DECONSTRUCTING SI: A CONTRIBUTION TO THE DEBATE ON COMPONENT PROCESSES

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In interpreter training, and to evaluate quality, we need to know what is easy or difficult in different conditions and situations. This implies some underlying model of how basic cognitive faculties cooperate and are trained to do the task. (The presence in our brains of an evolved module for translation or simultaneous interpreting is unlikely). In this discussion paper I will (i) try to show that the analysis of simultaneous interpreting into composite sub-tasks is neither particularly productive nor unequivocally justified by the psycholinguistics or expertise literature; (ii) argue for a different kind of 'componential' analysis of interpreting, as a skill involving a coordinated and enhanced use of existing basic *faculties* rather than as a composite of subtasks; (iii) suggest briefly how this applies to teaching; and (iv) outline a tentative research orientation aimed at deducing discourse-related difficulty by focusing on the ease or otherwise of forming clear intermediate representations.

The most obvious extreme limiting factors on interpreting, like acoustics, input speed, recited monotonous delivery, and the interpreter's preparedness, though well known to professionals, have not for the most part been formally demonstrated in replicable studies (with some exceptions, e.g. Gerver 1974 on noise), although their effects might show up accidentally as confounding factors if not taken into account in experimental design. Within these bounds, difficulty is often ascribed to overload in one or more of the processing modules which cognitive psychologists and linguistics claim to have differentiated, such as working memory, long-term memory, a syntactic processor, etc. Recently, however, it has become fashionable to treat interpreting as 'multitasking', or as a composite of sub-skills or sub-tasks, some of which might be 'automatable' with training (Lambert 1993, De Groot 2000 etc.).

Componential analysis is, of course, a common approach to modelling tasks in the information-processing paradigm. To mainstream psycholinguists, "it makes sense for us to start by investigating the clearly isolatable and testable aspects of SI. When some basic findings are firmly established in isolation, we can proceed to more complex situations in which the same aspects of behaviour are embedded in more realistic contexts..." (Frauenfelder and Schriefers 1997: 75). Gile, in modelling the interpreting task *a priori*, claims to make only one assumption about cognitive architecture: that three processes – comprehension, memory, and production – are distinct enough to be considered as *non-automatic* component efforts of the task; to these he adds coordination or attention control (Gile 1985; 1999). De Groot (2000: 53) has sufficient confidence in the paradigm to apply it directly to training: she assumes that word recognition, word translation, or attention control, among others, can be treated as distinct sub-tasks in which trainees can acquire fluency or automaticity through specialised exercises.

However, doubts persist even among authors working within the cognitive psychology paradigm. Shlesinger questions whether SI is decomposable into recognisable sub-skills: “To study the cognitive processes of SI in isolation would appear to be, in a sense, a contradiction in terms [...] SI clearly involves meaningful, contextualised materials [...] thus, decomposition of the task is problematic...” (2000: 4-6). Such doubts increase when researchers think of SI in terms of meaning processing (‘translation’) rather than of inter-modular coordination and effort (‘simultaneity’).

SI: translation plus simultaneity?

The simplest possible analysis of simultaneous translation is suggested by its name. Even an account as ostensibly holistic as the Paris school’s (e.g. Seleskovitch and Lederer 1989) recognises two special abilities required in SI, as distinct from everyday dialogue: (1) the ability to listen while speaking, and (2) the ability to resist morphosyntactic interference from the source language[1]. These two abilities are fundamentally different in terms of the systems they challenge and their potential for automation. Separating the two *voice streams* (i.e. hearing-while-speaking, or avoiding articulatory suppression), is learned once and for all early in training, through exercises like counting backwards while listening to a speech. In contrast, separating the two *language systems,* to avoid language interference, is a permanent challenge needing constant vigilance.

In terms of faculties mobilised, ‘simultaneity’ looks like a perceptual-motor skill which can be fully automated, like riding a bicycle, while ‘translation’ presumably includes a cognitive component requiring conscious attention. Save in exceptionally poor basic conditions (when negotiating uneven cobbles in the rain, or an inaudible speaker with unnatural choppy delivery) the cyclist does not worry about staying on his bicycle any more than the expert interpreter thinks

1 The Paris school does not propose any kind of componential analysis. Linguistic competence and general knowledge can be enhanced independently, but are considered just prerequisite tools for the job. Given these, comprehension and production are considered more or less automatic. The only permanent effort specific to SI is resistance to linguistic interference.

about hearing while speaking. In contrast, producing natural, native and elegant discourse in one language in the teeth of incoming discourse in another is a core function of good interpreting which, though it may be sharpened with warm-up exercises like sight translation, cannot be learned once and for all.

Still, decomposing SI simply into translation plus simultaneity is obviously inadequate: those who have performed both tasks would agree that one does not go about 'translating' in the same way in SI conditions. Separating 'simultaneity' from 'translation' would mean dissociating linguistic-conceptual from coordinating tasks, thus missing the cognitive-linguistic coordination (inference, pattern-matching, knowledge integration) which is probably the core of the interpreting task. A finer-grained account is obviously called for – ultimately, if possible, in terms of individual cognitive operations.

The component-skills approach in interpreting research and training

Those who isolate component subtasks do not feel the need to defend the componential approach as such, but take it as given with the information-processing paradigm. De Groot asserts *a priori* that both translation and SI are complex activities comprising many sub-skills that have been a separate object of study in cognitive psychology: perception, listening and speaking [...], reasoning and decision making, problem solving, memory and attention (cf. 2000: 54). The training strategy she proposes, based on automating sub-skills like word recognition, word retrieval, word-to-word translation, disabling articulatory suppression, or attention control, flows from this doctrine rather than from specific research (of which there is admittedly very little), and rests on two questionable assumptions:

(1) that certain individual components of comprehension, production or translation, like word-recognition, lexical retrieval, word transcoding, can be automated 'context-free', and that the improvement thus achieved will transfer to the full or criterion task as performed in variable discourse and environmental contexts;

(2) that the subtasks remain sufficiently independent in the performance of the full or criterion task (SI) for attention to be allocated to them separately. This assumption is so strong that subjects have been instructed in experiments to allocate attention to comprehension or production (de Groot suggests trainees can be directed to attend to 'memory'), and conclusions drawn assuming that they have done precisely that (e.g. Lambert, Darò and Fabbro 1995; Darò, Lambert and Fabbro 1996).

De Groot cites evidence (Frederiksen and White 1989; Gopher 1992) for the superiority of training in component tasks, followed by integration, over simple 'practice makes perfect' training in the full or criterion task throughout. But are the component tasks the right ones for SI? Exercises in word-recognition are proposed despite the admission that this process is different in SI, being ephemeral as well as more vulnerable to noise, not to mention heavily dependent on context (Marslen-Wilson and Welsh 1978). Word-to-word transcoding exercises should focus on words “notoriously difficult to translate” – but “trainees should also be made aware that the translation reflexes thus created may not always be quite appropriate, sometimes even totally inappropriate; that it would be wise always to save some of the mental resources to monitor and, if necessary, suppress a reflex” (ibid. 60). This is the mirror-image of the Paris recommendation to “strive always to reformulate, and with the exception of some technical terms, be wary of ‘equivalents’”, but does not seem obviously more efficient. More problematically, if lexical choice always needs some resources, how can it become automatic?

Apart from the difficulty of distinguishing automatic, ‘automatable’ and ‘controlled’ subtasks, it is hard to see how word-recognition or individual word translation could validly be isolated even provisionally (there is no discussion of later integration) from a situated speech communication task, where context is known to be crucial at every stage from phoneme recognition onwards and changes from one situation and discourse to the next. In a task involving a different speech each time, what might be the parts “amenable to automatisation” which “should be automatised as rapidly as possible” (once and for all, presumably), and which the “components which will always be effortful whatever the level of expertise”? (ibid. 55). The postulate that there might be sub-tasks common to the processing of any and all discourse is not implausible, but any suggestion about what kind of cognitive or linguistic operations these might be needs to be argued with some reference to discourses, especially with a view to any real-life application.

Attention: divided, shared, distributed…

The allocation of attention to different component processes, or channels, is sometimes presented as a distinct effort (Gile, passim) or even as an isolatable sub-skill which can be learned on one task and transferred to others (Gopher 1992, cited in De Groot 2000). Taken together, the divided-attention and component-task paradigms reinforce the picture of a juggling performance involving an irreducible coordination effort between inherently distinct tasks.

The psycholinguistic evidence is open to different interpretations. Experimental research shows that some activities are easier to perform simultaneously successfully than others: simple perceptual and motor tasks, such as finger-tapping and picture recognition, may be quite easy to combine, unlike, say, reading for recall while doing mental arithmetic. But there is much more to it than this, and to infer from this research that SI must be a difficult negotiation of several different tasks is to ignore two important variables – content and sensory modality – and one important difference between SI and some experimental tasks.

1. Channels and capacity

The notions of ‘task’ and ‘channel’ are fuzzy: shadowing, for instance, can be viewed as a combination of two sub-tasks (listening and speaking) in two different channels, or as a task competing with another task (e.g. reading) for a single channel. The very concept of ‘channels’, inherited from an early telecommunications-based model (Shannon and Weaver 1949), is inherently tendentious in suggesting constant uninterrupted attention. Studies like Allport *et al*. (1972, see below) have cast doubt on the ‘single channel hypothesis’ and suggest instead the possibility of parallel processing in multiple channels.

Let us assume for the sake or argument that SI involves four processes: (1) listening to speech, (2) conceptual/linguistic processing, (3) speaking and (4) self-monitoring. Even if these each occupied a distinct channel or capacity, smooth coordination between them does not seem problematic. Listening easily accommodates conceptual processing (we can think while listening), and more so with the redundancy of the input (Chernov 1979, 1992). The last three are routinely and effortlessly combined in everyday speaking, in which self-monitoring as a normal corollary must take only intermittent, sampling attention. Combining these four is therefore not as implausible as it appears when we model these processes as occupying distinct channels or capacities. It is even more conceivable that this can be done comfortably if they are all sharing the same representations.

2. Modality and content

Allport *et al.* (1972) showed that the ease or difficulty of combining operations depends both on the sensory *modalities* of the concurrent tasks (speech, perception or motor action) and their *content*: performance was better for associations of ‘dissimilar’ tasks’, like shadowing speech while taking in complex *unrelated* visual scenes, than for ‘similar tasks’ like attending simultaneously to two different verbal messages (the ‘cocktail-party problem’). Articulatory suppression, for example, is classically demonstrated when subjects are processing two *unrelated* speech streams. Dual-tasking experiments have shown different detrimental effects on the performance of tasks in similar or dissimilar modalities, and with similar and dissimilar content. When two inputs are presented with different tasks specified (e.g. accurate shadowing plus recall), or in *different modalities with no shared representations* (speech and digits), capacity is soon exceeded. But what about a goal-directed, cognitive-linguistic task involving the *same* content in the *same* modality? Could it not be that listening while speaking becomes easier when the two streams can be processed to the level of common, shared representations – in other words, that attention can become unitary in a third, cognitive channel integrating the products of two lower-level speech decoding processes? Gile (1995: 92; 1999) drawing on Kahneman among others, presents SI as a cognitive management tightrope in which attention is precariously allocated between the three efforts. But Kahneman himself concedes that "at high task load, attention becomes almost unitary" (1973: 193, cited in Gerver 1976).

3. Goal-directed synergies in complex vs. concurrent tasks

Interpreting may involve several inputs (speech, text, slides, body movements) but only one output, and is therefore not 'multitasking' in the sense of the dichotic tasking paradigm in experimental psychology, which involves coordinating two tasks each with its own input and output. More importantly, since such truly multiple tasks have *different goals*, the component-task paradigm fails to capture goal-directed synergies between components in a 'complex' but single task.

Outside the laboratory our behaviour is not neatly separated into sub-tasks each with a goal defined by someone else (remember this picture, repeat this sentence, tap that lever in time). As free agents we can focus on a chosen mix of different inputs, including our own thoughts, in a trade-off between our interest and the effort required to process them. As interested receivers we may freely divide or share our attention between listening, thinking and taking notes. But if the goal requires attending to multiple inputs, we will exploit whatever local and contingent conditions reduce the 'multiplicity'. If several people are angrily accusing me of something, I can at first attend only to whatever common representation emerges, such as 'anger directed at me', assembled from acoustic and visual features common to the inputs, and will be unable to process the multiple linguistic streams for their propositional content. In the case of interpreting, common representations from the speaker's speech and my own can be assembled and focused on as a single stream of content at the level of propositions concepts and attitudes, ignoring (at a conscious level) dimensions like morphophonosyntax, which form distinct systems in each stream.

In short, assuming a complex task to be a composite of sub-tasks, or a negotiation between distinct efforts or channels, overstates the task's complexity, missing the synergies and shortcuts made possible by local contexts. In SI, once a pattern of *significant features* is recognised in each voice stream, multiple 'channels' can plausibly be superimposed with sufficient attention to the semantically relevant peaks (not words or pauses) in each. To enhance this ability, training can focus on developing a sensitivity to patterns of relative significance in texts and discourses, first by active listening, then progressing to exercises such as on-line paraphrase.

Automatic, internalised, controlled…

Three degrees of 'automaticity' are usually recognised – automatic, automatable and controlled/strategic – and a complex task can be expected to comprise elements of all three. With increasing expertise, many actions and responses which were once new and deliberate will gradually become unthinking routine (Searle (1983) describes the process elegantly for skiing). The limits to such progressive automation are presumably set in part by the organism's basic capabilities, and in part by variations in the environment. Proficient cyclists and skiers, having internalised several layers of skilled moves, still meet (and for sport seek out) different and challenging terrains requiring focused attention and the use of local, contingent strategies.

The degree of possible automation of a task therefore depends on the amount of variation in the terrain or task environment. Interpreting and translation are done on a different discourse each time – a parametric variation surely greater than variations in skiing terrain and perhaps even of board positions in chess. Certainly interpreters try to collect and refine as many more-or-less-reliable all-weather word and phrase equivalents as possible. Lexical interference can be combatted by paying special attention to false cognates (*faux amis*), but the potential for automation is much more limited at the syntactic and pragmatic levels, since if identical words or phrases may recur, identical utterances or discourses hardly ever do. In a task involving processing of situated, real discourse, a very large component must therefore remain irreducibly variable and resistant to automation.

Expertise research – what kind of a task is interpreting?

It seems reasonable to assume that experienced interpreters perform better than novices without expending proportionately more effort; in other words, that they have developed some strategies which are both effective and partly internalised, perhaps based on recognition of recurrent patterns and/or generalisable procedures of some kind. If breaking down interpreting (or translation) into context-independent subtasks seems unsatisfactory, in what terms can we try to capture expertise?

Pioneered and guided since the eighties by Karl-Anders Ericsson and Herbert Simon, expertise research has investigated superior performance in a range of tasks in sports (e.g. wrestling, figure-skating, tennis), science (mental arithmetic, solving physics problems, mental arithmetic), games (chess, Space Fortress, Tower of Hanoi) and the arts (musical performance, reading, writing) (Ericsson and Simon 1980, 1987, 1996). Whereas psycholinguistic research explicitly aims to establish universal (non-domain-specific) limits to basic information-processing abilities, expertise studies have found that these are in fact bypassed or exceeded in expert performance. These researchers are also coming to realise that generalisations to capture the essence of expertise over a wide variety of tasks have to be framed at a level of considerable abstraction, ultimately in terms of intermediate representations.

The central methodology used in expertise research has been introspection through such devices as think-aloud protocols (TAPs), interviews and questionnaires. The godfathers of the paradigm recommend that each task being studied should first be analysed and modelled *a priori* as a sequence of cognitive operations, or in some cases, 'heeded thoughts'. Although introspective techniques are now being applied to written translation with some sophistication, it remains hard to pin down variables more precise than translators' personality traits, although some researchers have claimed to identify specific operations (Tirkkonen-Condit 2000).

It is difficult to find complete tasks which compare directly to translation or interpreting. Identifying common sub-goals like 'accuracy' or 'elegance' with tasks like Space Fortress or figure-skating does not seem particularly productive. Generalisations need to be sought at a more abstract, systems level. Tasks can be compared in terms of the tools used (car, tennis racket, chess pieces, skis), or variations in the task environment, whether physical (terrain, weather), cognitive (place, people, accessible semantic memories) or affective (competitors, mood, episodic memories). As we have seen, if discourse is the terrain of interpretation, there can probably only be limited automation.

Another parameter is the degree of goal determinacy. Translation scholars have expressed doubts about applying research on tasks with a clearly defined final goal or end-state, like mathematical problems and certain games (Space Fortress, Tower of Hanoi) to an 'open-ended' task like translation (Tirkkonen-Condit and Jääskeläinen 2000). But tasks like essay writing and judicial decision-making have also been studied. An interesting by-product of such studies was that, while mathematical models successfully predicted outcomes, think-aloud protocols showed that the experts' procedures for arriving at these outcomes were quite different, and were based more on *gestalt*-like recognition of patterns in episodic memory than on a sequence of binary decisions based on declarative knowledge of problem-solving steps or rules (Ericsson 1996: xxxix-xli).

Acquired or trained skills can also be classified in terms of the main systems they mobilise, as primarily 'perceptual-motor' (sports), 'perceptual-cognitive' (chess) or 'perceptual-linguistic' (word-recognition). T&I tasks, where the perceptual and motor systems have a proportionally auxiliary role, would have to be classified as 'linguistic' or 'cognitive-linguistic' (but not just 'cognitive', to distinguish them from mental arithmetic or scientific problem-solving).

Ericsson and colleagues have tentatively identified two universal characteristics of expertise: experts form, maintain and utilize larger and more structured representations; and they learn to bypass and surpass normal cognitive limitations (such as a working memory capacity of 7 ± 2 units) (Charness *et al*. 1996; Ericsson 1996: lii). In other words, baseline measures of speed and capacity in terms of units like words or digits are not applicable to expert cognitive performers, who work with large chunks and structures (cf. models of understanding and reasoning proposed in cognitive semantics: Fauconnier 1985; Garnham 1987; Gernsbacher 1990). In a cognitive-linguistic task, this means that while experts must necessarily be proficient in peripheral operations like decoding and encoding language, the critical element of expertise is located at the cognitive core rather than the linguistic periphery.

Expertise researchers are now aiming for a finer-grained analysis of tasks by increasing the temporal density of observations (Ericsson and Simon 1996). This should lead to analysis in terms of individual cognitive processes, and ultimately, according to the IP rationale, of representations. Ericsson recognised in a recent paper that

> expert performance in interpreting is mediated not by fully automatic translation processes but by mental representations and mechanisms providing them with tools to gain *more rather than less control* over their performance [...] *The improved ease of performing the task – typically seen as evidence for automation – can be explained by acquired and refined* [message-preserving] *representations*. By refining the representations experts will be able to attend and focus on only those aspects of the presented message that are relevant to the translation […] (Ericsson, forthcoming; my emphasis).

Interpreting models and data: a gap still unbridged

With the rejection of Behaviourism, cognitive science has adopted as a central postulate that non-reflex behaviour, such as meaningful speaking, is mediated by representations. This has posed the challenge of describing the interaction between linguistic and higher cognitive processes. The Chomskyan generative analysis was a huge advance in our understanding of language, but its application to modelling real-time speech processing has been problematic. The perceived need to integrate functional, communicative features of speech has resulted in a fragmentation of theory and a period of relative stagnation. Pending a synthesis, interpreting theory has drawn on some of the fragments (e.g. Dillinger 1989, Setton 1999, and those working with the Hallidayan framework), but most authors have fallen back on modular cognitive psychology. As a result, there is a gap between most models and the linguistic data.

To take a well-known example, Gile’s (1985, 1997) postulated efforts of comprehension, production, memory and coordination (attention allocation) reflect standard psycholinguistic modules. But the model is not easy to relate to a corpus. This is partly because (in the model’s terms) overloads can lead to knock-on effects downstream in the performance. But a more basic problem is that hypothesised load factors, or ‘problem triggers’, are not sufficiently specified to correlate effort (were it to be measured) with discourse or environmental events. It is not clear how capacity is measured and what constitutes a load.

In attempting to specify a model like Gile’s, the obvious source to consult for probable problem triggers is the speech processing literature, which suggests factors like phonetic or grammatical anomalies (e.g. foreign accents), short words vulnerable to noise, syntactic complexity (e.g. centre-embedded sentences), lexical density, and in production, lexical retrieval in the appropriate style and register (Gile 1995: 106-108). In other words, problem triggers and load factors have not been identified at the semantic and discourse levels, except in vague general terms like ‘tortuous logic’. This leaves a large theoretical gap in the correlation between input properties and processing challenges at the intermediate stage of inference and conceptualisation, where mainstream psycholinguistics has little guidance to offer.

This intermediate stage has always been the knottiest part of modelling interpreting. The ideas put forward include:

(a) a holistic, neurosensory process of knowledge integration and reconceptualisation and spontaneous generation of TL (Seleskovitch 1975), which remains rather underspecified;

(b) a semantic-conceptual network consisting of nodes with multilingual connections (Moser 1978), which probably underestimates contextual variation;

(c) a ‘translation’ module (Darò and Fabbro 1994), which is evolutionarily implausible;

(d) ‘memory’ as the third, intermediate effort, without specifying the linguistic and conceptual operations within it (Gile 1995, 1997).

These models all gloss over the core cognitive and integrative processes by hiding them in self-explanatory networks or modules labelled ‘memory’ or ‘translation’.

One less black box: memory as a property of representations

Memory is intuitively assumed to be a critical function in successful interpreting. Models of interpreting have generally imported the traditional distinction between a limited-capacity working memory (WM) assumed to be dealing with pieces of input or output in quasi-linguistic form, and knowledge retrieved from longer-term memories of various types (semantic, episodic, procedural, etc.). Once the role of background knowledge became clear, the problem arose of modelling the integration of this knowledge into working memory to generate a basis for output.

The characterisation of WM capacity in terms of digits or words has lingered for a long time, under the influence of Miller's '7±2 items' (Miller 1956) and of AI, and is implicit in much of the sentence processing literature, but it is now increasingly recognised (with *gestalt*-based cognitive semantics, mental models theory and similar trends) that in sophisticated cognitive activities, WM 'capacity' depends on the efficiency with which it can manage complex representations (see Setton 1999). At the same time, recent work is blurring the boundary between working and long-term memory (LTM), with the suggestion that experts use 'long-term working memory' (Ericsson and Kintsch 1995), or that in a task like interpreting, relevant knowledge is filtered in a 'working substrate' of LTM before being fed back into WM to be processed with the immediate discourse input (Shreve and Diamond 1997), or indeed, that WM capacity must be assessed in terms of 'underlying conceptual interpretations' rather than text chunks (McWhinney 1997).

Meanwhile, more fundamental work on the evolution of cognition, reviewed below, has drawn attention to the different types of representation needed for higher-order cognitive processes. By specifying required properties of representations like durability, traceability and so on, we can treat 'memory' as a distributed general property of cognition, instead of a store- or workspace-like fixed-capacity effort-consuming module. In assessing effort or difficulty, for example, the focus would shift to representation, and in a cognitive-linguistic task, representations formed primarily from linguistic input. Are some representations more difficult to form, manipulate and maintain than others? To answer this question we need a model of human (i.e. evolved) cognition, as opposed to an all-purpose, ideal or designed computational system.

Another side of cognitive science

The information-processing paradigm has blurred the difference between evolved (human) and designed (mechanical) cognitive devices. To ensure that we are working from a plausible model of human cognition we must turn away from cognitive psychology (component skills) and artificial intelligence (where information-processing models must be machine-compatible) and look instead to human evolutionary anthropology and neurology. These disciplines offer a rather different perspective on the most likely modules of the embodied mind/brain. Since they are not traditional sources of T&I theory, an expository digression is called for.

In designing an information-processing system from scratch, we are free to specify both hardware and software, so the most efficient solution is to design maximally general-purpose hardware capable of executing a wide range of programmes as rapidly as possible. An evolved cognitive apparatus is unlikely to have the same architecture. It is more likely, given the population needed to generate sufficient diversity, and the number of generations necessary for successive incremental adaptations, that our present behaviour and abilities are defined by specialised (domain-specific) basic faculties selected for the survival advantage they conferred in the hunter-gatherer environments we inhabited for over 95% of our history. According to this view, in addition to the sophisticated pattern-recognition faculties needed for all successful animals, like habitat selection and edible food discernment, we evolved two key abilities which enabled us to occupy the so-called 'cognitive niche' in evolution: (1) metarepresentation, or the ability to conceive of unreal and abstract things and attribute beliefs and intentions to other sentients and sapients; and (2) language: the ability to convey and receive messages to and from other linguistically-endowed sapients in a structured way, allowing cooperation, social organisation, sophisticated collective planning, mental manipulation, etc. and hence eventually the development of our present highly complex inner and outer environment (Tooby and Cosmides 1992; Cosmides and Tooby, 2000; Sperber 1994, 2000; Origgi and Sperber 2000; Pinker 1994).

Metarepresentation and language together separate us from animals and machines. Communication is impossible without some elementary metarepresentation, if only of another's intention to communicate. A few other species, among primates and possibly cetaceans, are thought to have some such ability. But apparently only humans have the higher-order metarepresentational abilities necessary for complex inferential communication aided by language, involving the distinct representation of one's own and others' opinions and of hypotheses with different credibility values. Humans display such 'metapsychological' abilities from late infancy; the full metarepresentational ability seems to emerge fully from the fourth year, becoming integrated with language use from early adolescence to allow increasingly sophisticated linguistic communication through adolescence to adulthood.

Conceiving and communicating abstractions and hypotheses requires metarepresentation, as does the 'negotiation' of meaning communicated by others. Sperber (1994) identifies three stages in communicative sophistication, linked to the levels of metarepresentation deployed. In *Naive Optimism*, the hearer assumes the speaker is both communicatively competent and benevolent, so no metarepresentation of his thoughts or communicative intention (as possibly deviating from the decoded surface meaning of his utterance) is necessary. In *Cautious Optimism*, the speaker's competence is not necessarily assumed, so that the hearer may also envisage what the Speaker *might have meant* to convey – for instance, in a slip like 'I've been feeding the penguins in Trafalgar Square' (Wilson 2000). In the third strategy, *Sophisticated Understanding*, the hearer assumes neither the competence nor the benevolence of the speaker (he might be lying), and may use second-order metarepresenting to infer what she *might have thought he would think* was relevant.

Interpreter trainers may find the account of *Naive Optimism* familiar. For some strange reason, students of translation and interpretation often seem to approach their texts and speakers at this level – expecting them to encode information perfectly and truthfully – whereas *Cautious Optimism* is needed at the very least, and they obviously practice *Sophisticated Understanding* in everyday life.

Metarepresentation and *irrealis* in interpreting

In current thinking, metarepresentation as a higher cognitive function allows for two related kinds of mental feat, which are reflected in language:

(a) the representation of abstract and hypothetical events, entities or states of affairs. *Irrealis*, as this dimension is known, finds linguistic expression in negation, epistemic or deontic modality, conditionals and interrogatives, encoded in different languages in various devices like subjunctive mood, modal verbs and adjectives, particles, or verb tenses.

(b) the representation of other people's beliefs and intentions. This 'attributive' metarepresentation can be seen as a special case of the general ability to represent states of affairs tagged with some epistemic restriction about their reality or desirability.

Metarepresentation and language are therefore, as one would expect, thoroughly intertwined. In addition to the lexical and syntactic equipment to formulate simple first-order statements and descriptions of states of affairs, all human languages comprise devices to communicate degrees of reality, possibility, probability, and desirability or to attribute statements or descriptions to another source. Not surprisingly, attributive uses and indirect quotation share many of the syntactic and lexical devices, including particles, conditionals and modals, which are used to mark hypothetical or abstract *irrealis* (Wilson 2000).

Irony, which involves sophisticated metarepresentation, also employs these devices and others, like intonation.

Returning to our pursuit of sources of difficulty, we can assume that inferential comprehension requiring higher-order metarepresentations – for instance, when Speakers are incompetent, vague, indirect, highly abstract, ironic or sarcastic – requires more effort than passages where the first relevant interpretation is available with only minimal enrichment and resolution of the basic proposition after linguistic decoding. There is in fact both empirical evidence and persuasive theoretical argument for seeking factors of effort in this inferential phase.

Anne Marie Bülow-Møller (1999) found that, regardless of the syntactic straightforwardness of the text, interpreters made significantly more errors on passages involving the expression of possible, hypothetical, conditional or implicitly negated events and facts (*irrealis*). On an argumentative, rhetorical speech, professionals stumbled on *irrealis* features, frequently failing to attach the right modality (e.g. 'is' vs. 'ought') with the right facticity (e.g. fact vs. hypothesis) and the right scope (e.g. they negated more or less of the proposition than the original).

On close inspection, most of Bülow-Møller's examples, especially those she calls 'inherent negatives' (explicit negatives pose no real problems) require higher-order metarepresentation. In one instance, the speaker is describing the intentions of the British Conservative Party in proposing legislation (the interpreter must form a third-order metarepresentation), and the beliefs and desires ascribed by the Conservatives to the British public (fourth-order metarepresentation):[2]

> 'Apparently it didn't occur to him *[Michael Howard, the British Home Secretary]* that what the public wants is more criminals arrested, not laws that may make it easier to convict people whether they are criminals or not.'

The translation [...] *apparently it didn't occur to him that more criminals were arrested* [...] loses one level of metarepresentation (from 4th to 3rd order). The record number of errors occurred on *finally they were to be allowed to bug*… which was generally rendered as *finally they were allowed to bug.* In

2 Formally we must recognise, with Gutt (1991/2000), that the entire utterance of a translator or interpreter is an unmarked direct quotation, expressing a detailed macro-metarepresentation of the Speaker's beliefs and intentions, thus distinguishing translational discourse as an interpretive (as distinct from descriptive) use of language. However, we need to go into more detail to identify local representational and linguistic challenges of the task.

some cases, either negation, or epistemic modality (*should, might, could*), or one order of attribution, as above, were simply lost. In other cases, the slippages take the form of a displacement of the scope of the *irrealis* or metarepresentation, a pattern which had been noted by Setton (1999).

These findings suggest that any measure of difficulty will need to consider factors to do with conceptual (meta)representation, like *irrealis* and attributive uses, in combination with factors affecting the more nuts-and-bolts levels of language processing, such as syntactic-semantic mapping.

Since *irrealis* is expressed through syntax, which is also doing other work and embodies other types of complexities which need to be processed with a view to reformulation in another language, the difficulty due to *irrealis* must be evaluated in combination with other discourse variables (as well as task-specific constraints). The following syntactic-semantic properties – i.e. concerning the form, concentration and sequence in which meaning is encoded and presented in the speech stream – have been identified as probably significant for processing difficulty:

– Pure *syntactic complexity* (centre-embedded sentences).
– *Semantic or propositional density*, measured as e.g. the number of propositions per clause (Le Ny 1978; Dillinger 1989; Tommola forthcoming).
– *Syntactic-semantic mapping, information structure, case-role relations*. Utterances may be difficult to process when they depart from canonical orders, or correspondences between Subject and Agent, Object and Patient, Indirect Object and Beneficiary, etc., as for example in passive constructions, or utterances beginning with an unmarked indirect object (Givón 1984/1990; see also Dillinger 1989).
– *Logical order*. Beyond the sentence, the order of presentation of premises – ‘figural effects’ – is a significant factor in the speed of logical processing (Cornish and Watson 1970; Johnson-Laird and Bara 1984; Givón 1990).
– *Pragmatic guidance*: word-order, stress, prosody and other devices which mark contrasts and emphasis or otherwise help the hearer to make the desired inferences (Blakemore 1987; Wilson and Sperber 1993; Setton 1999). Conversely, their absence probably makes aural reception more difficult (Déjean le Féal 1982).

Bülow-Møller (1999) discusses the possible combined effects of *irrealis* with some of these variables, as well as task-specific factors like forced compression or simplification under production constraints. Unravelling these interactions between logical-semantic structure, cognitive-pragmatic factors and task constraints will certainly be complex, but may open up a whole new paradigm in interpreting research.

Unpacking comprehension

To recapitulate, we are on firmer theoretical ground if we model any task as a team effort of known or evolutionarily plausible basic faculties towards a task-specific (and situation-specific) goal, rather than as a composite of other tasks which – particularly if not automatic – would each recruit these faculties differently to serve different goals. A rough configuration of basic faculties as they might be recruited in a cognitive linguistic task like interpreting is offered in Figure 1: perception and articulation, language (grammar and lexicon), and the higher cognitive functions, traditionally including categorisation, pattern-matching, reasoning, imagination and planning, all thought to be centred in the frontal lobes[3], here subsumed in two key faculties: deduction-inference, involving the construction of intermediate representations; and metarepresentation, with recursive embedding (tagging, scoping) of intermediate representations.

Note that the ‘cognitive’ box is superimposed on the ‘language’ rectangle. Translation proceeds neither in a special module nor via two competing routes (word for word vs. reconceptualising); in the professional translator, SL words and phrases evoke *both* concepts *and* SL words and phrases, and the latter are selected under more or less cognitive control.

Nor is there a box for ‘memory’: the phenomena traditionally going under that name are realised by the faculties of (meta)representation, in which representations are tagged, labelled and scoped for different degrees of reality, durability and reconstructibility: episodic, semantic and implicit memories can be treated as representations with different kinds of temporal, attributive or epistemic tags attached by the emotional, sensory and cognitive experiences associated with them.

This scheme provides a basis for a tentative distinction between basic cognitive constraints and resources, on the one hand, and task-specific strategies on the other (cf. Shlesinger 2000: 6-8). The potential difficulties discussed above – complex *irrealis*, uncomfortable logical sequences or language-*gestalt* correspondences, lack of natural prosody and so on – can be considered as challenges to basic, evolved cognitive abilities: perception, representation, pattern recognition, empathy etc. (cf. Chernov 1979, 1992 on evolutionarily preferred patterns of information flow and redundancy). Task-specific strategies, in contrast, are acquired skills to compensate for or bypass these basic cognitive

3 And apparently inseparable from the emotions (Damasio 1994) – but that is another story.

limitations, by learning to perceive, metarepresent, and formulate appropriately and flexibly on the changing task terrain.

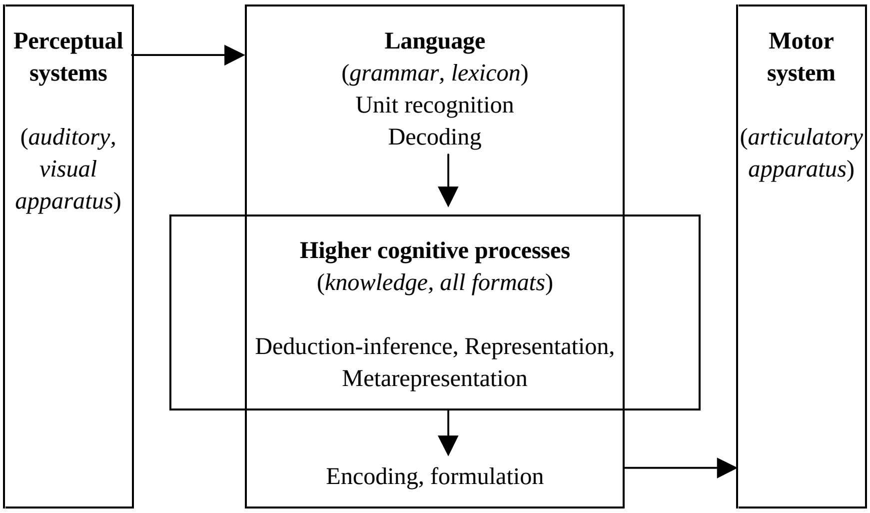

Figure 1: Faculties and sub-processes in interpreting
(*pre-requisite inputs and systems are shown in italics*)

To relate interpreting data to mental operations, we need to unpack the linguistic, inferential and integrative processes in comprehension. Taking our model of utterance processing from relevance-theoretic pragmatics (Sperber and Wilson 1986/1995; Blakemore 1987; Wilson and Sperber 1993), comprehension appears, independently of subjective factors like the interpreter's mood, as a cascade of processes, products and contingencies as shown in Figure 2. Using the inputs on the left, perceptual, semantic, pragmatic and formulating processes yield increasingly complete products – word meanings, propositions, explicatures, implicatures, speech – subject to the factors on the right. The inputs and potential obstacles are both cumulative, as shown by the plus signs in the table, e.g. satisfactory pragmatic processing depends on correctly interpreting prosody, given the inputs at the semantic level (basic word meanings, context); and awkward discourse structure, as in a recited written text, will add to the difficulty of interpreting a non-native speaker.

Now real discourse does not deliver the building blocks of full comprehension in this order – for example, clues to attitude may become available before the proposition they affect[4] – and this is where the interpreter's acquired skills and strategies come in. In consecutive, we learn to use later clues to clarify earlier ambiguities; in simultaneous, to enunciate incrementally: waiting, stalling or approximating then compensating or completing as more comes in.

Input	**Process**	**Product**	**Effort also depends on**
sensory input; language knowledge	perception and decoding	word strings	acoustics; speaker's use of language
(+) context: situation, background, earlier discourse …	semantics – reference assignment – disambiguation – conceptual enrichment	propositions (explicatures)[5]	(+) discourse structure (order in which information is presented, referential cohesion)
(+) clues from discourse connectors, prosody, marked word-order, facial expression, posture	pragmatics 1 *vouloir-dire*	intentional utterances ('higher-order explicatures') with attitude, illocution, evidential and epistemic values	(+) speaker's rhetorical skills, pragmatic guidance[6]
metarepresentation of shared meaning (S and A through I*)	pragmatics 2 what-is-understood	implicatures	(+) appreciation of speaker-audience relationship
active linguistic abilities	formulation	TL speech	norms

Figure 2: Cumulative comprehension in SI
* S=Speaker, I=Interpreter, A=Addressee

4 Compare this relevance-theoretic account of the on-line adjustment of inferences: "Interpretive hypotheses are made rapidly, on-line, and in parallel. The mechanism that mediates the inferences from logical form to communicated propositions is one of 'mutual parallel adjustment' of explicatures and implicatures […] the reasoning need not progress step by step from premises to conclusions. […] The process may involve several backwards and forwards adjustments of content before an equilibrium is achieved which meets the system's current 'expectation' of relevance" (Carston, forthcoming).

5 Sperber and Wilson (1986/1995).

6 This dimension cannot be properly assessed from a mere transcript.

Expertise thus results from a combination of an enhanced basic cognitive ability (comprehension) and acquired techniques of incremental formulation. It is the ability to make an ostensibly difficult process easier, and the product better, by (a) tapping higher, inferential inputs to understanding and (b) using enhanced linguistic skills, such as syntactic agility and a rich vocabulary, to express this richer understanding smoothly under the imposed conditions.

Space allows for only one example, from a political speech, to show how the ease and quality of SI production depends on the level of input tapped (words, context, clues to speaker's intentionality…) and the appropriate choice of output. The higher the level of information available at a given point, the better the production options available.

> Donner de nouveaux moyens au développement de la coopération, j'ai commencé de le faire en engageant dès la formation du Gouvernement la réforme des instruments de coopération. *(Lionel Jospin, December 2001)*

1. *Donner de nouveaux moyens au développement de la coopération*

The product yielded by the primary process of perception and decoding is a string of words assembled as a proposition lacking tense, subject and modality.

Option 1*:* Strategy: decide this is not enough to work with, and wait.
Option 2: Strategy: stick to information provided by the words and syntax, produce a proposition which is safely neutral as to tense, subject and modality:

> *Devoting fresh resources to expanding cooperation...*

Option 3: Strategy: use the clues to attitude and intentionality in the words, which convey a positive connotation of desirability:

> *We need to devote fresh resources to expanding cooperation...*

Option 4: Strategy: use previous discourse and general knowledge to metarepresent, allowing confident packaging. Jospin is listing his achievements, possibly after flagging them earlier in the speech. The clause can thus be analysed as a topicaliser, or topic refresher:

> *As for devoting fresh resources to expanding cooperation...*

2. At the next phrase, *j'ai commencé de le faire…* the following continuations are possible

Option 1: *I have begun devoting fresh resources*... (emphasis, topicalisation lost)
Option 2: *...is something I have begun to do*... (acceptable, but laborious; this construction is forced by having made the first proposition a Subject instead of a syntactically independent Topic 'As for...')
Option 3: *...and I have begun this work*... (acceptable, but over-translation - *we need to*).
Option 4: *...I have begun to do so...*
Option 4b: Wait (tense ambiguity of **j'ai commencé**…) ...and so on.

Option 4, based on the highest level of understanding, with metarepresentation, allows for the best continuation; but the next phrase contains an ambiguity – *I began* or *I have begun* … – suggesting, in this case, the waiting strategy (4b).

The oft-quoted 'strategies' observed in professionals can be seen as techniques for incrementally enunciating a TL version as far as possible or safe, using clues as they emerge from inference, other knowledge, and so on, and 'falling on your feet', thanks to the linguistic skill which I have elsewhere called syntacrobatics (Setton 1994). As shown in another corpus, this often entails temporary deviations and dilutions, which experts usually manage to rectify discreetly (Setton 1999). Both strategy and understanding are necessary: as seen in option 2, playing safe without drawing on higher levels of understanding is not optimal.

On this basis the interpreting task can be seen as a combination of the following sub-skills and competences:

- comprehension of SL at all levels (including pragmatic clues)
- context acquisition, off and on line: preparation, awareness, alertness
- metarepresentation, or in everyday terms, empathy and acting
- syntactic agility and a rich vocabulary in TL.

Given a proper grounding in syntax, semantics and pragmatics, combined with his or her own experience as a practitioner, an interpreter trainer should be able to attribute students' failures in any discourse, task constraint and language pair to linguistic, representational or strategic problems, in terms specifically related to the passage concerned.

Research on discourse difficulties as an input to training

In our view, overall interpreting quality can only be satisfactorily gauged by combining peer and user evaluations. However, with a view to an eventual application in training, there is room for a research programme aimed at clarifying text-specific sources of difficulty by controlling other variables. The following variables were identified as factors in performance:

(1) e*xternal factors* like acoustics and visibility, which affect perception and reduce contextual clues;
(2) the *interpreter's linguistic competence*, for the linguistic decoding and encoding phases of comprehension and production: recognition and retrieval (passive and active lexicon), syntactic and general verbal agility, etc.;
(3) the ease with which coherent representations can be formed from the discourse under ideal environmental conditions, which depends on
  (a) *properties of the discourse* like semantic density, information structure, metarepresentational demands, and pragmatic guidance from the Speaker in the form of prosody, cohesive pointers, and so on; and
  (b) the *interpreter's background knowledge*.

Experimental conditions can be designed to eliminate or minimise (1), and control or neutralise (2) as far as possible (without entirely losing sight of it) by selecting highly proficient experts. Variable (3b) might be controlled by using texts on unfamiliar subjects, checking equal ignorance on the part of subjects though preliminary interviews, and providing them with the same limited preparatory background material. Studies could then focus on independent variables chosen within (3a), either attempting to control the chosen features by constructing texts, or more 'ecologically', testing theoretical predictions by scoring passages of authentic discourses for anticipated difficulties.

Conclusion

Given the problems theoretical linguistics has had in coming to grips with real discourse, it is not surprising that interpreting researchers have hesitated to explore this avenue. But a corpus-based discourse processing model based in cognitive pragmatics appears to provide a better fit to the problems encountered in the classroom than a theoretical division into sub-tasks. In principle, such a model could be empirically refined by identifying particular combinations which pose problems – for example, embedded syntax plus metarepresentation, or logical deduction with passives, or any of these with or without prosodic and pragmatic clues. Perhaps it could be developed into a tool for scoring discourses and predicting loci of difficulty.

In terms of teaching, maximising understanding and verbal agility still seem to be more direct routes to expertise than enhancing attention or memory independently of their objects. Above-average working memory and concentration are prerequisites for aspiring interpreters. But these abilities serve understanding and formulation, not the reverse. It is not memory and attention which are specific to interpreting expertise, but enhanced understanding and speaking. If there is any pedagogical advantage in decomposing processes, we should be focusing on these rather than on the universal processes which subserve them.

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