Words

Left and right

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Many words are shared by the medical profession and the laity. Of these there can be few more fundamentally important than the words LEFT and RIGHT. People sometimes confuse these terms when attempting to describe a position or direction, saying or writing one when they mean the other. An error here can be disastrous, sending the traveller down the wrong road, or causing the surgeon to operate on the wrong side of the body. The annual reports of the medical protection societies give sombre evidence for the latter type of error. Clinically, there seem to be two sources of confusion. Firstly, when we face patients, their left side is on our right hand. Secondly, and on a more profound level, there is no immediately obvious way of telling which side is which other than by memorisation. A minority of people have difficulty in spontaneous memorisation. These people are apt to say "turn left" when they mean "right," or at best will be afflicted with a momentary uncertainty when a perplexed traveller asks the way. Some overcome their difficulty by wearing a mnemonic ring on the left hand or adopting an analogous device. It is said that Sigmund Freud would make small writing movements with his right hand to establish his laterality. Yet to the vast majority of people not encumbered with this disability, the identification of right and left by memorisation is self-evident and taken for granted.

Well, how *do* we tell left from right? Perhaps the dictionary can offer a definition of these terms. Let us see what the *Oxford English Dictionary* has to say.

LEFT. adj. the distinctive epithet of the hand normally the weaker of the two and the other parts of the same side of the human body, hence also of what pertains to the corresponding side of any body or object.

(A corresponding definition is given for "right"). As about one person in 11 is left-handed, but only one person in about 10 000 has situs inversus, the *Oxford English Dictionary* might do better to invoke the cardiac apex or spleen as the left-sided indicator, or for that matter any of the other innumerable constant asymmetries in the structure of animals and plants. Any such definition, however, implies a knowledge of the structure of living things, and furthermore, this type of lexicographic approach is, in essence, saying that the left side is on the left.

Would the concept of left and right be tenable in a world in which all living things were bilaterally symmetrical, or one in which there were no living things? Surely there must be a pure geometrical or mathematical way of defining laterality. The eighteenth-century German philosopher Immanuel Kant (figure) attempted to elaborate the problem of a geometric laterality in space independently of ourselves, and the same

problem has vexed philosophers and physicists to this day. Imagine a being out of sight but with whom we can communicate. We do not know if this being is physically symmetrical or indeed anything about his anatomy. Before him lies a pair of gloves. Tell him to pick up or otherwise indicate the left-hand glove—if you can. Without an asymmetrical structure, such as a constellation, which both the questioner and the questioned can

Immanuel Kant. (Photographed in the Kunsthalle, Hamburg, by the author.)

observe in common, there would appear to be no way of providing an operational definition of left and right. Whatever can exist or occur left-handedly can do so right-handedly. This is one aspect of a concept known to physicists as "parity."

Parity "fell," as the physicists say, when Mrs Chien Shiung Wu in 1952 carried out a historic experiment. Radioactive cobalt-60 was cooled to near absolute zero temperature and then submitted to an electromagnetic field, whereupon more electrons were emitted from the south magnetic pole of the nucleus than from its north pole. For the first time it was possible to make an absolute labelling of a magnetic pole. With this newly discovered asymmetry it was possible to erect a structure of right and left that could be communicated to our isolated being* and even to a lexicographer, assuming they each had a supply of cobalt-60 and the necessary electrical and low-temperature equipment. In the history of physics there

*Unless he is in a galaxy made of anti-matter.

have been some striking reversals of securely held concepts, and he would be a bold man who dares to say that parity has fallen forever. The conundrum of defining right and left may yet return to haunt us.

Lacking as we do the amenity of wearing a miniaturised physical laboratory on the wrist, and in general not experiencing undue difficulty in differentiating left from right, one is forced to the conclusion that this innate capacity is ultimately dependent on the asymmetry of our bodies. It is therefore appropriate to turn our attention to the phenomenon that, where asymmetry exists in the structure of the organisms of a specie, the asymmetry is constant—that is to say, it is in the same direction in all members (with rare exceptions) of that specie. I refer here to the asymmetries that are observable, for example, in the visceral anatomy of vertebrates, the claws of some crustacea, the spiral shells of some molluscs, and the helical turn of tendrils and some stems. It is not enough to ask why these structures are asymmetrical. We must also ask why the asymmetry is constant in direction. In the course of embryological development there must be a force that turns the enlarging structures in the same direction in all members of the same species. Were this not the case, roughly half the population would have situs inversus, just as, in the absence of a biasing force, a coin will fall heads or tails with equal probability. The work of Afzelius on the immotile cilia syndrome has thrown some light on the area from which this force may emanate, since about half of the subjects of this syndrome have situs inversus, often presenting as Kartagener's syndrome. Some subcellular elements are helically structured and the direction of spiralling is constant. It can only be a matter of time before

a causal chain of events is discovered linking the laevo-amino-acids, which are universal in the essential chemistry of all living things, with the constant laterality of subcellular elements—perhaps something akin to the “coiled coil” of electric light bulb filaments. We are thus driven to the conclusion (or shortly will be) that constant anatomical asymmetry on which our sense of right and left is based, derives from our amino-acids being of laevo form. Retropolating (to coin a phrase) to the origin of life on earth, it was probably by chance that our primordial amino-acid progenitor (PA would seem a suitably paternal abbreviation) was laevo, though a bias has been suggested. It is a curious thought that had PA been the enantiomorph (mirror image molecular structure) our hearts would all be right-sided and a reversal of existing asymmetries would hold throughout the animal and plant kingdoms. What we would in that case have called left and right is best left to professional philosophers.

This is not the place to discuss the cultural sequelae of handedness whence are derived the associations of right with what is correct, just, proper, and straight, and left with what is sinister and inappropriate. These associations, however, have spilled over into the terminology of direction. Some years ago when motoring in France, I inquired the way and was told, “Tout droit, tout droit.” I was about to turn right but was saved by my informant adding “Au fond de la rue.” We likewise may confuse the foreigner by saying, “Carry right on,” unless we add, “. . . to the end of the road.” Dutchmen please note; “Recht door. Tot het eind van de weg.” No confusion here with “Gerade-aus.” Finally, the story must be told of the schoolboy who translated the royal motto “Dieu et mon droit” as “My God, you're right!”

Lesson of the Week

Pulmonary oedema after transfusion with fresh frozen plasma

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Less than 1% of patients have allergic reactions after transfusion with fresh frozen plasma.¹ Severe allergic pulmonary oedema occurring after transfusion with fresh frozen plasma, however, can be fatal.² Standard treatment regimens consist of giving varying doses of antihistamines, corticosteroids, and diuretics.^{1 2}

Allergic pulmonary oedema after transfusion with fresh frozen plasma may be associated with hypovolaemia and need treatment with intravenous fluids

Case report

A 58-year-old man who had five episodes of haemorrhage after dental extraction was referred for investigation and

correction of any haemostatic defect before further urgent dental surgery. Investigations showed a consistently prolonged kaolin cephalin clotting time of 54 s (control 34 s) but normal bleeding time, one stage prothrombin time, thrombin time, platelet count, and factor assays of I, II, V, VIII coagulant activity, VIII related antigen, IX, X, XI, XII and XIII. The reason for his susceptibility to bleed is not known.

Treating him with four units of fresh frozen plasma on the day before dental surgery temporarily corrected the coagulation defect. On the next day before transfusion with fresh frozen plasma he was clinically well. Systemic blood pressure was

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