

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.

2

3

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Q. Shattering on --

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A. Shattering, and you got maybe portions of a deck, maybe bits and pieces of the munition. Certainly, when it comes down to separating out those fragments, it's like looking at fragments of bombs of Bali or something like that. It's very difficult - very difficult - to put everything together, but it seems to me that all the smaller fragments are low-velocity, small pieces which are coming from a relatively fixed position, which points to one impact.

29

30

31

32

33

34

Q. This is a hardening agent?

35

36

37

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

38

39

40

41

42

43

44

45

46

47

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.

2
3 There's one other thing that was found, and that was
4 some aluminium, which could be said to have come from, say,
5 the fuse of the munition, but, again, we don't have any
6 samples of those to work from, and we didn't at the time.
7 That's a long way of saying that my belief is that the
8 metallurgy shows that there was the impact of munitions
9 nearby. There has been spallation event. Somehow or
10 other, the Carley float has fallen off the *Sydney*. I don't
11 know what the Naval regulations are with respect to storing
12 these things in Battle Stations, but somehow or other it
13 has to come off the deck.

14
15 Q. And it weighs several hundred kilos.

16 A. Yes.

17
18 Q. It's not something you pick up and lightly throw
19 overboard.

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

22
23 Q. To a layman like me, the fact that you have some
24 hundreds of penetration holes from which there has been
25 extracted a number of metal pieces, not all, but some of
26 which have elements commonly used in the hardening of
27 steel, and my understanding is that those hardened steel
28 elements are commonly used in munitions for good reason -
29 that the munitions are hardened because they are meant to
30 penetrate steel, some to explode after having penetrated
31 and others to explode on striking steel. A layman would
32 think that a probability is that some of those fragments of
33 hardened steel are very likely to be fragments of exploding
34 munitions coming from *Kormoran*, in particular from her 15cm
35 guns.

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

45
46 I think that one can dwell too long on this, because
47 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 ...*

1
2 A. This is true.

3
4 Q. And that silicon-manganese is supported at least to
5 some extent by the analysis of the metal?

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

14
15 Q. Whilst not a 100 per cent probability, on the
16 information that we have there is a link between the
17 silicon and manganese from the analysis and the use of
18 those components in German hardening for its munition?

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

21
22 Q. There is only one other matter that I want to go back
23 to, Professor. You had some correspondence with
24 LEUT Nottle, and there has been a submission received by
25 the Commission of Inquiry which refers to a radio interview
26 that you gave apparently many, many years ago concerning
27 your analysis. That is at EML.005.0119. This is the
28 email trail. If we can go to 0120, to the paragraph that
29 is shown there, where you said this to LEUT Nottle:

30
31 *I said in the long forgotten radio*
32 *interview that "There was no correlation at*
33 *all between German ordnance and what was*
34 *there. What was there ... was consistent*
35 *with ship's steel and ship's brass." In*
36 *other words, the fragments which were*
37 *removed [talking about the Carley float]*
38 *were most probably spallation products*
39 *caused by the impact of projectiles nearby.*

40
41 Having regard to your evidence this morning, I think your
42 statement about definitive statements - as I understand
43 your evidence, you would say that it could be a combination
44 or a mixture of both?

45 A. It's certainly a mixture of both. I have to say,
46 after this period of time and several shifts of office, it
47 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**