# Chapter 11
# Language as a Repository of Tacit Knowledge

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**Abstract** The relationship between language and practice has been badly and profoundly misunderstood. There is an intimate relationship at the collective level and the content of language is formed by the practices of a community. It is not the case, however, that an individual has to engage in all the practices of a community in order to acquire the language and the practical understanding that goes with it. Were this not the case there could be no societies: societies depend on the division of labour and any profound division of labour depends on practical understanding by those who do not themselves practice what they have to understand. Were it not the case that individuals could learn language without practicing it then the speech of the congenitally wheelchair-bound, or blind, would be noticeably limited. The chapter works through this position, contrasting it with the position developed by philosophers of practice such as Hubert Dreyfus, describes experiments which support the position, and explores the question of the extent to which this means experience can be captured by language.

## 11.1 Introduction: The Main Argument

Computer enthusiasts, of the group sometimes referred to as the 'artificial intelligentsia,' tried to persuade us that human abilities including fluent language speaking could be captured in programs if only those programs were complicated enough. Some of those who thought hard about the matter, such as philosopher Hubert Dreyfus (1972), argued that they could not be so captured. They argued that human knowledge was not confined to symbols but involved physical involvement with the world. In this they were right – human knowledge does *involve* physical involvement with the world. I am going to argue below that the nature of that 'involvement' was misunderstood, but let it go for the time being. For the moment we can agree that Wittgenstein was right when he said, 'if a lion could speak we would not understand him.'[1] And he was right in saying that we would not understand him because a

[1] Ludwig Wittgenstein (1953, p. 223).

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lion's physical engagement with the world is so different to ours. Since our language was not built up out of experiences pertaining to the physical world of lions – such as using your teeth and claws to rip raw flesh from zebras that have just been pulled down and killed – it does not contain the knowledge of lions. A talking lion might be able to express what doing lion-like things was like in the symbols of Lionese, but Lionese would not mean anything to us that corresponded with what it means to talking lions. Hence, Hubert Dreyfus entitled one of his earliest papers on the topic 'Why Computers Must Have Bodies in Order to Be Intelligent.'[2] He called it that because he could see, quite correctly, that our knowledge had to do with the way we used our bodies. The same applies in a slightly different way to groups of people who live in different social settings: our language cannot capture what it means to divine a witch using the Azande poison oracle and the language of the Azande cannot capture what it means to take out a mortgage because, though we have similar bodies, we use them in very different ways.[3]

Unfortunately, the inference was inexact. Nobody noticed the problem nor, at the time, was there any reason to notice the problem, because Dreyfus was fighting a good war with enormous courage in spite of the contumely being heaped upon his head and it was vital that he win it. Nevertheless, 'war-damage' was being inflicted and now that the war is over we can see that it was pretty serious. The damage is that language and symbols have been equated; in throwing out the strings of digital symbols used by computers as a potential repository of human knowledge, language, which, on the face of it, is composed of symbols rather than physical activity, was also thrown out. The result is that the possibility that language could be a repository of human knowledge has been excluded from consideration in a doctrinaire way. The argument is that if understanding Lionese involves zebra-ripping then anyone or anything who/which understands the language must have ripped zebras; the language, it was said, cannot itself capture what it is to rip zebras, only the language plus the practice can contain it.

The fallacy is this: It is true that there could be no Lionese as we know it without zebra-ripping among lions at the collective level. This is what I have elsewhere called the 'social embodiment thesis' – the collectivity of lions develops its specific language as a result of the typical form of lions' bodies and the typical things they do with them. Not every individual who speaks Lionese with fluency has, however, to be a zebra-ripper. Lionese is the collective property of lions and their 'form-of-life' but that does not stop non-lions (or individual non-zebra-ripping lions if such there are), from acquiring it if they put in enough effort. The 'minimal embodiment thesis' claims that not every member of the collectivity has to have a lion-like body or engage in lion like activities to become fluent in the language of the collectivity

[2] Dreyfus (1965).

[3] Another incarnation of the argument is to do with the incommensurability of Kuhnian 'paradigms' in science. (Kuhn, 1962).

and certain individuals can, therefore, get by with a minimal body.[4] This is possible because a language, like Lionese, itself contains some or all of the knowledge and understanding of the practical activities that went to build it up in the collectivity of active lions, so that to acquire the language with fluency is to acquire some or all of that knowledge and understanding. To put this another way, the language of Lionese, when fluently exercised, does contain much or all of the tacit knowledge of what it is to be a zebra-ripper.

To acquire a language with the degree of fluency needed to capture the meaning that goes with it is not a trivial accomplishment. Such fluency is, as a matter of fact, nearly always acquired along with the carrying out of the practices pertaining to the language and that is another reason why it has not been noticed that it can be acquired without engaging in the practices – it is a rare thing. It is also why it remains the case that if lions could speak most of us would not understand them. Nevertheless, one or two of us, who had put in the effort that it takes to become fluent in Lionese from immersion in the spoken discourse alone, could understand lions in the absence of claws and ripping-teeth. It may be the case that strings of digital symbols cannot capture zebra-ripping but it is not the case that *language* cannot capture zebra-ripping because *language is more than strings of digital symbols*.[5]

What follows is that, *contra* Dreyfus, it has not been proved that a computer must have a body to be intelligent. The argument so far, if it is correct, shows that there is logical space for a computer to learn a practice-based language without practice because there is logical space for humans to learn a practice-based language without practice. This does not prove that computers *can* acquire such a language – I believe that they cannot while I will also argue that humans can. The reason I think computers (as we know them) cannot acquire language, is that they merely manipulate digital symbols not that they do not have bodies. It could be argued that the reason they merely manipulate symbols rather than engage in linguistic discourse is because they don't have bodies but if individual humans can acquire language without bodies, or without much in the way of bodies, then it seems odd to impose the need for bodies on computers.

That a human does not need a body, or much of a body, to speak fluently, and therefore capture the 'tacit knowledge' of a community whose physical practices have not been shared, should be obvious. Everyone in a wheel chair can do it![6] The reason it has not been obvious, and the reason it has been such hard work to establish the point, was, I believe, and as I have intimated, to do with the role of symbols in the artificial intelligence debate. It was felt that to allow fluency relating to bodily experience to entities without proper bodies would allow fluency, and hence human knowledge, to computers. Thus Dreyfus, to be consistent, also has to argue that

[4] See Collins (2004a) for the 'social embodiment thesis' and its counterpart, the 'minimal embodiment thesis'.

[5] For the difference between symbol manipulation and language see the 'The Transformation-Translation Distinction' in Collins (2010, p. 25).

[6] See, for example, Collins (2004b).

sports coaches or commentators who have not played a game to a high level cannot coach or comment properly and that non-surgeons cannot talk sensibly about the kind of cuts a surgeon makes:

> You may have mastered the way surgeons talk to each other but you don't understand surgery unless you can tell thousands of different cuts from each other and judge which is appropriate. In the domain of surgery no matter how well we can pass the word along we are just dumb. So is the sportscaster who can't tell a strike from a ball until the umpire has announced it.[7]

Arguers like Dreyfus have to say such things because they have to say that even humans who have not been engaged in the physical activities they try to talk about cannot talk about them fluently.

But the barrier was being put in the wrong place. To win the good war against the 'intelligence' of computers one had to argue, not that they must have bodies, but that digital symbols located in an entity that was not embedded in social life were not sufficient for it to become and remain fluent in language.[8] The crucial point is that even a fully embodied human being that is isolated from society cannot become or remain fluent in the language. The example of feral children exhibits the first part of the prohibition, the growing apart of physically separated cultures exhibits the second part.[9]

The logic of the two positions is set out in cartoon form in Fig. 11.1 which has language speakers in the left half and entities that fail to speak language in the right. The Dreyfus position (the top boxes) concentrates on individuals: it claims that only those who practice (represented by hammer and anvil) can speak 'Hammer-and-Anvil Language' (HAL) fluently – case 'A'. Anyone who is isolated from hammer and anvil – case 'B' – (dotted boxes indicate isolation) cannot be fluent in HAL and is bound to speak a different language at best. Since computers – case 'C' – cannot engage in any physical activity they cannot be fluent in any language.

The position being argued for here is that a language like HAL can only develop if there is a community of hammerers on anvils but that the language, once developed, has, to some extent, 'a life of its own.'[10] An individual who immerses themselves in that language – case 'D' – can acquire it and speak it fluently even though they do not do any hammering themselves. On the other hand, those isolated from the HAL community – case 'E' – (dotted boxes indicate isolation once more) will not be able to speak HAL even if they do use hammers and anvils. Furthermore,

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[7] Selinger, Dreyfus, and Collins (2007 at p. 737).

[8] It was unfortunate that one of the most salient arguments against the potency of computers, John Searle's 'Chinese Room' argument, starts by positing the existence of a completely fluent computer. Actually, the Chinese Room would not work without it being embedded in society through the medium of a human being (Collins, 1990, 2010).

[9] See the quotation from H G Well's 'Country of the Blind' below.

[10] I am sure Dreyfus too would believe that a community of hammerers is necessary to develop the HAL language but he does not work out the consequences, concentrating on the practices of individuals.

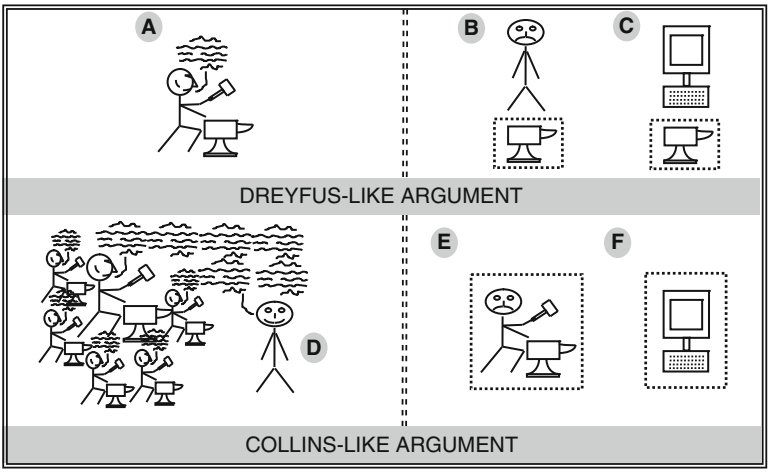


**Fig. 11.1** The language barrier: Dreyfus-like (*upper*) and as argued here (*lower*)

humans physically isolated from all societies cannot speak any language with fluency and computers – case 'F' – always being isolated from society even when physically located within it, cannot speak any language with fluency either. But the problem is the isolation, not the inability to practice.[11]

In sum, a language is formed in intimate relationship with the practices of the speaking community – whether zebra-ripping or hammering – but that does not mean that each individual who speaks the language has to engage in those practices; they can learn the language from immersion in the discourse alone as in case 'D'. At the same time, engaging in the practice without immersion in the discourse, as in case 'E', does not enable the discourse. The rest of this chapter is a commentary on this argument and on the nature of language [12].

## 11.2 Experiments on Interactional Expertise

Lest the example of the disabled is insufficient on its own, we have conducted a series of experiments designed to show that it is possible to become fluent in the language of a practice-based domain without practicing (e.g., Collins, Evans, Ribeiro, & Hall, 2006). These experiments involve the 'Imitation Game.' The Imitation Game is similar to the 'Turing Test' but the entity being tested is a human not a computer. In these experiments, and the theoretical developments

[11] I am sure Dreyfus would agree that isolated individuals and isolated computers could not speak. Again, however, it is a matter of what you concentrate on. He concentrates on their activity rather than their isolation.

[12] See also Collins (2011) for development of the point.

which underpin them, a person who has acquired the language of a practical domain without practicing is said to possess 'interactional expertise' in that domain. A person who has acquired practical ability is said to possess 'contributory expertise.' It is assumed that barring special cases such as inarticulateness or social isolation – which we call lack of 'interactive ability' – one who possesses contributory expertise also possesses interactional expertise.

In the Imitation Game, a judge, who has contributory expertise, tries to distinguish between a human who has contributory expertise (Participant 'A' in Fig. 11.2, who also has contributory expertise), and another human who has only interactional expertise (Participant B in Fig. 11.2). The judge asks questions freely over an internet link.

Success for 'Participant B' is indicated when the judge can do no better than chance in his or her identifications.

We nearly always run the experiments with a control, or 'quasi-control' condition. For example, blind persons are expected to possess interactional expertise in sighted-persons' discourse because they have been immersed in the language of the sighted all their lives. Running the experiment with a blind person pretending to be a sighted person is called the 'chance condition' because we expect the judge will do not much better than chance when he/she tries to identify the participants. The quasi-control or, 'identify condition,' has the reverse polarity. In the case of the blind we ask sighted persons to try to imitate the blind using a blind judge. Here we expect the judge to be able to identify the participants because the sighted have not been immersed in the discourse related to the practices of the blind.

The experiments that we did with the blind showed that the balance of correct guesses over failures to identify in the chance condition was 13% whereas in the identify condition it was 86%. Exact chance in the chance condition should not be expected because there are many ways to catch the pretending person out: they have to lie convincingly as well as demonstrate their possession of sighted discourse.

The experiment has also been run successfully with both polarities on the colour-blind, those with perfect pitch, a sociologist long immersed in the language of gravitational-wave physics pretending to be a gravitational-wave physicist, 'gays' pretending to be 'straights' and active Christians pretended to be non-Christians.[13]

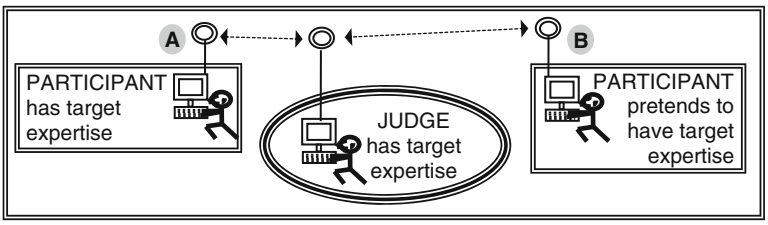


**Fig. 11.2** The imitation game

[13] Latest results can be found at www.cf.ac.uk/socsi/expertise

Readers should think about which they expect to be the chance condition and which the identify condition in each case. From here on I will take it that the existence of interactional expertise – that which is represented on the left hand side of the lower box in Fig. 11.1, has been established.[14] It now remains to explore the notion in more detail.

## 11.3 Domain Specific Languages and Language in General

The idea of interactional expertise contradicts the idea that each individual must have a body, that is capable of doing the practical activities corresponding to the concepts of the language, if linguistic fluency is to be attained. This claim has been disputed.[15] The confrontation between Dreyfus and Collins on this matter is clear in the case of domain specific languages. Thus Dreyfus insists that one cannot speak fluently about the cuts used in surgery unless one is a surgeon, one cannot commentate expertly on a sport unless one has played it, one cannot comment on chess unless one is an expert chess-player, and so forth. Collins, on the other hand, insists that all this can be accomplished in the absence of the corresponding practical experience so long as the immersion in the corresponding discourse is sufficiently profound; this explains why, according to Collins and *contra*-Dreyfus, non sports players can be excellent coaches and commentators and why the disabled can be fluent in the discourse of those who are not disabled. Furthermore, the only way smooth division of labour in complex areas, such as large technological projects, can be understood is via the mediation of interactional expertise: in such circumstances we have to be able to understand each other's jobs if we are to work smoothly in a team even if we cannot execute those jobs. Collins believes that the arguments and experiments strongly favour his viewpoint on this disagreement.[16]

When it comes to the ability to acquire language as a whole, as opposed to domain specific languages, the argument is more nuanced. Collins has to accept that languages cannot develop in the absence of certain bodily features – lungs, larynx, ears, certain brain developments, and so forth. That there are no speaking lions almost certainly has to do with the fact that they do not have these bodily features. Thus, human-like bodies are essential to the development of languages – and that is why only humans possess them in the first place – the social embodiment thesis. To save any possible confusion, this does indeed mean that no collectivity of computers could acquire a language of its own – 'Computerise', as it were. And it would not be able to do this for the reasons that Dreyfus provides – computers are not suitably

[14] For a 'philosophical' discussion of the notion see Collins et al. (2006) or Collins and Evans (2007).

[15] For example, Selinger et al. (2007), Collins (2008).

[16] For a recent analysis of the relationship between 'contributory expertise' and 'interactional expertise' see Collins (2011).

embodied. It does not mean, however, that, simply in virtue of the absence of a body, a single computer could not acquire language from the surrounding human society.

In humans, the requirement for a body also applies only at the species (collective) level and not to individuals. Thus, the congenitally profoundly deaf, who do not normally acquire fluency in the native language of the hearing, can acquire it if given intense and special help from an early age – such as learning to recognise sound through vibrations transmitted through a balloon. It seems reasonable to suppose that those born without the ability to form words could also learn to do so if given prostheses and specialised help. The most natural hypothesis appears to be that the body required by an *individual* who is to learn a native language is minimal: on the basis of this argument, it looks as though something close to a 'brain in a vat' could learn to speak if given the right prostheses to allow deep immersion in the spoken discourse.[17] Others have argued that it would be impossible to learn human-like languages without the senses of back and front, forward and backward, possession and loss, and so forth that come with a body.[18] As soon, however, as one begins to strip away the need for practice, and the corresponding body parts that correspond with understanding in every domain, there seems no obvious point at which the stripping-away has to stop. Therefore, my claim would be that though a community of brains-in-vats, would, like lions, and computers, not have the right kind of bodies to acquire any language as a species, individual brains-in-vats could acquire the ordinary human language of a fully embodied human linguistic community. It seems to me that the onus is now on those who want to argue for the need for a body in every individual who/which is to acquire language to show where and why the stripping away of bodily features has to stop.

## 11.4 Can Interactional Expertise Give Rise to a Self-Supporting Language

It seems probable that 'interactional' languages are parasitical. Let us define the language pertaining to a domain of practice as an 'interactional language.' So, the language of gravitational wave physics can be called 'Interactional Gravitational Wave language' or 'IGW.' For the sake of exposition we will also define CGW, which is the language spoken by those with contributory expertise in gravitational wave physics. According to the interactional expertise hypothesis, IGW and CGW are one and the same thing, so long as those who speak IGW are in continuing contact with those who speak CGW! Now imagine that enough people to support a

[17] A 'brain-in-a-vat' is here assumed to be different to a computer. A computer, (here by definition) is a digital symbol manipulator or *transformer*. It is not immersed in language, only in symbols, irrespective of its physical connections to the rest of society. The brain-in-the-vat, we assume, has some mysterious properties that allow it to be immersed in meaningful language, as opposed to symbols, if the right prostheses are added. It should be thought of as a human from whom more and more bodily parts have been stripped away.

[18] Selinger et al. (2007).

living natural language, each of whom was a speaker of IGW/CGW, went to live on a distant island where there was no contact with gravitational wave physics. Once they landed on the Island they would have to cease doing gravitational wave physics so we will refer to them as speakers of IGW. It seems probable that the IGW they spoke would soon cease to bear much resemblance to the language of those doing, or interacting with gravitational wave physicists who were left behind. This is for two reasons: the 'host language' – CGW – would be changing all the time in response to changes in the technology whereas IGW as spoken on the island would not be so affected – it would cease to be IGW and become 'Island-IGW'; at the same time Island-IGW would change as it responded to the new demands of Island society and practices. Island-IGW would come to look like the Pacific Islanders' cargo-cult language – including talk of 'cargo' and its correlates continuing long after the planes had left but bearing less and less resemblance to the living contributory language associated with the domain of air-freight. Island-IGW and IGW/CGW would pull apart. This does not mean that Island-IGW would cease to be a language *sui-generis* it would just mean that it would no longer be IGW because it would have less and less to do with gravitational waves – it would just be a new language. For IGW and CGW to remain identical, those who only speak but do not practice have to remain in contact with the lived activity of the community of practitioners.

H.G. Wells makes the point in his short story: 'The Country of the Blind.' He imagined a people who were completely blind and were isolated in a hidden valley.

> For fourteen generations these people had been blind and cut off from all the seeing world; the names for all the things of sight had faded and changed; the story of the outer world was faded and changed to a child's story . . .[19]

## 11.5 Does Interactional Expertise Carry Experiences?

What we call the 'Strong Interactional Hypothesis' is, to use the terminology of the last section, that IGW and CGW, and their equivalents in every other domain of practice, are identical. The hypothesis is that those with maximal interactional expertise are indistinguishable from those with contributory expertise in any test involving language alone.

This implies that the judgements made by such persons would also be identical. This is the implicit, but generally unnoticed, assumption behind all assessment committees where large issues are at stake and the committee members cannot have the skills associated with each and every facet of what has to be judged: it is the assumption behind what probably counts as good management.[20] In the

[19] H. G. Wells (1911) 'The Country of the Blind.' The quote can be found on page 474 of the Odhams collected edition of Wells's works. One might illustrate the point further with the metaphor of the immune system: however well a child is prepared for the biological environment via the antibodies in its mother's milk, isolate it from dirt and its immune system will start to fail – it will no longer be ready for interaction with the changing world of infective agents.

[20] See Collins and Evans (2007), and Collins and Sanders (2007), for more on this.

Imitation Game judges will spend a lot of time asking participants to make technical judgements as the ability to make sensible judgement is a good test of expertise.

Even if the Strong Interactional Hypothesis is true, having interactional expertise is not necessarily going to carry contributory expertise with it. It seems likely that no amount of talking to bike-riders is going to enable one to get on a bike and ride if one has never ridden before. So we know that what happens in the body of an interactional expert is not the same as what happens in the body of a contributory expert (and this is the essential point behind the experiments on the blind and similar). But *how does it feel* to be an interactional expert as opposed to a contributory expert?

There is some evidence from sports psychology that 'visualising' an activity can help in the performance. This might be explained by the fact that some of the neurons that 'fire' when an activity is visualised – the mirror neurons – are the same as some of those that fire when an activity is practised.[21] It is tempting to say, then, that the experience is the same.

It is hard to know how one might test for identity of experience given that, if the Strong Interactional Hypothesis is true, systematically different way of experiencing a domain will not be revealed in differences in the words that are spoken about it or judgements made within it. For example, we would not expect that the invented accounts of First World War experiences written by Sebastian Faulks, who did not serve in the trenches, would be obviously different to the accounts of Robert Graves, who did. According the Strong Interactional Hypothesis, even Graves would not be able to tell that Faulks had not served if Faulks had done the best job possible in terms of gaining interactional expertise in respect of trench life by immersing himself in the discourse of the soldiers who served in the war.[22]

It is true, of course, that, other things being equal, failures to acquire interactional expertise would indicate failures to share experience with contributory experts. Schilhab believes that preliminary Imitation Game tests she has run with midwives and mothers show that the experience of giving birth are not sufficiently well embedded in the language to allow non-mother midwives to acquire the interactional expertise of mothers. If non-mothers cannot acquire the interactional expertise we can be sure they cannot have imaginatively reconstructed the experiences. Again, do the masturbatory fantasies of a virgin – which many of us could try to recollect – match the actual first experience of sex? Probably not – in many cases because the experience is so disappointing, in other cases because it is so unlike what was expected, and in still other cases because the experience was so elevating.

Suppose Schilhab's results are right and suppose also that virgins cannot imaginatively reconstruct sexual experience. These are not decisive proofs that interactional expertise cannot carry experience. Perhaps the problem is that the conditions have not been right for the acquisition of the interactional expertise. Thus my

[21] For a discussion in the context of interactional expertise see Schilhab (2007).

[22] Whether this could be achieved as a matter of fact rather than principle is not so clear since serving soldiers' discourse would begin to change as soon as the war ended.

own experience suggests that people do not spend a lot of time in deep conversation about the moment-by-moment physical experience of sex so there is no reason to suspect that one is in a position to gain interactional expertise in respect of sex when one is a virgin, or indeed at any time. The same might be true of Schilhab's midwives. Do women spend hours in deep conversation about the moment-by-moment experience of childbirth? Interactional expertise is not easy to acquire (see below); it may be that a midwife who has attended multiple births has not been much engaged in detailed and skilfully descriptive interchange about moment-to-moment sensation; the birth of a child might be too traumatic for all but the most phenomenological reflexive mothers to engage in such an accounting.

In sum, to know the extent to which interactional expertise carries experience it is necessary to reflect about those experiences prior to which one has good reason to think one already has excellent interactional expertise. It is quite hard to know that one has good interactional expertise, however, as the examples of sex and birth-giving indicate. One might think one knows so much about a topic that one has interactional expertise in it but further reflection might show that this is far from clear. Consider, for example, the case of war. Soldiers say that no-one who has experienced war would ever go to war again. This is in-spite of the fact that huge amounts have been written and spoken about war. If it is true that those without war experience are much more ready to go to war – as is often said about politicians – then it goes against the drift of my argument and it goes against the Strong Interactional Hypothesis. But do those who embrace war more willingly than the experienced soldier really have good interactional expertise? Soldiers are normally portrayed as finding it too painful to talk of the most horrible details of battle while pro-war sentiment is deliberately spread before a war so it may be very hard to gain the real thing because the 'language of war' is subject to continual distortion. Further consideration indicates that in a case like the First World War the discourse is sufficiently strong so that no-one hungers for a repeat of that experience, not even the most bloodthirsty politicians. So the case of war is, at best, ambivalent.

My inclination is, nevertheless, to say that interactional expertise cannot carry every kind of experience. I cannot imagine that talk could ever reproduce the condition for the experience of (a) the rare intense sexual desire for an individual associated with either love or infatuation and (b) the witnessing of the birth of one's own child and the early years of parenthood. The astonishing intensity of these experiences is, in each case, a thing that I cannot imagine being imaginatively reconstructed. But this is not a proof – it may just be a failure of imagination on my part.

Crucially, whether such experiences can be reconstructed through the medium of discourse or not, the Strong Interactional Hypothesis can still be true. The Strong Interactional Hypothesis does not depend on re-experiencing practice even in the imagination. If the Strong Interactional Hypothesis is true, language alone carries a sufficiently good repository of tacit knowledge to enable judgements to be made about practical matters which have not been directly, or even imaginatively, experienced. Perhaps serious drug addiction is an example. This is an experience that I have not had though I would guess it is something like intense sexual infatuation.

But even without imagining it I think discursive experience of it would make it possible to make good judgements in respect of it.

This section has dealt with the question of whether the possession of interactional expertise carries experiences with it which are similar to those of the contributory expert. The visualisation process of athletes, along with the idea of 'mirror neurons,' indicates that some experiences can be reproduced imaginatively in the absence of practice.[23] I have suggested that I find it hard to believe that all experiences can be reproduced in this way. But proofs have not been developed, only invitations for more phenomenological introspection and more experiments on language acquisition.

## 11.6 How Is Interactional Expertise Acquired?

The easiest way to acquire interactional expertise is to become a contributory expert. While learning to do the things that have to be done in a domain of practice, the language will be learned. Learning to do the thing ensures the most intense immersion in the spoken discourse of the community – the person learning to practice is continually alongside fluent instructors, continually listening to the 'war stories' and hearing the myths of the community being recounted; there is no better way of becoming deeply immersed in the language. Of course, it may turn out that a contributory expert is not very good at language – they are inarticulate or lack interactive ability – but other things being equal, immersion in the practice is the best way of being immersed in the language.

One of the hardest ways to acquire interactional expertise is in the way the author of this chapter acquired the interactional expertise of gravitational wave physics. This was to enter the social domain of the target group and set up specially arranged conversational encounters. Many status barriers have to be jumped, the participants have to be persuaded to expend valuable time, and relatively little time can be spent immersed in the discourse when it is compared to the time spent by a practitioner. It is a long process, taking this author about ten years to gain what he has in the way of interactional expertise in gravitational wave physics. His interactional expertise, by the way, was enough to pass an Imitation Game test and to have his remarks about physics listened to and taken seriously by the practitioners and even, on one or two rare occasion, to win a debating point about the physics itself.[24] Once the initial barriers have been overcome, however, becoming more fluent is an enjoyable process, especially if one enjoys the company of those whose language one is trying to learn.

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[23] Schilhab (2007).

[24] See also Collins (2004, chapter 23), where I give an account of my participation in a review committee and my feeling that I understood the technology in question better than some of the official reviewers.

These two accounts of acquiring interactional expertise at either end of the spectrum of possibilities obscure a host of subtleties to do with exactly how one mixes with the community. The possibilities have been referred to as 'levels of immersion.'[25] Thus, I claim to have acquired interactional expertise purely from talking to the scientists but actually I spent as much time as I could around the apparatus they were building, looking at it, and 'getting the feel' of it. I suspect that, as a person who likes diagrams, and likes having a visual image of things that are being spoken of, I would have been, at best, much slower at acquiring the expertise without these contacts with the physical correlates of the world of practice. Rodrigo Ribeiro, who is making a special study of levels of immersion and interactional expertise, will almost certainly find that deeper immersion results in better interactional expertise. Whether this is a result of the logistics of deeper immersion, or whether there is some barrier that cannot be surmounted without visual experience of physical settings, is going to be hard to show. My inclination is to say that the arguments and evidence gathered to date indicate that a space has to be left for the possibility of acquiring full interactional expertise in the absence of any visual immersion or physical contact – this is what the experiments on the blind and the argument about the brain-in-the-vat seem to show. But it might also be the case that for many practical purposes there might as well be a barrier between shallow immersion and deep immersion since it is so hard to get a high level of interactional expertise from shallow immersion and it is not something that anyone should choose unless forced.

## 11.7 Conclusion: Symbols and Language

In the introduction it was argued that language was more than a set of computer-like symbols, it was a repository of understanding. It was then argued that since fluency in the language without ability in the practices to which a language referred, still makes it possible to make good judgements about practical matters pertaining to the domain, language was a repository of tacit knowledge.

How can something that is expressed in symbols be more than the symbols? How can something expressed in the medium of explicit knowledge be a repository of tacit knowledge? The circle is squared because language is itself a practice. It is learned in communities which practice spoken discourse; discoursing is a practical activity. Thus, when one learns a natural language, one learns not only words but how to make well-formed sentences in the language in question and reject some badly-formed sentences or expressions while understanding and generating others that are not well-formed according to any formal rule, or even any rule that can be anticipated, but can be understood as though they did confirm. The rules of sentence or phrase formation are like any 'social rule' – they do not contain the rules for the own application; thus language fluency contains the tacit knowledge of sentence

[25] The term belongs to Rodrigo Ribeiro ex-Cardiff PhD student and professor at the University of Minas Gerais in Belo Horizonte, Brazil.

and phrase formation. In the same way learning the language of a practical domain contains the tacit knowledge needed to make judgements including judgements that would be impossible to anticipate. Perhaps it is contained in the exact nuance or rhythm of words or phrases, perhaps it is in the sentence pattern of paragraphs of the emphases within them – I do not know. Again, the rules of these judgements would not contain the rules of their own application and so knowing how to apply them would be a matter of tacit knowledge. One way or another, it does seem that to become good at the practice of spoken discourse is to come to know how to understand the practical implications of words and the way they capture the life of a community. Remember, it is the way words are bound into practices that would prevent most of us understanding speaking lions, so to speak Lionese fluently – and the idea of interactional expertise and the experiments that correspond to it show it can be done without doing the practices – must be to understand the practices that gave rise to Lionese. When language is taken on in the spirit of a way of being in the world, it contains the tacit knowledge of that way of being in the world.

One can also be bad at spoken discourse, in the way computers are bad, in which case the words are merely frozen representations of momentary states of affairs, not participating in the lived life and lived practices of a community, and not containing the tacit knowledge of the practices. Indeed, computers cannot understand the way to form those bad/good sentences on which so much ordinary speech is composed. The first shock of the new computer user is that every 'word' has to be spelled exactly right for the computer to use it as an instruction whereas humans cope with small mistakes without even noticing. Improved computers are making better guesses at how to rectify mistakes but it is always a matter of statistics not the kind of 'meaning repair' that comes with understanding.

The argument of this chapter begins with the idea that language is a property of social groups and that individuals only share in it. Now that the computer-wars are over, the war damage can be repaired by keeping this constantly in mind.

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