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Translation and cognitive science

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3.1 Introduction

The inception of cognitive science might be traced back to 11 September 1956 (Miller, 2003, p.142), the second day of the first “Dartmouth College Summer Research Project on Artificial Intelligence”. On that day, several researchers from different disciplines found that the ideas they presented converged into creating what was, for them, a distinct new world view. One by one, they displayed the belief that everything was falling into place. Under the influence of John von Neumann’s thoughts, John McCarthy had coined the term “artificial intelligence” (AI) one year earlier. McCarthy was one of the convenors of that brainstorming summer school that welcomed Newell and Simon’s (1956) presentation of their Logic Theorist, the first AI program ever. Afterwards, and inspired by the work of Claude Shannon, Noam Chomsky (1956) sketched many ideas he would publish in Syntactic Structures one year later. Finally, George Miller (1956) gave a presentation on the limitations of memory and bottlenecks in mental processing.

These presentations may seem disconnected, but they had a common thread: for Newell and Simon, mental processes consisted of applying search and planning rules onto internal representations. Chomsky suggested the existence of an inner, universal, mathematical grammar with a finite set of rules that would nevertheless allow people to be creative when constructing novel sentences. Also, drawing on Shannon’s work, Miller showed that there were memory limits that could be tackled in terms of units. Such units might be complex and, in turn, consist of other, minor units—hence, they entailed some internal organization and structure. In brief, all presenters had different proposals that closed onto the existence of internal mental states. It was, in other words, an interdisciplinary return to mentalism. Only now it would be called cognition, following Jerome Bruner’s preference for a term that avoided the stigma of a mind, all too often likened to soul in the 19th century and dubbed “unscientific” by psychologists at the time.

These and other moves crystallized into a so-called “cognitive revolution” that entailed sweeping changes in established scientific assumptions. Among other consequences, it brought about the end of behaviourism in psychology. Behaviourism had fallen short of explaining complex behaviour and, anyway, symbols were not behaviour but internal representations. In linguistics, the change called for an end to structuralism, because now the focus was on grammar rather than on the lexicon. Grammar rules were developed, according to Chomsky (1957), with
minimal external input thanks to an innate language faculty. The mind emerged from the physical properties of the brain. This notion, originally from the Berlin Gestalt School of psychology, was used to separate brain and mind in order to make it possible to liken computers and humans as cognizing agents.1

The mind, like a computer program, would be composed of several interacting parts or modules. In this view, cognition would amount to flows of information within complex systems controlling diverse processes to (1) sense the environment; (2) symbolize it for internal handling; (3) transform, reduce, elaborate, store, recover and use such symbols; and (4) yield controlled behaviour as a consequence (cf. Neisser, 1967/2014, p. 4). Thought was reduced to problem solving, and personal, social and cultural variations were disregarded, because the human mental machine was one, and universal. Indeed, psychologists still think that humans’ minds are basically alike, but nowadays they try to take on board all that was left out before, as we will see later.

The nascent cognitive sciences—note the plural, then more common—underpinned each other but were far from being cohesive.2 This would be crucial in the development of Cognitive Translation Studies (CTS, henceforth), because cognitive psychology and the first version of cognitive linguistics (i.e. generative linguistics) took quite diverse epistemological paths. The father of cognitive psychology, Ulric Neisser, made it clear that behaviour was still the only acceptable evidence to sustain hypothesized mental processes (1967/2014), whereas linguists felt quite comfortable with introspection. With cognitive psychologists trying to discern the structure, modules and properties of the mind, and generative linguists busy trying to develop a universal grammar (see later), there was still room to focus on the interaction between mind and language.

The psychology of language may be traced back to Wilhelm Wundt and Karl Bühler, but the immediate trigger of a renovation and leap forward in psycholinguistics was the cooperation between psychologists and linguists, e.g. between Osgood and Sebeok (1954), and then between Chomsky and Miller, who inaugurated the trend of sentence processing. Many of the first empirical publications on human translation were carried out by psychologists who studied “simultaneous translation”, e.g. Oléron and Nanpon (1965), Barik (1969), Chernov (1971), Gerver (1971) and Goldman-Eisler (1972). The term “psycholinguistics” had been coined by Jacob R. Kantor (1936), but such studies on interpreting epitomize a new take on psycholinguistics that would last 30 years: it would be a branch of psychology centred on the interface between mental skills and faculties and decontextualized language use in laboratory settings, within a clearly generative approach. Their efforts focused on manipulating an input variable, such as speech delivery rate, and then watching its effects on the interpreters’ output (e.g. input segmentation, ear-voice span, pauses). In general, simultaneous interpreting was for them a peculiar task to trigger differential effects. Even language was deemed a secondary research topic when compared with message processing, attention and memory.

Meanwhile, written translation had languished over the centuries as a minor concern within the realm of languages, literatures and cultures, until machine translation (MT) jump-started it elsewhere in academia. Chomsky had been working in Yehoshua Bar-Hillel’s MT team, and researchers in this budding field soon realized that their goal was not as easy to tackle as expected. MT research then forked out into applied, trial-and-error projects, looking for language rules, and a “pure” line that focused on the very nature of translation and language in the mind and paved the way to “theoretical linguistics”. Noam Chomsky was very influential in the first years of the movement, mainly because of the publication of his 1959 review of Verbal Behavior (1959), an all-out attack on Skinner’s (1957) radical behaviourist manifesto. Then, the Automatic Language Processing Advisory Committee (ALPAC; 1966) report nearly killed MT research in the USA, and it also called for research to focus on computational linguistics and
human translation. Many founders of modern Translation Studies were scholars in humanities departments who had started working on problems and concepts inherited from MT views, now applied to human translation (Muñoz, 2016a, pp. 5–6).

### 3.1.1 First attempts to develop Cognitive Translation Studies

The events summarized previously were the academic milieu in which the Karl Marx University of Leipzig founded the Institute of Interpreters in September 1956 under the direction of Albrecht Neubert. Otto Kade, the deputy director, obtained his PhD in 1964 with work seeking to find out “whether solutions for translation problems could be derived from rules or were rather the result of individual accomplishments” (1964, p. 7, our translation). Inspired as they were by Chomsky, the Leipzig translation scholars—mainly Gert Jäger, Otto Kade, Albrecht Neubert, Heide Schmidt and Gerd Wotjak—never saw themselves as a school of thought proper (Wotjak, 2003, p. 7, note 1). They shared, nevertheless, some important basic tenets, such as their deductive approach and their search for translation grammars that would apply to both translation and interpreting, for which they coined the German term *Translation* [translæ’tʃjo:n] as a hypernym of *Übersetzen* (translating) and *Dolmetschen* (interpreting).

In spite of a restrictive, objectivist approach that led them to proscribe literary translation, the contributions of the Leipzig scholars were far richer and varied than commonly acknowledged. They soon recognized a “double nature” in translation (linguistic and communicative) and developed the notion of “communicative equivalence” (Jäger, 1977, pp. 16–17), which put an end to the extreme formalism inherited from MT. Kade realized that the study of translation and interpreting needed to go beyond linguistics; Neubert was very pragmatic and included socio-cultural aspects first and text linguistics later; Wotjak slowly drifted towards cognitive linguistic approaches (see also Muñoz Martín, 2016a, p. 6). This was to little avail, because some basic assumptions inherited from MT and the information processing paradigm of cognition—the one that emerged from the cognitive revolution—remained unshattered in their work. By the mid-1980s, the Leipzig model of a science of translation based on generative linguistics had already broken down. For instance, Höhlein (1984) had to acknowledge several important drawbacks both in standard generative theory and in case theory when applied to translation. In its last years, however, the Leipzig School scholars turned to West Germany and were instrumental in fostering the development of Translation Studies there, where many of their basic insights were continued by e.g. Wolfram Wilss and, more recently, Gutt (e.g. 1989, 2000).

At the same time, the Paris School came into being after Danica Seleskovitch joined the Sorbonne in 1957 and created a PhD programme, which would become the mainstay of the *théorie du sens*, later known as the “interpretive theory of translation”. The Paris School mistrusted previous experimental research by psycholinguists. Observation—but mainly introspection, much in the Chomskyan fashion she otherwise criticized—became centre stage. Hence, being an interpreter was very important to doing this kind of research, and a whole generation of researchers led by Seleskovitch would be dubbed “practisearchers”. The Paris School also disliked the mechanistic approach of the Leipzig School but were not ready to criticize the then prestigious generative views (see Muñoz Martín, 2016a, pp. 6–7). Instead, they tried to enlarge, complement and reconcile heterogeneous sources—from semiotics to cognitive psychology—to propose an alternative account of interpreting that would later be generalized to (non-literary) translation.

The cornerstone of the interpretive theory of translation was the highly contested concept of “deverbalization”, an intermediate step between comprehension and reformulation where words would lose “their form”. Interpreters would then just find the words in another language to “repack” such deverbalized, pure meaning. Seleskovitch’s was a very abstract and deductive
model, so it was very difficult to falsify with anything but logical argument. Furthermore, its correlation with contemporary (and evolving) models of the mind was sometimes doubtful. Lederer, Déjean Le Féal, Delisle (who added insights from discourse analysis) and García Landa, among others, made an effort to streamline Seleskovitch’s model and to flesh it out. Even so, many basic concepts, such as comprehension, remained highly idealized. In spite of this, the Paris School were first at many things that today are more or less widely accepted in CTS, such as the focus on translators and interpreters rather than on a disembodied mind; the importance given to an individual construction of meaning, where personal experience was crucial; and the notion that translating is not a matter of language but of communication.

The Paris School faded away after Seleskovitch passed away. By the end of the 1980s, Translation Studies was becoming a university discipline in its own right thanks to scholars such as Snell-Hornby, Toury and Holmes, who opened it to approaches within the tradition of the humanities. Some scholars—e.g. Fraser, Guerloff, Kußmaul, Lörscher and Tirkkonen-Condit—embraced psychological concepts and methods and focused on the empirical research of translation processes, but most of them shared notions of cognition, meaning, language and communication similar to those held by the Leipzig and Paris Schools. Towards the turn of the 21st century, some scholars—e.g. Shreve, Halverson, Risku and the authors of the present chapter—were promoting a change in the theoretical foundations of CTS, taking on board advances mainly in cognitive linguistics, cognitive psychology and the philosophy of mind. Such advances may shed new light on received approaches to translation process research (TPR) against the backdrop of a changing landscape in cognitive science.

3.1.2 The changing landscape in cognition

Jerome S. Bruner co-authored *A Study of Thinking* (Bruner et al., 1956), the first landmark of the cognitive revolution. Later on, however, Bruner did not seem very happy with the way the cognitive revolution had evolved: “at least in my view, that revolution has now been diverted into issues that are marginal to the impulse that brought it into being. Indeed, it has been technicalized in a manner that even undermines that original impulse” (Bruner, 1990, p. 1). As early as 1962, Bruner (1962/1979, pp. 129–130) wrote:

> Man does not respond to a world that exists for direct touching. Nor is he locked in a prison of his own subjectivity. Rather, he represents the world to himself and acts on behalf of or in reaction to his representations. The representations are products of his own spirit as it has been formed by living in a society with a language, myths, a history, and ways of doing things.

For Bruner, who became a proponent of “cultural psychology”, meaning making was the cornerstone for cognition, and the aim of the cognitive revolution should have been to discover and to describe formally the meanings that human beings created out of their encounters with the world, and then to propose hypotheses about what meaning-making processes were implicated. It focused upon the symbolic activities that human beings employed in constructing and in making sense not only of the world, but of themselves

> Bruner, 1990, p. 2

Bruner, thus, may also be seen as having contributed to a second cognitive revolution that started in the 1990s. Neisser also became disappointed with information processing theories and
simplistic laboratory-based methods because they could not apprehend the way people think in natural settings, and argued that research should be designed to explore how people think in real-world tasks and environments. Neisser also contributed (e.g., 1976) to this new intellectual revolution by becoming an advocate for “ecological” cognitive research. Behaviourism had not been as dominant in Europe, and Bruner sympathized with the work of European psychologists such as Bartlett (e.g., 1932), Vygotsky and Piaget. In Europe, the second cognitive revolution felt rather more like a merger of new American and existing European traditions.

Theoretical differences had been there from the start. In the meeting at the Dartmouth College, Nathaniel Rochester et al. (1956) presented a paper drawing on the work of Marvin Minsky (1954). They had tested Donald Hebb’s (1949) theory of learning through cell assemblies—later known as artificial neural networks (ANN), which would pivot on the links between word features rather than on whole concepts. This trend was called “parallel distributed processing” (PDP; Rumelhart et al., 1986), or “connectionism”, and would claim that the brain is a network of simple units working together. Thought and memories would be stored not as full-blow representations (symbols) but, rather, as patterns of activity throughout the network linking symbol features, i.e. below the level of symbols. Such patterns would be determined by the strengths of the connections between the units, which would vary as a function of exposure. In brief, mental representation was portrayed as “sub-symbolic”, and this entailed an important correction of the by now classical cognitive paradigm of information processing. Neural networks became very successful, and they lie at the core of the current advances and hype with Big Data and also with “neural machine translation”. However, Minsky himself first curbed connectionists’ enthusiasm by showing some limits of ANNs’ capacities (Minsky & Papert, 1969) and also by challenging the difference between rational thought and emotions (Minsky, 2006).

The moves by many pioneers echoed parallel developments in other realms of cognitive science. For example, de Groot (1992a, 1992b) suggested decompositional conceptual representations in bilingual memory that amount to distributed memory representations very much in the PDP fashion. Damasio (1994) studied the neurological foundations of emotions and saw in them bodily reactions to stimuli that play a crucial role in decision-making processes. In other words, emotions and rational thought cannot be separated in human experience. The challenge to Cartesian mind/body dualism is now one of the new foci—see Muñoz Martín (2016a) and Risku, this volume—for researchers in various strands of cognitive science. Varela et al. (1991) showed that categorization is based on experience and is graded; that is, that knowledge is embodied and situated. Rowlands (2010, pp. 51–84) summarizes the new convergence in describing cognitive processes as (1) the product of the interaction with the environment, rather than being internal and self-sufficient; (2) conditioned and mediated by the body, rather than being autonomous; (3) oriented to action, rather than neutrally (aimlessly, objectively) processing information; and (4) supported by tools and environmental affordances that blur the internal/external distinction. In other words, cognition is embedded, embodied, enacted and extended. Since we have seen that emotions also belong to it, an A, for affective, is often added to the acronym: “4EA cognition”.

In the last decades, there has been a call to ensure the “psychological reality” of constructs and tenets. As Johnson-Laird (1980, p. 110) put it for cognitive science in general, in building CTS we may be torn apart by two divergent tendencies: an empirical pedantry where only facts count, no matter how limited their purview; and a concept of truth leading to systematic delusion, where all that counts is internal consistency, no matter how remote it is from reality. Furthermore, we need to strive for coherence between our views and the tenets of different branches of cognitive science, now mainly in the singular (cf. Lakoff’s cognitive commitment; 1990, pp. 54–55). In the next sections, we will try to put a few issues in perspective, and we will use the distinction between
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“microcognition” and “macrocognition” to weave a topical thread. Other scopes are equally appro-
appropriate, but this one has drawn much attention recently, thanks to an article by Chesterman (2013) in
which he developed Toury’s (2012, pp. 67–68) notions of “translation act” and “translation event”
in ways that parallel extended views on microcognition and macrocognition.

3.2 Microcognitive and macrocognitive approaches to cognition and
translation

In the cognitive sciences, microcognition and macrocognition are usually described as theoret-
etically, epistemologically and methodologically opposite approaches. While microcognitive
approaches focus on cognition “within” the individual mind and tend to use experimental,
quantitative methodologies, macro-approaches focus on action and social interaction, and
they mostly use ethnographic, qualitative methods. Furthermore, quantitative and qualitative
approaches usually rely on different epistemological positions. While quantitative (micro-)
approaches are deductive and claim universality for their results, qualitative (macro- )approaches
are more inductive, and their results tend to be contextual or contingent (Halverson, 2017,
p. 199). For these reasons, both kinds of approaches have often been considered incommensur-
able. Let us consider the differences between micro- and macro-approaches to cognition and
translation and the possibilities of combining them.

3.2.1 Getting the big picture or zooming in on details?

The term “macrocognition” was coined by Cacciabue and Hollnagel (1995) to refer to the
study of complex cognitive functions—such as decision making and problem detection—in
natural settings, while performing realistic tasks, in contrast to traditional, information pro-
cessing approaches, which operated in artificial laboratory settings and focused on single cog-
nitive functions, such as perception and memory. Microcognitive research usually works at time
scales of seconds or less, while macrocognitive approaches focus on complex processes extending
over time that often can only be tackled with qualitative methods, because their time scale is
too long and too noisy to use quantitative methods such as reaction time measures (West et al.,
2013). Macrocognition does not study what goes on in the individual mind while performing
a task, but the overall performance of the whole complex socio-technical system (Cacciabue &
Hollnagel, 1995; Schraagen et al., 2008).

Some specific questions about human cognition seem to have a better fit in microcognitive,
experimental approaches, while the findings of these approaches can only be applied to real-
world situations using a macrocognitive perspective (Smieszek & Rußwinkel, 2013). Thus,
micro- and macro-approaches to cognition are not always considered as antagonistic frameworks.
Staszewski (2008), for instance, argued for the search of convergent findings between both
approaches in order to strengthen their validity, and Klein et al. (2000) claimed that micro-
and macro-approaches can be complementary. Smieszek and Rußwinkel (2013) described three
attempts to bridge the gap between them that relate to three different understandings of the
term “macrocognition”.

The first follows the line initiated by Cacciabue and Hollnagel (1995) within cognitive
“modelling” and focuses on the overall complex human–machine system. Here, the strategy
to connect microcognition and macrocognition amounts to downscaling the model to reach a
finer granularity. This is done by integrating microcognitive functions into the macrocognitive
model; for example, Smieszek et al. (2013) implemented a micro-model of limited working
memory within a macrocognitive model of air traffic control with the purpose of predicting

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more accurately the overall performance of the whole human–machine system. In order to gain domain knowledge, macro-modellers rely on interviews with experts and on observations of their interaction with the working environment, which are ethnography-inspired methods.

The second take on macrocognition is based on the “macro architecture hypothesis”, first proposed by Newell (1990) with the aim of building a complete cognitive architecture that could model all macro-level tasks in all knowledge domains (West et al., 2013). According to this hypothesis, human intelligence can be described at different levels, each of which relies on the next lower level: macro-level architectures are built on micro-level architectures, which, in turn, are built on neural architectures. Like macrocognitive models, cognitive architectures allow researchers to model complex, real-world behaviours, although in this case the gap between microcognition and macrocognition is overcome by upscaling from microcognitive architectures to model macrocognitive functions, such as expert performance in chaotic, multiagent environments (West & Nagy, 2007). Another difference between macrocognitive models and architectures is that macrocognitive architecture is hypothesized to exist in the individual brain, and it is supposed to enable people to perform complex real-world tasks using information processing abilities that emerge from micro-architectures (West et al., 2013, p. 427).

The third understanding of macrocognition, also labelled “shared cognition”, stems from research on teamwork. Here, macrocognition refers to the cognitive processes of a group of people collaborating in complex socio-technical contexts (e.g. Fiore et al., 2010; Grauel et al., 2013). Studies of team cognition coincide with distributed and extended cognition approaches (e.g. Clark, 2001; Hutchins, 1995) in the view that cognitive processes take place not only “within” individuals but also “between” individuals, in their cooperation and in their interactions with the environment. Macrocognition in teams describes how individual internalized knowledge is transformed into externalized team knowledge in order to build a shared understanding of the task at hand (Fiore et al., 2010). For these approaches, microcognitive aspects of individual cognition are only relevant inasmuch as they can contribute to team performance, and the connection between micro- and macro-levels takes place through knowledge internalization and externalization processes.

In a broad sense, the first and third understandings of macrocognition described previously may be related to situated and distributed approaches to cognition, while the second may be nearer to classical views of cognition, in particular to Newell’s goal of reducing intelligent behaviour to simple micro-processes of symbol manipulation. So, it would seem that macrocognition could be addressed from both a symbol-manipulation and a situated/distributed perspective. And yet, the gap between the classical assumption that cognition—mainly understood as information processing and problem solving—happens in the individual mind, and the view of cognition as taking place “in the wild” (Hutchins, 1995), may be too deep to ignore.

### 3.2.2 Minding the gap: Cognition in the wild

Can macrocognition be understood from a symbol-manipulation perspective? Are experimental, laboratory research and ethnographic studies incommensurable? Before trying to answer these questions, it may be helpful to take a closer look at the differences between micro- and macro-approaches. Flach (2008) identified three interrelated gaps between them:

The first gap may be said to be implicit in the methodological approaches of traditional experimental research, on the one hand, and the more ethological, situated studies of human cognition, on the other. This gap has to do with the dynamics of the investigated processes. While laboratory research mostly implies some linear dynamics, i.e. a series of isolated, simple processes that take place step by step, ethological observations suggest some non-linear dynamics of coupled processes interacting in a flexible, adaptive way (Flach, 2008, p. 29).
The second gap pertains to the locus of cognition. While micro-approaches—and, as we have seen, macro-architectures—locate cognition in the individual mind, situated and distributed approaches describe cognition as taking place in the interactions between individuals, and between them and their socio-technical environment (Flach, 2008, p. 29). Hutchins (1995), for example, approached navigation from a distributed perspective, using an ethnographic methodology, and described the cognitive and computational properties of a complex socio-technical system—a ship entering a port—in terms of the cooperation of crew-members and their interaction with the technical equipment of the ship.

The third gap described by Flach (2008, p. 30) relates to the traditional disconnection between rationality and emotion. Micro-approaches to cognition have tended to consider affective, motivational aspects of experience as epiphenomena of cognition that disturb pure rationality. Enactive approaches, on the contrary, view cognition as essentially affective, since it depends on the cognizer's evaluation of the objects of cognition (Ward & Stapleton, 2012). Emotions are both mental and bodily (Damasio, 1999) and, as such, they may play an essential role in the attempts to bridge the traditional dichotomy between body and mind (Colombetti, 2007).

This dichotomy of physical and mental events characterizes the metaphysics guiding Western science and causes a deeper rift of which the three gaps sketched here are only the visible part. Flach (2008, p. 30) rejected the term “macrocognition”, arguing that all cognition is macro, and proposed two alternatives to the body/mind dichotomy: (1) the perspectives of ecological psychology (Gibson, 1979) and distributed/situated cognition (Hutchins, 1995; Suchman, 1987); and (2) radical empiricism (James, 1912). Common to these approaches is the focus on situated action and the idea, also formulated by Varela et al. (1991), that cognition takes place in the dynamic coupling of organism and environment. Gibson’s (1979) notion of “affordance” is the epitome of this relational approach. Affordances are the opportunities for action perceived by an organism in the environment. They are not completely objective, since they are configured by the agent’s perception and exploratory behaviour; but they are not completely subjective either, because they emerge from the history of dynamic interactions between the organism and the environment. Affordances are both physical and mental (Gibson, 1979, p.129).

Now we may attempt to answer the first question posed earlier about approaching macrocognition from a symbol-manipulation perspective. Approaches inspired by ecological psychology, distributed/situated cognition and radical empiricism envision cognition from a relational, dynamic perspective. They focus on situated action and interaction, so they may be best suited to approach macrocognition. And, since all cognition takes place in the wild—since all cognition is macro (Muñoz Martín, 2016b)—these situated approaches may be the best way to address cognition in general.

In order to answer the second question about the commensurability of laboratory and ethno-graphic research, it is worth considering the methodological implications of ecological, situated approaches for experimental research. Flach (2008, pp. 36–37) identified three implications. The first pertains to the common distinction between basic and applied research. Psychologists Hoffman and Deffenbacher (1993, pp. 323–324) claimed that this distinction had been inadequately specified, since it was understood as a one-way road from basic to applied research, although the applied-to-basic direction was not an exception in the history of experimental psychology. New research paradigms can emerge from applied research, and existing theories can be transformed by their applications. Basic and applied research depend on each other and cross-fertilize one another. Flach (2008, pp. 36) argued that an ecological or radical empiricism approach to cognition implies “to start with the phenomena of human experience as it is lived”, that is, to start with what traditionally have been considered “applied” questions.
The second implication addresses the focus of research, which should not be placed on the “internal” mental processes of the participants but on the whole socio-technical system. The “context” should not be considered an “external” factor, but intrinsic to the phenomena under study. The third implication refers to the relevance of laboratory research when generalized to the real world, i.e. to external or ecological validity. Flach (2008, p. 37) did not argue for taking research “out” of the laboratory but, rather, for taking “in” the ecological context in the research design and in the generalizations made from experimental studies.

This last implication is particularly relevant to the question of the compatibility of laboratory and ethnographic research. For Gibson (1979, p. 3), the laboratory “had to be” like life. In the context of the psychology of perception, Brunswik (1955, p. 199) originally defined ecological validity as the correlation between two variables, one of which can function as a probability cue for the other. For instance, some points of light moving in the dark can be perceived as a person. In this first definition, ecological validity was not a property of an experiment but a property of a cue. This early definition was then extended to mean the correlation between the features of experimental research—materials, tasks, conditions and setting—and the natural conditions of human cognition. Hoffman and Deffenbacher (1993, pp. 329–331) further expanded Brunswik’s (1955) concept into four ecological dimensions for analysing experimental research:

1. Validity: the correlation between experimental materials, tasks, conditions and setting, and the natural conditions of real-world human cognition.
2. Relevance: the pertinence of experimental tasks to actual human experiences and activities.
3. Salience: the connection between experimental tasks and important human activities.
4. Representativeness: the connection between experimental tasks and conditions, and frequent human activities and environments.

In sum, if laboratory research starts with “applied” questions, if the focus is on the whole socio-technical system in which cognition takes place, and if it preserves natural forms and is relevant to actual, salient and frequent human activities, then it can be said to be compatible with ecological, situated approaches to cognition and ethnographic methodologies.

### 3.2.3 Macro-approaches to translation: Workplaces, classrooms and laboratories

The first methodological implication of adopting an ecological, situated perspective on cognition as suggested by Flach (2008)—i.e. that research starts with applied questions—is fulfilled in cognitive approaches to translation, since their object of study is a culturally informed, socially embedded human activity. As an applied science, cognitive translatology can both help to test and contribute to creating new hypotheses in the cognitive sciences.

As for the second implication—that research focuses on the whole socio-technical system—Halverson (2014) argued that adding cognitive approaches to the study of translation had prompted a transition from linguistic micro-approaches, centred on the text and the comparison between language systems, to broader views focused on translators and their situated work. However, and despite what may be a growing tendency, not all cognitive approaches to translation can be considered “macro”, since not all of them envision the whole socio-technical context as an integral part of translation processes. The classical view of cognition as a series of rational, disembodied and isolated processes—and of contexts and situations as something external to cognition—was also initially adopted in CTS. Muñoz Martín (2016a) identified various simultaneous efforts taken in the 1990s to go beyond this inherited view of cognition, drawing on the theoretical frameworks of expertise studies (Shreve, 2002, 2006), cognitive
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linguistics (Halverson, 1996; Muñoz Martin, 1994), and situated cognition (Risku, 1994, 2002). Common to these approaches was the focus on different aspects of cognition neglected by micro-approaches, such as the social embeddedness of expertise acquisition, the embodied nature of language, and the situatedness of cognition and translation.

These efforts crystallized in some theoretical proposals that adopted a macrocognitive perspective. Risku (2000, 2002, 2010) proposed applying the findings of situated and embodied cognition to translation research, broadening its object of study to include, for example, the history of use of artefacts, the social organization of work, and communication between experts. The new approach should focus on real-life translation and use qualitative research methods “to study basic practices central to the organization of translation” (Risku, 2010, p. 104). The members of PETRA Research Group (see Muñoz Martín, 2006, 2010a, 2010b) started developing a theoretical framework for a “cognitive translatology” drawing from cognitive linguistics, situated and embodied cognition, and social constructivism. PETRA’s research methods included non-invasive data collection and ecological validity checks.

Adopting a theoretical macro-perspective paved the way to introducing ethnographic methods in translation process research (reviews in Risku, 2017 and Risku, Rogl, & Miloševic, 2017). Ethnographic methods include participant observation—with researchers taking part in the observed activity in some way—and interviews with translators at the workplace. Although ethnographic research projects usually approached new aspects of the translation process, such as translation project management (Risku, 2004; Olohan & Davitti, 2015) or ergonomic needs (Ehrensberger-Dow, 2014), some projects have thrown new light on aspects frequently addressed by microcognitive approaches to translation, such as creativity (Risku, Miloševic, & Rogl, 2017) and literary translation (Kolb, 2017), adopting a broader perspective that includes not just the individual translator process, but also interactions at the workplace and the organization of work. In other cases, the results of macrocognitive approaches converge with the findings of microcognitive research. For example, Risku, Miloševic, and Pein-Weber (2016) compared the processes of translating and writing in an ethnographic case study and confirmed the findings of Flower and Hayes (1981) and Immonen (2006).

The projects developed by Ehrensberger-Dow and her colleagues (e.g. Ehrensberger-Dow, 2014; Ehrensberger-Dow & Hunziker Heeb, 2016; Ehrensberger-Dow & Massey, 2017) addressed translation from a situated perspective and combined methods in the ethnographic tradition—observation of the workplace and semi-structured interviews—with techniques commonly used in more controlled settings, such as computer logging, screen recording and retrospective verbalization. Moreover, their corpora of professional translators’ processes include data collected at the workplace and in the controlled setting of a laboratory. The use of both sources of information allowed them to obtain data about the constraints placed on the situated activity of professional translators by comparing the interviews conducted in the workplace with those carried out in the lab (Ehrensberger-Dow & Massey, 2017, pp. 107–108). Combining workplace and laboratory research methods is a promising path to paint a broader picture of translation processes based on robust sets of data underpinned by the ecological validity of field research.

Let us now turn to the ecological validity of classroom and laboratory research. Cognitive approaches to translation have developed in universities and, from the start, they have been concerned with translators’ education. Thus, empirical research on translation processes has frequently taken place in the classroom. Although classroom and laboratory research have often been placed together, as belonging to one pole, and in opposition to field research, there are important differences between them. Classrooms are authentic settings where social and human–computer interactions take place “in a natural way”. In traditions such as action research, teachers-as-researchers are often involved in the situation and participate in the activities of the
class as a community of practice. This sets classroom research closer to ethnographic approaches than to experimental settings. On the other hand, classroom conditions are more flexible and can be more controlled than the circumstances of the workplace; for example, the same text can be translated by many translators, allowing comparisons that are not possible in the workplace (Ehrensberger-Dow, 2014). For these reasons, classroom research can be placed somewhere between ethnographic approaches and laboratory settings, depending on the research interests and methodologies, and it can exhibit high ecological validity and relevance when the objects of study are novices or advanced students.

Experimental research “involves the specific manipulation of conditions or variables in a controlled environment” (Mellinger & Hanson, 2017, p. 6) and, accordingly, it tends to have less ecological validity than ethnographic and classroom research, although some efforts can make the laboratory (more) lifelike. Beyond the ecological validity of the experimental methods and setting, the possibilities of combining laboratory research with macro-approaches to translation also depend on their ecological relevance—the pertinence of experimental tasks to actual human activities. From a 4EA perspective on cognition and translation, translation processes encompass the interactions with, and the cognitive processes of, all the people involved, including the addressees. Experimental research on reception from an embodied perspective that includes emotional response (e.g. Ramos, 2016; Ramos & Rojo, 2014; Rojo et al., 2014) is an example of how laboratory research can contribute to expanding the study of translation from a micro- to a macro-perspective.

In CTS—in particular, in translation process research—the use of multi-method research designs has increased in the last decades (Halverson, 2017). Very often, multi-method research takes the form of triangulation of quantitative and qualitative data of the same event (Jakobsen, 2014). Expanding this kind of triangulation to combine micro- and macro-approaches may contribute to further strengthening the foundations of our research. Compound projects balancing laboratory and ecological data collection instances may contribute to blurring the theoretical dichotomy between micro- and macro-approaches in the future, in the same way as the dichotomy between process and product has become outdated in recent years (Halverson, 2017).

3.3 Concluding remarks: Tearing down walls for a cognitive translatology

Cognitive science is today no more cohesive than it was in the 1950s, even though many research strands tend to share basic assumptions, which can be the backbone for any “cognitive translatology”, i.e. for any framework within CTS that draws from 4EA cognition (Muñoz Martín, 2010a). We would like to close by summarizing several notions we have discussed that feel outdated and that should simply be left behind. We cannot keep entertaining naïve notions of a mental lexicon that looks like a dictionary, in view of de Groot’s and Minsky’s contributions (see earlier) and others such as Elman’s (2004, 2011) notion that words are stimuli that operate directly on mental states and Langacker’s (1987) basic contentions that (a) grammar forms a continuum with the lexicon in our minds and that (b) any symbolic unit—not only words—is in our minds a point of access to a network or cognitive routines with nodes that work much in the connectionist fashion (1987, pp. 163–164, 182).

The differences between the classical cognitivist paradigm and the (common assumptions in) current trends in cognitive science are too general and fundamental for a small set of experiments to directly test between them: they are not rival theories, but differing philosophical paradigms (van Dijk et al., 2008, p. 299). This also means that we could go on and on reviewing every single
notion and aspect in the CTS landscape, but there is not enough room for this here. Besides, this whole volume offers a wide array of perspectives on cognition, and the reader is thus invited to consider their philosophical foundations as an exercise in critical reading.

First, and foremost, if we agree that (a) meaning is encyclopaedic; (b) the mental organization of stored information is sub-symbolic; (c) each language symbol may trigger the activation of a network of sub-symbolic nodes that will never be identical due to the interaction with other activated nodes through spreading activation; (d) language underspecifies meaning, in that what we experience mentally is far richer than what is meant with language symbols; and (e) meaning is an active process that will use any kind of inputs and stored information, then we will necessarily conclude that translating is not a matter of language but, rather, a matter of meaning or of communication.

This is indeed what the members of both the Leipzig and the Paris School sensed and hinted at, and what Kokkola and Ketola (2015) and Ketola (2016) have argued and proved. Language is a cognitive tool that will help us perspectivize knowledge, organize and develop ideas, and learn. But when it is separated from its communicative purposes, it drifts away from psychological reality. Language is also a social tool, and humans simply cannot use it in a pure, self-sufficient form. It always comes with an intonation, a font size, an addressee; it is always multimodal. Only abstractions of some of its regularities can give us the false impression that it is an autonomous system. This is why both psychology and linguistics, cognitive or otherwise, are not adequate referential frameworks to explain how we translate. Cognitive science is.

Using cognitive science as the referential framework for our attempts to explain how we translate and interpret would also put an end to the traditional divide between Cognitive Translation Studies and (cognitive) Interpreting Studies. If we are trying to account for a set of social behaviours that we can overarchingly describe as multilectal mediated communication, then we need to come to terms with the fact that our prototypical opposition between simultaneous interpreting and book translation are but two instances of a wide array of activities whose features used to be neatly clustered around oral and written language (use) but today can be easily separated, as in remote interpreting, asynchronous interpreting, sight translation, respeaking, post-editing, trans-creating and the like: new labels for old tasks, sometimes activities at the fuzzy borders, but well within our research scope.

This, of course, does not mean that there are no differences between translation and interpreting but, rather, that we need to seek to accommodate current and future forms of multilectal mediated communication as instances along continuums with a common core in the structure of the mind, its neurological roots, and the way language and communication are socially and culturally nurtured and gradually modified throughout a lifetime. There is also an undeniable, prominent role for (purely, merely) linguistic and psychological topics within cognitive translatology, but they will always be only partial explanations of phenomena that go well beyond their scopes.

We also need to expand our research in different directions. From a distance, CTS has a distinct Western-centric flavour and a clear bias towards professional forms of multilectal mediated communication. But “professional” is a social, not a cognitive concept. Away from some more developed countries, the most usual forms of translation and interpreting are not necessarily similar to those in complex, rich, post-industrial societies. What is it that we learn when we learn how to translate? How is it that some people will reach acceptable translation or interpreting skills on their own, and, crucially, why are we not studying them?

We have perhaps also been blindly focused on mediators. After all, we started out by focusing on the minds of interpreters and translators. But what about the other agents who participate in
multilectal mediated communication? Do we behave in exactly the same way when we communicate “through” an interpreter with a third party? Do translators and interpreters take that into account? Are translation addressees constructed in translators’ minds in fashions similar to those used by writers and speakers to construct their readers or audiences in monolingual settings? Are such addressee constructions intuitively rooted in communication? If so, we should include audiences, interlocutors, and addressees into the picture. We cannot afford to leave part of the picture out. These are some of the main cornerstones that cognitive science can provide for Cognitive Translation Studies.

Notes

1 According to Pinker (2002, pp. 31–32):

*The mental world can be grounded in the physical world by the concepts of information, computation, and feedback.* A great divide between mind and matter has always seemed natural because behavior appears to have a different kind of trigger than other physical events. Ordinary events have causes, it seems, but human behavior has reasons [italics in the original].

2 A certain leeway or vagueness would even be welcome:

It often does more harm than good to force definitions on things we don’t understand. [...] The things we deal with in practical life are usually too complicated to be represented by neat, compact expressions. [...] In any case, one must not mistake defining things for knowing what they are. You can know what a tiger is without defining it. You may define a tiger, yet know scarcely anything about it.

(Minsky, 1985, p. 39)

3 “ob die Lösung von Übersetzungsproblemen einer gewissen Gesetzmäßigkeit unterliegt oder ausschließlich als individuelle Leistung zu betrachten ist”

4 The use of mathematical neural networks to develop and learn statistical models to translate texts based on regularities abstracted from large corpora of examples. See some caveats for the notion of ANNs as mimicking human brains and the use of Big Data in Muñoz Martín (2017, pp. 562–563, 565).

Further reading


Clark draws from empirical evidence to argue, sometimes densely and somewhat dryly, that the brain is proactive and that it self- organizes to minimize error in its constantly updated predictions. Such predictions shape perception and lead action, but an embodied, symmetrical bottom-up correction mechanism renders the mind a hierarchical set of mechanisms for Bayesian inference.


A clear introduction to enactivism, which distinguishes it from the other Es and tackles the role of intersubjective social engagement in language, while it shows that the construction of meaning and the acts of communication are multimodal.


This guide to quantitative research methods in translation and interpreting studies provides information and advice on the different stages of the research process, from survey design to the interpretation of results and reporting. Although this methodological book is not exclusively devoted to Cognitive Translation Studies, it offers useful insights for microcognitive approaches to translation and interpreting.


Risku describes the developments that led to the study of cognitive processes in their authentic environments, and provides examples on the use of ethnographic methods in cognitive translation and interpreting studies. She also describes the methodological commitments of macrocognitive approaches and the challenges they pose to translation and cognition research.
References


Muñoz Martín and Martín de León


Translation and cognitive science


