

1 with the camera in the ends of it, and also the little  
2 three-pronged grab device which was used and actually  
3 provided gratis by Mr Ingham. The idea was that the image  
4 from the end of the lens came back and was produced on  
5 a TV-type screen, and by moving the probe we could actually  
6 see what was occurring at the end of it, so we could  
7 actually zoom in on pieces of interest before trying to  
8 extract them.

9  
10 Some of the X-ray shots showed pieces that, when we  
11 tried to locate them with this method, proved to be too  
12 large to extract through the holes, and one piece, which  
13 looked like it would have been of great interest, was  
14 a fairly large piece of shrapnel. It had gone in, but we  
15 couldn't get it out.

16  
17 CMDR RUSH: I have no further questions, sir, of  
18 Mr Ashton. May he be excused?

19  
20 THE PRESIDENT: Thank you, Mr Ashton.

21  
22 <THE WITNESS WITHDREW

23  
24 CMDR RUSH: Sir, I call Professor Creagh.

25  
26 <DUDLEY CECIL CREAGH, affirmed: [11.16am]

27  
28 <EXAMINATION BY CMDR RUSH:

29  
30 CMDR RUSH: Q. Professor Creagh, could you state your  
31 full name to the Commissioner, please?

32 A. Yes, I'm Dudley Cecil Creagh.

33  
34 Q. And your address?

35 A. [REDACTED]

36  
37 Q. And you are a professor with a particular role in  
38 teaching of metallurgy?

39 A. Not so. I am trained as a metallurgist, materials  
40 scientist. I'm currently - well, I was until the beginning  
41 of this year - Professor and Director of Cultural Heritage  
42 Research at the University of Canberra and I have worked  
43 with the War Memorial since about 1988 on all matters to do  
44 with analysis of materials.

45  
46 Q. What are your qualifications in relation to those  
47 aspects?

1 A. I have an honours degree from the University of  
2 Queensland, a Diploma of Education, a Master of Science  
3 from the University of New England, a Master of Science in  
4 the Physics of Materials from Bristol University, PhD from  
5 the University of New South Wales. My professional  
6 qualifications - I'm a Fellow of the Institute of Physics,  
7 Fellow of the Australian Institute of Physics, chartered  
8 physicist and consultant engineer.

9  
10 Q. Professor Creagh, in connection with your work with  
11 the Australian War Memorial, were you asked to assist in  
12 relation to the metallurgical examination of fragments of  
13 metal recovered from the Carley float? I think you've been  
14 in the Inquiry room during the course of some of this  
15 examination.

16 A. Yes, I was.

17  
18 Q. And in relation to that, were you presented with  
19 a number of samples?

20 A. I was.

21  
22 THE PRESIDENT: Q. Just before we go on with this,  
23 Professor Creagh, I think somebody showed me an email you  
24 sent which inquired whether this float came from *Sydney*.

25 A. Well, it was one of the things that were in the  
26 report, which, at the beginning, if you look at the summary  
27 at the end of it, it says words to the effect that we went  
28 in with the possibility that this might have come from  
29 *Sydney* but came out of it feeling that there was some  
30 probability - I forget the exact words.

31  
32 Q. Yes.

33 A. But I have held for a long time that - I should  
34 perhaps here intersperse that for some time now my work has  
35 moved over to being related to forensic science, and if  
36 I were looking at the causality of this as a forensic  
37 scientist, I would be still asking myself the question, is  
38 this really from *Sydney*?

39  
40 Q. Would you have a look at this. Would you put that up  
41 on the screen, please.

42 A. It's one of those things that at the time we took  
43 this, which is 1992, I expect, I had this feeling that the  
44 evidence was not strong, because in fact one Carley float  
45 had gone in the direction south-east of where the action  
46 was supposed to be taken, and another one was supposed to  
47 have wound up at Christmas Island, the two originating from

1 the same spot, from the same area, same action. Big  
2 question.

3

4 Q. Well, we know a lot more about it now. Would you have  
5 a look at this document. This is a rough document that  
6 I have had prepared and we'll have it drawn up more  
7 accurately in due course. It shows, as you can see there,  
8 in the green and red/orange dots the now known location of  
9 *Sydney* and *Kormoran* at the bottom of the page.

10

11 It shows every relic which has been recovered or every  
12 boat which the survivors of *Kormoran* were in when they were  
13 recovered and where they were recovered. Of particular  
14 interest are the items numbers 8, 9 and 10.

15 A. I see a Carley float has gone almost due north.

16

17 Q. Number 8 is a lifebelt, which is an RAN-type lifebelt  
18 with the straps tied together, but broken. Can we move it  
19 up a little bit so that we can see the details at the  
20 bottom. Number 8 was picked up by *Wyraallah* on 27 November.  
21 You can see the latitude and the longitude.

22

23 Above that, number 9 is a lifebelt and two Carley  
24 floats, which were two German Carley floats tied together,  
25 which contained the body of a German sailor. Number 10 is  
26 the Carley float picked up by *Heros* and is the Carley float  
27 in the War Memorial.

28

29 Commonsense tells one that 8, 9 and 10, two of them  
30 being of Australian origin and one being of German origin,  
31 both drifted in a similar pattern from a common event,  
32 namely, the battle between *Kormoran* and *Sydney*. We now  
33 know that those two vessels are sunk some 12 nautical miles  
34 apart.

35

36 That seems to me to be prima facie very powerful  
37 material to suggest that the Carley float picked up by  
38 *Heros* did come from *Sydney*?

39 A. Indeed so, but this information was not available at  
40 the time, and the latitude, I think, is not the same as was  
41 postulated at the time.

42

43 Q. I think for *Heros*, it is?

44 A. No, I'm thinking more in terms of --

45

46 Q. *Sydney* and *Kormoran*?

47 A. Regrettably, my briefcase jammed shut after I came

1 through the examination at the airport, but I thought the  
2 latitudes were more like 26 degrees, as postulated back  
3 then.

4  
5 Q. In any event, on the assumption that this is  
6 approximately accurate - and I think it is --

7 A. Yes, I would agree, this seems to me to be evidence.

8  
9 Q. And it also, although you can't see it on this map,  
10 shows that they were all drifting northwards.

11 A. Northwards, yes.

12  
13 Q. The second piece of information, which we now have,  
14 which we had then, I suppose, is that the *Heros Carley*  
15 float was made out of metal made by Lysaghts, which is an  
16 Australian company. The third piece of information we have  
17 is that the Carley float picked up by *Heros* has been  
18 subjected to a multitude of shrapnel strikes.

19 A. Certainly.

20  
21 Q. So there were only two ships engaged in a battle off  
22 the West Australian coast around about this time and a week  
23 before the 27th and 28th when this was picked up. They  
24 were the *Sydney* and the *Kormoran*. They are the only  
25 possible sources of shrapnel damage to a Carley float.

26 A. It would seem to be so.

27  
28 Q. And it seems to me to be incontrovertibly established,  
29 if I may say so, that the *Heros Carley* float did come from  
30 *Sydney*. That then leaves one with the question, is that  
31 concept, theory, thesis - whatever you like to call it - or  
32 fact reinforced by the metallurgy which you have been able  
33 to do?

34 A. Yes, well, in the final event, what one has is lumps  
35 of metal.

36  
37 Q. Yes.

38 A. And from the lumps of metal, when you look at them,  
39 you can say this is a steel, this is a brass, this is  
40 primarily an aluminium object. They don't come branded  
41 this is German, this is Japanese or this is Australian.

42  
43 Q. No.

44 A. So what you have to say is, right, this is a steel.  
45 Is it a steel which is common or in common use at the time?  
46 In the evidence that Mr Ashton just gave, there was  
47 considerable talk about what might be the origin of these

1 fragments. I think we have to go there first.

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Q. Shattering on --

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There are a couple of things that I think are interesting but not conclusive. At least one of the pieces had quite a lot of tungsten in it. I say "quite a lot" - this is like 0.1 per cent.

34

Q. This is a hardening agent?

35

36

37

A. This was used, has been I think since about the 1880s, as a hardening agent.

38

39

40

Q. Does that mean that it is more likely to have come from a munition than, for instance, the deck plating on *Sydney*?

41

42

43

44

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46

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A. I don't know what the deck plating on *Sydney* was. It didn't seem to be even sensible to go and find a ship like *Sydney* and take some of the steel, because in times of war, you find that there have been so many replacements made in a particular structure that there's no commonality in, say, plating on a ship or strips on the fuselage of a plane to make definitive statements. It's just one of those things

1 that you have to accept.

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There's one other thing that was found, and that was some aluminium, which could be said to have come from, say, the fuse of the munition, but, again, we don't have any samples of those to work from, and we didn't at the time. That's a long way of saying that my belief is that the metallurgy shows that there was the impact of munitions nearby. There has been spallation event. Somehow or other, the Carley float has fallen off the *Sydney*. I don't know what the Naval regulations are with respect to storing these things in Battle Stations, but somehow or other it has to come off the deck.

Q. And it weighs several hundred kilos.

A. Yes.

Q. It's not something you pick up and lightly throw overboard.

A. I agree. Perhaps something exploded underneath and jarred it free. I don't know.

Q. To a layman like me, the fact that you have some hundreds of penetration holes from which there has been extracted a number of metal pieces, not all, but some of which have elements commonly used in the hardening of steel, and my understanding is that those hardened steel elements are commonly used in munitions for good reason - that the munitions are hardened because they are meant to penetrate steel, some to explode after having penetrated and others to explode on striking steel. A layman would think that a probability is that some of those fragments of hardened steel are very likely to be fragments of exploding munitions coming from *Kormoran*, in particular from her 15cm guns.

A. Yes. When the report was written, you have to think what was going through the minds of the authors of the report. The greater proportion of the fragments which were found are low-velocity fragments which come from spallation events. There were some which you could say might have originated from munitions. Maybe the report should have said at one stage that in this global holocaust of shrapnel pieces flying around, some of them have to be from the deck, and so on.

I think that one can dwell too long on this, because it's a trivial matter. The fact is that our brief was to

1 look for evidence of machine gunning and the like, as  
2 alluded to by Montgomery, to look to explanations - first  
3 of all, the link to *Sydney*, which at that stage we couldn't  
4 prove. We can prove it now, but we couldn't prove it then.  
5 Was there machine gunning? No, couldn't see any evidence  
6 of that in any of the tests.

7  
8 The next phase of play then comes down to trying to  
9 sieve out the fine detail. In an event like that, it's  
10 frankly unproductive. So many of the pieces, as Mr Ashton  
11 referred to, actually went in only a couple of centimetres  
12 and are little pieces of rust lying at the bottom of holes.

13  
14 Q. If one assumes that there were two types of 15cm  
15 shell, as we know there were, used by *Kormoran*, one nose  
16 fused and one base fused - the first designed to explode on  
17 impact, the second to penetrate the hull or superstructure  
18 of *Sydney* and thereafter explode - what we do not know is  
19 where those shells were made; we do not know if they were  
20 made in different factories. We can probably assume that  
21 there was a specification for their manufacture.

22  
23 But as a metallurgist, is there a spectrum that you  
24 would expect if, for instance, it could be said that the  
25 shells were made in one factory? I don't imagine each  
26 shell would come out with the same metallurgy. Is there  
27 a band that you can say?

28 A. There are specifications for different types of  
29 steels, and one might suppose that if you got steel of that  
30 specification, say specification A, and it was to be made  
31 in this foundry and another one in another foundry, it is  
32 the case that there would be always trace differences  
33 between the two. There is always variability in the making  
34 of any alloy. It really comes down to acceptable standards  
35 from the side of the purchaser.

36  
37 I mean, bridges have been known to fall down because  
38 of one small error in a trace element. It's one of those  
39 things - if you were to take a shell made by this person  
40 and a shell made by that person and you had all the time in  
41 the world and the best of equipment, you would be able to  
42 tell the difference. But put that through a blast event  
43 and you have a different kettle of fish, because some trace  
44 elements might boil off.

45  
46 In the case of the brass that we saw, the zinc to  
47 copper ratio was inverted on the surface, and this seems

1 anomalous, but in an impact event, in the laboratory, you  
2 can get inversion of the ratios. Funny things happen in  
3 a blast event that's catastrophic.

4  
5 Q. So that means that, if we look at, I think, eight  
6 samples here, some of them are clearly different from  
7 others, but there is a number of what I would like to call  
8 hardened steel. They have a different range. They're  
9 approximate, but they're not the same for Fe content and  
10 the hardening agent contents.

11 A. Yes, I think it would be possible for there to be  
12 visible differences in the spectra for steel from the same  
13 source - one which has been to melting point and back and  
14 one which has just flown off as a matter of a fracture.  
15 I think it's possible that if you analysed the two, you  
16 would see there would be some differences between the two.

17  
18 Q. Have you been involved at all in comparing the  
19 metallurgy of the piece of metal that was found in the  
20 skull of the Christmas Island man?

21 A. No. It would be very interesting. I only heard about  
22 the piece of metal in the skull just recently. I should  
23 imagine that it would be an interesting thing to look at,  
24 but I don't know what standard would be applied to that.

25  
26 CMDR RUSH: NHQ.001.0029, sir.

27  
28 THE PRESIDENT: I probably should mark this little diagram  
29 that I had put on the screen as an exhibit.

30  
31 **EXHIBIT #209 PHOTOGRAPH SHOWING THE LOCATIONS OF THE**  
32 **VARIOUS LIFEBOATS AND LIFEBELTS AND CARLEY FLOATS RECOVERED**  
33 **BETWEEN 23 AND 28 NOVEMBER 1941 OFF WESTERN AUSTRALIAN**  
34 **COAST NORTH OF THE POSITION WHERE THE WRECKS OF *KORMORAN***  
35 **AND *SYDNEY* ARE NOW KNOWN TO BE, BARCODED EXH.209.0001**

36  
37 CMDR RUSH: Q. I think, sir, you are being asked for an  
38 analysis of the metal sample taken from the skull of the  
39 body located on Christmas Island, which is on the screen,  
40 Professor Creagh.

41 A. How was this taken? I'll ask you a question.

42  
43 THE PRESIDENT: Barristers never answer questions -  
44 certainly not accurately.

45  
46 CMDR RUSH: And not in metallurgy.

1 THE WITNESS: Well, it's of importance to know whether  
2 this is done by X-ray fluorescence or ICPMS, or whatever,  
3 because each has its own peculiarity. This looks like  
4 a fairly standard steel. It doesn't show a carbon content,  
5 but traditionally carbon is a very difficult element to  
6 analyse. You have to go to very special techniques to get  
7 a carbon analysis, so most systems add up all the peaks  
8 that they can find and if it comes to 98.39, or something  
9 or other, they actually subtract from 100 to get the carbon  
10 content.

11  
12 It's very hard for me to explain on these numbers,  
13 because they haven't put carbon in. They don't have carbon  
14 in that analysis at all. They've just taken the peaks that  
15 they can find - silicon, manganese.

16  
17 THE PRESIDENT: Q. We can tell you how it was done. If  
18 you look at NHQ.001.0028 --

19 A. No, I don't need to look at it. I just need to  
20 know --

21  
22 Q. What happened was that it was removed from the skull,  
23 and this states:

24  
25 *A small amount of remaining metal,*  
26 *approximately 5mm x 2mm x 4mm was revealed.*  
27 *A sample of approximately 2mm x 2mm x 2mm*  
28 *was cut off for analysis. The cutting*  
29 *process was very difficult and time*  
30 *consuming because the metal is very hard,*  
31 *much harder than mild steel.*

32  
33 *The sample was taken to Dr Ulrike*  
34 *Troitzsch, Department of Earth and Marine*  
35 *Sciences ... ANU, Canberra, for analysis.*  
36 *The sample was embedded in epoxy resin, and*  
37 *then polished with diamond paste to reveal*  
38 *a flat, uncontaminated surface to analyse.*

39  
40 *Quantitative analyses were obtained with*  
41 *a JEOL JSM-6400 scanning electron*  
42 *microscope with attached Si(Li) detector,*  
43 *Link ISIS EDS, at 15 kV and 1 nA, located*  
44 *at the Electron Microscopy Unit (EMU) at*  
45 *the ANU. Spot analyses were carried out in*  
46 *four random locations.*

47

1 If that helps.

2 A. It does. It tells me that it was done essentially  
3 with the same technique as I initially did the analyses.  
4 I had a JSM-35C with a metallurgical attachment. They had  
5 an advantage, in that they were allowed to do much more by  
6 way of damage to the sample than I was allowed to do. But  
7 in fact that is a stock standard steel. Can we go back to  
8 where we were?

9

10 CMDR RUSH: Q. If we go to 0029.

11 A. I'm sorry to have dragged you away from that. It's  
12 a low-carbon steel, I think, but there's no carbon there.  
13 It has no tungsten in it at all. And I don't know what  
14 conclusion you might divine from that, except that perhaps  
15 this is something that has come off the hull of a ship  
16 rather than having anything to do with munitions.

17

18 THE PRESIDENT: Q. The conclusion that was drawn by  
19 those researching it was that it was definitely not a small  
20 arms projectile, since there is no trace of lead. It is  
21 unlikely that the fragment is a piece of German --

22 A. I'm not going to argue about that, but I would have  
23 thought that if - it's a pretty large chunk, isn't it?  
24 It's 2mm by 2mm by 4mm, or something. It's more likely to  
25 have come from something of a larger calibre. But this is  
26 speculation. You couldn't draw any conclusions, apart from  
27 that this is a lump of steel that killed the man. My  
28 opinion, looking at this, is that it's a fairly standard  
29 steel such as you might find in the hull of a boat or  
30 something like that.

31

32 CMDR RUSH: Q. Professor, just underneath the analysis  
33 table, there is reference to:

34

35 *The lack of trace elements and the*  
36 *predominance of silicon and manganese are*  
37 *significant. Whether the hardness of the*  
38 *metal is a deliberate result of manufacture*  
39 *or from rapid heating and cooling during an*  
40 *explosion cannot be determined for certain.*  
41 *However, according to Ross ... "steels with*  
42 *1-2% silicon have excellent hardenability."*

43

44 *It is also known that, during the Second*  
45 *World War, Germany was using*  
46 *silicon-manganese-chromium steel alloys for*  
47 *armour piercing shells ...*

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A. This is true.

Q. And that silicon-manganese is supported at least to some extent by the analysis of the metal?

A. Yes, there are so many different types of steels and so many different types of hardening techniques and so many different types of malleability techniques that it's very, very difficult to look at a piece and say, ha, this came from such and such. There's nothing in what they've said that you could take exception to. On the other hand, you would have to say that if you gave a probability to it, you mightn't give it a 100 per cent probability.

Q. Whilst not a 100 per cent probability, on the information that we have there is a link between the silicon and manganese from the analysis and the use of those components in German hardening for its munition?

A. Yes, but - there is a link, let's put it that way. You're not going to say that there is a 100 per cent link.

Q. There is only one other matter that I want to go back to, Professor. You had some correspondence with LEUT Nottle, and there has been a submission received by the Commission of Inquiry which refers to a radio interview that you gave apparently many, many years ago concerning your analysis. That is at EML.005.0119. This is the email trail. If we can go to 0120, to the paragraph that is shown there, where you said this to LEUT Nottle:

*I said in the long forgotten radio interview that "There was no correlation at all between German ordnance and what was there. What was there ... was consistent with ship's steel and ship's brass." In other words, the fragments which were removed [talking about the Carley float] were most probably spallation products caused by the impact of projectiles nearby.*

Having regard to your evidence this morning, I think your statement about definitive statements - as I understand your evidence, you would say that it could be a combination or a mixture of both?

A. It's certainly a mixture of both. I have to say, after this period of time and several shifts of office, it was a major surprise to me that they actually found the

1 documentation. It took my wife to remind me about the  
2 radio interview. That was long gone. It wasn't until  
3 I had actually looked in the last few days carefully at my  
4 laboratory notes that I realised that there was indeed the  
5 indication that there was tungsten in some and there was  
6 this anomalous piece of aluminium.  
7

8 These are almost unum e pluribus - they were small  
9 compared to the totality of the objects.  
10

11 THE PRESIDENT: Q. When you use the word "correlation",  
12 do you use it in the scientific sense?

13 A. I was using it then in the scientific sense, so if  
14 I was plotting in my mind a correlation graph, I would have  
15 found this incident here of these two objects small  
16 compared to the other objects on the correlation graph. If  
17 I were a psychologist, I would say there was no correlation  
18 between this and that. I should have been more careful  
19 with my wording.  
20

21 THE PRESIDENT: No, you probably were very careful. It's  
22 just that you have been misunderstood, to some extent, by  
23 some.  
24

25 CMDR RUSH: I have no further questions, sir. May  
26 Professor Creagh be excused?  
27

28 THE PRESIDENT: Yes. Thank you very much,  
29 Professor Creagh.  
30

31 CMDR RUSH: Sir, Mr Courtney is indisposed and not  
32 available this week. CAPT Parsons is the next witness but  
33 is not due to arrive in Sydney until midday, and if we  
34 could take his evidence at perhaps 2 o'clock, sir.  
35

36 THE PRESIDENT: Yes, very well. I shall adjourn until  
37 2 o'clock.  
38

39 **LUNCHEON ADJOURNMENT**  
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