

Science in the Making: Right Hand, Left Hand. **I: A BBC television programme broadcast in 1953**

I. C. McManus, Richard Rawles, James Moore, and
Matthew Freegard

University College London, UK

In August 1953, the BBC broadcast a television science programme entitled *Science in the Making: Right Hand, Left Hand*. The programme was broadcast live, being presented by Dr Jacob Bronowski in collaboration with Dr Kenneth Smith, and produced by George Noordhof. It not only presented a popular account of current ideas about right- and left-handedness, by using a group of celebrities (and a chimpanzee) in the studio, but also asked viewers to complete a brief questionnaire on handedness, which was printed in the *Radio Times*. Recently 6,336 of the returned questionnaires, which were said to have been analysed by Sir Cyril Burt and a colleague, were found in the archive of the Psychology Department of University College London. The present paper describes what we have discovered about the programme from various sources, including the producer and the son of Dr Kenneth Smith, and also presents basic descriptions of the postcards and the response to the programme. In two subsequent papers we will describe our analysis of the data from the postcards, which represents an unusual, large-scale survey of handedness in the mid-twentieth century.

The present study was prompted by the discovery, in the summer of 2002, of two medium-sized cardboard boxes crammed with about 6,000 postcards dating from August 1953. The discovery was made by one of us (RR), in the archive of UCL Department of Psychology. The story will be told chronologically at first, in order to describe how the history of these cards was uncovered, and then, after a brief analysis of some statistical aspects of the cards, the remainder of this paper will be devoted to a discussion of the programme, its participants, its context, and the survey that was carried out as a part of the programme. Two subsequent papers will analyse in more detail the data contained on the cards, looking separately at the two

Address correspondence to: I. C. McManus, UCL Department of Psychology, University College London, Gower Street, London WC1E 6BT, UK. E-mail: i.mcmanus@ucl.ac.uk

We are extremely grateful to Dr Michael Apter, Mrs Vera Smith, and Mr George Noordhof for giving of their time and their memories in the writing of this paper.

questions of the incidence of handedness, and the role of directional scanning in the duck-rabbit illusion.

SCIENCE IN THE MAKING: RIGHT HAND, LEFT HAND

The postcards contained in the boxes were mostly of a very standard format, typified by that shown in Figure 1. Postmarked mostly towards the end of August 1953 (see also Figure 7, below), the postcards were addressed to to

a Recto



b Verso

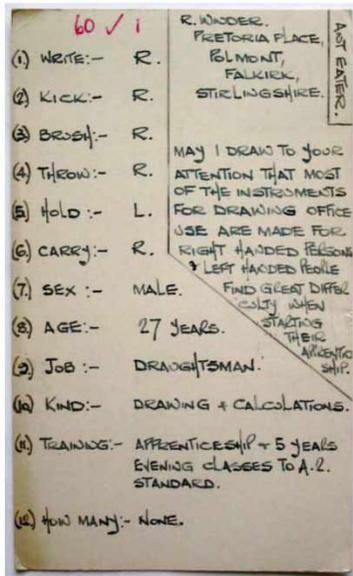


Figure 1. Typical postcard contained in the boxes in the archive: (a) recto and (b) verso.

“Right Hand, Left Hand, BBC Television Service, Alexandra Palace, London N.22”. On the verso the cards showed a list of answers to what were clearly 12 questions, indicated synoptically by phrases such as “Write”, “Kick”, “Brush”, etc., which were obviously to do with handedness. A few other statements were to do with age, sex, and other demographic features. On many cards, at right angles to the main line of writing, was the name of an animal (such as “Ant eater” in Figure 1b). Some cards also contained other comments as in Figure 1b. In a separate hand, written in red biro, were what seemed to be codes, such as “60 √ 1” in Figure 1b.

Sorting through the boxes eventually revealed a few cards, such as that in Figure 2, on which had been pasted an extract from the *Radio Times*, the weekly magazine in which the BBC listed (and continues to list) details of upcoming radio and television programmes. This contained the full text

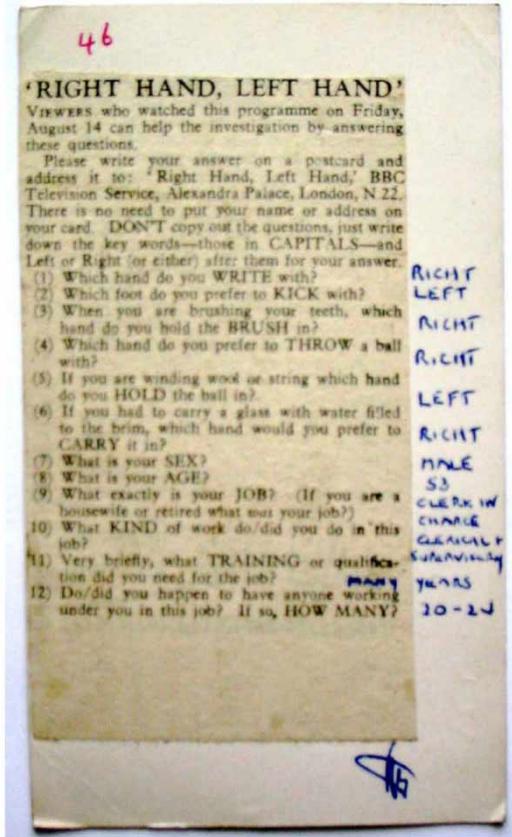


Figure 2. A postcard on which the respondent has pasted an extract from the *Radio Times*.

of most of the questions that had been asked, along with instructions on how to provide answers. The *Radio Times* is available in the British Library, and it was straightforward to find that on Friday 14 August 1953, at 9.45 pm, immediately after “International Speedway racing, Scotland vs England”, and just before “News (sound only)” and the Close Down (during which the National Anthem would have been played), was broadcast a half-hour programme called “Science in the Making: Right Hand, Left Hand”,¹ hereafter *RHLH*, presented by Dr Jacob Bronowski. An announcement of the programme was made in the *Radio Times* dated 7 August (p. 36):

Dr. Kenneth Smith shows that left handedness is not limited to writing, and demonstrates by means of experiments with well-known personalities that most right-handed people are left-handed in some ways.

Viewers are asked to perform certain simple tests and invited to submit the results in writing to. ‘Right hand, Left hand’. BBC Television Service, Alexandra Palace, London N.22. Produced by George Noordhof.

The questionnaire itself was included in the issue dated 14 August: “Viewers who watched this programme on Friday August 14 can help the investigation by answering these questions”.

THE PROGRAMME

The BBC’s Written Archives Centre in Reading, UK, had no photographs or other visual records of the programme,² but could provide both the scripts and transcripts³ (“transcribed by a Telediphone recording”), not only for *RHLH*, but also for the remaining six programmes in the series. The next five programmes, broadcast over the next 8 months, were entitled “The Common Cold” (Monday 12 October 1953), “Twin Sister, Twin Brother” (Monday 9 November 1953), “Like Father Like Son” (Wednesday 27 January 1954), “The Sense of Sight” (Wednesday 24 February, 1954), and “The Living Memory” (Friday 16 April, 1954). The seventh and final programme, on Monday 14 June 1954, contained a summary of viewers’ responses to three of the programmes, on visual acuity, on twins, and on asthma, but did not mention again the question of handedness. All the programmes in the series were presented by Dr Jacob Bronowski, and

¹ The *Radio Times* questionnaire referred to the programme as “RIGHT HAND, LEFT HAND”, whereas the script refers to it as “Right hand left hand” on its title page.

² Only important programmes were “kinescoped”, in which a 16-mm film camera was put in front of a television monitor, video-tapes not then being available (GHN).

³ The transcript of *RHLH* is dated “14th June 1954”, which presumably is the date of transcription.

produced by George Noordhof. Dr Kenneth Smith took part only in the first programme of the series, where Bronowski introduced him and the programme by saying, “let me introduce an expert to tell us what we do know about right hand – left hand – Dr. Kenneth Smith”.⁴

The programme itself contained many of the devices and tricks that are still popular in television science programmes, including a series of celebrities who tried out various tasks with their right and left hands, and whose eyedness and hand-clasping were also assessed; there was film of Dennis Compton, a cricketer who bowled left-handed and batted right-handed, bowling to the Australian Neil Harvey, who batted left-handed but bowled right-handed; there was Charlie Chaplin in *Limelight* playing the violin left-handed; there was a brief discussion of mirror-writing; and finally there was a chimpanzee in the studio who ate a banana with both hands to make the point that “man is the only animal to have a marked preference for one side”. The programme was broadcast live, and there was seemingly no film or photographic record of it.

An unusual feature of the programme, as Bronowski announced at the beginning and as its series title implied, was that “viewers will be asked to submit certain details about themselves and help scientists in their investigations”. Near the end of the programme, Bronowski says in the transcript:

Now for many years now famous experts in this subject have been anxious to collect large numbers of answers and questions on this [topic]. We consulted a most distinguished authority, Sir Cyril Burt, and he drew up some questions which have never in the past been answered by many people. We hope to get answers from – oh – thousands of people – from you. The questions are on page 15, bottom right-hand corner of the Radio Times but next week’s Radio Times, the one that came today and starts with Sunday’s programmes.

The transcript then takes a slight detour, Bronowski saying that before he describes how to answer the questions, “I’d like to show you a picture, a puzzle picture. Here is a picture that has something to do with left-handedness and right-handedness. Will you look at it carefully?” The picture is a version of Jastrow’s famous duck–rabbit illusion, and the details of precisely what was asked, and how the answers were to be recorded, will be left until later when the data themselves are analysed. For reasons that are not clear, viewers were asked to write their response to the duck–rabbit figure at a right-angle to the main answers, in a way that was presumably demonstrated on the television screen, and can be seen in Figure 1.

⁴ Quotations in general are from the transcript.

The programme finished with Bronowski saying:

... the next programme in this series will run on Oct 12th, and by that time I hope that Sir Cyril Burt's team will have analysed your answers sufficiently for me to be able to give you some information about it. I'll also be able to tell you why the puzzle picture is connected with rightness and leftness, so let me say goodnight to you, and show you the puzzle picture for a last time – WHAT IS IT?"

The second programme in the series on October 12, entitled "The common cold", and featuring Dr C. H. Andrewes, of the National Institute for Medical Research, mentioned at the end the analysis of the postcards from the previous programme concerning handedness. First, Bronowski talked about the duck-rabbit illusion, discussion of which will be deferred until later. The transcript then continued:

The information came from all over Great Britain and far beyond it, we had over 8,000 postcards, rather more than half by women, rather less by men – this has nothing to do with the figures I quoted earlier. The great majority came from London, Yorkshire was next, and Lancashire immediately afterwards. Our most distant postcard came from Norway. And I may say that postcards are still coming, there is a postcard that arrived only today. The larger number – a disproportionately high number of cards came from left-handed people, and many of them, like the envelope I'll show you now, were in mirror writing. And one is addressed to our producer George Noordhof, and I can only suppose that the Post Office supplied mirrors to its postmen for the purpose of its delivery.

We were particularly interested, as you will recall, with how left-handedness in writing goes with left-handedness in sewing or left-handedness in kicking, and the like. Now there we found something which really is rather interesting about educational policy in the past. That if you analyse the replies by age groups then you found that people who've been to school, oh, about, 40 years ago, had on the whole been bullied out of being left-handed. That is, we had many left-handed throwers or left-handed kickers who were right-handed writers. But as we come down the age scale to modern times we found this less and less, until in the present generation of schoolchildren we found that almost no left-handed throwers were right-handed writers. I'm afraid that Dr Smith wouldn't care for this very much, but those are the facts.

I'm only giving you a kind of stop press report on this, because there has been far too large a response for me or anyone to be able to do a complete analysis. The analysis has been done by the Department of Psychology of the University College of London, under the direction of Sir Cyril Burt. And he asks me to thank viewers for giving him an amount of information which is, oh, many tens of times larger than it's ever been obtained on this topic before. I hope that you will make Dr Andrews this evening feel equally obliged to you. Goodnight.

None of the ensuing programmes gave any further information about the survey of handedness, and as far as we can tell none of the data have ever been published in any form.

THE PARTICIPANTS IN THE PROGRAMME

The programme transcript has on its opening page:

PRODUCED BY: G E O R G E N O O R D H O F

Those taking part:

Dr J. Bronowski
 Dr K. Smith
 Helen Cordet
 Philip Harben
 Elizabeth Allan
 Mervyn Levy
 Brenda Bruce
 Eamonn Andrews
 Chimpanzee

Among the celebrities were Helen (properly, Hélène) Cordet (1924–1996), who was just finishing a run of presenting a Saturday evening cabaret show entitled *Café Continental*; Philip Harben (1906–1970) the first TV chef on the BBC; Elizabeth Allan (1908–1990), a film actress who achieved stardom on BBC TV's *What's my Line?*; Mervyn Levy (1915–1996), an artist whose portraits of Dylan Thomas are in the National Portrait Gallery, London, who subsequently became a friend of Kenneth Smith, and whose portrait of Smith is owned by his family; Brenda Bruce (1918–1996), a television and film actress; and Eamonn Andrews (1922–1987), the television presenter who at the time of the programme was on *What's my Line?* and subsequently found lasting fame with *This is Your Life*.

The identity of the chimpanzee is not known, but a newspaper clipping of unknown provenance said that “George Cansdale would be taking part”. Cansdale (1909–1993) was the Superintendent of the London Zoo, who had been working with animals on television since 1948. Another newspaper clipping commented, “But it was hardly tactful to introduce a chimpanzee after the fuss over J. Fred Muggs”, a reference to a chimpanzee who from 1953 to 1957 was the mascot of the American NBC's *Today Show*. The “fuss” probably refers to a controversy over whether the chimpanzee trivialised the *Today Show*, a story that eventually resulted in a comment in 1955 in the

Soviet newspaper *Izvestiia* that “Muggs is necessary in order that the average American should not look into reports on rising taxes, and decreasing pay, but rather laugh at the funny mug of a chimpanzee”.⁵

One of the participants, Dr Jacob Bronowski, and also one of the collaborators in the programme mentioned several times in the script, Professor Sir Cyril Burt, are well known, and biographical information is readily available.

Dr Jacob Bronowski (1908–1974)

A distinguished scientific broadcaster, who studied maths at Cambridge, and was subsequently lecturer in mathematics at University College Hull (Sheets-Pyenson, 2004). During the war he carried out operations research, including studying the effects of the atomic bomb at Nagasaki. After the war he worked for the National Coal Board, but was also gaining a reputation as a broadcaster, particularly on television programmes such as *The Brains Trust*, where he was particularly successful because of his wide range of interests, his first two books, published in 1939 and 1944, being on poetry and on William Blake. He subsequently published extensively on science and values, and the two cultures. His best-known achievement in television was his 13-part series, broadcast in 1973, *The Ascent of Man*. Figure 3 shows Bronowski in action in a programme from the early 1960s, in which he was describing the Platonic solids (Bronowski, 1964, p. 105). He had first appeared on television in 1951, and in 1953 wrote a letter to George Noordhof, the producer of *Science in the Making*, summarising his approach to presenting science on television:⁶ “I like the logical unfolding of a scientific idea. I do not care for programmes which work by the accumulation of points. I find it easiest to explain a scientific idea by presenting its evolution, because I want to explain its inner logic.” At the time of *RHLH*, Bronowski was working at the National Coal Board’s Central Research Establishment at Stoke Orchard, Cheltenham, of which he had been director since 1950.

Sir Cyril Burt (1883–1971)

An important but controversial figure in the history of British psychology (Mazumdar, 2004). As an educational psychologist he was extremely influential, contributing extensively to the work of the Board of Education. In 1932 he was appointed Professor of Psychology at University College

⁵ en.wikipedia.org/wiki/J._Fred_Muggs

⁶ atschool.eduweb.co.uk/stevemoss/bron/noordhoff.htm

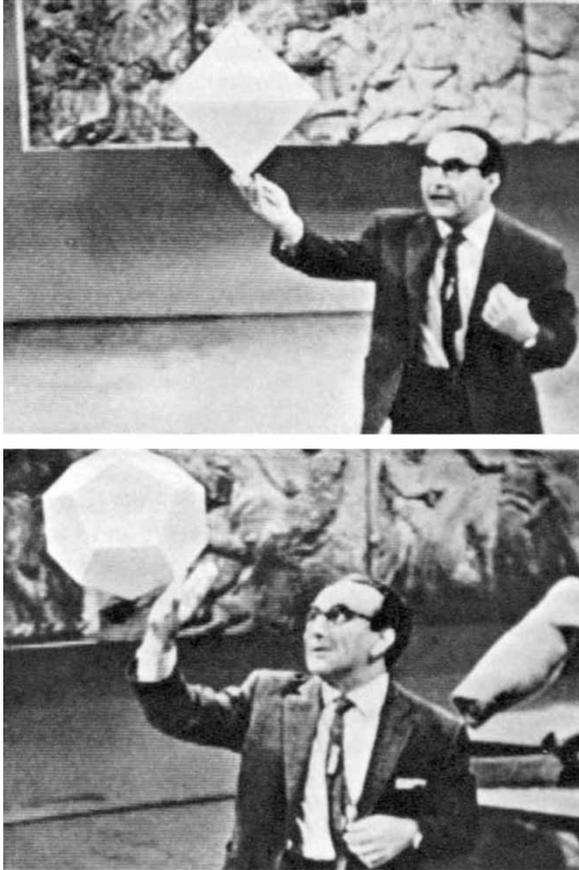


Figure 3. Dr Jacob Bronowski in a television programme from the early 1960s.

London, succeeding Charles E. Spearman, and he remained there until his retirement in September 1950. His retirement was not a relaxing one, not least because of financial problems which meant that even until his last days he was carrying out large amounts of routine work, such as marking of exam papers and theses. Relatively soon after his retirement his ideas were also becoming controversial in the media, particularly because of his emphasis on eugenics. He died in 1971 and controversy re-erupted in 1976 when, in the London *Sunday Times*, he was accused of fraud. The existence of several of his research assistants was questioned and the suggestion made that many of his data on separated identical twins were fabricated. The controversy has continued since then with a series of books on the topic, taking many different positions (Hearnshaw, 1979; Joynson, 1989; Fletcher, 1991; Mackintosh, 1995). Burt was a frequent contributor to BBC Radio—as

Mr George Noordhof (b. 1922)

George Noordhof was the last of the main participants to be found. A few sparse details about him had been gleaned from the Internet. Noordhof was a student in Cambridge in 1949, where he was a member of the Footlights Company, and was also its property master. In 1953–1954 he produced *Science in the Making* for BBC TV, and he also produced a programme called *Science News*, which Arthur Dungate said “must have been one of the first science programmes on television”.⁸ Much later, from 1987 to 1988, he was Head of Media Services at Brunel University, where he acted as an educationalist and producer of educational television, and in 1988 he also wrote the introduction to a book on audiovisual communication (McPherson & Timms, 1988).

Eventually, in August 2005, we managed to find Mr Noordhof, who was living in London, aged 83, with an excellent memory of the events surrounding *Science in the Making*.⁹

George H. Noordhof was born in Haarlem in the Netherlands in 1922, and at the age of 9 came to live in London, where he attended a school in Golders Green. He studied metallurgy at Imperial College from 1940 to 1943, and then, being fluent in English, Dutch, and German, went to Holland and Germany as a military liaison officer. After the war, in October 1945, he went up to Cambridge and started but never completed a PhD on corrosion. A year spent in industry gave him experience of making presentations to varied audiences, and he joined the BBC in 1951, where he was the first science producer for “Television Talks”, as the department was then known. The head of department was Mary Adams (1898–1984) who had worked in television from 1930,¹⁰ was herself a Cambridge science graduate in biology, and had also started but not completed a PhD. His immediate superior was Andrew Miller-Jones (1910–1994), perhaps best known for creating the BBC television news magazine programme *Panorama* in 1953. Among the programmes that Noordhof produced before *Science in the Making* were *Inventor’s Club*, *Science Review*, and *Looking at Animals*. Subsequently he produced many programmes for television, including at

⁸ www.bbctv-ap.co.uk/marriage.htm

⁹ George Noordhof was interviewed by telephone on 8 August 2005, and in more detail on 4 October 2005, for the BBC Radio 4 programme, *6000 postcards*, broadcast 6 January 2006 – see <http://www.bbc.co.uk/radio4/factual/pip/89q7m/> (recording available from <http://www.talking-book-store.com/list.aspx?catID'87>). Much of what follows immediately is a result of those interviews. Comments elsewhere are indicated by the initials GHN. We are very grateful to him for his help and enthusiastic collaboration in carrying out this research.

¹⁰ mymovies.imdb.com/name/nm0011196/; www.televisionheaven.co.uk/history3.htm; www.museum.tv/archives/etv/W/htmlW/watchwithmo/watchwithmo.htm

least one other, in collaboration with Donald Broadbent in about 1964, from which adequate data were also collected for scientific analysis (Broadbent & Gregory, 1965).

Dr Kenneth Smith (1910–1999)

The fourth major participant in *RHLH* was particularly problematic to identify, especially before George Noordhof had been traced. All that was known from the script was the name, “Dr Kenneth Smith”. An initial false trail led to Dr Kenneth (Manley) Smith (1892–1981) who wrote a series of textbooks, as well as popular science books for Penguin, including his *Beyond the Microscope* of 1943 (revised edition 1957). However he restricted himself to writing on virology and related subjects.

A search through *Psyclit*, *Medline*, and similar databases found no papers on handedness by an author named Smith, and for nearly a year the trail ran cold. Finally, in October 2003, a Google search on “Kenneth Smith Bronowski left-handedness” found an obituary notice in the Royal College of Psychiatrists’ *Bulletin* (Early, 2000), written by Dr D. F. Early, for Dr Kenneth Carl Pfeiffer Smith (1910–1999), a psychiatrist who had been Medical Director of Wiltshire Child Guidance Services and in which it was commented most crucially, but not entirely accurately, that:

In the late 1950s he researched and presented a programme on left-handedness produced by Dr Jacob Bronowski, one of the first TV programmes to deal seriously from a psychological view point, with a topic of everyday interest.

Obituaries of Smith were also published in *The Independent* (London) on 5 November 1999, *The Guardian* (London) on 9 November 1999, and the *British Medical Journal* on 11 December 1999, of which only the latter, also written by Early, mentioned handedness (but not Bronowski). Subsequently, after making contact with Dr Early’s wife (Dr Early being unable to help because of illness), we were put in touch with Dr Smith’s widow Vera, a painter and ceramicist, and also with Dr Smith’s son, the distinguished psychologist Dr Michael J. Apter,¹¹ who is now known by his mother’s maiden name. Apter has published extensively on “reversal theory”, an

¹¹ Professor Apter was interviewed at length on 19 December 2003 by ICM, and a somewhat shorter discussion was also held on the same day with Kenneth Smith’s widow, Vera. Much of the material in this section comes from those interviews, and from press cuttings and other memorabilia in the possession of the Smith family. Comments elsewhere referring to the interviews are indicated as MJA.

approach to psychology that was initiated in collaboration with his father, whose clinical observations had engendered the theory, and Apter's 2001 overview of the theory is dedicated to Kenneth Smith (Apter, 2001).

Kenneth Smith (Figure 4) was born in Bristol in 1910, and spent most of his life in the area. He qualified in medicine from the University of Bristol in 1937, went into the RAF on a short-service commission, and attained the rank of Squadron Leader. Always interested in show business, in the RAF he met a number of famous artists while presenting a national radio programme, "Aircraftman Smith Entertains". After demobilisation he returned to medicine, specialising in psychiatry initially before entering general practice, and finally becoming director of the Wiltshire Child Guidance Service. While practising he continued his interests in show business and sport (and for many years was medical officer to Bristol Rugby Club and Gloucestershire County Cricket Club), as well as gaining extensive knowledge of antiques, particularly art nouveau and art deco. A large man in every sense, with a big personality, who was a good pianist, singer, compère and raconteur, he loved being in and around the entertainment industry, and he had many long-lasting friendships, with Leslie Howard and Paul Robeson among others. The interest in entertainment passed in part to



Figure 4. Dr Kenneth Smith, drawn in 1953 by Mervyn Levy, whom Smith met while taking part in *Right Hand, Left Hand*. Pencil on paper, slightly foxed; the picture is in the possession of Dr Smith's family.

his sons, the younger of whom, Paul, is a producer for BBC TV. The older son, Michael, though now a psychologist, had at one time appeared on student television.

Kenneth Smith's interest in left-handedness came about through his clinical work, since so many children seemed to be left-handed or ambidextrous. He never published any formal research on the topic (nor indeed on anything else), but had a life-long interest in the topic, seeing it as "an awkward way of interacting with the world". He was not left-handed himself, and neither was there a history of left-handedness in the family. He had at some time sent data on handedness to Malcolm Piercy and Oliver Zangwill in Cambridge (and he had a copy of Zangwill's 1960 monograph), but had been disappointed that nothing had come from that initiative.

RHLH was apparently Smith's first television appearance, but subsequently he appeared on a number of other programmes in the 1950s, including an ITV programme entitled *Crossroads*,¹² which was broadcast on 29 September 1955 in the very first week of ITV's broadcasting. It was a panel discussion chaired by Leslie Mitchell (1905–1985),¹³ subsequently Head of Discussion Features, and the co-panellists with Smith were the actress Lesley Osmond,¹⁴ and the future MP Jeremy Thorpe¹⁵ (see Figure 4 and Figure 5, which give a good idea of how Smith would have looked at the time of recording *RHLH*). The programme had a very psychological approach, taking a participant at a critical moment, a crossroads in their lives, discussing what options might have been available to them, and then finding out from the participant what they had actually done.

It is not clear how Kenneth Smith became involved in *RHLH*, although it is possible that he had previously done a radio programme on the topic – "and he was the local psychological expert". George Noordhof was also very clear that Smith was "a television natural", relaxed, unstuffy, humorous, and with a good presence. Smith did not know Bronowski (and indeed he apparently only met Bronowski on the day of the programme [MJA], and "regarded [Bronowski] as a bit of a charlatan"). Smith did know Burt a little, as perhaps would anyone who worked in child guidance, given the prominence of books by Burt, including the two parts of *The sub-normal*

¹² Not to be confused with the subsequent soap opera of the same name which was broadcast from 1964 to 1988.

¹³ <http://www.doramusic.com/LeslieMitchell.htm>

¹⁴ We have been unable to find much in the way of biographical details, except that she was born in 1921 and died in 1987. Between 1942 and 1951 she appeared in a series of films (www.imdb.com), with IMDb describing *Death is a number* (1951) as "A good contender for possibly the worst British feature film of all time."

¹⁵ Jeremy Thorpe (b. 1929), who from 1954 worked as both a barrister and a TV presenter, was subsequently an MP and leader of the Liberal Party. His career collapsed in scandal in 1976 (en.wikipedia.org/wiki/Jeremy_Thorpe).



Figure 5. A studio photograph taken on the set of the ITV programme *Crossroads*, probably of the edition broadcast on 10 November 1955. The woman on the left is a member of the public who is the “story-teller”, describing a crucial moment in her life. The other individuals from left to right are: Leslie Mitchell, the chairman; Lesley Osmond, an actress; an unidentified woman; Dr Kenneth Smith, with pipe in hand; and Jeremy Thorpe, then a barrister and TV presenter.

school child—volume 1 being *The Young Delinquent* (Burt, 1925), first published in 1925, with its fourth edition in 1944 (reprinted 1969) and volume 2 being *The Backward Child*, first published in 1937 and by 1961 in its fifth edition (reprinted 1969), with a 90-page chapter on “Left-handedness” (Burt, 1961).¹⁶ As far as Smith’s other reading is concerned, he certainly owned a copy of Blau’s *The Master Hand* (1946), as well as Woodworth’s *Experimental Psychology* (1938).

MAKING THE PROGRAMME

Kenneth Smith’s contract with the BBC stipulated that he would be paid £31.10.0d plus expenses, and said there would be rehearsals at 6.00 pm on 13 August and 3.00 pm on 14 August, although Smith only attended the rehearsal on the 14th. The programme itself was broadcast at 9.45 pm on 14

¹⁶ Although *The Backward Child* went into five editions, a comparison of the 1st and 5th editions shows very few changes, apart from the addition on the title page of Burt’s knighthood and a collection of honorary degrees. The pagination of the 1st edition is identical to that of the 5th edition for all six chapters (and in particular, Chapter X on left-handedness is from pp. 270–359). The only major change in pagination is that the last Appendix, III, “Statistical criteria”, runs from pp. 658–674 in the first edition, and pp. 658–684 in the fifth edition. Likewise the tables and figures are identical. We can find no differences of any sort in the chapter on left-handedness. Certainly there is little evidence for Burt’s comment in the Preface to the 5th edition of him taking the opportunity “to incorporate the results of recent research ...”.

August, at the Lime Grove Studios in Hammersmith, West London,¹⁷ from Studio D which had been the first to go live in 1950.¹⁸ Michael Apter, then aged 14, and his mother were present in the studio at the recording. The younger son Paul, aged 10, stayed at home and, as the family didn't have a television, watched the programme at a neighbour's. He remembers standing in the garden moving the aerial around as those inside shouted whether the picture was better or worse. Michael Apter remembers the studio as very hot because of the lights, and rehearsals went on all day. "A little before the programme went out my father said I can't go on, I need a breath – get some air." And so he walked up and down the street for half an hour with Michael and his mother. When they got back "there was absolute panic in the studio". However Smith "was not panicking – [he] already had some understanding of reversal theory – need[ed] to reverse at some point".

Michael remembers his father talking to the family during the rehearsals, but also recalls that none of the other participants, including Bronowski, talked to the family, with the sole exception of Eamonn Andrews, and "My mother fell in love with him on the spot."

As with much early live television there were technical problems, such as Smith being unable to see any of the films that were being transmitted, since they were broadcast from Alexandra Palace and could only be seen on a single monitor. The movements were acted out by a technician, and those in the studio had to guess what was happening.

RESPONSES TO THE PROGRAMME

The programme was reviewed in *The Listener* on 20 August 1953, by Reginald Pound, the "Critic on the hearth" (p. 314). The review was not especially good, and in particular did not like the use of celebrities:

A more discerning instinct would have rejected the celebrity notion as hackneyed . . . The theme was curiously muddled, and because of it was made at times to seem embarrassingly trivial. I think it would have been better to leave the doctor to make his points in his own engagingly homespun fashion, with the aid of the cartoons. Fine as are Bronowski's expository powers, they were clouded on this occasion by his oozing suavity.

We are aware of only one other brief review, in an unidentified newspaper, which commented that "it is possible to be instructive without boring". We have also searched the full-text *Times Digital Archive*, which apparently

¹⁷ en.wikipedia.org/wiki/Lime_Grove_Studios

¹⁸ For pictures see www.bbctv-ap.co.uk/lgdem01.htm and www.bbctv-ap.co.uk/lgdem05.htm

contains no mention of the programme. The Apter family does have a few press cuttings, from unidentified newspapers, one of which is entitled “Tele-talk”, and contains some comments by George Noordhof:

Although these are basically serious science programmes, I want them to be fun. . . . At the same time I hope that, with the co-operation of viewers, we shall be able to make a valuable contribution to scientific knowledge.

The force of the piece might have been a little greater if the author had not also commented, entirely wrongly as it turned out, that “The second programme – in the autumn – on *Humour*, will endeavour to find out the kind of jokes that make people laugh most”.

An undated piece in the London *Daily Mail*, entitled “Viewers will aid science”, fairly accurately described three of the questions that would be used in the questionnaire, but was also under the impression that the second programme in the series would be on humour.

METHOD

A preliminary sort of the postcards was carried out by ICM, RR, JM, and MF, and the cards were organised by age, sex, and handedness (see Figure 6). The postcards in the archive were numbered using an automatic numbering stamp, and as many details as possible entered into the computer by JM and MF, as part of their final-year undergraduate projects for the BSc degree. JM and MF were equally and jointly responsible for data entry, although JM’s



Figure 6. One of the authors (RR) sorting the postcards by age, sex, and handedness. These cards, from female right-handers, are grouped by decade of age, and literally form a histogram.

project primarily concerned the incidence of handedness, whereas MF's concerned the duck-rabbit illusion.

RESULTS

Only basic descriptive statistics will be presented here, more detailed analyses being reserved for the subsequent two papers.

Altogether 6,336 postcards were found in the archive, of which 213 contained information from multiple individuals, almost always members of the same family, and therefore details of 6,549 individuals were known. Not all information was available for all individuals.

Date of posting

Figure 7 shows the distribution of date of posting in our set of postcards. The programme was broadcast late on Friday 14 August (which we have described as day 0), and most postcards were postmarked Saturday 15th (+ 1), there was then a slight dip for Sunday 16th (+ 2) (and in 1953 there were Sunday postal collections throughout the UK), and the numbers then rose again on Monday 17th (+ 3). The number of cards returned is almost

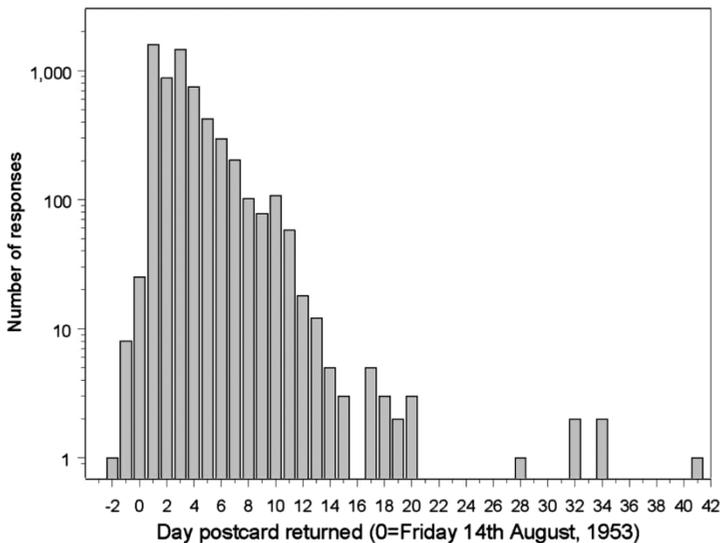


Figure 7. Date of response. Day 0 is the day of broadcast of the programme. Note that the vertical axis is logarithmic.

linear when plotted on a logarithmic scale, as in Figure 7, indicating that to a first approximation the number of returns declines exponentially. A few postcards are dated on or before 14 August (0, -1, or -2), and from comments made on some postcards these are probably from people who answered the *Radio Times* questionnaire before watching the programme (and, interestingly, some postcards indicated that they were returned by people who did not have a television, but were still interested in the topic). The last postcard in our collection is dated 24 September (day 41).

Age and sex

The respondents ranged in age from 5 to 89 (mean 35.8; SD 14.8; median 33; quartiles 25 and 44; 5th percentile 15; 95th percentile 65). A total of 3,014 respondents were male (46.0%), 3,534 were female (56.0%), and one did not give their sex.

The handedness questions

The details of these will be left to a succeeding paper. Suffice it here to say that 5,444 (83.1%) individuals said that they used the right hand for writing; 64 (1.0%) said that they used the right hand for writing but added a comment that they had at one time used the left hand for writing; 107 (1.6%) said they used either hand for writing; and 934 (14.3%) used the left hand for writing. Altogether, therefore, 1,105 (16.9%) of individuals did, had, or could use the left hand for writing. That proportion is higher than most current estimates of the rate of left-handedness, and suggests a response bias—a conclusion that will be analysed in more detail in a succeeding paper. Table 1 shows the responses to each of the handedness questions.

The duck–rabbit question

All analysis of this will be deferred until the succeeding paper. However it is of interest to note here that only 3,701 (56.5%) of the 6,549 respondents answered the question about the mystery animal, with 2,268 (61.3%) saying it was a duck (or duck-like), 911 (24.6%) saying it was a rabbit or rabbit-like, and 522 (14.1%) mentioning both duck-like and rabbit-like answers. The high proportion of non-responders to this question probably reflects the fact that, first, the question was not on the *Radio Times* questionnaire, and second, some respondents did not watch the television programme but only replied to the questionnaire that they had seen printed in the *Radio Times*.

TABLE 1
The questions and some answers

	<i>Right</i>	<i>Either</i>	<i>Left</i>	<i>Total</i>
(1) Which hand do you WRITE with?	5444 (83.1%)	107 (1.6%)	998 ⁺ (15.2%)	6549
(2) Which foot do you prefer to KICK with?	4559 (69.6%)	490 (7.5%)	1499 (22.9%)	6548
(3) When you are brushing your teeth, which hand you hold the BRUSH in?	4827 (73.7%)	250 (3.8%)	1470 (22.4%)	6547
(4) Which hand do you prefer to THROW a ball with?	4916 (75.1%)	151 (2.3%)	1476 (22.6%)	6543
(5) If you are winding wool or string which hand do you HOLD the ball in?	1792 (27.4%)	321 (4.9%)	4427 (67.7%)	6540
(6) If you had to carry a glass with water filled to the brim, which hand would you prefer to CARRY it in?	4103 (62.7%)	883 (13.5%)	1555 (23.8%)	6541
(7) What is your SEX?				
(8) What is your AGE?				
(9) What exactly is your JOB? (If you are a housewife or retired what <i>was</i> your job?)				
(10) What KIND of work do/did you do in this job?				
(11) Very briefly, what TRAINING or qualification did you need for the job?				
(12) Do/did you happen to have anyone working under you in this job? If so, HOW MANY?				

The 12 questions included in the *Radio Times*, and the proportion of respondents answering Right, Either, or Left to the six handedness questions. The words in capitals are the terms that respondents were asked to use when describing the questions.

⁺ Includes 64 who indicated that they currently used their right hand but had used their left hand in the past.

DISCUSSION

Right Hand, Left Hand, the first of seven episodes of *Science in the Making*, was an important early achievement of Dr Jacob Bronowski,¹⁹ and helped to consolidate his position as a television personality and scientific presenter. Bronowski's philosophy of making science accessible took several forms. In *RHLH* he allowed programme contributors to carry out model experiments for demonstrating principles, and subsequently, by allowing viewers to partake in the process of data collection itself, he demonstrated the ways by which science makes progress. Later, in *The Ascent of Man*, he was most

¹⁹ *Science in the making* was not Bronowski's first television programme on science, his debut being "in a programme which he guided himself" in 1951 (<http://atschool.eduweb.co.uk/stevemoss/bron/noordhoff.htm>). He is also likely to have taken part in Noordhof's earlier series, *Science News*.

clearly to demonstrate his belief that “the other possible method is to trace the evolution of a scientific idea”.

The title of the programme

It was not coincidence that the topic of handedness was chosen for the first programme in the series for, as Noordhof said, it was something on which everyone has made observations. Everyone is clear about their own handedness, most people are aware that a sizeable minority of the human population is left-handed, and many, not least left-handers themselves, have wondered why. It is therefore a perfect topic with which to engage studio participants and viewers, particularly as Bronowski, “really didn’t want to talk about theories [but] generally wanted to make it easy [for people] to note things that were peculiar [about the world]” (GHN).

The title was also guaranteed to attract attention. A few years earlier, in 1945, Sir Osbert Sitwell had published the first volume of his autobiography, the five volumes together going under the collective title of *Left Hand, Right Hand!*²⁰ For the time it was a major publishing sensation,²¹ selling over 141,500 copies by 1948 (Ziegler, 1999), and therefore was well known among the book-reading classes who also were likely to watch serious television programmes on science. The title of the programme was Noordhof’s, who also created the other titles in the series [GHN]. The near universal knowledge about Sitwell is shown by the fact that Kenneth Smith apparently had his book, despite the fact that he “didn’t read much fiction or biography” (MJA).

The analysis of the questionnaire

The questionnaire included in the *Radio Times* was returned, according to the comment in the programme itself, by 8000 individuals. Perhaps the most intriguing and most disappointing of the outcomes of the programme was how little was done with the data (and Noordhof was shocked, in 2005, to find that little had been done with the data in comparison, say, with the data

²⁰ The exclamation mark is a part of Sitwell’s title. One of us (ICM) has also published a book entitled *Right Hand, Left Hand* (McManus, 2002). That title was a direct modification of Sitwell’s title, but at the time of writing the author was completely unaware of the BBC programme of the same title, and indeed would have referred to it if he had been so aware.

²¹ The impact can be assessed from the fact that John Lennon, for his first book, published in 1964 as *In his own write*, had apparently considered adapting Sitwell’s title as *Left Hand, Left Hand* (see e.g., www.kirjasto.sci.fi/lennon.htm).



Figure 8. Dr Charlotte Banks, who collaborated with Sir Cyril Burt (original in Department of Psychology Archive, University College London; date unknown).

from the twin programme²²). Bronowski refers rather grandly to Sir Cyril Burt “and his team”, but it seems unlikely that there was much of a team for, as Hearnshaw (1979, p. 245) said, “After his retirement [Burt] had few, if any, co-workers, apart from Charlotte Banks, who assisted him with a small number of articles.” The only person who can be identified with any certainty is Dr Charlotte Banks (Figure 8), a lecturer in psychology at University College London from about 1950 to the 1970s, who published research papers with Burt (Banks & Burt, 1953, 1954; Burt & Banks, 1947), edited a *Festschrift* for him (Banks & Broadhurst, 1966), and later published her reminiscences of Burt (Banks, 1983). The marks in red biro on the cards are in her handwriting, and occasional cards also carry the tell-tale signs of burns from a cigarette left on a card—Banks was an inveterate smoker. All but about 2% of the cards have red ticks upon them, and therefore almost all of those that we had processed had also been processed by Banks. There is, however, no record of Banks ever publishing any research on handedness. Some processing of the data was clearly carried

²² Professor James Shields (1918–1978) had collaborated in the programme on twins, and the data collected in the audience survey, in particular on pairs of twins separated early in life, contributed to his subsequent book on the subject (Shields, 1962).

out, demonstrated by the comments at the end of the second TV programme, although these say relatively little. The first (numerical) code written on the cards seems to refer to the place of origin, and the third (numerical) code indicates whether the mystery picture was seen as a duck (1), a rabbit (2), or a mixed answer (3). Place of origin and duck/rabbit were each referred to in the second programme. What the tick indicated is not at all clear. Altogether 61.7% of cards had a tick on them, but we could find no correlation with any other aspect of the data that we had coded.

The questions on the questionnaire

In the programme Bronowski is explicit that the handedness questionnaire was written by Burt: “We consulted a most distinguished authority, Sir Cyril Burt, and he drew up some questions which have never in the past been answered by many people.” The questions on the questionnaire are also interesting, not least because the specific set of questions is unusual, and does not seem to have been used before in this form. The idea of a questionnaire for assessing handedness was not new even in 1953. Humphrey (1951), who presented results of a 20-item questionnaire, said that it was based on Hull (1936), and that “Numerous questionnaires on handedness and laterality have been prepared by previous investigators...”. It is unlikely that Burt would have been unaware of Humphrey’s paper, since it was published in the *British Journal of Educational Psychology*, of which Burt was a member of the Editorial Board. However, of the six questions used in the BBC survey, only three—Writing hand, Throwing hand, and Hand to use a toothbrush—are included among Humphrey’s 20 items. The inclusion of the foot for kicking, the hand for holding a ball of wool or string while winding, and the hand for carrying a glass of water full to the brim, suggest that Humphrey’s paper had little influence on the BBC questionnaire.

Burt himself, in *The Backward Child*, does say, “For group inquiries a questionnaire on the following lines will pick out about 90 per cent. of those with left-handed tendencies” (1961, p. 279), and there then follows a list of 10 tasks. However only four of them are in the BBC questionnaire, three being the same as those in the Humphrey questionnaire (Write, Throw, Brush), and the fourth being the somewhat unusual item “to carry a cup of water or lift a glass in drinking”; the wording is not, however, as specific as that used in the BBC question. Holding a ball of wall and kicking are not mentioned by Burt (and indeed Burt does not seem to mention foot preference at any point). Burt does suggest that a 3-point answering scale should be used (“The words ‘left’, ‘right’, ‘either hand’ are printed as alternative answers against each question”). Although the BBC questionnaire does allow three responses—“Left or Right (or either)” —the

parentheses and the lower-case for “either” suggest that it is hoped few people would use it (as indeed was the case). In the transcript, Bronowski explains how to fill in the questionnaire, and does at least mention the possibility of replying “either”, saying:

... pick out the first question which says: ‘Which hand do you write with?’. Just write the word ‘WRITE’²³ there, and put R for right. Which foot do you kick with? Write the word in capitals – KICK – oh let’s say that I kick with either foot. Which hand do you brush your teeth with? Just pick out the word BRUSH and white – right hand, and so on down the card ...

Although the use of a 3-point scale might seem to reflect Burt’s influence, Humphrey also used a 3-point scale in his study.

Perhaps the most unusual feature of the questionnaire is the question asking “If you are winding wool or string which hand do you hold the BALL in?”. A strong right-hander would typically hold the string in their right hand, and hence the ball in their *left* hand, so that most people would be expected to answer “left” (as was indeed the case). Such reversed items are common nowadays in handedness questionnaires, but were not used either in Humphrey’s questionnaire or in the set of 10 questions that Burt described. Why it was included in the BBC questionnaire is not at all clear.

When asked about Burt’s contribution to the questionnaire, Noordhof suggested that “what Bruno [Bronowski] said [about Burt’s contribution] in the programme was one thing – but I don’t think he was greatly enamoured by the connection with Cyril Burt” (GHN). Burt had apparently not got on well with Noordhof, in part following on from Burt having a number of other bad incidents involving the media, and he was very caustic to Noordhof and the others. The only one who got on well with the *RHLH* team was Charlotte Banks, described as “a jolly hockey-sticks sort of woman” (GHN).

Six of the questions do not ask about handedness. Two, on sex and age, are standard for almost any survey and are uninteresting. The remaining questions are less obvious, and are concerned with the person’s job. “What exactly is your JOB?” and “What KIND of work do/did you do in this job?” are somewhat overlapping, but nevertheless fairly useful in any survey, as perhaps also is the question on qualifications, which effectively is about educational level: “Very briefly, what TRAINING or qualifications did you need for the job?” The final question, though, is unusual: “Do/did you happen to have anyone working under you for this job? If so, how MANY?” Even ignoring what is now the rather strange usage of “happen”, with its

²³ The transcript actually says “the word ‘Right’”, but it is an easy error to make, and few of us are entirely innocent of it.

modern implication that this somehow occurred absent-mindedly or by chance, the purpose of the question is obscure. At the time of the survey there was undoubtedly literature showing a sex and probably an age/cohort difference in the rate of left-handedness, described among others by Burt (1961), but we are unaware of any work on handedness and social class, job type, educational level, or responsibility for others in employment. In reality the answers to the questions do not seem to have been analysed—and it is not surprising, to anyone used to analysing questionnaires, that the answers are in fact pretty well unanalysable (and we did not even attempt to code them in our re-analysis). Although the questions themselves are quite interesting and, as Noordhof emphasised to us, he was keen to have them included as they were there to show the breadth of the social background of the respondents, in reality little systematic work could be done with them.

On balance it is not at all clear where several aspects of the BBC questionnaire came from. Although Bronowski clearly attributes it to Burt, there are sufficient discrepancies from Burt's own published thoughts to make it possible that he did not actually write the questions, and that may be reinforced by the fact that subsequently he seems never to have published anything on them, not even in subsequent editions of *The Backward Child*, where it seems highly surprising that he does not comment on such a large survey. The questionnaire may have been put together on an ad hoc basis by diverse hands, several perhaps unskilled at questionnaire construction (and that is supported by the inclusion of the near unanalysable question on employment, training, and job responsibilities). However the questions on employment do suggest that the author must have had some prior research questions, but precisely who that author was, and what the questions were, are very unclear. Certainly the data obtained on those questions still remains unanalysable in any straightforward quantitative way, at least by us. However, a more qualitative analysis might reveal something of historico-sociological interest.

The number of responses

To recapitulate, we found 6,336 postcards in the archive, of which 213 contained information from multiple individuals, almost always members of the same family. Therefore the handedness of a total of 6,549 individuals was known. In the second programme however, Bronowski comments that “we had over 8,000 postcards, rather more than half by women, rather less by men”. Our total of 6,336 is therefore somewhat less than that reported, although we also found a small excess of women (54.0%). Bronowski also comments that, “Our most distant postcard came from Norway. And I may say that postcards are still coming, there is a postcard that arrived only today.” However, we did not find a card from Norway among our collection.

Although Bronowski comments in the second programme, on 12 October, “that postcards are still coming, there is a postcard that arrived only today”, our analysis of the date of posting of the cards in our collection suggests that there are unlikely to be many late arrivals (and certainly there are none in our collection). Interviews with Noordhof also made it clear that Bronowski and the rest of the team saw few, if any, of the returned questionnaires (and anyway, would have been busy working on the next programme when the replies were arriving).

An important question concerns whether our collection of 6,336 cards is in fact the entire collection, or whether there were actually “over 8,000” and another 1,700 or more have been lost or are lurking elsewhere. When the postcards were found, in their two cardboard boxes, they were not obviously organised in any chronological or other order, with no rubber bands or other method of classifying them. The negative exponential rate of responding after the programme in our set of cards suggests they are probably at the least a random sub-set of the entire data, if the true number is indeed larger than 6,336. More likely, we suspect, is that the data had never been completely analysed for the programme, and that Bronowski’s figure is at best a guesstimate and perhaps an optimistic one at that. In a revealing comment on Bronowski’s attitude to the absence of precise numbers during broadcasting, Michael Apter recalled how, during the rehearsals, his father had talked to him and his mother about how Bronowski wanted Smith to say what percentage of the population was left-handed. Smith had said, “We can’t say that because we’re not sure,” to which Bronowski had apparently replied, “You say, ‘Ooooh ... there are about ten per cent’ ... that’s what I do when I’m not sure.”

The response rate

Calculating a response rate for the questionnaire is not straightforward because although the numerator is known, the denominator is very unclear. The *Radio Times*, in which the questionnaire was printed, at one time had the largest circulation of any magazine in the UK, selling about eight million copies a week.²⁴ However most of the readers would have been primarily interested in the radio rather than the television schedule. The number of television sets in the UK was very low when television broadcasting restarted after the Second World War, there being only 15,000 households watching in 1946, a figure that had risen to 90,000 by 1949 (Dunn, 2003). For most of the

²⁴ www.offthetelly.co.uk/features/rt1.htm

public the turning point for BBC television was the Coronation, on 2 June 1953, which was watched by about 20 million people in the UK, often on television sets erected in church halls or with a dozen or 20 people sitting in a living room. The percentage of homes with a television licence rose from 0.1% in 1947, to 48.1% in 1957, and 88.1% in 1967²⁵, with about 12% of households having a licence in 1953 (Macmillan & Smith, 2001). If the UK population was about 52 million, and making some adjustment for the old and the young who would not watch television, then perhaps 5 million people had regular access to TV in their homes. Of these, only a small percentage were likely to watch a science programme, particularly one broadcast after speedway racing. However, it was a Friday evening, presumably a good spot. If 1% of those with a television watched the programme, then that would have meant about 50,000 viewers. Not all of those would have had the *Radio Times* to hand (although probably most would have, given its penetration of the market), and not all would have wanted to take part. The 6,336 respondents are perhaps 12% or so of the total viewers, although it is accepted that the figure is a very broad estimate, and the true rate could be much lower than that—it is unlikely to be much higher. Certainly the response rate leaves room for response bias to occur and, as has already been seen, there is a clear excess of left-handers among the respondents (and that will be discussed in detail in a subsequent paper).

The script

Michael Apter commented that his father, Kenneth Smith, was unlikely to have written any of the script as such, “as he practically never wrote anything. But he obviously had an input” [MJA]. That was supported by George Noordhof who described how the basic writing of the script was done by Noordhof himself, “although Kenneth gave us a number of for-instances ... and Kenneth was [used] as a sounding board” [GHN]. Noordhof also described taking the script to Bronowski at his home in Cheltenham (Bronowski’s “day-job” still being with the National Coal Board laboratories, which were based there): “used to visit him, stay over, ... and we’d talk about things. [Then we would] have the basic structure.” Noordhof also described how “Bruno [Bronowski] was a marvellous presenter – he made his own thing of it, based on the script we gave him”, a comment that is supported by a detailed comparison of the script and the transcript. It seems unlikely that Cyril Burt was involved

²⁵ www.iser.essex.ac.uk/pubs/workpaps/pdf/1990-03.pdf

directly in the writing of the script of *RHLH*, and Noordhof did comment on how Burt “in some peculiar way, was rather difficult to me”, being “rather caustic”, and “annoyed by people of the likes of me [i.e., from the media]”. Certainly some of the comments in the programme do not look as if they could have come from Burt. For instance, Bronowski’s comment in the second programme about “people who’ve been to school, oh, about, 40 years ago, had on the whole been *bullied* out of being left-handed” (our emphasis) hardly fits with Burt’s own view, expressed even in the final 1969 edition of *The Backward Child* that “in general . . . parents and teachers will in the long run earn the gratitude of the child if they do all they can to make him right-handed from the very start” (p. 323).²⁶ The words given to Smith in the programme script are a little more liberal:

One piece of advice – begin at the earliest possible moment before the age of six, if your child is left-handed, try to help it to be right handed. It is in many ways more convenient to be right handed in a right handed world, but do not force [the child] to be right-handed. Give the child the opportunity to be right handed.

In the programme itself, though, the transcript finds an even less forceful Smith actually saying:

Well, the advice I would give is from the earliest possible days to give right-handedness the first chance, for toys, spoons, in the position where they are more convenient for the right hand. But I must issue a warning as well; be patient, be gentle. Don’t fuss, don’t be insistent, and don’t be obvious.

The implication is that Smith himself had not written the precise words in the script, and that being, like Bronowski, a seasoned and experienced performer, he was willing to improvise around the text. Likewise, in those words of Smith’s one can also hear the practised words of an experienced clinician used to advising in the clinic. None of that, however, is compatible with Burt.

²⁶ This comment of Burt’s is, however, at odds even with some other of Burt’s own statements in *The Backward Child*, where he discusses how “in the more advanced of our modern infants’ schools, greater freedom is nowadays allowed for the natural inclinations of each child” (p. 289). Whether that is beneficial or not cannot, he says, be known until more is understood about left-handedness: “Only when we have solved these problems can we say whether a right-hand training for the left-hander is feasible and wise, or whether it will be attended by unsuspected risk and perhaps by insuperable difficulties” (p. 290).

CONCLUSIONS

The programme *Right Hand, Left Hand* is an interesting example of a very modern approach to television broadcasting, with the use of celebrities in a studio carrying out a range of tasks, and viewers sending in data by means of postcards. Large-scale surveys of handedness are relatively rare in the middle decades of the twentieth century, and *Right Hand, Left Hand* potentially offers an unusual and useful source of data. Two subsequent papers will look at the data in more detail.

REFERENCES

- Apter, M. J. (2001). *Motivational styles in everyday life: A guide to reversal theory*. Washington, DC: American Psychological Association.
- Banks, C. (1983). Professor Sir Cyril Burt: Selected reminiscences. *AEP (Association of Educational Psychologists) Journal*, 6, 21–42.
- Banks, C., & Broadhurst, P. L. (1966). *Stephanos: Studies in psychology presented to Cyril Burt*. Oxford, UK: Barnes & Noble.
- Banks, C., & Burt, C. (1953). Statistical analysis in educational psychology. In C. A. Mace & P. E. Vernon (Eds.), *Current trends in British psychology* (pp. 152–171). London: Methuen.
- Banks, C., & Burt, C. (1954). The reduced correlation matrix. *British Journal of Statistical Psychology*, 7, 107–111.
- Blau, A. (1946). *The master hand: A study of the origin and meaning of right and left sidedness and its relation to personality and language*. New York: American Orthopsychiatric Association.
- Broadbent, D. E., & Gregory, M. (1965). Some confirmatory results on age differences in memory for simultaneous stimulation. *British Journal of Psychology*, 56, 77–80.
- Bronowski, J. (1964). *Insight*. London: Macdonald.
- Bronowski, J. (1973). *The ascent of man*. London: British Broadcasting Corporation.
- Bulley, M. H. (1925). *Art and counterfeit*. London: Methuen.
- Bulley, M. H. (1933). *Have you good taste? A guide to the appreciation of the lesser arts*. London: Methuen.
- Burt, C. (1933). A test in aesthetics. In M. H. Bulley (Ed.), *Have you good taste?* (pp. 44–52). London: Methuen.
- Burt, C. (1961). *The backward child* (5th ed.). London: University of London Press.
- Burt, C. (1933). *How the mind works*. London: Allen & Unwin.
- Burt, C., & Banks, C. (1947). A factor analysis of body measurements for British adult males. *Annals of Eugenics (Cambridge)*, 13, 238–256.
- Burt, C. L. (1925). *The young delinquent*. London: University of London Press.
- Dunn, K. (2003). *Do not adjust your set*. London: John Murray.
- Early, D. F. (2000). Kenneth Carl Pfeiffer Smith. *Psychiatric Bulletin*, 24, 158.
- Fletcher, R. (1991). *Science, ideology, and the media: The Cyril Burt scandal*. London: Transaction.
- Hearnshaw, L. S. (1979). *Cyril Burt, psychologist*. London: Hodder & Stoughton.
- Hull, C. J. (1936). A study of laterality test items. *Journal of Experimental Education*, 4, 287–290.
- Humphrey, M. E. (1951). Consistency of hand usage: A preliminary inquiry. *British Journal of Educational Psychology*, 21, 214–225.
- Jonson, R. B. (1989). *The Burt affair*. London: Routledge.
- Mackintosh, N. J. (1995). *Cyril Burt: Fraud or framed?* Oxford, UK: Oxford University Press.
- Macmillan, P., & Smith, I. (2001). Explaining post-war cinema attendance in Great Britain. *Journal of Cultural Economics*, 25, 91–108.

- Mazumdar, P. M. H. (2004). Burt, Sir Cyril Lodowic (1883–1971). In *Oxford dictionary of national biography*. [http://www.oxforddnb.com/view/article/30880, accessed 5 Aug 2005.]. Oxford, UK: Oxford University Press.
- McManus, I. C. (2002). *Right hand, left hand: The origins of asymmetry in brains, bodies, atoms and cultures*. London/Cambridge, MA: Weidenfeld & Nicolson/Harvard University Press.
- McPherson, A., & Timms, H. (1988). *Audiovisual handbook: How to communicate ideas with the aid of sound and pictures*. London: Pelham.
- Sheets-Pyenson, S. (2004). Bronowski, Jacob (1908–1974). In *Oxford dictionary of national biography*. [http://www.oxforddnb.com/view/article/30859, accessed 5 Aug 2005.]. Oxford, UK: Oxford University Press.
- Shields, J. (1962). *Monozygotic twins brought up apart and brought up together: An investigation into the genetic and environmental causes of variation in personality*. Oxford, UK: Oxford University Press.
- Woodworth, R. S. (1938). *Experimental psychology*. New York: Henry Holt.
- Zangwill, O. L. (1960). *Cerebral dominance and its relation to psychological function*. Edinburgh, UK: Oliver & Boyd.
- Ziegler, P. (1999). *Osbert Sitwell: A biography*. London: Pimlico.