Forties, suggesting that he ought to, as he was known as an X-ray structure man at the GEC labs, he ought to work on the X-ray refraction and study the structure of sperm heads. And this chap Barber knew the right ones, which birefringence studies had been done on. But Randall was in no position to do this at St. Andrews, but he did...there was an SEB meeting, a big meeting on nucleic acids about that time. I think Randall went to it, but I think I...I certainly didn't go; I may not even have known about it. And Randall went to New York on a visit and saw Mirsky and people like that. So in a way he probably saw the wrong people there who would have put him off Avery, who was also a...most people were completely dismissive of Avery's work. But I started with the ultrasonic effects, to see what mutations you might get. That was my first project I thought up.

**End of Part 9**

## Part 10

### Digitised from tape 5 [F1173] Side B

...the first project I thought up, which in some ways was rather a silly thing but you've got to begin somehow. But anyway, it was a question of gene structure, physical changes in gene structure, sort of like with the X-rays, Muller [ph] had done it with X-rays. But then Randall asked me to get on to, when we moved down here, on to the ultraviolet microscope work, which was...he'd started that up, which was nucleic acid work, sort of Casperson stuff. And so, then I got on to reflecting microscopes and so on, which were related to my amateur astronomy, working on reflecting telescopes. And so all that was good fun. And people weren't very clear about the role of the nucleic acids, something to do with microbes, and there was this idea about...of course they were in chromosomes and everything, but it wasn't very clear. But we had the immense advantage here that Geoffrey Brown, who was a physics research student knew a biochemist upstairs, forget his name, who had worked in the Rockefeller Institute and he knew about the Avery work, and he knew about Kunitz and the enzyme work, and he knew that Avery's work stood up because it was based on the use of these purifying enzymes. So why Mirsky confused the issue so, or...well, maybe it was animosity and things like that, I don't know. But, so that we knew in this lab, though this connection, not by reading textbooks, which would have sort of dismissed [inaud – both talking] material. And so, through Geoffrey Brown I was on the right track so far as DNA was concerned. But the DNA work...yes I was working with the...on various things; virus structures. Yes, I got off cell division with the microscopes, partly because Jerry Oster [ph], who had worked with...sorry, the virus man in Berkeley, that he said as a physicist one ought to be working at the molecular level. And I said no, I find it much more interesting working, seeing all these lovely little cells that Honor Fell makes, it's much more exciting. But I began to see his point, that it was all very well having fun like that, but I mean, where was one really getting from a scientific point of view in studying the movements of nucleic acids around cells during cell division. And so we started doing some molecular orientation work, birefringence, and linked up with the infra-red people, and ultra-violet dichros and so on. And it was at that time, having got some DNA from Sigma, that...found that the stuff pulled these fibres and so on. And so then I took it to

Gosling, a research student who was working under Randall trying to do some X-ray diffraction on sperm heads. So Randall had finally got around to doing something which Bob had suggested. The only thing was, goodness knows why, it was a totally unsuitable type of sperm head. Why he didn't do it with the right ones Bob had suggested I don't know. But anyway, that work then took off wizz, like that you see, straight away. Because the fibres diffracted properly, and Gosling was very glad to do something where he was getting somewhere. Randall was spending all his time doing electron microscopy of sperm heads; it was really getting him nowhere from any interesting scientific point of view. But he always tended to say, ah well, this was always his plan to get on the structure of DNA, and I'd cut in on him! [laughs] I can see his point; I mean historically there was a line there. But, you know, he'd done...he'd been here for over a year, and he'd gone on in other directions, but he had of course got a research student with some X-ray equipment, and so he was...

*He was Gosling?*

Yes. Credit due there. So we got cracking at that time, and things started moving. But we had no suitable equipment; we had to use any bits and pieces we could find in the Chemistry Department. And we also were rather at a loss to know what to do with the patterns. I had no previous experience in these things. And when we went to see experts like Bunn on fibre diffraction, they were practically no damn use either! And...you know, he worked on nylon and all these things, it wasn't very relevant to our problems. And so, it seemed to me, or us, that what one badly needed was to...you'd probably have to get stuck into this problem for some time, and what you wanted was someone with some real, you know, professional in the area. And then you see the Rosalind Franklin thing came up, because she...Randall wanted to put her on to diffraction, proteins in solutions or something, which I thought was rather silly. Now I always think that I went to Randall and said look, you know, it's silly doing that, putting things in polite terms, you don't know what you're doing with this low-angle diffraction from proteins. Never really done anything very useful. So my judgement was right. I mean we got these wonderful DNA patterns, and we must bash ahead with this, and really sort of do more on it, and exploit it. But at least Randall and I are agreed that we both agreed to get her, that she should do that!

[laughs] But that gets one...I mean what were the main reasons, there was a division there; well I think one of the major factors was that Randall never told me that he'd written to her, making very clear to her that I was dropping out of the work, that was the implication. And so she was rather bewildered, finding that I went on doing certain things, which I did, and that I was taking such a special interest in it. And so...I mean there was the time at Cambridge at one of Perutz's protein structure things, when I gave a talk about the preliminary work on DNA fibres and sperm heads, and backed up by...or largely derived from Alec Stokes, the helical idea, and the evidence for helical structure and all this, a talk which down very well there. And he came up to me afterwards and said, "Look, I really think, you know, this isn't your work, you ought to stop and go back to your microscopes". So I thought, well what's going on? Well of course, I mean if I'd known, I'd probably have understood the position more, that she'd been...this was her area to work, and she'd been engaged to do it. So misunderstandings developed like that. So, that sort of was part of the difficulty.

*I mean she had a quite separate lab here at that time, so...just the two of you were going on in parallel in some cases?*

Well, it wasn't...you know, everything was very mixed up. You see I think this another thing that she didn't understand, she couldn't fit in very well, from her previous...her ways of working. She came in relatively late to the lab, and we'd been going for two or three years then, since '47, and we had a marvellous spirit of everyone sort of pitching in and doing things, and it was all a great sort of jumble, sort of anarchic co-operative sort of activity. It was very nice indeed. The infra-red people...I mean at one stage for example, the...the Frazer, the infra-red man, came in, and came and sort of did this with his finger, saying, you know, a big smile, 'Come and have a look', and he built a three-chain model with the bases hydrogen bonded...bonded in a planar way. And I didn't feel particularly sort of miffed that he'd done that and hadn't told me. I mean everyone was having a go in a nice sort of friendly co-operative manner. And that it was...there was no sort of strict allocation of problems to anybody. And for a time it worked well, in those preliminary years. And it was a very nice way of working. And I think...it isn't I think often you find labs in that condition; to be fairly fair it must seem rather weird. And it was referred

to of course as Randall's Circus in the college by people. Well a lot of antagonism towards Randall, they didn't like the fact he was getting much more money than the other scientists in the place - jealousy, petty attitudes. And, so I think it was very difficult for her to suss out what all these...amateurish physicists you see. She was being brought up in real professional X-ray structure labs, established lines of research, all this kind of thing. So there were kinds of reasons why she shouldn't...would find it difficult to fit in. And Alex Stokes once told me about how...what serious difficulty - or at least her real difficulty at one stage - in Birkbeck, that she wanted the director, Bernal, to come down and allocate how many yards of bench she could work at, and the other person. She couldn't work this out with the neighbour. People grow up in different ways.

*But one argument would be that that was because, as a woman she wasn't being taken seriously, and therefore in fact she had to sort of make her space and make her territory.*

Well she shouldn't have felt that way. I mean in Bernal's lab, where the...you know, there was special attention... But I think you're probably quite right, that, being touchy like that, and feeling insecure, was due to the background. Oh certainly, in that sense you're absolutely right, that I think when you look into the awful time she'd had with her father, didn't want her to go into any higher education, and I think the pretty awful time she'd had with her PhD supervisor, she'd had, you know, a very deprived, sort of horrific sort of history, that way.

*I mean, did you feel, or were you sort of personally sort of close to her, or there was animosity between you, or it was just that it was...*

Oh, at the beginning we got on very nicely. She'd come over from Paris, and we'd go out Saturday, both be working. Saturday afternoon, and morning, and go out and have lunch, maybe with other colleagues too, down at the Palace and all that sort of thing. And, what's in the New Statesman, and the whole... She introduced me to the notion of...neutralism or something, you don't want to be the Soviet Union, or the other side you know, was the buzz word going around then. And we got along fine.

But, it was when she was trying to get her work going, set up, and we were handing over what Stokes had done on the X-ray set, the micro-focus X-ray thing, and all that, and she didn't appreciate properly the extent to which I'd been involved in all this, and she wondered what the hell was I doing here you see, because of...Randall had really misled her. And, so to preserve her independence from these dreadful amateurish people, who got crazy helical hypotheses like Stokes and Wilkins and so on, she was of course forced into the position of saying that was a lot of tommyrot. So that I mean, it was a...polarization was induced like that, and it was a sort of lamentable situation. But a lot of it resulted from the...well A) our lab, as I say, was very loosely organized, practically not organized at all, she wasn't used to that; Randall had really given her a false...had been quite unhelpful in rather misleading her about my position in the whole thing; and a series of factors like that. The other thing is, I think it's perfectly right to say, that I was uncertain about what my...just what I was going to be doing in that autumn, before she arrived, because if we were going to get a professional X-ray person in, I didn't want to become one of these awful people, you know, stoogeing away on X-ray diffraction for six or eight years or something, the way the protein people had, I couldn't stand that sort of thing. And so, I was...didn't know just, if this work was going to develop, quite how I was going to fit in. But I mean, Randall claimed you see that I had said I was dropping out. Well, if I'd seen the letter he wrote to her, I would have been up in his office like a shot, saying...this won't do! [laughs]

*But he never told you that he'd written it?*

No, no no. You see, and this is I think the great shame, that... I mean, one wonders, you see he always had this thing that he wanted to to be...he felt this was his problem you see, rather from the Barber [ph] connection. And, in one sense he was right.

*So it was his problem, and you were all working to him in some way.*

Well, we were...well I think the other thing was, you see, that I was MRC, and that, Franklin you see, these fellowship people came in, they were departmental; he was head of department.

*Ah, I see.*

And so he could have separated it all up. And in fact he came to me with a story that the MRC didn't want me to be doing this work, it wasn't biological enough you see, that this was molecular structure. Well, I just said to him, well you know, I don't believe that! [laughs] Because I said, "Well look, if they want to take that line, I will explain it to them, about how this is biology, and it doesn't worry me at all", so I wasn't going to be bamboozled by... But I mean, I think it might have suited him better, from his personal standpoint, if he had... If Franklin had been kept quite separate on the DNA structure, he could have got involved on this you see, as head of department and so on, and I could have been back on the cells dividing, or something like that. But...

*But as MRC staff you didn't have much independence anyhow; my impression of MRC staff is they're pretty much feudally related to their boss, and if he says 'Do X', you do X.*

Oh, it wasn't like that with me, I can tell you. That's one reason we didn't get on of course, because I'd been his research student, and he knew that if I didn't...if some things didn't suit me I certainly said so to him, and we had awful rows sometimes. And, actually though, he was a pretty unreasonable person too, I mean we both were! But, we find ways of working things out. He knew that I could be unreasonable as a research student when he invited me to St. Andrews, because he knew what I'd done in Birmingham. Well, to a large extent got him in the Royal Society, the electron trap [ph] stuff. He suggested the problem, that was his idea, and it was a very good idea indeed, but I mean, I did the work. And it came out very well indeed, it was a very lucky strike. And I did a PhD in two years.

*Where do Francis and Jim fit into this picture? I mean when did you know that they were working on that?*

Well, oh well, that's a big thing. I remember Francis...Francis had been...Massey spoke to him too, and said why don't you...yes, I think Francis was interested in something biological, because Massey said, "Go and see Maurice Wilkins", so Francis came along here. So that's the way I met him.

*This was late '40s I guess, something like that.*

Yes. But then he got pushed off into the Strangeways by this silly MRC thing. But I don't think...I feel quite confident that if MRC had wanted to say to me that I shouldn't go on with DNA structure work, that I would have had no difficulty in dealing with them, because you know, it was so...well, I feel quite confident on that. And I mean, Randall knew that, although I might be awkward on occasion, that his previous experience of me he knew it was worth putting up with it, because things came out. And the reflecting microscopes and things, we made pretty good progress on those when I took them up. And so, he wouldn't have risked sort of antagonizing me by trying to, you know, be the big boss. Well, I mean it wouldn't have worked. And to be fair to him, I don't think he was really that sort of person, in any case. I mean, he had a big democratic element in him, and that went for the women too, because the place was full of women. I mean, in top positions, like Jean Hanson, Honor Fell and so on.

*Despite what Anne Sayre says in her book.*

Well that's...doesn't know a damn thing about it, it's sort of pretty pitiful. I mean all she knew about was the line she got, the side she got from Rosalind Franklin, which is interesting to see how it's all presented. And I can quite see that a lot of that is...probably a fairly true picture.

*It's true that there were sort of...that women weren't allowed in some of King's common rooms and so on.*

Well, yes, but...some of the people in our department, the men were barely allowed. I mean the thing is, we were MRC staff that initially the college barely recognized. But

they did...[inaud] Well, no, we did get into the senior common room, that's true. Now they say they're going to abolish it incidentally, I was hearing again, confirmed today! [laughs] But, no, that was nothing to do with us. I mean, as soon as there was some move in the college to support the women in the senior common room, of course, I remember some of them coming in, 'Well of course we'd support you'. But we had to wait for the college people to start that moving. I mean I was a sort of outsider, MRC staff, you can't be interfering with the college's things. But...

*But coming back to the DNA, I mean you had presumably known from sort of fairly early on that the Cambridge lab was working in parallel, or at least that Crick and Watson were.*

Well they weren't working on the...

*They were model building.*

They...well...the...Francis wasn't doing anything on DNA, he was pushing on with his thesis on the protein structure. And I forget at what stage, having met Jim Watson in Naples, at what stage I heard that Watson was in Cambridge with Francis.

*Yes. In Jim's book he has this sort of match-making story about you, doesn't he?*

Ah, I don't...yes, I do remember his sister, but I don't know, he seems to have been a bit sort of...imagining things there. All this history about just when I knew about what they were doing, and vice versa is rather complicated; I have set down notes on it. And that of course was a further confusion so far as Rosalind Franklin was concerned, that...well she wasn't the only one who felt rather resentful that I was going and talking with these outsiders up in Cambridge. And I suppose to some extent, in a limited worldly-wise sense it was silly for me to do so. But at one stage, John Kendrew suggested to me that I should collaborate with them, how about it, and... But it simply wasn't on, because, I mean Randall wouldn't have agreed to that, and, you know, it would have made a very confused situation, especially... We could have done it I think possibly before Rosalind Franklin came, but not afterwards. That

would have been out of the question. In any case, I said that I didn't think I could collaborate with Francis, there were just different styles. I mean we were good friends and so on, but, you know, his whole style was different. And so it...it wasn't viable.

*What's your...I mean the famous story of the photographs has had several different versions. I'm not sure what your version of it is.*

Oh, how I stole Rosalind Franklin's photograph and showed it to Jim.

*Mm.*

Yes, well I think the main thing about that was that, I'd got the impression when I'd seen Jim before, which I think was in Paris in the summer - I hadn't seen him for some time. But I'd just given up on the whole business, I couldn't work in the atmosphere, and was doing the dry weights in cells with the interference microscope for a change. That he was still completely sold on the helical thing, and I think that if I had known that showing him pattern would have got him all excited, or changed his view about DNA being helical, I think it's quite possible I wouldn't have shown it to him!  
[laughs] I don't know. But, yes, Gosling had handed me over the negatives as part of the preparation, you know, she was clearing her stuff out, preparing to go.

*She was already leaving by that time?*

Oh yes. Oh that was the reason I got it.

*She was leaving, what, because the fellowship had run out, or because she was sort of, fed up with working in King's, or Bernal had offered her a job, or...?*

No, I think the fellowship was probably going on for a year or something, and... No, it was mainly... Look, she'd...so far as she was concerned, she had driven DNA into the ground, and you can ask Gosling about this; he said something about they were peeling oranges or something. All this sort of laborious Patterson thing was

misconceived. And her talk that she gave, leaving reports of the lab, Bernal came down to hear it, was that she'd just damn well got stuck and didn't know what DNA was. And the interesting thing was, it was after she gave the talk, in the last three weeks or so before she left the lab, that her notebooks showed that she started then doing some helical analysis on the B pattern. And then immediately things started making sense. And they are quite right, which I didn't know, for years later, till I saw that thing, that was the basis of her letter with Gosling, with our letter and the Watson-Crick one, for 'Nature'. And at the time, I didn't know of this sort of last wee spurt of helical activity, and I was very cynical when she said she wanted to produce a thing too. So I thought, oh well - I didn't say this - if you want to hop on the helical bandwagon now, and change your tune completely, I suppose it's a free world, and one can't make any objection. So I was rather cynical about it. I didn't know, that she had actually done something. So I did her a discredit there, but how was I to know? So there was a lot of people simply not knowing what each other were doing, and...sort of misunderstandings and so on.

*Did you all even look at the drafts of the papers when they were being produced, or were they all done separately as well, the 53 papers?*

The papers were done separately, yes, and so we exchanged our drafts, and made a few minor suggestions, well, little matters, but...no, they were independent publications.

*So as far as you were concerned then, she was leaving, so the problem stayed with you, and therefore the photographs belonged in the lab?*

Well, I didn't ask for the photographs, Gosling...my memory...I'm pretty sure it was he and not she who gave it to me. But you see, we had...the awful thing was, that pattern had been taken...May, nine months before. And she had taken that pattern, that looked so good from a helical point of view, shortly before the meeting at which she called, where Stokes and I had to go - I don't think Randall was at it - and she produced the data proving it...it wasn't helical. And so I felt, well, it was a bit naughty of her to have had all this evidence for it not being helical, and not telling us

anything about the thing. I think she must have known very well that if Stokes and I had seen that thing then we would have gone off the top of our heads and said well look, this is what... When Stokes took the first, one of the first patterns she had under-exposed a year earlier or so, that...isn't it exciting, that this fits in with helical things? And she got so annoyed, and sent him away with a flea in his ear. Poor chap, he was taken aback! But...so she must have known exactly our reaction. If that pattern, we'd seen it, we would have said well look, this is exactly what we've been saying, you've got much better pattern now, we must all publish this together.

*So why didn't she? Because she was sort of dead set against helixes, or...?*

Well, oh, I don't know. I mean, I think Klug said something...he had some peculiar explanation about how she didn't...I don't know quite what, see the the significance of it, or, I don't know at all. But I think I didn't know that she'd had that pattern for nine months, till years later when I saw her notebooks, through Klug. And he was very helpful about the notebooks, and went through them. And when Gosling brought me the pattern I thought this was something they'd taken recently, because I'd never heard of it before. But to be fair to her, at her leaving seminar, I asked her, I said, "Well all this about the A pattern. What about the B pattern that we were saying looked helical?" And she said, "Oh well, I think that's helical". And so I was staggered by this, and I didn't say anything more, because I couldn't understand how the thing could go from a helical to a non-helical thing by simply altering the water content; I thought this was such patent physical nonsense that I...I didn't discuss it any more. But she did say that at that stage. But she hadn't done any helical analysis then. But she did do some simple helical analysis, as we'd always proposed earlier, meaning...in those last week or two. And obviously she deserves proper credit for that.

*Jim and Francis in their papers immediately sort of said, ah, we now understand the biological significance of the structure.*

Yes.

Was that something that was equally sort of much in your mind at that time, or...?

Well, I think Jim was in touch with the phage people, and he had much more...done much more thinking about complementary structures, and replication.....

**End of part 10**

## Part 11

### Digitised from tape 6 [F1174] Side A

*Yes, so when did you...I mean so that after then, when did you leave DNA finally?*

Well I left DNA some time after the prize, and after we had got...well we moved on to helical RNA, which helped to confirm the whole DNA thing, which was worth doing, double helical RNA, and I thought it was worth staying on the work for many years, because I felt it important to get the thing tied up properly. And I remember Honor Fell coming to me, I think Randall's instigation saying look, using these words, something effectively, you know, 'You've got in a rut, why do you go on working on X-ray diffraction of DNA like this?' And I took no notice, because I thought it important to get the thing cleared up. And I think I was quite right, because when one saw that there were several attempts afterwards by Donahue and others to prove that the X-ray data were not sufficiently definitive, and the Watson-Crick thing wasn't right. So I think it was...

*Oh I remember that, yes.*

Perfectly sensible to do that. And so...but it was in a way boring, and confirmatory research, nothing more. Pretty dreary stuff. But it seemed to me that, I didn't see anyone else was going to be doing it, and I suppose in a way I didn't want anybody else to do it! [laughs] And, I think I may also have...yes, I think it's true to say that I...the thought must have gone through my mind at some stage that one reason for going on doing it is, that the better job I can do on the confirmatory analysis, I'd improve the chances of my getting a bit of the prize, which I think was perfectly true. And I think it was...but you know, from the point of general scientific situation, the thing needed to be wrapped up properly, so I stayed on that long.

*And Franklin never showed any interest in coming back to it at all?*

Well, I think of course this was an awkward point, because Randall wrote the letter to Bernal saying that she shouldn't continue, and some people said - at Birkbeck - and

said this was a dreadful thing to do. But I think that if you take into account - I mean Randall of course was quite capable of doing dreadful things - but I think if you take into account the whole situation in our lab, and the...there was a strong feeling that we had missed the boat, partly because of her obstructions, definitely, this way; I mean whatever her positive contributions were, which were considerable, I mean she still sort of managed to fox us very...completely. And that was without knowing that she'd been sitting for nine months on the best B pattern. And so, you know, I wouldn't blame Randall... Anyway, Randall did that. And so she moved on to the TMV, and the...

*And coal or something, wasn't it?*

Sorry?

*Coal or something wasn't it she got involved in?*

No no, coal was before she got onto biomics [ph].

*Oh really, ah!*

Yes, that was where she began X-ray work.

*But you never felt tempted to, as it were, sort of move much more biological then, in the same way as Francis clearly did, and sort of go on about sort of DNA function and coding, and those sorts of questions?*

Well I think that, I wasn't set up for...I didn't have the background for coding experiments at all, so that sort of...and I wasn't a theoretician like Francis, who could sit down with great ideas in his head like that, so...I mean he said he was like a sort of theoretical physicist, that...worked like that; I was an experimentalist. And so... But I did go biological in the sense of spending time on sperm heads and cell nuclei and so on. And of course some people were very derisive of the fact that I was wasting time doing these things, because what I ought to be doing was simply working on DNA

itself. But I mean, they don't understand the historical context of the whole thing. And it was important to...I mean quite a lot of people felt calf thymus DNA was quite peculiar, and what it showed wasn't necessarily relevant to genes in general. And so this was one thing we did, was to take a lot of different DNAs and study them. So it was broadened in that rather limited sense. And...no, I think in many ways it was rather sort of dreary stuff; sort of the really interesting thing had been solved by getting the general form of the double helix, and then it was a sort of dreary sort of slog to work the thing out in detail. But I think, Rosalind in fact did publish some stuff after she had left the lab with Pattersons, and some of this...I mean she rather over-interpreted. And I remember one thing, that we saw fairly early on on the A structure, that the two chains were not equally spaced at all, couldn't be. And I remember at a biochemical congress in Paris or something we had some stuff on this, and she came up once and seemed very upset and annoyed. She said, "Look, you know, why didn't you tell me about this?" This was after she had left the lab. Because she published the thing with Pattersons, showing the two things were more or less exactly on the period. Well, I didn't...I never thought it...I was a bit surprised that she was still so interested in the whole thing, I thought she had dashed something off with Pattersons, and in fact it was, in one sense wrong, it didn't seem to me of really great interest, and we were pushing on with other stuff. But evidently she still felt sort of touchy that she had got one aspect of the thing wrong. I think the truth of the matter was that she was rather, you know, pushing the Patterson thing a bit far, in that context. But I don't think it... Well anyway, she was rather touchy about that. Of course once helices became respectable for X-ray workers of course she was quite happy to do them, but I think she didn't like the idea originally, because this was a totally new sort of notion, and...I think she was rather conventional as a scientist goes. And then doubtless she thought that some of us were sort of very sloppy amateurs.

*I thought the sloppy amateur was Jim, wasn't it? I mean he seems to be a sort of amazingly sort of brash and bouncy person.*

Yes, but I mean, of course Jim got things wrong at times, but then he tried other things, and he was...I think deserves enormous credit. I mean, obviously, and he had

the back-up with Francis, who really understood the...how to think about the structures.

*The remark was certainly not addressed to Francis in that context.*

Yes, yes. But anyway, look, DNA, what is there there... Yes, I think...yes, I think the hysteria of the whole thing, certainly after the structure came out, everyone was pretty damn silly except Stokes. But then Stokes, he said afterwards, he said he never really realized how important it was! And he was very sort of calm and non-aggressive. But, I do feel, apart from all these organisational, social points in laboratories, that...and if you get people getting very excited about important work, you can easily get serious misunderstandings developing. And I think that the position of the women in the lab was only one component of many; that if one had had a man in her position, and he wasn't a fairly equable and easy-going person, you could easily have got upset there too. But I do feel very strongly that if you look at her life, I think that it was a...it really was pretty awful what she had had to put up with. And I think that we in our lab, and me in particular, we were at fault for not having realized the extent to which women would be...needed extra consideration in these situations. And one of the reasons was, we had all these women - maybe we were very fortunate, we had a lot of women in the lab and got on fine you see, and we were mis-led by this, to think that there was no problem there.

*When did you get married again?*

Oh dear, when did I get married again? I don't remember when I got married!  
[laughs]

*Well, give or take a year or so! [laughs]*

Oh, quite a bit! Well it would be about 30 years from now. Yes, it was about 1960. Yes, it was a bit before the...yes, it was just a bit before the prize.

*So you had a whole chunk when you were single, all over that period of time.*

Yes, yes. And they...I think this whole business about people in labs, when you have single people like me and single people like Rosalind you see, I mean, there can be other dimensions to tensions developing. And, I don't know what goes on in people's minds, but there can be all kinds of things there. And it was...I think it was a very unfortunate position she got into there, and I know...I was... Maya Friedman [ph] gave me a photograph of her tombstone recently, and, you know, one begins to look at this, and realize...it was a damn shame that she didn't have a happier life, because she was not one of these awful competitive people; she had a decent, civilized attitude towards scientific research, she was a very able worker indeed, and...I think it was a very great shame that this whole nasty, very unhappy situation developed. There was great suffering out of it. And I think all the people outside, who want to pass judgement on the individuals concerned, and start making accusations of A or B or C or anything like that, well, I will just say to them, wait until you find yourself in a position like that before you pass judgement on others. It's very easy. But, maybe we should get on to something else if we want to... No, I suppose in...I might say one more thing. I think if we hadn't had that bust-up over the DNA, that, as sort of colleagues and so on, we could have been good sort of friends, with a good relationship between colleagues. Her tongue was a bit sharp at times, but I think I could take it, and I've had things like that, and there could have been sort of mutual respect, I think could have developed, and one could have understood sort of how people with different backgrounds work in, do research in different manners, and yet those different manners can still, you know, be OK for what they are. But we didn't have that opportunity, so, that was unfortunate. Oh yes, about the DNA generally, as I said, I wasn't involved in any 'science in society' problems, I didn't go on any of the marches to Aldermaston; I read about them in the paper, and got very annoyed with The Guardian when it jeered at them, that was as far as I got to anything. But I remember two years before the Nobel award there was an American thing, Lasker Award, had to go to San Francisco for that. And I remember I had to make a bit of a speech there, and somewhere in the speech I said, "Well, you know, these big scientific advances are all very well, but what really matters ultimately is what they are going to be used for" you see. I don't know whether I said anything about weapons or something, but that was the kind of idea in my mind. And I remember,

there was a big sort of sound in the audience, something about, 'Oh, yes, yes...'  
something to the effect, 'Yes, yes,' you know, 'we think it's very good that scientists  
should be thinking about this'. And it rather sort of struck me, I thought well, I'm glad  
they feel that way, because I feel like it, although I haven't been doing anything about  
this side. And, so in a way, that little incident probably foreshadowed the start of all  
the BSSRS and everything. And, I think that I would like to say a few things about  
the rise of the BSSRS, because I think this is really phenomenal business, that, as I  
remember it it all started out of the Porton, opening up Porton and so on, and I think  
the first I heard about it, I think you must have come to me, because you got the  
whole thing stirred up, hadn't you?

*Well it was all...yes, it started with an 'angry science' thing, in my recollection; this is  
'68, '67/'68 we're talking about, and it was at the height of the Vietnam war, and the  
'angry arts' were having...a lot of literary people were doing an 'angry arts' thing at  
the Roundhouse, and so we thought we ought to do an 'angry science' thing to match  
it.*

I see, I see.

*And we had a meeting, which Dorothy spoke at, in, probably somewhere like the  
Conway Hall; I'm not sure if you spoke at that or not.*

No, I don't think so, I don't remember that.

*I can't remember who got involved in it now. Eric certainly was involved with it.*

Yes, yes.

*And then there was the Bernal peace library thing which ran its conference on  
chemical and biological warfare.*

Yes, I don't think I...

*Which I got involved in, in organising and editing.*

Oh, I see.

*And you came in at the stage then when we were trying to get the inaugural sponsors for the BSSRS.*

My memory was, I came into the thing, first in relation to Porton, the...yes, I must have...yes, of course, I had the prize then, so I was one of the people drawn in to write letters to bigwigs, to sign the letter for The Times or something, in support of opening up Porton or something. Because I remember giving these letters to Lord this and Professor, Sir something-or-other, and all that, to my daughter, and...or going with her up to the post box up the road, and thinking, and saying something to her (I don't think she could quite take it all in) that probably never in your life again would you carry so many letters addressed to very important people! [laughs] And so...and of course it was a colossal success, wasn't it?

*Yes.*

So I was very glad to play a part there, because I think, the whole situation had been set up, and it was a little bit like...well, I can't bury myself with Einstein, but, somebody...who was it who got Einstein to write a letter to...?

*I don't know, Leo Szilard.*

That's right, Szilard, quite. Szilard got the letter and Einstein signed it, and so one needed to have some sort of special gongs and prestige marks or so on that the letter to go in, and so I supplied those. And so the letter went up. And it was a terrific success that campaign, wasn't it?

*Oh yes.*

Amazing. As Porton threw itself all open, and...must have spent a hell of a lot of money, everyone went down there, and paraded around, and... And so, this...and I think the BSSRS started fairly soon after that, didn't it?

*That's right, it sprang pretty much after that; there was an inaugural meeting at the Royal Society, which you were definitely involved with.*

Yes, yes. And the...yes, I think that...you and some others had been suggesting about...that I might be president of the thing, and so...I wasn't quite sure what this would entail, but anyway, I did become president of the BSSRS soon after didn't I?

*Yes.*

And the...I was just looking through the file, about the position of BSSRS there. Every important scientific issue which came out at that time, BSSRS issued sort of press statements, didn't they?

*Mmm, mmm.*

And I came across a letter from one Margaret Thatcher, who was Minister of Education or something, wasn't she? What was she then? In science.

*I think so. I don't know what happened to her afterwards, but she was certainly Minister for Education then! [laughs]*

Yes, well... And I had been one of the people writing a letter to 'The Times' on this, and so she wrote a letter back to me, sort of...it was something about unemployed scientists, something like that. And so...we were sort of right up in the front so far as being in the public eye, and the scientific establishment and all that. But of course the scientific establishment element sort of got us into hot water with the more radical elements of the BSSRS didn't they? They thought this was backsliding. But that was another aspect. That big meeting that we had in Friend's house, looking back it was a pretty phenomenal meeting.

*Social Impact on Modern Biology.*

That's right, yes.

*197...2, 3? Something like that.*

Yes, possibly '72, I'm not sure. And the list of speakers we had from the established...I mean, viewed from the conventional position of the scientific profession, it was a terrific meeting. But of course viewed from the point of view of Bob Young and some of the other people, it was a disgrace. Not what BSSRS was supposed to be doing. But it is interesting that so many...there was an enormous audience, and the list of speakers was very impressive.

*Well they certainly wouldn't have come just to hear Bob Young!*

Well, lots of people were asking Bob Young to speak at that time, I remember him pointing that out, and I'm sure he was quite right. But, it's...I want to look again at that meeting, because I think it's...it can give one some sort of guidance about some of the...how real some of the ethical problems are now, about...out of human gene, or whatever it is. Because one can say well, what were the problems worrying people then, about artificial insemination and other things. And to what extent have those things really blown over. Mind you, I think the thing is, it's not altogether simple, because I think some of those things have left fair degrees of problem, which have been swept under the carpet a bit. But I mean they're not...public attention isn't directed towards them much. Fairly soon...about the same time we started our Social Impact course in the college, because a student had been to Jean Hanson and had said that he thought that we ought to have something on science and ethics, which is not what I wanted to do, but anyway. And so Jean told me this, and so I said well maybe we should do something of rather a wider kind. And so we started up a, what is now a very conventional way of having university teaching, or more conventional, by having a, you know, ten-minutes staff introduction and then sitting in a circle. Of course everybody does that now; training to be a manager, the university staff, they

all say they do that. But it still works well. I just had a student this afternoon, two girls in the course were working in Addis Ababa, had a very interesting time in urban development problems there. And in fact they can make that their essay, one of an essay project. So...well later on, as you say, the DNA structure work got - and RNA structure work got utterly boring, so got out of that, but couldn't find anything really interesting to do in neuro-biology, so decided well I know one technique, and that's X-ray diffraction, so what can I do with X-ray diffraction? Got on to membrane structure, which is pretty dreary stuff really, but...got a certain amount of interest out of it for a time.

*It's almost as if, having had that huge success, you'd sort of lost...it was difficult to find another problem which would actually be as potentially stimulating and exciting.*

Oh absolutely. Because problems like that only come up once every 50 years or something, don't they? And so I suppose that I was extremely lucky. I was very lucky with a lot of success. The solid state physics was a very lucky break, that... Well, I give myself some credit there, because I had decided for myself that seemed to be an interesting area, and all the electrons buzzing around the crystals must be doing something interesting. Well the general judgement was right. But..I was very lucky there. And the whole state of biological, physical sciences just after the War was an exceptional time. Stanley, the TMV work. I mean those things, a lot had been done before the War, but hadn't really got off the ground at all. Astbury's work, Stanley, a whole lot of people. Ultracentrifuge work, all kinds of things had been done. One gene, one enzyme had been done before the War hadn't it?

*Yes, that was Beadle and Tatum in '36 about.*

Yes, there were a lot of sort of absolutely basic stuff, the Chargaff sort of stuff on base ratios; all kinds of things like that had been done. But I mean, it was by bringing in the more physical approaches, other physical approaches after the War, that accelerated the whole process much further. And I know people have traced the development of molecular biology, some people (Olby) back into the phage group

don't they? Well obviously that was very important. And I would, yes, like to fill in, to answer your...

*The Informate [ph] school and the student school?*

Yes, that's valid enough. But there were only two main chains of development; one was through the Astbury type of stuff, and the other was through the phage group. But you see, Jim had told me all about the phage group stuff, so I was completely, you know, awakened up to all these possibilities there in relation to DNA. And so...how much I would have picked up of that on my own I don't know, but we did at least as I said, through the Geoffrey Brown connection, we knew about the Avery stuff. And so I think we... But I certainly owed a...you know, Jim was a very stimulating element in the whole thing. And so... Herbert Wilson found some notes I'd given on a lecture before the '53 publications, and it was full of all this stuff about, you know, the sort of thing Jim would have been talking about anyway. So that the...I certainly absorbed all those ideas. But I hadn't thought much about complementarity and gene replication and things like that. I mean I had heard Jim sort of mention this a little bit, but he hadn't talked much about it either. And so...I mean he got on to the two-chain idea from the biological basis, and I certainly hadn't got there, because I'd been under the impression that the X-ray evidence ruled it out. Actually I was looking at a thing from Frazer there, and he was saying he definitely understood it was three-chain. And this...in a way I don't like saying this thing, it was Rosalind Franklin's fault, it sounds awful, but it is a fact that she had been a bit dogmatic on water contents, that the crystalline and non-crystalline, one had to have more water than the other - I don't know where she got this from. And we were so intimidated by her authoritative approach, that silly me, I never questioned it! That was my fault as much as anything. We should have said well look, does it have to be like this? But she said, "It had to be well above two, more, three or something". And so, that was Frazer's thing, and that's why he said well he made it three. And of course we couldn't get anywhere by making three-chain models, couldn't.

*Three-chain models are bound to be disastrous.*

Well yes, they made no sense. I was temporarily on a one-chain model earlier on, but that was based on wrong water contents. But at least I felt from a biological point of view it made sense, because this was the minimum number you had to have! So, I mean, the idea of bringing in biological arguments was not...one was...did have thoughts like that sometimes. Oh, the other thing is about the base pairing was that the...I started getting around to the base pairing, but I brought it in...oh, I've probably said this before, that Jim.....

**End of part 11**

## Part 12

### Digitised from tape 6 [F1174] Side B

I've probably said this before, that Jim...I think it may have been the time I showed him that photograph, or round about that time, that I said to him, well you know, I think that the Chargaff ratios are...are sort of the key to the structure.

*And he said 'What Chargaff ratios!' [laughs]*

No no no, he didn't; he said, "I think so too".

*Oh I see, he actually knew about them then, did he?*

Oh God, yes. No no, that was late on, this was late on, in the beginning of '53 or so. Oh yes, they'd been switched on about this for more than a year. So I was much slower than they were in realizing this thing. But I did get around to it, very late. But then I tried to use those to explain this terrific dilemma, that Rosalind Franklin was getting X-ray evidence which appeared to show that the crystalline thing was quite asymmetric, and so I thought, could you have a structure in the helix which was highly asymmetric? And I thought well, you could do it if you put all one basis, each turn of the helix you get the pyrimidines, and...up on one side, and you have the internal part of the helix being asymmetric. So that that was...but...so I knew, that was my only use of the base pairing idea for rather a sort of...well the whole thing was wrong anyway, because the X-ray evidence didn't. I mean I think the whole business about the X-ray evidence in indicating it was asymmetric was a bit...shall we say that it was a bit of confusion, or... Well again, the fault you might say was, putting faults, was with Stokes and me, we should have asked her for all the data and gone through it in detail. We would have seen it didn't stand up. But, on the other hand, if we had asked her to give all her data to us to go through, it would have been very insulting to her, she would have taken it that way, and it would have required enormous, much more courage than any of us had!

*You couldn't have done that.*

It would have been offensive to any scientist.

*Yes, yes.*

But I think the thing is that we shouldn't have allowed us to be influenced so much as we were by her...because she could be very authoritative in her manner, and we shouldn't always have accepted these things without questioning her more energetically. So I think the whole business about who you blame for something, I mean, it's ultimately everyone concerned is...if you want to blame them, they're all to some extent to blame.

*Well, you know, I mean there are different bits about it. I mean partly there's as it were, sort of to try to map out what happened, and also to try and map out everyone's perceptions of what happened, granted that one of the key actors is not alive. But also the other thing is the way that the whole episode has become sort of, part of the whole sort of ideology within the science, both because of the Watson book, because of the television programme, and because of the Anne Sayre book and so on. It's very difficult not to see that as an extraordinarily sort of tight episode in which sort of all sorts of things are happening which meant things symbolically to people much later.*

Well it meant a lot to them at the time.

*Well yes, I can believe that too.*

Very painful! Yes, I think...I must say, it was such a miserable business, for the first time in my life, I'd never had such shocking experience that...to...you know, scientific research, a break-down of my marriage and so on, and all kinds of things that, putting yourself into scientific research, this is what one sort of lived for - and she did too you see - and then to have a colleague come up to you and want to tell you to stop doing it, and be contemptuous and derisive and everything, was extraordinarily painful for me. But of course, one then hears that she found the whole thing extraordinarily painful too, and of course she didn't show it, I mean in the lab she was absolutely sort

of self-contained and sort of a bit like sort Maggie Thatcher coming along, you know, sort of wang-bang and everything. But she wasn't like that inside I think.

*Perhaps she thought you were too.*

Maybe, yes, good point, good point.

*What was your reaction to Jim's book when it came out?*

Oh, I didn't like it.

*Did you know he was doing it, or...?*

Yes, he showed a typescript at one stage, and the...oh yes, I was with Francis in trying to stop publication, which I think was really rather a bad, stupid thing for us to have done! [laughs] But Francis seemed even more concerned to stop it I think than I was. Silly. I don't think...it wasn't right to try and stop it.

*Well it's difficult to do that. I mean, you did actually take legal proceedings or anything like that?*

There was something like this that was being cooked up in the States, and I was a party to it. Francis was the one took the initiative. And looking back I think it was really rather disgraceful. One should not suppress the publication of books.

*No, I mean I think that's right, although I actually do regard it as a quite pernicious book...[laughs]*

OK, but I mean, look, it wasn't going to be setting the Muslims in Bradford and everywhere else at such disadvantage, and stirring up the trouble the way that the Rushdie book had.

*No no, absolutely; there wasn't going to be a 'fatwa' against you! [laughs]*

No, but...and I think it was...I think Rushdie went on a television interview and said that he's had to change his attitude totally on everything, and so presumably this must mean that his attitude about the, you know, one should have completely freedom to...artists to publish anything. So I think the...it's not like that, but I think that...I think it was...I certainly regret, I should not have been a party to...it was a small-minded, mean-minded... [laughs] ...thing to have done. But it was understandable in the circumstances...

*But you never even reviewed it anywhere did you? I mean I think you were remarkably restrained.*

I don't know anybody asked me to review it. I don't know. I wrote...look, somebody once wrote to me about why I didn't like the book. I wrote a very emotional piece, I don't know whether I've still got it, which I feel rather ashamed of, just letting off steam over all the things I didn't like in the book. But, I was pretty silly over it, and the...I mean I still don't like the book, and I think he's also done harm, but I mean, the harm it has done, it accelerated certain processes which were taking place anyway in science, and so in that respect it didn't really matter very much. But I think of course, I would say in general it was utterly wrong for Francis and me to try and stop that publication.

*Mm. No, that I would also agree with I think.*

I was...I think I shouldn't have... But I certainly...I was glad to join with Francis in that venture! [laughs] I feel...shame, so far as that's concerned! I think so far as feeling shame, of all the other business, I think the thing is mainly that the... I think one doesn't sort of...no, it's difficulty of my thoughts. The main thing is, you get caught up in these situations, with many people involved, or sort of manipulating things and so on, and you get in a total situation where it is very difficult to put yourself in the shoes of the so-called opponent. I mean it's the...it is like these international situations. I mean look at Bush and Saddam Hussein or something you see. Mind you, there are things of course on totally different lines there. But, I mean

things get...presumably Bush is stirred up about it, and does have some genuine feeling about monster Saddam Hussein - of course to some extent he is a monster; you think about Halabja, and... But... I think it is beyond the limits of most human beings' capacity I think, not to get...behaving in a pretty frightful way when these situations develop like that. And I think what I...as I said, what I objected to was...well...if...I don't like people outside passing judgement! [laughs]

*What I wanted to do, because we're coming towards the end of the tape now, we've talked a lot about the...obviously about the DNA thing, and that, because it's an important episode and so on. But to round off, I think probably so far as Paul and the oral history exercise is concerned as well, you've said almost nothing about your domestic life, apart from the...apart from your first marriage.*

Yes, yes, yes, I see.

*I think it would be nice as it were to include a little bit about that. Because...I mean I find it quite odd for example that, I've known you, what, 20-some years, and I don't think I've ever sort of met your family at all. It seemed to me that you live in two different worlds.*

Oh, you met Pat at Eric Burhop's once, certainly.

*OK, just that one time.*

Yes, well I think possibly one main thing there was that I've always had, in a way, a kind of love-hate relationship with science, because I've been pulled into the sort of the art field, and some people would say well, you're not much of a scientist anyway, that I like messing about. But the...and so, yes, my first wife, in Berkeley, she was an art student, and so I was into those things, and after the War for a time I did think, should I just give up science. Never thought about it very seriously. But the San Francisco whole situation was very conducive to thinking about art, and I thought well, and I'd been to some classes by a very interesting young woman called Zahara Shots [ph], and...very good mind, and I wondered, you know, I had this sort of silly

notion that maybe I would be a painter and go and live in Paris or something! Never got very far on it at all. But I did sort of wonder, a bit. And so...I met Pat, my wife, round about a few years before we got married; I met her at the Institute of Contemporary Art, which was a very lively place then. You see it wasn't all that easy, when you were a working scientist, to meet people in another area; at least I didn't find it easy, and I think other people have said that too. But anyway, I met her there. And she was into Rudolph...she was working in a very unorthodox, Rudolph Steiner school, and with backward and maladjusted children. Now Rudolph Steiner I think is absolute bloody crap, piffle and so on, but, his weird notions did seem to work very well in the educational field. And Pat had had an art training, and had got in there, and she found this very rewarding, from her point of view. And so it is this sort of...sussing out human problems which she's been interested in, and is currently doing, in the bereavement counselling area, which was an area which...well she was teaching art to old people before for a long time, one of her main things. But she's been into a number of...oh she works for a Russian dance group too, does costumes as well as her dancing, so she does a lot of things like that. So, I found this very, as you may say, supportive in a complementary manner, to have a life outside the laboratory, which was in these areas of human problems and artistic things and so forth. And I was also especially interested in children, that... May sound a silly thing to say, but my father always struck me as being an exceptionally good father, and...I mean my mother was very good too, but I think the...there seemed to be something special about my father, and I had the notion that a little bit of this had rubbed off on to me, and, I don't know, I felt something about...children seemed to interest me, sort of as human beings and not just as children. And so I felt, to get some fulfilment in my life, that I needed to sort of...well, be a father. And so, we did that. And of course sometimes the difficulty is that, to what extent young people growing up in the present world get their fulfilment! [laughs]

*How old are your children?*

30 down to 25. Four of them. I sometimes do wonder whether we were right to encourage them into south-east London comprehensive schools; that if we'd sent them to some...I was going to say prissy grammar school or something, they might have all

been on the nice little respectable ladder up to university education, and life would have been easy for them.

*But it hasn't been?*

Well, it's varied, but I mean, it...but my own feeling is that, if people, some of them, don't get on straightforward ladders going up like that early, it may stand them in good stead later on. Because I think the opposite can happen to some people. Well you either do two things, you get on all the Establishment ladders, and you stay an utterly Establishment person, and when you meet St. Peter at the gates afterwards and he says, "What have you done?" and you say, "Well I don't really know, I've been an Establishment person"; I mean what did people do with their lives? And the other thing is, that people who start asking questions like that at age 40, I mean some of them will break out completely and everything will come crashing down, as I've heard from some people. Very successful children who have married and got all the sort of signs of fulfilment and success and everything, and then it all falls apart, because they've never sort of really questioned anything, because they've all been so busy climbing up these damned ladders, being so-called educated. Well my children say that I always said such dreadful things about education in universities, it's one reason why they were determined not to go to one! [laughs] I think it's partly true! That's the awful truth, I don't think in some ways I've been a very good father.

*Well, I don't know what constitutes being a good father. It seems to me to be an extraordinarily difficult role; I don't think I've succeeded.*

Exactly. I think this is what I've got to learn. And, I mean, what did Bettelheim say? The title to one of his books was, 'A Good Enough Parent' or something, wasn't it?

*Mhm.*

Yes, I think it's a...it's a no-win situation, I feel. I don't know what you think about your children.

Well, you end up, when the children are very young, then you have this practical problem of having power and responsibility; I just feel as they grow older you have responsibility and no power! That you never sort of lose that.

*Yes, well, yes, you mean you feel responsible?*

That's right.

*Yes. Yes, I think that's quite true. And, I think that if the children still, if they don't get free of the home sufficiently, you feel you haven't done your job properly, and there is a slight tendency - or there is a tendency in some of my children, it varies from one to another. I mean, in many respects they've got on very well indeed. But I think that my own life was especially easy, because before the War you had all this bloody ladder there, and it was very easy to get intensely interested in science at that time, and go on up it. And also you had the whole political thing, this immense sort of ferment of progressive ideas, pre-War, sort of putting some meaning into your...*

Well much more certainty about what was right and what was wrong, and which way one ought to go, yes.

*Right. And you knew what was wrong with it clearly, was this ghastly Fascist thing, you know. This is unbelievable now, in a way. And so I think that may have helped to polarize things. And so I was very fortunate there. And of course I was very fortunate in coming in this molecular biology period after the War. But there were quite a lot of...I might say oh well, I deserve credit for having gone into the area, but a whole lot of other people did too. The Kendrews and Cricks and others. And all these people in the early lot practically all got Nobel prizes, you couldn't avoid it! Provided you had a reasonable degree of intelligence, the field was like that, you see.*

It was the right place at the right time, and that's always a good thing to be.

Terrible, yes. And...the choice element comes into it a bit, but not all that much. You could get immense sort of minds, trying to function in science and many areas now, and it's not so easy.

*Well, that's what Medawar called the 'The Art of the Soluble'; I spend a lot of my time wondering whether I've actually chosen a wholly insoluble problem to meddle with!*

Yes, well I was wondering how you felt about it, yes. But I think...were you...very special times which I operated in, and I think people have... You cannot expect those times always to be available, and one has to settle for something of a more sort of humble nature.

*You've done brilliantly, because the tape is just about to run out. I think that's spectacular. You've got about two seconds more for something crucial!*

Well, I mean, you see in other areas, some of these sort of science and other questions, you might say well I haven't had much success there, and I don't know that anybody's had all that much success there, so it's no great disgrace. But I mean, the whole business about the meaning of science to humanity as a whole is, well...it's.....

**End of part 12**

**End of Interview**