

# Right Hand, Left Hand

*Corrections, clarifications and additional notes*

## Chapter 2: Death and the right hand

*The handedness of everyday events:* Primo Levi, in his autobiographical *The Periodic Table* (1985 p.147"), comments in the essay 'Chromium' how "life is full of customs whose roots can no longer be traced: .... the buttoning from different sides for men and women...". The buttons of men's shirts are typically on the right hand side of the garment, whereas those on women's blouses are usually on the left hand side of the garment. One common explanation is that tailors arranged the buttons to the benefit of the majority right-handers, but assumed that while men would dress themselves, and hence buttons were on the right, women would have maids who dressed them, and hence the buttons were placed on the left to help the right-handed maid. Whether there is any truth in it I know not – there is perhaps some useful work to be done in museums and art galleries to assess the universal validity of the phenomenon. [March 2002]

## Chapter 4: *Kleiz, drept, luft, zeso, lijevi, prawy*

*Left-handed DNA:* In his novel *Thinks...*, in which David Lodge describes the cognitive scientist Ralph Messenger, David Lodge describes the Holt Belling Centre for Cognitive Science on the campus of the fictional University of Gloucester:

“ ‘D’you notice anything unusual about the staircase?’ , Ralph asks.  
‘Well, it’s extremely elegant, especially the banister,’ says Helen.  
‘No, not that. It’s left-handed, like the double helix of DNA. Spiral staircases usually go the other way.’ ”  
Lodge, 2002 p.40.

Spiral staircases may usually go the other way, although that is far from clear, but DNA certainly goes the other way. [August 2002].

## Chapter 5: The heart of the dragon

*Situs inversus in literature (1):* References to *situs inversus* are rare in literature. A recent exception is in Ian McEwan’s novel *Atonement* McEwan, 2001, where a nursing colleague of Bryony’s describes a patient who says,

"It's me 'art, Nurse. It's always been on the wrong side. Me mum was just the same".

McEwan’s character Bryony also says at one point,

"To enter a mind and show it at work ... and to do this within a symmetrical design – this would be an artistic triumph".

*Atonement* is indeed an artistic triumph. The showing of the mind at work may well be aesthetically symmetric, although the mind itself would inevitably have to be asymmetric. [August 2002].

*Situs inversus in literature (2):* Dorothy L Sayers describes in her short story ‘The image in the mirror’ a curious case which presents Lord Peter Wimsey (Sayers, 1933). A character tells Peter Wimsey how,

“I’ve got my heart on the right side... My liver’s got round the wrong side, too, and my organs. ... I’ve got my appendix on my left side – that is, I had till they took it away. ... It was a great surprise to the surgeon when they told him about me. He said afterwards it made it quite awkward for him, coming left-handed to the operation, as you might say”.

Later Wimsey asks the character,

““ Were you left-handed as a child?

‘Well es, I was at first, But mother broke me of it.’ ”

The character is subsequently a murder suspect, and the plot involves mirror-images, and photographs that are printed back to front. The denouement is that the character has a mirror-image twin who was separated from him at birth and is the real villain. Eventually Wimsey reveals how:

“ ‘Dissimilar twins and some kinds of similar twins may both be quite normal. But the kind of similar twin that result from the splitting of a single cell *may* come out as looking glass twins. It depends on the line of fission in the original cell. You can do it artificially with tadpoles and a bit of horsehair.’ ”

‘The image in the mirror’ is probably set in 1930, (for a chronology of the Wimsey stories see <http://www.spies.com/~rawdon/books/mystery/sayers.html>), only two years after Aldous Huxley had referred to related experiments on tadpoles in *Point Counter Point*, and several years before Huxley and de Beer’s *The elements of experimental embryology* (1934). Sayers was clearly aware of recent scientific work, although the account is slightly garbled, *situs inversus* only occurring in these experiments if the twins are conjoined.

[August 2002]

*The curious flatfish, the Greenland Halibut*. Redmond O’Hanlon, in his account of a journey on a deep-sea trawler, has a colleague who describes the Greenland Halibut:

“The boys call them Black butts. Because they’re blackish both sides. Their left eye has moved up to the edge of the head. Wo we think they swim on the ventral edge, like normal fishes – and not like fltfish., blind side down. But surely you’re thinking – aren’t you? – their eyes are still wonlky, they must be ill-adapted as hunters. But east o the Wyville Thomson Rige, they and the various species of redfish are the main commercial catch. So in biological terms theyre very successful. But how? Well most of the time they live one or two kilometres down, and the answer is, Redmond, we don’t know.” O’Hanlon, 2002

Pictures of the Greenland Halibut (*Reinhardtius hippoglossoides*) can be found at [http://216.239.51.100/search?q=cache:HG\\_HQ8C8n7gC:www.holst.no/Ingar.Holst.Publishing.Co/ordbok/illustrations/fish/reinhardtius-hippoglossoides.html+Reinhardtius+hippoglossoides&hl=en&ie=UTF-8](http://216.239.51.100/search?q=cache:HG_HQ8C8n7gC:www.holst.no/Ingar.Holst.Publishing.Co/ordbok/illustrations/fish/reinhardtius-hippoglossoides.html+Reinhardtius+hippoglossoides&hl=en&ie=UTF-8), and

<http://216.239.51.100/search?q=cache:TrlINgOAmJAC:www.fishbase.org/Summary/SpeciesSummary.cfm%3Fgenusname%3DReinhardtius%26speciesname%3Dhippoglossoides+Reinhardtius+hippoglossoides&hl=en&ie=UTF-8>, and it can be seen how dark is the fish. A picture at <http://www.proainternacional.es/rodabae.htm>, does however look rather different.

[August 2002]

## Chapter 6: The toad, ugly and venomous

*D-amino acid incorporation into proteins in fungi and bacteria*. Bacteria and fungi that include d-amino-acids in their proteins typically do so using so-called non-ribosomal peptide synthetases, which are huge molecules that act as dedicated assembly lines for these unusual proteins (which may also contain other things which cannot be synthesised in the usual DNA-RNA mechanisms). A good review recent can be found in Gewolb (2002). [April 2002]

*The predominance of left-handed amino-acids*: The superb recent biography of the Italian novelist and chemist, Primo Levi, by Carole Angier (2002) reveals Levi’s interest in the asymmetry of molecules. His undergraduate thesis in 1941 was on Walden’s inversion, the spontaneous reversal of enantiomers. Later in his life he was still interested in the topic,

publishing in 1984 an article entitled “L’assimetria e la vita” (1984). In the article he speculates that there may have been millions of years of silent struggle between left-hand life and right-hand life, until left-hand life finally won. This is the view of Haldane and several others earlier in the twentieth century. Of some interest is that the article, despite being published in 1984, does not mention the crucial findings of Yang and Lee, for which they had received the Nobel Prize in 1957, suggesting that Levi had not kept up to date on this particular topic. It nevertheless continued to fascinate him, and in *The double bond*, the unfinished book he was writing at the time of his death, he returns to the topic, proposing three possible explanations for the excess of left-handed amino acids: “a divine plan; sheer chemical chance; a source in space” (Angier, 2002 p.686”). He rejects the first hypothesis, and then sides with the second, following the Greek philosopher Democritus who talked of ‘chance and necessity’. Ironically he rejected the third possibility, of an origin in space, mainly on the grounds that “it only moves the question of origin to another place” (*ibid*). [March 2002]

In August 1970, Levi wrote a beautiful poem entitled “In the beginning” (Levi, 1988 p.27”) which if I had been aware of it while writing *Right Hand, Left Hand* could have provided a fine ending or epigraph for the book, with its linking of the events of the Big Bang to the very hand with which we write. After talking of the very narrow human conception of time, Levi talks of the origins of the universe: “Twenty billion years before now ...There was a ball of flame, solitary, eternal ... It exploded, and every change began”.

“Even now the thin echo of this one reverse catastrophe  
Resounds from the farthest reaches.  
From that one spasm everything was born:  
...  
Everything anyone has ever thought,  
The eyes of every woman we have loved,  
Suns by the thousands  
And this hand that writes”.

[March 2002]

*The origins of amino-acids.* The hypothesis that amino-acids in meteorites come from the inter-stellar dust has been supported by two separate studies which deposited ammonia (NH<sub>3</sub>) and hydrogen cyanide (HCN) on to thin layers of ice kept at about 15° K, a temperature typical of inter-stellar space. After being subjected to high levels of ultraviolet light and then very slowly warmed to room temperature in a vacuum, the residue was found to contain amino-acids, both those found in living organisms on earth and also some which are not (Bernstein et al., 2002; Caro et al., 2002; Shock, 2002). In these experiments the amino-acids were a racemic mixture, as was to be expected given that the light was not circularly polarised. The fact that the mixture was racemic, and also confirmed amino-acids not found in living organisms on earth, confirmed that the amino-acids were not inadvertent contaminants. These experiments confirm a key part of the story provided in chapter 6 — that meteorites could contain amino-acids generated in inter-stellar dust — and now one must await confirmation that circularly polarised light in the same conditions produces an excess of left-handed amino-acids. [March 2002]

## Chapter 10: Three men went to mow

*Driving*: The novel *Austerlitz* by W.G. Sebald (2001 pp.242-243") describes Prague, after the German invasion in 1939 of Eastern Czechoslovakia:

“What particularly upset us, so Vera remarked, said Austerlitz, was the instant change to driving on the right. It often made my heart miss a beat, she said, when I saw a car racing down the road on the wrong side, since it inevitably made me think that from now on we must live in a world turned upside down”.

The invasion of Prague took place on 15<sup>th</sup> March and official documents suggest that the change to driving on the right was indeed immediate (Kincaid, 1986, p.89"). [March 2002]

## **Chapter 12: Vulgar errors**

*Why mirrors reverse left and right but not up and down.* The hoary old question of mirror reversal has recently been revived by Takano (1998), and by Navon (Navon, 2001) in the on-line journal *Psychology* (<http://www.cogsci.ecs.soton.ac.uk/cgi/psyc/newpsy?12.017>). Both articles propose complex explanations for what seems essentially simple. I am grateful to Tatsuo Tabata not only for letting me know about this recent work, but also for directing me to his own paper (Tabata & Okuda, 2000), which is probably as elegant and clear a description of the situation as one will find, and with which I am in total agreement. The commentaries of Michael Corballis on the two papers (2001, 2000) are also well worth reading.

[August 2002]

## **Chapter 13: The handedness of Muppets**

*Figure 13.1:* The caption is confusing, since it seems to imply that the gun which Billy the Kid is actually holding is a six-shooter. It is not however. The phrase “holding his six-shooter with his right hand” should be read as “so that he would hold his six-shooter with his right hand”. [March 2002]

## References

- Angier, C. 2002, *The double bond: Primo Levi: A biography*, London: Penguin/Viking.
- Bernstein, M. P., Dworkin, J. P., Sandford, S. A., Cooper, G. W., & Allamandola, L. J. 2002, "Racemic amino acids from the ultraviolet photolysis of interstellar ice analogues", *Nature*, **416**, 401-403.
- Caro, G. M. M., Meierhenrich, U. J., Schute, W. A., Barbier, B., Segovia, A. A., Rosenbauer, H., Thiemann, W. H.-P., Brack, A., & Greenberg, J. M. 2002, "Amino acids from ultraviolet irradiation of interstellar ice analogues", *Nature*, **416**, 403-406.
- Corballis, M. C. 2000, "Much ado about mirrors", *Psychonomic Bulletin & Review*, **7**, #1, 163-169.
- Corballis, M. C. 2001, "Why mirrors reverse left and right - Commentary on Navon on mirror reversal", *Psychology*, **12**, #32, 1-4.
- Gewolb, J. 2002, "Working outside the protein-synthesis rules", *Science*, **295**, 2205-2207.
- Huxley, J. S. & de Beer, G. R. 1934, *The elements of experimental embryology*, Cambridge: Cambridge University Press.
- Kincaid, P. 1986, *The rule of the road: An international guide to history and practice*, New York: Greenwood Press.
- Levi, P. 1984, "L'assimetria e la vita", *Prometeo*, #7, **September**, 62-67.
- Levi, P. 1985, *The periodic table (translated by Raymond Rosenthal)*, New York: Schocken Books.
- Levi, P. 1988, *Primo Levi: Collected poems (translated by Ruth Feldman and Brian Swann)*, London: Faber and Faber.
- Lodge, D. 2002, *Thinks....*, London: Penguin Books.
- McEwan, I. 2001, *Atonement*, London: Jonathan Cape.
- Navon, D. 2001, "The puzzle of mirror reversal: A view from clockland target article on mirror-reversal", *Psychology*, **12**, #17, 1-19.
- O'Hanlon, R. 2002, "The bellies and the beasts", *Times Literary Supplement*, **July 19th 2002**, 7-9.
- Sayers, D. L. 1933, *Hangman's Holiday*, London: Victor Gollancz.
- Sebald, W. G. 2001, *Austerlitz (translated by Anthea Bell)*, London: Hamish Hamilton.
- Shock, E. L. 2002, "Seeds of life?", *Nature*, **416**, 380-381.
- Tabata, T. & Okuda, S. 2000, "Mirror reversal simply explained without recourse to psychological processes", *Psychonomic Bulletin & Review*, **7**, #1, 170-173.
- Takano, Y. 1998, "Why does a mirror image look left-right reversed? A hypothesis of multiple processes", *Psychonomic Bulletin & Review*, **5**, #1, 37-55.