Cognitive Translatology: A primer, revisited

Cognitive Translatology: A primer, revisited

Ricardo Muñoz Martín & César Andrés González Fernández
MC2 Lab, Università di Bologna

Abstract Over the past 15 years, we have seen a steady growth of research in Cognitive Translation & Interpreting Studies (CTIS). One of the paradigms within CTIS, *Cognitive Translatology* (CT), draws from Situated Cognition and already is an alternative to traditional views on the interface between brain, mind and diverse forms of multilectal mediated communication. One decade after the original presentation of the CT framework, this article aims to clarify and update the notions introduced there. First, the article elaborates on prerequisite concepts such as inter-textuality, meaning, language, and communication from cognitive translatological perspectives. Second, it reviews the nature of translations and translating and presents a précis on CT's disciplinary basics, such as the object of study, research methods and future directions. Altogether, we hope to contribute to dispelling misunderstandings and answer some recurrent questions on the theoretical edifice of Cognitive Translatology.

Keywords Cognitive Translation & Interpreting Studies; Cognitive Translatology; multilectal mediated communication; intertextuality; language; communication.

In the last decade we have witnessed an explosion of research and interest in the ever-widening list of phenomena and scopes that today make up Cognitive Translation & Interpreting Studies (CTIS). Ten years have also passed since the terms *computational translatology* (Carl 2010, 2013) and *Cognitive Translatology* (in English, Muñoz 2010) were introduced, together with the basics of these budding CTIS frameworks. A growing number of researchers have started to converge and flesh out either one of these foundational paradigms within CTIS. Computational translatology draws from information processing theory, which has also framed most traditional approaches to study the interface between translation and cognition, back to the Leipzig School. Cognitive Translatology basically draws from situated (4EA) cognition and aims to become an alternative to such traditional approaches (Risku & Rogl 2020; see also Muñoz 2016, 2017). [131]

The move towards coherent integration of philosophical, communicative, linguistic, psycholinguistic, psychological, and neuroscientific approaches to build Cognitive Translatology (CT) has been particularly gratifying. Areas such as cognitive ergonomics, human-computer interaction, emotions and bi- and multilingualism research are getting closer now to the place they deserve within CT. Others, like ecological psychology, are promising to blend in. Still others,

This is a post-print, please refer to the actual version of register:

Muñoz Martín, Ricardo & César A. González Fernández. 2021. Cognitive Translatology: A primer, revisited. *语言、翻译与认知 [Studies in Language, Communication & Cognition]* 1 (1), 131-165. Beijing: Foreign Language Teaching and Research Press (ISBN: 9787521326949).

such as Natural Language Processing, have fared better in computational translatology and are still only slowly making way in CT. Many reasons may contribute to explaining why CT is still dragging its feet in some research areas, but perhaps one of them is the variations in the understanding of its proposed principles.[1]

Over the years we have received requests for clarification over several details in the original proposal. Some of them were recurrent, so we decided to revisit and elaborate on those points in a new article that should complement the first one. Also, at the time several insights were little more than suggestions with scarce empirical support that now stand on firmer grounds, so that an updated review seemed in order. Finally, we realized that we should include our take on some concepts that lay at the foundation of any translation theory, such as intertextuality, meaning, language, and communication (Section 1, conceptual prolegomena). Most space for meaning has been taken by its relationship with memory, so readers are referred to Muñoz & Rojo (2018) for a fuller account of CT views on meaning. The reminder of this article is structured as follows. Section 1 discusses texts and intertextuality (§1.1), meaning and memory (§1.2), language (§1.3) and communication (§1.4). Section 2 addresses the nature of translations (§2.1), and translating (§2.2), and the basic architecture for this theory, thus opening a pathway into future directions.

1. Conceptual prolegomena

Throughout this text we will be referring to texts, reading and other concepts mainly related to written language communication. This is so because it is what most readers are used to talking about. However, we are trying to lay out a general theory across modalities. Readers will thus be [132] reminded now and then that when we use words such as *text*, *translator* and *translating,* we are referring to all multilectal mediated communication tasks—e.g., translating, interpreting, sight translating, revising, postediting, localizing, fansubbing, transcreating, respeaking, audiodescribing, etc. (Halverson & Muñoz 2021; see note 3 and § 2.1)—and events since we are focusing on the common basic features present in all of them, sometimes mutatis mutandis.

1.1. *Texts and intertextuality*

Let us describe *texts* as communicative artifacts with coherent sets of oral, written, and signed natural language symbols that, bundled together with instances of other communication codes (e.g., font, color, gestures, pitch, etc.), are assumed to be built for people other than their writers to assign them both an overall (complex) communicative purpose and a unified, overarching meaning—always greater than the sum of the meanings of their parts. Texts may just consist of a couple of words (e.g., *Nie wieder; Me too; ¡No pasarán!*) but they usually go beyond the sentence. Their distinguishing feature is that they are taken to be self-standing, self-contained.

We are literally surrounded by texts, and they come of all kinds, each one with its particular mix of bells and whistles: drawings and pictures, captions and cutlines, charts and graphs, tables and diagrams, maps and timelines, inserts and sidebars, and the like. Getting humans to master texts takes decades of gathering experience. Still, if texts have an advantage, if we can *learn* from them, it is because in them we identify patterns and regularities. For instance, written texts tend to have titles, headings and subheadings, indents, bullets, blank lines, stretches in italics, bold, varied font colors and sizes. These and other elements contribute to texts' internal organization.

We use them to support our reading and writing because they are codes too and we know how to deal with them (e.g., Lemarié, Lorch & Péry-Woodley 2012).

The textual features above were just props to scaffold structure, but the wordings we find and the meanings we build for texts also echo previous texts, such as *ladies and gentlemen, once upon a time, the bottom line is, yours truly.* Think, for instance, of a restaurant menu and how it echoes other menus you have read. In a way, "every text is an intertext that borrows, knowingly or not, from the immense archive of previous culture" (Leitch 1983:59). Writers are conscious of this to different extents, and to different extents they tend to adhere to text patterns and regularities when drafting their own, in the hope that they will get readers closer to understand what they mean. These regular features also prompt particular expectations in readers that help them in their active pursuit to assign (appropriate) meanings to texts. Thus, both when we produce and receive texts, our behavior is cued and constrained through intertextuality. [133]

Intertextuality is the relationship that for a person holds between two texts or parts thereof, by virtue of one of them reminding the other one in a range of ways: contrast, copy, paraphrase, etc. Examples of intertextual relations affecting small text stretches include *quotations*, or verbatim repetitions of someone else's phrases, sentences, and passages; *citations,* that also make the source explicit but do not repeat the wording; and *allusions,* i.e., hints or indirect references to sources that are not explicitly mentioned.

Other intertextual phenomena affect whole texts. Certain clusters of intertextual features give rise to text types and genres (e.g., *System Requirements, Getting Started,* etc.), and also to forms, which only become *full* texts (or, rather, *other* texts) when readers enter information to fill in the blanks interspersed with the invariable bits (e.g., *Name, Surname, Date of Birth,* etc.). A few text-wide intertextual relationships are eminently creative, such as *parodies*—artistic texts imitating another text's or an author's characteristic style, often with deliberate exaggerations, for comic purposes (e.g., Henry Fielding's *Shamela*)— and *pastiches,* which celebrate other texts by borrowing fragments, features, or patterns from them (e.g., Tom Stoppard's *Rosencrantz and Guildenstern are Dead*). By far, however, the best known forms of text-wide intertextual relations are *versions, adaptations*, and *translations*. What they have in common is that we assume the existence of a single previous text with which they have some kind of direct meaning correspondence.[2]

Versions are particular forms of a text that in certain ways or detail differ from other (earlier, somebody else's) forms of the same text, as in the case of the five known drafts of Abraham Lincoln's *Gettysburg Address* and the 99 stories in *Exercices de style* by French writer Raymond Quenau. *Adaptations* are text versions rewritten to meet stipulated communicative goals, like targeting different audiences; e.g., the medical drug leaflets for patients vs those for health professionals.[3] *Translations* are texts whose meanings correspond to those of other texts written in a different language variety. Often, the defining characteristics of many kinds of intertextuality are not mutually exclusive, hence the fuzzy, singular mesh of intertextual relationships we can point out in each and every text. We will come back to translations and their characteristics (§ 2.1), but let us now focus on translations and their meanings. [134]

1.2. *Meaning and memory*

Our scope makes meaning the cornerstone of translation, but meaning is not to be found in texts. A text is just a bunch of signals and "Signals *do something.* They cannot *contain* anything" (Reddy

1979:306). They are just prompts for people to construct meaning (Evans, Bergen & Zinken 2007:9). Meaning is in our brains and it never leaves, because meaning is "[...] what happens in our minds as we process signs that we perceive through the senses in any communicative intent. Meaning is thus not a thing, it is a process [...]" (Muñoz & Rojo 2018:61). It is not something that we find in and extract from—let alone transfer to—texts but rather something we build and bestow on them. How we go about creating and understanding meaning has a lot to do with the nature and workings of memory and language.

At a neural level, one of the organizing principles of memory is often summarized as "Neurons that fire together, wire together" (Shatz 1992:64). This rule basically posits that a junction or *synapse* between a pair of neurons becomes more efficient thanks to repeated firing by the source neuron to the target neuron (Hebb 1949). In other words, every time that neurons linked to each other are activated together, their connection grows stronger, thus making it easier for them to row-fire the next time. The Hebbian rule for learning has recently been challenged but it is still generally accepted to explain at least partially how memory is encoded in the brain at the synaptic level (review in Langille & Brown 2018).

Correlated, recurrent neural activity leads to *cell assemblies,* groups of transiently active, highly interconnected neurons. These assemblies may yield cortically disperse and subsymbolic—but also anatomically particular—representations, including those for all kinds of language elements (Garagnani, Wennekers & Pulvermüller 2009). In other words, there may be single neurons handling complex information (e.g., a face) but, in general, stored complex information emerges from the activation of cell assemblies. These cell assemblies are activated by stimuli, whether coming from our senses or other assemblies. After the original stimulus decays, the activity in a cell assembly may be maintained through reverberations—this we call *short-term memory.* Actions involving perception, memory and other cognitive processes combining into [135] activities such as translating are performed via transient and dynamic sequences of simultaneous, partially overlapping activations of very many functional brain networks.

Many brain processes are fast and associative, thanks to *spreading activation,* by which the firing of one neuron is presumed to cause a selective domino effect on its linked neurons, which are thus more likely to fire as well. In about 5 milliseconds, a neuron may deal with 500 incoming *action potentials* or *spikes* and in turn fire a unitary response, often to as many as 7,000 other neurons. On average, a typical firing neuron can do so a few times per second. Every second, about 40,000 synapses fire spikes that can travel at speeds as high as 120 meters per second. This explains that "Real-time cognition is best described not as a sequence of logical operations performed on discrete symbols but as a continuously changing pattern of neuronal activity" (Spivey & Dale 2006:207). Meaning really is a fast, transitory process, and it turns out to be a one-off experience. Let us summarize why.

On the one hand, cell assemblies have internal structure: a center or *kernel* of neurons with stable and robust interconnections and a periphery or *halo* with weaker ones. These regions activate and fire differently, depending on the stimulus, so that the constantly changing constellations of synaptic weights are never exactly the same. It is not only the ways some neurons fire, but their very physical structure that changes over time. New synapses are steadily created and those no longer in use fade away. Haloes may become pruned overtime and not even kernels are stable through the years. The brain is plastic and constantly adapting to experience, to perform at its best. Indeed, whole neurons get replaced too. For instance, about

80% of the cells in the hippocampus, which is crucial for memory, will be renewed through our lifetime (cf. Spalding et al. 2013). In sum, the exact neural subset activated in a given assembly in each case is slightly different from all previous ones.

On the other hand, we can simultaneously engage in up to 50 independent brain processes while performing a visuomotor task (Georgiou 2014). This is not too much, because a number of such processes is devoted to monitoring bodily functions and to interacting with the environment (cf. Evans 2010). Neural connections, whether central or peripheral in a given assembly, may become activated when they reach a threshold thanks to stimuli that include those from task-unrelated processes (cf. Yee & Thompson-Schill 2016). Meaning emerges from the interaction of all active mental processes, and it is constructed in each occasion. Did you ever re-read a [136] translation of yours and surprised yourself fine-tuning nuances here and there that you had been content with two months earlier? You probably were not wrong back then. You just changed your mind. *Literally.* The situation is now different, if only in minute ways, and the brain doing the new reading is also different enough to contribute to your taking different decisions in some cases.

We also *read* our environment, and we do not even sense exactly the same. Perceiving is a process of constructing a reality, an interactive attempt to balance new information from the senses and predictions from our cortex (van Moort, Koornneef & van den Broek 2018, 2020; van Moort et al. 2020). An important step to build meaningful perceptual experiences is *multisensory integration*—combining perceptions of different nature, such as smells, sounds, and images. This is crucial to study audiovisual translation (Doherty 2021:156), but all language use is multimodal to different degrees (cf. Perlman 2017; see also Halverson & Muñoz 2021:4–6). This is so because thinking is not just aseptically churning symbols in and out: perceving is embodied (Firestone 2016), remembering is embodied (Sutton & Williamson 2014), and understanding is embodied too (Johnson 1987, 2017). "Ultimately all the meaning of all words is derived from bodily experience" (Malinowski 1935:58; Pulvermüller & Fadiga 2010; but see also Zwaan 2014).

Neural level features—such as the plasticity of the human brain, the neural workings of memory, and multisensory integration—provide a basis to support a psychological level in the study of meaning and memory. At this level, we can envision *experience* as an organizing principle of memory (cf. Lakoff & Johnson 1980; Lakoff 1987; Johnson 1987). Here, neural assemblies are envisioned as *memory traces* and spreading activation explains the simultaneous and successive emergence of associated ideas, concepts, and memories. Experience lets us predict what may come next. A simple, evolutionary mechanism that lets us spare and distribute our mental resources to attend and handle very complex environments and actions. At every split of a second we are adapting what our brains link to what we perceive and think so as to better formulate and adjust expectations (Hohwy 2013).

In order to build and assign meaning to a stimulus, people predict and evoke everything that may be relevant in their memories and then inhibit whatever seems not to be so. Memory's purpose is to support our actions and develop behaviors appropriate for our current situation (Glenberg 1997). It does so by building a dynamic *context,* the transitory web of information and processes that, in order to interpret a signal, we as receivers activate in each case (De Mey 1982). [137] In other words, *context* is the information we provide and constantly update as a fluid basis to make sense of texts. Contexts are also in our heads, not out there.[4] Both meaning and context are concepts typically associated to language, so we should now turn to our notion of language.

1.3. *Language*

We are very likely somehow wired to acquire language (Berent et al. 2014), but language actually develops in our brains because it is grounded in perceptual experiences (Barsalou 2008). Children acquire their first languages or L1s through sensorimotor processes that go hand in hand with their cognitive development. This means that all linguistic practices are forms of experience (Johnson 2014:15). Soon the immediate reality of little children is linguistically exhausted but they are offered access to realities beyond their reach through language exposure. That is how language "[...] enables human beings to transcend the immediately given in their individual experiences and to join in a larger common understanding" (Sapir 1933:157).

Language becomes an integral part of cognition, a resource to organize memory that interacts with other mental processes. It pervades our brains, so that a normal human brain is a "languaged" brain (Boroditsky 2019:13). From this perspective, the ways we think and understand are a function of our personal history of language use. There is no such thing as an objective, transcendental, or universal meaning, because language does not directly reflect Nature. The world out there is rather mediated by our unique human construals. These dynamic construals are the brainchildren of our experience, and not necessarily of our language (Zwaan 2004). It should thus come as no surprise not only that language partially structures our minds but also that acquiring another language and using it often—becoming bilingual—radically restructures the brain, even physically (Mårtensson et al. 2012; Bialystok & Poarch 2014; Pliatsikas, DeLuca & Voits 2020).

The language we speak can ease us into highlighting bits that otherwise we would probably not have foregrounded (e.g., regarding time and space, objects and events, colors, etc.). This does not mean, however, that we cannot see features ignored or dispreferred in our language (e.g., Vandeberg, Guadalupe & Zwaan 2011). What we speak does not modify but just colors the ways we perceive the world and our basic mental processes. For instance, as with other language [138] resources, the metaphors we use may have some influence on the way we reason (Thibodeau & Boroditsky 2011), but we usually have more than one to choose from. We certainly need to accommodate to the endowment of the language we speak when *thinking for speaking* (Slobin 1996)—when we are trying to communicate—but even then we may need to inhibit alternative registers, competing ways to think and express ourselves.

We characterize everything in our minds with shared language tags that were, after all, handed down to us. In the vast, multifarious, distributed, subsymbolic repository of human memory, language elements tag everything we store and are themselves simply additionally tagged as language. Almost everything we think has a language tag or can be assigned one—actually, and crucially, many more than one. This is not restricted to words: "lexicon, morphology, and syntax form a continuum of symbolic units serving to structure conceptual content for expressive purposes" (Langacker 1987:35). In fact, there is no mental lexicon (Elman 2009; Dilkina, McClelland & Plaut 2010). Symbolic units, from alophones to plurilexical expressions and beyond, are points of access to dynamic configurations of neural networks or cell assemblies (Langacker 1987:161–166).

Language elements may be tagged as belonging to one language or another, and they can be inhibited when communicating in (just) one of them (summary in Schwieter & Ferreira 2017:152–154). This makes translating possible but, beware: first, this is a necessary but in no way sufficient condition; and, second, a bilingual is not two monolinguals in one person (Grosjean 1989, 1992).

Bilinguals filter out verbal "interference" when communicating in one language (Filippi et al. 2012, 2015) but they are not just switching off a whole language—that would be too taxing—, only transitorily inhibiting the activated language tags that are locally relevant (Costa 2005, La Heij 2005, Green & Abutalebi 2013, Purmohammad 2015) while the rest stay active in the background, adding to our possibilities. In any case, our mental experiences are far richer than what language may convey (see below). Interestingly, rather than making communication more difficult, this seems to contribute to make it possible.

1.4. *Communication*

We have argued that language plays an important role in structuring the mind and in cognitive processing but, so far, we did not mention its role in communication. Communicating is giving, [139] receiving, or exchanging communicative artifacts (multimodal, ad hoc selections of signs, symbols, and behavior), for complex purposes that include creating a shared understanding. Not much happened with regard to modelling communication between Aristotle (384–322 BCE) and Shannon & Weaver's (1949) mathematical theory, and not much has happened ever since. Probably all readers are familiar with their highly influential box-and-arrow model of communication, whereby a *sender* encodes a *message* into a *signal* that is sent through a *channel* to a *receiver* who, *noise* permitting, will then *decode* it. For this model to work as envisioned, any act of communication *must* have identical sets of possible messages to choose from, and identical sets of both signals and combinatorial rules to codify their messages into signals at both poles. However, these and other tacit assumptions in the mathematical model could not be more wrong for human communication.[5]

We wrote above that no two persons share identical knowledge and experience, so what they can and aim to communicate (the palette of messages) can never be exactly the same. Furthermore, no two persons have the same language skills, vocabulary and grammar—that is, the signals, the rules and the ways they are used are not exactly the same either. Human *senders* vary a lot, e.g., as to their number (anonymous, co-author, collective, institution, etc.) and their roles (client, dubber, presenter, spokesperson, etc.) and *receivers* are not necessarily the addressees (publisher, judge, by-stander, hacker, etc.) or have double or blurred roles, as in the case of *fansubbing prosumers* (Orrego 2015: 10–17, 20–23).

Both senders and receivers typically have several goals when communicating—never just one—, especially because GOAL is a recursive category that may be assigned not only to the whole communicative artifact but also to parts of it, such as chapters, paragraphs, turns, etc. (cf. Ferrara 1980a, 1980b and Mann & Thompson 1988). The model also assumes that sender and receiver are stable throughout the communication event, so it would not survive a celebration dinner of an extended Mediterranean family! Jokes aside, the model only envisions two steady singular parties, and no *polilogues,* so it cannot account for a public lecture in a conference panel (cf. Pöchhacker 1995:35) or an exchange in an instant messaging group of schoolchildren parents as unitary communicative events.

Furthermore, the mathematical model cannot accommodate instances of strategic behaviors seeking to prevent, identify, or repair misunderstandings or communication breakdowns. This is [140] called negotiation of meaning in second language acquisition (e.g., Ellis 2003:346), but it can be extended to L1-L1 interlocutors—e.g., parent-child—and beyond. It can indeed even apply to one-

way interactions if we think of it as building rapport, as we do when we contextualize a text in the first paragraphs, or do not when we zap through TV channels with the remote. Such communicative fine tuning and adaptation (see, e.g., Costa et al. 2009; Bhandari, Prasad & Mishra 2020) cannot be accommodated in a system where senders and receivers are passive automatons with no initiative, no self-monitoring capabilities, and no means to fix their own errors, but is only natural in situated approaches to human communication, such as Cognitive Translatology.

We acquire our languages through statistical learning, i.e., extracting prominent regularities from the environment in communicative interaction (Aslin 2017). We do so by using both environmental and contextual information to roughly guess meanings. Environmental (perceptual) information grounds meanings and language in sensorimotor processes (Yu, Smith & Pereira 2008). Contextual (stored and activated) information fosters indirect associations arising from past exposure or usage (Landauer & Dumais 1997). When we read sled, we cannot but represent an object in a certain scenario, with size, color, and many other attributes, that may also bring about memories and emotions (e.g., Citizen Kane's Rosebud). We know that all these details must be different from those that other people evoke—but we also know that those details were not meant. This is what it means that language underspecifies meaning: our mental experience is far richer than what languages usually can and people intend to convey (Hoeben Mannaert, Dijkstra & Zwaan 2017), and this also makes translating possible. This effortful communication leading to experiential and vague meanings also motivates two additional considerations: communicating (translating) is an interpersonal activity and it entails excelling at imitation.

Translating is routinely described as the epitome of *inter-* or *cross-cultural* communication, i.e., of communication between (people from) different cultures (Chen & Starosta 1998; Omori 2017). *Culture* is an abstract concept with an incredibly extensive array of definitions. A conflation of several usual ones would have *culture* as the range of knowledge, beliefs, values, behaviors, and traditions handed down within a large group—a community, an ethnic group, a society, a nation—to its members. Culture is often assumed to be distinctive of such groups, and to provide shared tacit assumptions or implicit givens as common grounds in communication. In its more [141] extreme formulations, culture is the collective mental programming of the human mind which distinguishes one group of people from another (cf. Hofstede, Hofstede & Minkov 2010). With McSweeney (2002), we think that national cultures cannot systematically explain individual behavior. We also agree with Signorini, Wiesemes & Murphy (2009) that such views oversimplify differences. We actually contend that gross overgeneralizations as national or ethnic cultures play down similarities, iron out multiple exceptions, and cannot adequately explain, let alone predict, the cognitive aspects of real people communicating.

In Cognitive Translatology, *culture* is not a grand canon of all-time masterpieces, or a set of off-the-shelf recipes and clichés, nor is it an objective commodity to be sliced down into culturemes and knowledge pills (cf. Amigo 2015).[6] Culture is rather your connectome at use, your mental pool to feed your continuous activity of perceiving, abstracting, categorizing, storing, retrieving and blending your stored information to make sense of the world and streamline how you behave for success, based on your own experiences and statistical learning. Whether and to what extent your stored information is shared by a certain group other than the people you are communicating with is irrelevant. If you stored it, it is because it works *for you, in your usual environments.* This is particularly important when mediating in multilectal communication tasks. Success in getting two

other parties to understand each other may lie in the ability of mediators to tailor their own behavior and messages to adapt to their perceived, not their prejudged peculiarities.

Adapting to other participants in communicative events usually entails imitation. Humans are the most imitative creatures on Earth. Imitating is for us a powerful learning mechanism in areas such as cultural propagation, causal learning, and social-emotional interaction (Meltzoff & Williamson 2013). Children develop mentally by emulating people interacting with them. Most importantly for us here, imitating is an active process that demands social motivation. Mimicking others is an early building block towards the ability to understand that other people have knowledge and beliefs, emotions, desires and intentions different from one's own, and to attribute such mental states to others. This is *perspective taking* or *Theory of Mind,* the skill of *mindreading* or *mentalizing*—the capacity to make inferences about and represent others' intentions, goals and motives (Stietz et al. 2019: s.p.)—that usually develops between 3 and 5 years of age, and a pre-requisite to fully understanding others (Iacoboni 2008) and thus, to communicating well and to translating as well. [142]

We have not exhausted the conceptual prolegomena for Cognitive Translatology (further readings in Schwieter & Ferreira 2017, chapters 4, 6, 10, 16, 18, 20, 25, 26 and 30; and Alves & Jakobsen 2020, chapters 2, 3, 4, 8, 16, 21, 24, 26 and 27), but perhaps what we sketched is enough to move on to the fundamental notions for any translation theory: what is a translation, how do we do it, and what should we study.

2. Core notions

2.1. *The nature of translations*

We defined translation as a text whose meaning corresponds—often, is just assumed to correspond—to that of another text in a different language variety, where *text* is a multimodal, communicative artifact including natural language.[7] We can now consider the three elements in this minimal definition, two texts and their relationships, with some more detail. We need to stretch our understanding of all of them, starting with the nature of a ST and its role as *the* antecedent of a target text (TT). First, like any other text, STs will be read as samples of exemplar text models (types, genres) and interpreted with respect to them. STs are but immediate environmental stimuli that translators contextualize thanks to their experience with many texts totally or partially comparable to the STs, which are (intertextually) brought to bear in the process of building meaning and assigning communicative purpose to STs.

Second, STs may be unstable (cf. Hernández 2009:42–46 on news texts). From Jerome's bible, *Vulgata Latina* (translated ca. 383–405), whose contents were settled and sanctioned only at the Council of Trent in 1546, through *Arabian Nights* to any current software manual, videogame, and multilingual website, many STs are far from being the stone-carved versions of register usually implied in CTIS. In news translation, for example, excerpts from several STs may merge into a single TT (Davier 2017:28–29, 32–34). This extends to contents of specialized magazines (mainly, on sports and hobbies), financial reports, and other commercial publications that are assumed to be translated cover-to-cover but really contain translations together with alternative originals, excerpts, versions, and adaptations. [143]

Third, STs may prompt translators' behaviors usually unaccounted for in our research, such as correcting STs. Please note that we do not mean variations in the TTs that people may describe as manipulations of the ST, but actual modifications in the STs wording. These are often due to the ST authors' wanting mastery of the intricacies and subtleties of writing, far below professional communicators' standards.[8] Other reasons include that the main text may not cohere with its paratexts (see Ketola 2018); and that the TT may not read as hoped for—as with the wording of international treaties, often translated into the languages of all signatories and assessed in those languages before the final wording of the ST is approved (Stefaniak 2013:60–61). Furthermore, *indirect translation*—where the ST is actually a TT of another ST—and *relay interpreting* (where interpreters render the output of another interpreter) are also special but by no means rare role swaps. Sometimes the two texts are both ST and TT at once, as in legislative bilingual drafting or co-editing (e.g., Levert 2004, Uhlmann & Höfler 2018, Chan 2020). In computing, by virtue of internationalization, "What was once a source can become just another end-use locale" (Pym 2004:36). STs are not dethroned, but their presumed singularities are wobbly.

The intertextual specificity and diversity of translations can also be appreciated in the variable nature of the relationships between STs and TTs. On the one hand, translations are expected to refer to the world but they also refer to their respective STs. In general, keeping the meaning as close to that of the original as possible is good enough but very often TTs are expected to reproduce the symbolic codification of the original. Such is the case of sworn translations of administrative forms. The labels of unticked boxes (e.g., *single, married, widowed, separated, divorced, registered partner*) that would otherwise be ignored often need to be translated as well to account for the options provided by the applicable original legal system—which may be relevant for procedural decisions to match them with the target legal system. It is also the case of literary translations, where readers usually want to feel that they are accessing not only the meaning, but also the style and other attributes of the original. Yet romance novels and those of other "subgenres" play as STs a role very much like that of reference materials, as is also the case in transcreation.

On the other hand, one ST may link to multiple TTs. This is the case when TTs choose different languages, like interpreting in international conferences, or dialects of a language, like with popular computer applications, often translated into the main dialects of major world languages. [144] Children and abridged editions of literary masterpieces (e.g., *Don Quixote*) co-exist with regular renderings.[9] Different TTs may coexist due to the affordances of the medium or the demands of the commission. For example, some viewers (e.g., L2 learners) may choose to watch a dubbed film with subtitles in the same language; transcreators are often expected to deliver two or three alternative TTs to the client for final approval (Pedersen 2016:181).

Target texts also add to the complexity of our simplest definition. First, they may combine semiotic codes in slightly different ways (but see note 3). Natural language instances were often classed as oral, written or signed, and each mode used to entail bundles of communication features (e.g., presentiality, synchronicity, unidirectionality, etc.) that technology is slowly but surely teasing apart, as in the case of respeaking. This is bringing the focus closer to hybrid practices customarily ignored in most if not all multilectal mediated communication tasks: cross-modal teamwork communications (Jiménez 2017, Hirvonen & Tiitula 2018), simultaneous interpreting with text (e.g., Seeber & Delgado 2015, Seeber 2017), combined oral and written community mediation (Komter 2006, Defrancq & Verliefde 2018), speech-to-speech or sign-to-voice (written machine) translation (e.g., Kidawara, Sumita & Kawai 2020, Zhou et al. 2020), etc.

Target texts within multilectal communicative events now seem much more varied and only bound by family resemblances.

Second, TTs often differ from STs in the same language in subtle but perhaps substantive ways. Many of these differences are conceived of as *translationese,* sometimes a consequence of ST "interference" spilling over into its translation, and some other times language-independent statistical deviations of translations from non-translations (Koppel & Ordan 2011). However, the first view on translationese may be explained by poor translation skills or the pursuit of stylistic effects, like the so-called "foreignizing" effects.[10] The other view, that of general effects, is linked to purported universal tendencies such as simplification and explicitation. However, technical, academic, and professional writers trying to improve or achieve high readability in the same language also use those strategies when rewriting texts. Hence, in all rigor these hypothesized universals (cf. Volansky, Ordan & Wintner 2015) should not be claimed to be translation-specific and not "simply universals of language also applying to translation"(House 2008:11).

A few language features with different distributions might be candidates for language-independent universals: Volansky, Ordan & Wintner (2015:112) mention many of them, including that "The suffix *-ible,* originating in Latin, is much more common in all the Romance languages, which are 'clustered together' around this feature, compared with English." This may be noteworthy, but is not due to translating, nor particularly revealing. They also acknowledge that "[...] the letter sequence *di* is among the best discriminating features between O[riginals in English] and T[ranslations], as it is about 16% more frequent in T than in O; but it does not teach us much about T, and we cannot interpret this finding" (113). Many such typological differences are plainly trivial or can be modulated by translators (Cifuentes & Rojo 2015). Translations never replace their STs, which are still at work in their original environments, and translators do not usually aim that their texts be mistaken for originals. In short, this work may be very interesting for linguistics, but it is close to futile in CT. Nevertheless, it seems true that "[...] Translations tend to under-represent target-language-specific, unique linguistic features and over-represent features that have straightforward translation equivalents which are frequently used in the source language" (Eskola 2004:96). [145]

The accounts in this section provide an image of the three minimal elements featuring in our definition as radial categories that branch out into multiple variables and circumstances, making each task quite singular. From a cognitive perspective, this makes our study more difficult but also more real. The cognitive demands placed upon the mediators can thus be seen as a fuzzy set of prototypical instances linked by family resemblances. Hence, there emerges an image of translators and interpreters as very adaptive communicators with an excellent control of their mental and communicative resources. Let us now focus on them now, i.e., on the how.

2.2. *Translating*

We are all translators because translating is a natural skill (Harris 1973; Harris & Sherwood 1978; Malakoff 1992; Muñoz 2011; Whyatt 2017): (a) The features of a communicative artifact—including (and mainly) those related to natural languages—work as stimuli to activate appropriate bits of the vast mesh of interrelated memories in our brains; (b) these memories are multiply tagged linguistically; (c) bilinguals retrieve and inhibit language elements tagged as belonging to any of their languages, as an extension of closely related monolingual behaviors

between, e.g., registers; (d) we understand that other people may have different knowledge, [146]
viewpoints and language idiosyncrasies; (e) we know how to imitate; and (f) we can build new communicative artifacts for certain addressees taking into account all of the above, within our own interests and scopes.

This explains why all bilinguals informally interpret or translate now and then. It also contributes to fitting in CT many practices which are not fully professional or unprofessional. Bilingual children and teenagers, often from immigrant families, take on the role of designated family translators and interpreters (Hall & Sham 2007; Dorner, Orellana & Jiménez 2008; Antonini 2016). Thousands of fansubbers will subtitle audiovisual materials (Díaz & Muñoz 2006; Orrego 2015) regularly. Also thousands of scholars translate books on account of their expertise on the topics and they often relapse. Employees in the export sector, cabin crews, and also public servants, bank tellers and store clerks in border towns, tourist areas and airports perform ad hoc mediating activities, often as duties unwritten in their job profiles. Anyway, the requirements to become a professional translator or interpreter are often close to none and the vast majority of professionals have no specialized degree in translation or interpreting. [11]

In general, however, professional translators and interpreters (bilinguals trained for the tasks) tend to perform notably better than untrained bilinguals, for several reasons. First, there is a level of language command and communication skills above *native speaker,* which is being a *professional communicator*. Being a native speaker may suffice when talking about everyday affairs, but it is not enough. In Europe, native speakers also benefit from 9–10 years of compulsory education that will focus on language as a core skill but again, this is not enough: one in five adult native speakers in France, Italy and Spain have reading difficulties and fewer than one in five attained the highest literacy level (OECD 2019)—the one needed to engage in professional mediation within multilectal communication. Native speakers are perfect speakers and writers in their own spheres of communication, the ones they are adapted to. Professional communicators tend to be much more conscious and deliberate language users and they usually strive to be good technical writers and at least as able as native speakers in *any* sphere of communication.

Second, professionals usually know how to make up for their lack of domain knowledge. They tend to excel in their information literacy, specifically in their skills at information search and management (Massey & Ehrensberger-Dow 2011, Enríquez 2014, Granell 2015). Third, professionals tend to master the tools of their trade, a very large but fuzzy set of disperse knowledge and skills, [147]
from typographical syntax and graphic design through translation and interpreting conventions (e.g., dubbing Do you speak my language?) to an ever growing and increasingly helpful palette of digital applications. Fourth, professionals usually have entrenched work routines to make their activities more efficient and effective and thus economically viable. This means that they need to have engaged in deliberate, feedbacked practice that will have developed particular steady behaviors thanks to which, in turn, their brains will have physically adapted to task demands so as to spare time and effort while they meet quality and productivity standards.

The two guiding principles for professional and unprofessional mediators alike remain the same. The first one is imitation. Perhaps literary prose translators are the epitome of trying to imitate STs and simultaneous interpreters, of succeeding in doing so. We imitate the symbolic codification of STs because we—often, intuitively—know that (a) texts prompt an encyclopedic and grounded richness of mental experiences they are not intended to transmit; (b), we can never be sure of having understood *completely* what was meant, because meaning cannot be

quantified; (c) "Unlike any other skill [...] language can work well despite poor execution. Its meaning is recoverable even when its form is incorrect" (Skehan & Foster 2001:183) and (d), languages are very similar in many ways—all the more those in close contact. Since assumptions may be other, communicative goals may not coincide, requirements may be diverse, and languages differ more in what they *must* convey (Jakobson 1959:236), it is only normal to imitate when possible and to formulate more distant translations to sort out lexical gaps and grammatical differences, but also often to introduce somewhat different construals and perspectivizations (see Verhagen 2007). This demands considerable amounts of creativity. Translating is thus the restricted production of texts led by creative imitation.

The more a mediator knows about the task and text at hand, the more reasons she may find not to imitate here and there, but there is a limit. The centrifugal drive to imitate is counterbalanced by the centripetal, general strategy of obtaining the maximum benefit with the minimal effort. This is Levý's (1967:1179) *minimax* strategy, and it is the second principle guiding mediation—and many other tasks. This strategy can only work properly when translators have a clear albeit intuitive notion of the end result and its quality (cf. Lörscher 1991:268–272). When they do not, they may tend, for instance, to over correct themselves, whether in interpreting (Roberts 2000), in translation (Lorenzo 2002) or postediting (Mellinger & Shreve 2016), often [148] leading to worse results. In contrast, De Rooze (2003:02–95) found that professionals displayed a more or less undifferentiated behavior under time pressure, and translation quality was not affected. The minimax strategy lends support to many current approaches that assume a general tendency to spare efforts by repeating and then automating process aspects and routines. However, routines may induce functional fixedness, which may in turn result in worse performance (Schilling 2005, Tiselius 2013:36–37).

In our view, what emerges is a fresh view of mediators as very flexible and adaptive agents taking very active roles in very complex and deeply human activities of communication. Mediators need to understand, be aware of and constantly monitor their own thought processes and steer them towards a vague goal until task completion by constantly adapting the activated information in their minds and managing and juggling their mental resources to yield the best performance possible in the circumstances. It also entails solving problems now and then (Muñoz & Olalla-Soler, in press).

As mediators accumulate relevant experience, their task-related thought and behavioral processes become more integrated. We have learned that reading "just" to receive new information is not exactly the same as doing it for translating (Shreve et al. 1993, Castro 2008, Jakobsen & Jensen 2008), sight translating (Ho, Chen & Tsai 2020) and post-editing (Mellinger & Shreve 2016:133). Writing is also different depending on the task (Immonen 2006, Risku, Miloševic & Pein-Weber 2016, Dam-Jensen, Heine & Schrijver 2019), and listening is definitely special in tasks such as simultaneous interpreting.

However, the cognitive processes and demands involved in multilectal mediated communication events are slightly different between very close tasks too—say, between interpreting with text and sight translating, or between neural MT post-editing and revising in a digital environment. In fact, even within single task boundaries they may display variation; e.g., simultaneous interpreting with or without access to speakers' graphic presentations (Lei & Li 2019), revising with or without the ST, co-presential vs remote community interpreting (De Boe 2020), postediting phrase-based vs neural machine translation (Jia, Carl & Wang 2019), etc.

In view of the swift pace of growth and innovation in our realm, the first reaction of the scientific community—sometimes acritically following the market—has been to hastily suggest new but inaccurate labels (e.g., *pre-editing, respeaking*) to single out alleged new phenomena, often on the basis of shaky arguments.[12] Rather than splitting tasks on the grounds of subjective nuances, we might accommodate all tasks and future developments resorting to their common basic factors. In all multilectal communicative events there are at least three parties—not necessarily (co-) present or even alive—using at least two language varieties, where one party uses both of them to mediate between the other two and improve communication or make it possible at all. This is *multilectal mediated communication*—a linguistically clumsy but conceptually accurate and convenient blanket term to describe the object of study of our academic enterprise, to which we now turn. [149]

2.3. *Cognitive Translatology as an academic enterprise*

Translation and Interpreting Studies (TIS) is an academic discipline. Universities and colleges worldwide train translators and interpreters through more than 400 full programs, although there are not many independent academic departments outside Europe. Several learned societies (e.g., EST, IATIS, AIETI, ATISA, etc.) foster research published in about 30 core journals plus some 125 other academic periodicals and in a dozen of book collections.[13] Two features seem anomalous: first, after more than 30 years of TIS, the gap between what is taught and what is researched seems even wider than in the first years. Second, TIS is not as cohesive as other disciplines (say, botany) in that it seems to host two main traditions: one in the humanities and another one within the *social sciences,* which is far smaller in members and volume of publications.

Cognitive Translation and Interpreting Studies (CTIS) belongs in the second group, together with approaches drawing from, e.g., history, sociology, psychology, anthropology, pedagogy, law and linguistics. They all study phenomena related to humans in their relationships with individuals and groups. An emerging discipline within this group is *communication sciences,* to which CTIS obviously belongs. Communication sciences—not only multilectal mediated communication—have experienced a technological revolution that has impacted their goals and methods. CTIS also belongs to a set of disciplines converging into *cognitive science,* that comprises the cognitive aspects of some of the above social sciences (psychology, sociology, anthropology, linguistics) and also branches out towards biology (neuroscience) and engineering (artificial intelligence and natural language processing). [150]

One more feature characterizes CTIS: it belongs to *applied sciences.* Whereas basic sciences strive to describe, explain and predict phenomena in the natural and social world, applied sciences aim to use the knowledge and methods of basic sciences to achieve particular practical or useful results, as socially defined. Applied sciences, such as medicine and CTIS, are inherently multi- and interdisciplinary endeavors that freely borrow from basic and other applied sciences to reach their goals. This is, admittedly, an aspect where CTIS does not have lot to offer. Or maybe it does: As an applied science, CTIS is often the touchstone of many theories and tenets in the basic sciences, which often seem to benefit at least as much as we do from CTIS research. We may not be closer to our goals than we were 20 years ago, but we have helped other disciplines to discern their options and test their tenets and this in turn helped us formulate better questions.

In view of the above, disciplinary borders invented more than a century ago feel too rigid, verging on obsolete. Our points of reference are that CTIS is *scientific;* it seeks to create knowledge that offers systematic and testable explanations; *social*—it focuses on human communication between individuals and groups—, *cognitive* (it studies the mental activities and processes involved in gaining, retaining, elaborating and using knowledge and comprehension through perception, learning, experience, and thought); and *applied,* because it concentrates its efforts on solving socially and variously defined practical problems related to multilectal mediated communication.[14] These are the milestones that define the space for CTIS and where different theories should thrive and prove they are correct and useful. One of such theories is Cognitive Translatology (CT), whose goals are to improve (1) mediators' training; (2) mediators' working ways and conditions; and (3) product quality.

The object of study of CT comprises the behaviors and cognition of all participants—not only the mediators—in multilectal mediated communication events. The rationale behind widening the scope is that (a) often mediators are more than one person (e.g., translator + revisor tandem); (b) their roles in communication events may be combined or blurred, as in the case of fansubbers; and (c) mediators interact with ST producers, clients, and addressees (e.g., dialogue interpreting) so that their behaviors cannot be explained if the behaviors of the other parties are not taken into account. This can be extended to non-interactive cases, in that mediators presume knowledge, intentions and language abilities in their prototypical (often, intuitively constructed) speakers and addressees. Thus, to fully know why translators behave the ways they do, we need to study their envisioned readers and their notions about the authors, if only as schematic holders of their assumptions. [151]

As for the methods, in CT claims on objectivity and accuracy need to be toned down and defined by the characteristics of the research design. We adhere to experiential realism and know that our scientific endeavors should give up hope for objectivity and should rather think in terms of partial intersubjectivity. There is no entire population to generalize results to. Many mediators are not professionals or have features that distort results; texts display considerable variation; tasks, tools and working conditions may vary a lot from language to language and place to place. Our results need to be understood in terms of tendencies, and degrees of probability. We must also learn to tell apart hypothesis-generating research from hypothesis-testing research. The level of precision and objectivity that can and should be asked of each of these two types is different (Olalla-Soler, in press), but we just love to present research with 5 subjects and 150 word-long texts as confirmatory.

Yet, CT sees a primary role for empiricism and a need for coherence that will match our tenets with those in other cognitive sciences. We need to combine rigorous empiricism with a resistance to absolute answers. CT also seeks to take research home, the street and into the office (and the Internet!), but not necessarily out of the lab. Whereas conventional lab tests often neglect and miss the full range of contrasts in mental capacities and behaviors, combined projects where results in naturalistic settings are contrasted with those in controlled environments are probably the best way to go. [15] Furthermore, without collaboration between researchers from different countries/languages we will not be able to reach research that helps us to generalize (within the limits of possible generalizations). As of today, cooperation in CTIS is modest, often within national boundaries and the walls of one institution (Olalla-Soler, Franco Aixelà & Rovira-Esteva 2020).

CT aims to study phenomena at different levels of granularity, and not all levels may apply the same strategies. Time, for instance, may range for months to milliseconds, but one pole asks for comprehensive accounts and the other one for exact quantification. CT does not choose. It does not need to. What is important is to start offering valid, comparable, and useful results. In order to secure more valid results we need larger samples of informants, longer tasks and texts, and more appropriate data collection tools. Comparable results should come from introducing research texts, [152] tasks, and participant standards and profilings, and open science ways that will foster reproducibility and replication. Usefulness is a thorny issue, because many results are just good to pave the way for further research or more applicable results. Often only time can tell the difference between a step in the right direction or a phenomenal flop but in CT—actually, in CTIS—concepts and approaches should not overstay their refutation, as if they were a matter of taste or faith.

CT aims to reassess several unquestioned concepts shared by several CTIS frameworks—which may thus be used, crucially, to contrast competing explanations. For instance, we tend to acritically assume psychological theories of cognitive resources that assume that our "mental machinery" needs "energy" to work well or at all. So we talk about the availability of cognitive resources, the ways we can free and reassign them, and *effort* as the amount of resources invested to carry out a task. These theories predict that a shortage of resources and longer task times make people more prone to error but there is evidence in other realms that points to the contrary (e.g., Cañas 2017). Models with a compensatory control mechanism seem able to explain why humans can provide additional resources under demanding conditions, at the expense of psychophysiological cost (Muñoz de Escalona, Cañas & Noriega 2020). The same Occam's shaving of task labels we suggested by the end of section 2.2 applies for concepts and constructs.[16] Perhaps the one line of research that is more underdeveloped is that of comparing multilectal mediated communication tasks performed by the same people. Similitudes and contrasts in demands and performance may shed light on elusive notions such as cognitive effort and expertise, which cut across cognitive theories, whether general or devoted to a task or mode.

We think we have covered most questions we were asked in the last ten years regarding Cognitive Translatology, but we will be happy to correspond to offer further clarifications. Anyway, a good theory is nothing else than a research program, and we would like to invite readers to help us prove or disprove what we wrote here. We now need joint efforts to put more data where these reasons are. [153]

Notes

[1] The coincidence of popular translations of *Cognitive Translation Studies* and *Cognitive Translatology* into languages such as Chinese has not helped either. For Chinese, Prof. Xiao Kairong suggests the use of 认知翻译学 for the field of *Cognitive Translation Studies;* 认知翻译论 for the framework of *Cognitive Translatology;* and 计算翻译论 for the framework of *computational translatology.*

[2] We very seldom check that correspondence and, of course, we cannot know all texts ever written. That is why we will often accept texts as versions, adaptations or translations simply because we are told they are so (cf. Toury 1995:31–35; see also Halverson 2004).

[3] Adaptations can also entail radical changes in the semiotic codes—e.g., from book to movie (definition reviews in Elliott 2013 and Corrigan 2017)—that may even dispense with natural language. Many adaptations may thus fall close to what Jakobson (1959:233) called *intersemiotic translation* or *transmutation*. Such operations hold only some very distant resemblances with what mediators do in multilectal communication events and can here in no way be considered translations. A crucial feature of translations is that the codes they use are similar, socially sanctioned, and individually accessible (inferrable), however fuzzily. You can explain why a word translates adequately with another (or not), but there is no agreement as to, e.g., what Bach meant with his changes of key (say, from A minor to C Major) and even basic color symbolism changes from one place to the next. That is, both codes and their correspondences are not necessarily shared, systematic and inferrable. This entails no judgment on those operations or products. They are just out of our scope. See also §1.4, § 2.1 and note 7.

[4] European languages borrowed the Latin word *contextus* to express what lately is referred to as *co-text:* the parts of a writing or discourse which precede or follow the text part under study, and are directly connected with it because they partially determine its interpretation. Malinowski (1923) coined the notion of context *of situation* to refer to the extralinguistic aspects of a communicative event that impact the interpretation of a text. Brilliant as his suggestion was, he seems to have either missed or ignored the fact that he did not provide the actual contexts of situation for the texts that helped his readers understand them, but rather a verbal account of those contexts, making it plain that context is also stored information and not direct perception of the world around us (Malinowski 1923:301, **our emphasis**):

> In this case, the utterance refers to an episode in an overseas trading expedition of these natives, in which several canoes take part in a competitive spirit. This last-mentioned feature explains also the emotional nature of the utterance: it is not a mere statement of fact, but a boast, a piece of self-glorification, extremely characteristic of the Trobrianders' culture in general and of their ceremonial barter in particular.
>
> **Only after a preliminary instruction is it possible to gain some idea** of such *technical terms of boasting and emulation* as *kaymatana* (front-wood) and *ka'u'uya* (rear-wood).

By using *preliminary instruction,* Malinowski acknowledges that he had to provide information for his readers, not a direct perception of the situation, to build an ad hoc, would-be context to understand the rites of the natives of the Tobriand islands.

[5] We are striving to define concepts *ex positivo.* In this case, however, it is quite an impossible quest, in view of the absolute hegemony of the mathematical model and the few reasonable but ignored attempts to redress the understanding of COMMUNICATION, such as Reddy's (1979:171–176) *toolmakers' paradigm.* Hence, we feel forced to at least define it *ex negativo,* so as to make it clearer to the readers what we do *not* mean or imply with communication. The mathematical model seems perfectly apt to deal with the problems Shannon designed it to solve, namely, "reproducing at one point either exactly or approximately a message selected at another point" (1948:379)—that is, maximizing cost-efficiency and realiability when signals were transmitted between machines. For human communication, however, Lyons (1977:39) politely objected that it is "admittedly very schematic and highly idealized". Yet read his detailed, far-reaching criticisms (Lyons 1977:35–56). [154]

[6] In explaining why he wrote a comprehensive dictionary of Mexican Spanish, thus breaking away from a tradition that made northern peninsular (European) Spanish the norm and American Spanish dialects mere lists of isolated, regional, "cultural words", Prof Luis Fernando Lara (ColMex) rhetorically asked "But... is there no culture in the verb *to have*?" (personal communication, our translation, Santa Barbara, California, 1989).

[7] This definition of *translation*, like that of other concepts in this article (e.g., *culture*) is specific for Cognitive Translatology. It should thus not be confused with standard lay usage of the word *translation* or its meaning and value in other research areas. For instance, single word translating, a popular research task in psycholinguistic and neuroscientific research, does not qualify here as *translating* because it lacks a communicative purpose. This does not mean, however, that the access to mental word pairings is not interesting or acceptable within Cognitive Translatology, but just that it cannot be considered the same as lexical matching within full-blown translating, let alone as the whole situated task (see § 2.2). Arguably, integrated tasks more closely resemble authentic tasks than isolated parts thereof, and therefore increase the construct validity (see, e.g., Ehrensberger-Dow 2014). See also note 3.

[8] No text is error-free. Readers of translations of the novel *The Hive,* by Nobel Prize winner Camilo José Cela—who drew from John Dos Passos works to populate his novel with so many characters that some editions had a "census of characters" as an appendix—, missed the following note featuring only in old Spanish editions (our translation):

> **N. of the A.** My German translator, Gerda Theile-Bruhns, pointed out to me that *Padilla* is not the shoeshine man, but the cigarette hawker. She is right and I rectified the slip, which happened again a few pages later. As of the fourth Spanish edition, I christened the shoeshine *Segundo Segura* ['Second Certain'].

[9] Besides, texts are anchored in the places and times of their writers, and they get old. Few people are trained to read *Sir Gawayn and þe Grene Knyȝt* as it was written in the late 14th century. Aged STs populate national literary canons but they are merely reinterpreted, whereas their translations are not enshrined and they need to be retranslated. A few translations may manage to survive those that superseded it, like the English rendering of the *Rubáiyát* of Omar Khayyám by Edward Fitzgerald.

[10] Originals may also display this kind of translationese, as in Agatha Christie's frenchified dialogues by Hercule Poirot and Hemingway's hispanicized English in the mouth of Santiago *(The Old Man and the Sea).*

[11] The piling demands generated by 4.33 billion people connected to the Internet for 6.5 hours a day in 2020 and technically able to establish P2P, B2B, B2P, P2B, etc., communications—just an example—cannot be met with an estimated world workforce of 333,000 professional translators (Pym et al. 2013:132–135). This is one translator/interpreter every 23.423 persons, and they are very unevenly distributed. In 2017, there were around 180,000 translators and interpreters in the European Union (EU). When considered per 1,000 citizens, the world average was 0.04 translators for every 1,000 humans and in the EU, 0.3. At the time, the EU also had 2 PhD students every 1,000 citizens. Germany had 1 employee in the tourist travel sector, and 0.4 translators—32,000 professionals, nearly 10% of the world's estimated total (World Bank data elaborated by us). The American Bureau of Labor Statistics sets the number of professionals translators in the USA at 77,400 (0.23 every 1,000 citizens). Small wonder the US translators' job outlook projections for 2019-2029 are a 20% growth! Please note that translators' ratios did not differentiate their professional languages. In 2020, Google's search page is available in 149 languages, and Wikipedia offers contents in 290 languages.

[155]

[12] Compare, for instance, the notions of *collaborative translation* (O'Brien 2011, Bistué 2014, Cordingley & Manning 2017, Jiménez 2017), present in translation practice at least since the *Setptuaginta* (3rd-2nd century BCE), and the newly coined *translaboration* (Alfer 2017). See also *translanguaging* (e.g., Liu & Fang 2020).

[13] The number of core journals results from filtering those indexed in BITRA, ERIH PLUS and SCOPUS in RETI's list, https://www.uab.cat/libraries/reti. The number of additional journals results from subtracting the above number of core journals from those in the EST list of journals; see https://est-translationstudies.org/resources/journals/.

[14] CTIS has an association, TREC; a journal, *Translation, Cognition & Behavior,* a few devoted international conference series and research centers (e.g., CRITT, CSTIC, LETRA, MC2 Lab, TRA&CO) and a somewhat distinctive behavior when compared to TIS as a whole (Olalla-Soler, Franco Aixelà & Rovira-Esteva 2020). However, arguing whether CTIS should be a discipline or a subdiscipline within CTIS would, in our view, miss the point. We have accumulated too modest results to go bragging to our colleagues in other areas of TIS, and we are not sure to agree that we should simply either reproduce the old ways in science or move towards somewhat relativistic trends (e.g., Nowotny, Scott & Gibbons 2001).

[15] This will probably entail mixed method research projects, which already now are perhaps the bulk of CT research. Scholars engaged in the discussion over quantitative vs qualitative approaches seem to miss or actively ignore the point that such choice, and others, depend on the research question. What we need to agree upon is on the more difficult issue of generalization, that both sides in the debate seem to sideline. See, e.g., Sandelowski (2001), Polit & Beck (2010), Toomela (2010), and Claveau & Girard (2019).

[16] Occam's principle, *Numquam ponenda est pluralitas sine necessitate* ['do not suggest more than one if unnecessary']—i.e., choose the simplest explanation or conceptual apparatus and shave off more convoluted ones in the process—is particularly necessary in CTIS, in view of the complex topological space we defined, with concepts and scopes borrowed from half a dozen basic sciences and several branches of cognitive science to apply to a wide arrays of practical, multifarious phenomena.

[156]

References

Alfer, A. (ed.). 2017. 'Translaboration'. Translation as Collaboration [J]. Special issue of *Translation and Translanguaging in Multilingual Contexts* 3 (3).

Alves, F. & A. L. Jakobsen (eds.). 2020. *The Routledge Handbook of Translation & Cognition* [C]. Abingdon: Routledge.

Amigo Extremera, J. J. 2015. Fitting CULTURE into translation process research [J]. *Translation & Interpreting* 7 (1): 26–46. http://www.trans-int.org/index.php/transint/article/view/368

Antonini, R. 2016. Caught in the middle: child language brokering as a form of unrecognised language service [J]. *Journal of Multilingual and Multicultural Development* 37 (7)**:** 710–725. https://doi.org/10.1080/01434632.2015.1127931

Aslin, R.N. 2017. Statistical learning: A powerful mechanism that operates by mere exposure [J]. *Wiley Interdisciplinary Review of Cognitive Science* 8:e1373. https://doi.org/10.1002/wcs.1373

Barsalou, L. W. 2008. Grounded cognition [J]. *Annual Review of Psychology* 59: 617–645.

Berent, I., H. Pan, X. Zhao, J. Epstein, M. L. Bennett, V. Deshpande, R. T. Seethamraju and E. Stern. 2014. Language Universals Engage Broca's Area [J]**.** *PLoS ONE* 9 (4): e95155. https://doi.org/10.1371/journal.pone.0095155

Bhandari, P., S. Prasad & R. K. Mishra. 2020. High proficient bilinguals bring in higher executive control when encountering diverse interlocutors [J]. *Journal of Cultural Cognitive Science* 4*:* 201–205*.* https://doi.org/10.1007/s41809-020-00060-7

Bialystok, E. & G. Poarch. 2014. Language experience changes language and cognitive ability [J]. *Zeitschrift fur Erziehungswissenschaft* 17 (3): 433–446. https://doi.org/10.1007/s11618-014-0491-8

Bistué, M. B.. 2014. *Collaborative Translation and Multi-Version Texts in Early Modern Europe* [M]*.* Farnham: Ashgate.

Boroditsky, L. 2019. Language and the brain [J]. *Science* 366 (6461): 13. https://doi.org/10.1126/science.aaz6490

Cañas Delgado, J. J. 2017. Fatigue and theories of resources: The energetic metaphor of the mind functioning might be reconsidered [A]. In K. S. Hale & K. M., Stanney, Kay M (eds.), *Advances in Neuroergonomics and Cognitive Engineering* [C]*.* Cham: Springer. 269–277. https://doi.org/10.1007/978-3-319-41691-5_23

Carl, M. 2010. A computational framework for a cognitive model of human translation processes [J]. *Proceedings of the 32nd International Conference on Translating and the Computer*. 18–19 November 2010, London. Available at www.mt-archive.info/10/Aslib-2010-Carl.pdf

Carl, M. 2013. A computational cognitive model of human translation processes [A]. In S. Bandyopadhyay, S. K. Naskar, & A. Ekbar (eds.), *Emerging Applications of Natural Language Processing: Concepts and New Research* [C]. Hershey, PA: IGI Publishing. 110–128.

Castro Arce, M. 2008. Procesos de lectura y comprensión al traducir [A]. In M. M. Fernández and R. Muñoz (eds.), *Aproximaciones cognitivas al estudio de la traducción y la interpretación* [C]*.* Granada: Comares. 31–54

Chan, C. H. 2020. *Legal Translation and Bilingual Law Drafting in Hong Kong: Challenges and Interactions in Chinese Regions* [M]. Abingdon: Routledge.

Chen, G. M. & W. J. Starosta. 1998. *Foundations of Intercultural Communication* [M]. Boston: Allyn & Bacon.

Cifuentes Férez, P. & A. M. Rojo López. 2015. Thinking for translating. A think-aloud protocol on the translation of manner-of-motion verbs [J]. *Target* 27 (2): 273–300. https://doi.org/10.1075/target.27.2.05cif

Cordingley, A. & C. F. Manning (eds.). 2017. *Collaborative Translation. From the Renaissance to the Digital Age* [C]*.* London: Bloomsbury.

Corrigan*,* T. 2017. Defining Adaptation [A]. In T. Leitch (ed.), *The Oxford Handbook of Adaptation Studies* [C]. Oxford: Oxford University Press. 23–35.

Costa Martínez, A. 2005. Lexical access in bilingual production [A]. In J. Kroll & A. de Groot (eds.), *Handbook of Bilingualism: Psycholinguistic Approaches* [C]. New York: Oxford University Press. 308–326.

Costa Martínez, A., M. Hernández Pardo, J. Costa Faidella & N. Sebastián Gallés. 2009. On the bilingual advantage in conflict processing: Now you see it, now you don't [J]. *Cognition* 113 (2): 135–149. https://doi.org/10.1016/j.cognition.2009.08.001

Dam-Jensen, H., C. Heine & I. Schrijver. 2019. The nature of text production – Similarities and differences between writing and translation [J]. *Across Languages and Cultures* 20 (2): 155–172. https://doi.org/10.1556/084.2019.20.2.1

Davier, L. 2017. *Les enjeux de la traduction dans les agences de presse* [M]. Lille: Presses universitaires du Septentrion.
Díaz Cintas, J. & P. Muñoz Sánchez. 2006. Fansubs: Audiovisual translation in an amateur environment [J]. *JosTrans* 6: 37–52. https://jostrans.org/issue06/art_diaz_munoz.php
Dilkina, K., J. L. McClelland, & D. C. Plaut. 2010. Are there mental lexicons? The role of semantics in lexical decision [J]. *Brain Research* 1365: 66–81. https://doi.org/10.1016/j.brainres.2010.09.057
De Boe, E. 2020. *Remote Interpreting in Healthcare Settings. A Comparative Study on The Influence of Telephone and Video Link Use on the Quality of Interpreter-Mediated Communication* [D]. University of Antwerp.
Defrancq, B. & S. Verliefde. 2018. Interpreter-mediated drafting of written records in police interviews. A case study [J]. *Target* 30 (2): 212–239. https://doi.org/10.1075/target.16141.def
De Mey, W. 1982. *The Cognitive Paradigm* [M]. Chicago: University of Chicago Press.
De Rooze, B. 2003. *La traducción, contra reloj. Consecuencias de la presión por falta de tiempo en el proceso de la traducción* [D]. Universidad de Granada.
Doherty, S. [in press] Multisensory integration in audiovisual translation [A]. In R. Muñoz & S. Halverson (eds.), *Multilingual Mediated Communication and Cognition* [C]. London: Routledge. 155–170.
Dorner, L. M., M. F. Orellana & R. Jiménez. 2008. It's one of those things that you do to help the family: Language brokering and the development of immigrant adolescents [J]. *Journal of Adolescent Research* 23 (5): 515–543.
Elliott, K. 2013. Theorizing adaptations/Adapting theories [A]. In J. Bruhn, A. Gjelsvik & E. Frisvold (eds.), *Adaptation Studies: New Challenges, New Directions* [C]. London: Bloomsbury. 19–45.
Ellis, R. 2003. *Task-based Language Learning and Teaching* [M]. Oxford: Oxford University Press.
Elman, J. L. 2009. On the meaning of words and dinosaur bones: Lexical knowledge without a lexicon. [J] *Cognitive Science* 33 (4): 547–582. https://doi.org/10.1111/j.1551-6709.2009.01023.x
Ehrensberger-Dow, M. 2014. Challenges of translation process research at the workplace [A]. In R. Muñoz (ed.) *Minding Translation*. Special issue 1 of *MonTI Monographs in Translation and Interpreting* [C]. Alicante: Universidad de Alicante. 355–383. http://rua.ua.es/dspace/handle/10045/43732
Enríquez Raído, V. 2014. *Translation and Web Searching* [M]. New York: Routledge.
Eskola, S. 2004. Untypical frequencies in translated language [A]. In A. Mauranen and P. Kujamäki (eds.), *Translation Universals: Do They Exist?* [C]. Amsterdam: John Benjamins. 83–99.
Evans, J. S. B. T. 2010. *Thinking Twice: Two minds in One Brain* [M]. Oxford: Oxford University Press.
Evans, V., B. Bergen & J. Zinken. 2007. The cognitive linguistics enterprise: an overview [A]. In Evans, Vyvyan & Jörg Zinken (eds.), *The Cognitive Linguistics Reader* [C]. London: Equinox. 263–266.
Ferrara, A. 1980a. An extended theory of speech acts: Appropriateness conditions for subordinate acts in sequences [J]. *Journal of Pragmatics* 4 (3): 233–252. https://doi.org/10.1016/0378-2166(80)90038-7.
Ferrara, A. 1980b. Appropriateness conditions for entire sequences of speech acts [J]. *Journal of Pragmatics* 4 (4): 321–340. https://doi.org/10.1016/0378-2166(80)90028-4.
Filippi, R., R. Leech, M. S. C. Thomas, D. Green & Frederic Dick. 2012. A bilingual advantage in controlling language interference during sentence comprehension [J]. *Bilingualism: Language and Cognition 15* (4): 858–872. https://doi.org/10.1017/S1366728911000708
Filippi, R., J. Morris, F. M. Richardson, P. Bright, M. S. C. Thomas, A. Karmiloff-Smith & V. Marian. 2015. Bilingual children show an advantage in controlling verbal interference during spoken language comprehension [J]. *Bilingualism: Language and Cognition 18* (3): 490–501. https://doi.org/10.1017/S1366728914000686
Firestone, C. 2016. Embodiment in Perception [A]. In B. P. McLaughlin & H. Kornblith (eds.), *Goldman and His Critics* [C]. Hoboken, NJ: Wiley-Blackwell. 318-336. https://doi.org/10.1002/9781118609378.ch15
Garagnani, M., T. Wennekers & F. Pulvermüller. 2009. Recruitment and consolidation of cell assemblies for words by way of Hebbian Learning and Competition in a multi-layer neural network [J]. *Cognitive computation 1*(2): 160–176. https://doi.org/10.1007/s12559-009-9011-1
Georgiou, H. V. 2014. Estimating the intrinsic dimension in fMRI space via dataset fractal analysis—Counting the CPU cores' of the human brain [J]. *arXiv preprint* https://arxiv.org/abs/1410.7100
Glenberg, A. M. 1997. What memory is for [J]. *Behavioral and Brain Sciences* 20 (1): 1–55. https://doi.org/10.1017/S0140525X97000010
Granell Zafra, X. [Joaquín]. 2015. *Multilingual Information Management: Information, Technology and Translators* [M]. Oxford: Chandos Publishing.

Green, D. W., & J. Abutalebi. 2013. Language control in bilinguals: The adaptive control hypothesis [J]. *Journal of Cognitive Psychology* 25 (5): 515–530. https://doi.org/10.1080/20445911.2013.796377
Grosjean, F. 1989. Neurolinguists, beware! The bilingual is not two monolinguals in one person [J]. *Brain and language* 36 (1): 3–15.
Grosjean**,** F**.** 1992**.** Another view of bilingualism [J]**.** *Advances in Psychology* 83**:** 51**–**62**.** https://doi.org/10.1016/S0166-4115(08)61487-9
Hall, N. & S. Sham. 2007. Language brokering as young people's work: Evidence from Chinese adolescents in England [J]. *Language and Education* 21 (1): 16–30. https://doi.org/10.2167/le645.0
Halverson, S. L. 2004. Assumed translation. Reconciling Komissarov and Toury and moving a step forward [J]. *Target* 16 (2): 341–354.
Halverson, S. L. & R. Muñoz Martín. [in press]. The times, they are a-changin'. Multilingual mediated communication and cognition [A]. In R. Muñoz & S. Halverson (eds.), *Multilingual Mediated Communication and Cognition* [C]. London: Routledge. 1–17.
Harris, B. 1973. La traductologie, la traduction naturelle, la traduction automatique et la sémantique [A]. In J. McA'Nulty (ed.)*, Cahier de linguistique 2. Problèmes de sémantique* [C]. Montreal: Presses de l'Université du Québec. 133–146.
Harris, B. & B. Sherwood. 1978. Translating as an innate skill [A]. In D. Gerver & H. Wallace Sinaiko (eds.), *Language Interpretation and Communication* [C]. New York: Plenum. 155–170. https://doi.org/10.1007/978-1-4615-9077-4_15
Hebb, D. O. 1949. *The Organisation of Behaviour* [M]. New York: John Wiley & Sons.
Hernández Guerrero, M. J. 2009. *Traducción y periodismo* [M]. Bern: Peter Lang.
Hirvonen, M. & L. Tiitula. 2018. How are translations created? Using multimodal conversation analysis to study a team translation process [J]. *Linguistica Antverpiensia, New Series: Themes in Translation Studies* 17: 157–173.
Ho, C., T. Chen & J. Tsai. 2020. How does training shape English-Chinese sight translation behaviour? An eyetracking study [J]. *Translation, Cognition & Behavior* 3 (1): 1–24.
Hoeben Mannaert, L. N., K. Dijkstra, & R. A. Zwaan. 2017. Is color an integral part of a rich mental simulation? [J]. *Memory & cognition 45* (6): 974–982. https://doi.org/10.3758/s13421-017-0708-1
Hofstede, G., G. J. Hofstede & M. Minkov. 2010. *Cultures and Organizations: Software of the Mind* (revised and expanded 3rd ed.) [M]. New York: McGraw-Hill.
Hohwy, J. 2013. *The Predictive Mind* [M]. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199682737.001.0001
House, J. 2008. Beyond Intervention: Universals in Translation? [J]. *trans-kom* 1 (1): 6–19. http://www.trans-kom.eu/ihv_01_01_2008.html
Iacoboni, M. 2008. Imitation, empathy, and mirror neurons [J]. *Annual Review of Psychology* 60: 653-670. https://doi.org/10.1146/annurev.psych.60.110707.163604
Immonen, S. 2006. Translation as a writing process. Pauses in translation versus monolingual text production [J]. *Target* 18 (2): 313–335.
Jakobsen, A. L. and K. T. H. Jensen. 2008. Eye movement behaviour across four different types of reading tasks [A]. In S. Göpferich, A. L. Jakobsen and I. M. Mees (eds.), *Looking at Eyes. Eyetracking studies of reading and translation processing* [C]. Copenhagen: Samfundslitteratur. 103–124.
Jakobson, R. 1959. On linguistic aspects of translation [A]. In R. A. Brower (ed.), *On Translation* [C]. Cambridge, MA: Harvard University Press. 232–239.
Jia, Y., M. Carl & X. Wang. 2019. Post-editing neural machine translation versus phrase-based machine translation for English–Chinese [J]. *Machine Translation* 33: 9–29. https://doi.org/10.1007/s10590-019-09229-6
Jiménez Crespo, M. A. 2017. *Crowdsourcing and Online Collaborative Translations: Expanding the limits of Translation Studies* [M]. Amsterdam: John Benjamins.
Johnson, M. 1987. *The Body in the Mind* [M]. Chicago: University of Chicago Press.
Johnson, M. 2014. Experiencing language: What's missing in linguistic pragmatism? [J]. *European Journal of Pragmatism and American Philosophy* VI (2): 13–27. https://doi.org/10.4000/ejpap.284
Johnson, M. 2017. *Embodied Mind, Meaning, and Reason. How Our Bodies Give Rise to Understanding* [M]. Chicago: University of Chicago Press.
Ketola, A. 2018. *Word–Image Interaction in Technical Translation: Students Translating an Illustrated Text* [D]. University of Tampere.

Kidawara, Y., E. Sumita and H. Kawai (eds.). 2020. *Speech-to-Speech Translation* [C]. Singapore: Springer.
Komter, M. L. 2006. From talk to text: The interactional construction of a police record [J]. *Research on Language and Social Interaction* 39 (3): 201–228. https://doi.org/10.1207/s15327973rlsi3903_2
Koppel, M. and N. Ordan. 2011. Translationese and its dialects [J]. *Proceedings of the 49th Annual Meeting of the Association for Computational Linguistics: Human Language Technologies,* 1318–1326. Portland, OR: ACL. https://www.aclweb.org/anthology/P11-1132
La Heij, W. 2005. Selection processes in monolingual and bilingual lexical access [A]. In J. Kroll & A. M. B. de Groot (eds.), *Handbook of Bilingualism: Psycholinguistic Approaches* [C]. New York: Oxford University Press. 239–307.
Lakoff, G. 1987. *Women, Fire, and Dangerous Things* [M]. Chicago: University of Chicago Press.
Lakoff, G. & M. Johnson. 1980. *Metaphors We Live By* [M]. Chicago: University of Chicago Press.
Landauer, T. K. & S. Dumais. 1997. A solution to Plato's problem: The latent semantic analysis theory of acquisition, induction and representation of knowledge [J]. *Psychological Review* 104 (2): 211–240.
Langacker, Ronald W. 1987. *Foundations of Cognitive Grammar: Theoretical Prerequisites* [M]. Stanford: Stanford University Press.
Langille, J. J. & R. E. Brown. 2018. The synaptic theory of memory: A historical survey and reconciliation of recent opposition [J]. *Frontiers in systems neuroscience 12*: 52. https://doi.org/10.3389/fnsys.2018.00052
Lei, V. & D. Li. 2019. Tracking where the professional conference interpreter looks: A case study in naturalistic settings [J]. Paper presented at the 2nd International Congress on Translation, Interpreting and Cognition *Interdisciplinarity: The Way out of the Box* Germersheim, Germany, 4–6 July 2019.
Leitch, V. B. 1983. *Deconstructive Criticism: An Advanced Introduction* [M]. London: Hutchinson.
Lemarié, J., R. F. Lorch Jr. & M. P. Péry-Woodley. 2012. Understanding how headings influence text processing [J]. *Discours* 10. https://doi.org/10.4000/discours.8600
Levert, L. A. 2004. Bilingual and bijural legislative drafting: To be or not to be? [J]. *Statute Law Review* 25 (2): 151–164. https://doi.org/10.1093/slr/25.2.151
Levý, J. 1967. Translation as a decision making process [A]. *To Honor Roman Jakobson, vol. 2* [C]. The Hague: Mouton. 1171–1182. https://doi.org/10.1515/9783111349121-031
Liu, Y. and F. Fang. 2020. Translanguaging theory and practice: How stakeholders perceive translanguaging as a practical theory of language [J]. *RELC Journal* [s.p.]. https://doi.org/10.1177/0033688220939222
Lorenzo, M. P. 2002. Competencia revisora y traducción inversa [J]. *Cadernos de Tradução* 2 (10): 133–166. https://periodicos.ufsc.br/index.php/traducao/article/view/6148/5706.
Lörscher, W. 1991. *Translation Performance, Translation Process, and Translation Strategies. A Psycholinguistic Investigation* [M]. Tübingen: Gunter Narr.
Lyons, J. 1977. *Semantics,* vol. 1 [M]. Cambridge: Cambridge University Press.
Mårtensson, J., J. Eriksson, N. C. Bodammer, M. Lindgren, M. Johansson, L. Nyberg, & M. Lövdén. 2012. Growth of language-related brain areas after foreign language learning [J]. *NeuroImage* 63 (1): 240. https://doi.org/10.1016/j.neuroimage.2012.06.043
Malakoff, M. E. 1992. Translation ability: A natural bilingual and metalinguistic skill [J]. *Advances in Psychology* 83: 515–529. https://doi.org/10.1016/S0166-4115(08)61514-9
Malinowski, B. K. 1923. The problem of meaning in primitive languages [A]. In C. K. Ogden & I. A. Richards (eds.), *The Meaning of Meaning* [C]. London: Kegan Paul, Trend, Trubner. 296–336.
Malinowksi, B. K. 1935. *Coral Gardens and their Magic, vol. 2* [M]. London: Allen & Unwin.
Mann, W. C. & S. A. Thompson. 1988. Rhetorical structure theory: toward a functional theory of text organization [J]. *Text* 8 (3): 243–281.
Massey, G. & M. Ehrensberger-Dow. 2011. Investigating information literacy: A growing priority in translation studies [J]. *Across Languages and Cultures* 12 (2): 193–211. https://doi.org/10.1556/Acr.12.2011.2.4
McSweeney, B. 2002. Hofstede's model of national cultural differences and their consequences: A triumph of faith— a failure of analysis [J]. *Human Relations* 55 (1): 89–118. https://doi.org/10.1177/0018726702551004
Mellinger, C. D. and G. M. Shreve. 2016. Match evaluation and over-editing in a translation memory environment [A]. In R. Muñoz (ed.), *Reembedding translation process research* [C]. Amsterdam: John Benjamins. 131– 148.
Meltzoff, A. N., & R. A. Williamson, R. A. 2013. Imitation: Social, cognitive, and theoretical perspectives [A]. In P. D. Zelazo (ed.), *The Oxford handbook of developmental psychology (Vol. 1): Body and mind* [C]. Oxford: Oxford University Press. 651–682.

Muñoz de Escalona Fernández, E., J. J. Cañas Delgado, & P. I. Noriega Pinto Machado. 2020. Inconsistencies between mental fatigue measures under compensatory control theories [J]. *Psicológica Journal* 41 (2): 103–126. https://doi.org/10.2478/psicolj-2020-0006

Muñoz Martín, R. 2010. On paradigms and cognitive translatology [A]. In G. Shreve & E. Angelone (eds.), *Translation and Cognition* [C]. Amsterdam: John Benjamins. 169–187. https://doi.org/10.1075/ata.xv.10mun

Muñoz Martín, R. 2011. Nomen mihi Legio est: A cognitive approach to Natural Translation [A]. In Mª J. Blasco & A. Jiménez (eds.), *Interpreting… naturally* [C]. Frankfurt: Peter Lang. 35–66.

Muñoz Martín, R. 2016. Of minds and men—Computers and translators [J]. *Poznan Studies in Contemporary Linguistics* 52 (2): 351–381. DOI 10.1515/psicl-2016-0013

Muñoz Martín, R. 2017. Looking toward the future of Cognitive Translation Studies [A]. In J. W. Schwieter & A. Ferreira (eds.), *The Handbook of Translation and Cognition* [C]. Hoboken, NJ: Wiley Blackwell. 555–571. https://doi.org/10.1002/9781119241485.ch30

Muñoz Martín, R. & A. M. Rojo López. 2018. Meaning [A]. In Sue-Ann Harding & Ovidi Carbonell Cortés (eds.), *The Routledge Handbook of Translation and Culture* [C]. London: Routledge. 73–90.

Muñoz Martín, R. & Olalla-Soler, C. [in press]. Translation is not (only) problem solving [J].

Nowotny, H., P. B. Scott & M. T. Gibbons. 2001. *Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty* [M]. Cambridge: Polity Press.

O'Brien, S. 2011. Collaborative translation [A]. In Y. Gambier & L. van Doorslaer (eds.), *Handbook of Translation Studies, vol. 2 [C].* Amsterdam: John Benjamins. 17–20.

OECD. 2019. *Skills Matter: Additional Results from the Survey of Adult Skills* [M]. Paris: OECD. https://doi.org/10.1787/1f029d8f-en

Olalla-Soler, C. [in press]. Yes! we're open. Open science and the future of academic practices in translation and interpreting studies [J].

Olalla-Soler, C, J. F. Aixelà & S. Rovira-Esteva. 2020. Mapping Cognitive Translation and Interpreting Studies. A bibliometric approach [J]. *Linguistica Antverpiensia, New Series: Themes in Translation Studies* 19: 25-52.

Omori, K. 2017. Cross-cultural communication [A]. In M. Allen (Ed.), *The Sage Encyclopedia of Communication Research Methods*, vol. 1 [C]. Thousand Oaks, CA: SAGE. 309-312. https://doi.org/10.4135/9781483381411.n116

Orrego Carmona, D. 2015. *The Reception of (Non)professional Subtitling* [D]. Universitat Rovira i Virgili.

Pedersen, D. 2016. *Transcreation in Marketing and Advertising: An Ethnographic Study* [D]. University of Aarhus.

Perlman, M. 2017. Debunking two myths against vocal origins of language. Language is iconic and multimodal to the core [J]. *Interaction Studies* 18 (3): 376–401. https://doi.org/10.1075/is.18.3.05per

Pliatsikas, C., V. DeLuca, & T. Voits. 2020. The many shades of bilingualism: language experiences modulate adaptations in brain structure [J]. *Language Learning* 70 (52): 133–149. ISSN 0023-8333 https://doi.org/10.1111/lang.12386

Pöchhacker, F. 1995. Simultaneous Interpreting: A Functionalist Perspective [J]. *Hermes, Journal of Linguistics* 14: 31–53.

Polit, D. F. & C. T. Beck. 2010. Generalization in quantitative and qualitative research: Myths and strategies [J]. *International Journal of Nursing Studies* 47: 1451–1458.

Pulvermüller, F. & L. Fadiga. 2010. Active perception: sensorimotor circuits as a cortical basis for language [J]. *Nature Reviews Neuroscience* (11): 351–360. https://doi.org/10.1038/nrn2811

Purmohammad, M. (2015). Grammatical encoding in bilingual language production: A focus on code-switching [J]. *Frontiers in psychology*, *6*: 1797. https://doi.org/10.3389/fpsyg.2015.01797

Pym, A. 2004. *The Moving Text: Localization, translation, and distribution* [M]. Amsterdam: John Benjamins.

Pym, A., F. Grin, C. Sfreddo and A. L. J. Chan. 2013. *The Status of the Translation Profession in the European Union* [M]. London: Anthem Press.

Reddy, M. J. 1979. The conduit metaphor: A case of frame conflict in our language about language [A]. In A. Ortony (ed.), *Metaphor and Thought* [C]. Cambridge: Cambridge University Press. 284–310.

Risku, H., J. Miloševic & C. Pein- Weber. 2016. Writing vs. translating. Dimensions of text production in comparison [A]. In R. Muñoz (ed.), *Reembedding translation process research* [C]. Amsterdam: John Benjamins. 47– 68.

Risku, H. & R. Rogl. 2020. Translation and situated, embodied, distributed, embedded and extended cognition [A]. In F. Alves & A.L. Jakobsen (eds.), *The Routledge Handbook of Translation and Cognition* [C]. 2020. Abingdon: Routledge. 478–499.

Roberts, D. 2000. Training interpreters for La Relève-Part III [J]. *Terminology Update* 33 (3): 16.
Sandelowski, M. 2001. Real qualitative researchers do not count: The use of numbers in qualitative research [J]. *Research in Nursing & Health* 24: 230–240.
Sapir, E. 1933. Language [A]. In E.R. Anderson & A. Saunders (eds.), *Encyclopaedia of the Social Sciences*, vol. 9 [C]. New York: Macmillan. 155-169.
Schilling, M. A. 2005. A small-world network model of cognitive insight [J]. *Creativity Research Journal* 17 (2-3): 131–154.
Schwieter, J. W. & A. Ferreira. 2017. Bilingualism in cognitive translation and interpreting studies [A]. In J. W. Schwieter & A. Ferreira (eds.), *The Handbook of Translation and Cognition* [C]. Malden, MA: Wiley-Blackwell. 144–164
Schwieter, J. W. & A. Ferreira (eds.). 2017. *The Handbook of Translation and Cognition* [C]. Malden, MA: Wiley-Blackwell.
Seeber, K. G. 2017. Multimodal processing in simultaneous interpreting [A]. In J. W. Schwieter & A. Ferreira (eds.), *The Handbook of Translation and Cognition* [C]. Hoboken, NJ: Wiley. 461–475. https://doi.org/10.1002/9781119241485.ch25
Seeber, K. G. and Carmen Delgado Luchner. 2015. Simulating simultaneous interpreting with text: From training model to training module [A]. In M. D. Rodríguez, I. Horváth & K. Ferguson (eds.), *The Role of Technology in Conference Interpreter Training* [C]. Frankfurt: Peter Lang. 129–151.
Shannon, C. E. 1948. A mathematical theory of communication [J]. *The Bell System Technical Journal* XXVII (3): 379–423.
Shannon, C. E. & W. Weaver. 1949. *The Mathematical Theory of Communication* [M]. Urbana: University of Illinois Press.
Shatz, C. J. 1992. The developing brain [J]. *Scientific American* 267 (3): 60–67. https://doi.org/10.1038/scientificamerican0992-60
Shreve, G. M., C. Schäffner, J. H. Danks and J. Griffin. 1993. Is there a special kind of "reading" for translation? An empirical investigation of reading in the translation process [J]. *Target* 5 (1): 21–41.
Signorini, P., R. Wiesemes & R. Murphy. 2009. Developing alternative frameworks for exploring intercultural learning: a critique of Hofstede's cultural difference model [J]. *Teaching in Higher Education. Critical Perspectives* 14 (3): 253–264. https://doi.org/10.1080/13562510902898825
Skehan, P. and P. Foster. 2001. Cognition and tasks [A]. In P. Robinson (ed.), *Cognition and Second Language Instruction* [C]. Cambridge: Cambridge University Press. 183–205. https://doi.org/10.1017/CBO9781139524780.009
Slobin, D. I. 1996. From ''thought and language'' to ''thinking for speaking.'' [A] In J. J. Gumperz and S. C. Levinson (eds.), *Rethinking Linguistic Relativity* [C]. Cambridge: Cambridge University Press. 70–96.
Spalding, K. L., O. Bergmann, K. Alkass, S. Bernard, M. Salehpour, H. B. Huttner, E. Boström, I. Westerlund, C. Vial, B. A. Buchholz, G. Possnert, D. C. Mash, H. Druid, & J. Frisén. 2013. Dynamics of hippocampal neurogenesis in adult humans [J]. *Cell* 153 (6): 1219–1227. https://doi.org/10.1016/j.cell.2013.05.002
Spivey, M. J. & R. Dale. 2006. Continuous dynamics in real-time cognition [J]. *Current Directions in Psychological Science* 15 (5): 207–211. https://doi.org/10.1111/j.1467-8721.2006.00437.x
Stefaniak, K. 2013. Multilingual legal drafting, translators' choices and the principle of lesser evil [J]. *Meta* 58 (1): 58–65. http://dx.doi.org/10.7202/1023809ar
Stietz, J., E. Jauk, S. Krach & P. Kanske. 2019. Dissociating empathy from perspective-taking: Evidence from intra- and inter-individual differences research [J]. *Frontiers in Psychiatry* 10: s.p. https://doi.org/10.3389/fpsyt.2019.00126 10.3389/fpsyt.2019.00126
Sutton, J. & K. Williamson. 2014. Embodied remembering [A]. In L. Shapiro (ed.), *The Routledge Handbook of Embodied Cognition* [C]. New York: Routledge. 315–325.
Thibodeau, P. H. & L. Boroditsky. 2011. Metaphors we think with: The role of metaphor in reasoning [J]. *PLoS ONE* 6 (2): e16782. https://doi.org/10.1371/journal.pone.0016782
Tiselius, E. 2013. *Experience and expertise in conference interpreting: an investigation of Swedish conference interpreters* [D]. University of Bergen.
Toomela, A. 2010. Quantitative methods in psychology: Inevitable and useless [J]. *Frontiers in Psychology* 1: 29. https://doi.org/10.3389/fpsyg.2010.00029
Toury, G. 1995. *Descriptive Translation Studies and Beyond* [M]. Amsterdam: John Benjamins.

Uhlmann, F. and S. Höfler. 2018. Multilingual legislative drafting in Swiss cantons: Burden or blessing? [J]. *The Loophole – Journal of the Commonwealth Association of Legislative Counsel* (1): 54–62. https://doi.org/10.5167/uzh-146872

Vandeberg, L., T. Guadalupe & R. A. Zwaan. 2011. How verbs can activate things: Cross-language activation across word classes [J]. *Acta Psychologica* 138 (1): 68–73. https://doi.org/10.1016/j.actpsy.2011.05.007

van Moort, M. L., A. Koornneef & P. W. van den Broek. 2018. Validation: Knowledge- and text-based monitoring during reading [J]. *Discourse Processes 55*(5-6): 480-496. https://doi.org/10.1080/0163853X.2018.1426319

van Moort, M. L., A. Koornneef & P. W. van den Broek. 2020. Differentiating text-based and knowledge-based validation processes during reading: Evidence from eye movements [J]. *Discourse Processes.* https://doi.org/10.1080/0163853X.2020.1727683

van Moort, M., D. D. Jolles, A. Koornneef & P. van den Broek. 2020. What you read versus what you know: Neural correlates of accessing context information and background knowledge in constructing a mental representation during reading [J]. *Journal of Experimental Psychology: General.* 149(11): 2084–2101. https://doi.org/10.1037/xge0000764

Verhagen, A. 2007. Construal and perspectivisation [A]. In D. Geeraerts & H. Cuyckens (eds.), *Handbook of Cognitive Linguistics* [C]. Oxford: Oxford University Press. 48–81.

Volansky, V., N. Ordan, & S. Wintner. 2015. On the features of translationese [J]. *Digital Scholarship in the Humanities* 30 (1): 98–118. https://doi.org/10.1093/llc/fqt031

Whyatt, B. 2017. We are all translators: Investigating the human ability to translate from a developmental perspective [A]. In Antonini, L. Cirillo, L. Rossato & I. Torresi (eds.), *Non-professional Interpreting and Translation* [C]. Amsterdam: John Benjamins. 45–64.

Yee, E. & S. L. Thompson-Schill. 2016. Putting concepts into context [J]. *Psychonomic Bulletin & Review* 23: 1015–102.

Yu, C., L. B. Smith & A. F. Pereira. 2008. Grounding word learning in multimodal sensorimotor interaction [A]. In B. C. Love, K. McRae & V. M. Sloutsky (eds.), *Proceedings of the 30th Annual Conference of the Cognitive Science Society* [C]. Austin, TX: Cognitive Science Society. 1017–1022.

Zhou, Z., K. Chen, X. Li, S. Zhang, Y. Wu, Y. Zhou, K. Meng, C. Sun, Q. He, W. Fan, E. Fan, Z. Lin, X. Tan, W. Deng, J. Yang & J. Chen. 2020. Sign-to-speech translation using machine-learning-assisted stretchable sensor arrays [J]. *Nat Electron* **3:** 571–578. https://doi.org/10.1038/s41928-020-0428-6

Zwaan, R. A. 2004. The immersed experiencer: Toward an embodied theory of language comprehension [A]. In B. H. Ross (ed.), *The Psychology of Learning and Motivation: Advances in Research and Theory* [C]. New York: Elsevier. 35–62.

Zwaan, R. A. 2014. Embodiment and language comprehension: reframing the discussion [J]. *Trends in Cognitive Sciences* 18 (5): 229–234. http://dx.doi.org/10.1016/j.tics.2014.02.008

Bionotes

Ricardo Muñoz is professor at the Department of Interpreting & Translation of the University of Bologna, where he directs the Laboratory for Multilectal Mediated Communication & Cognition (MC2 Lab). His major research interests include the development of Cognitive Translatology (based on situated cognition) and empirical translation studies. His contact email is ricardo.munoz@unibo.it

César González is a PhD student at the Department of Interpreting & Translation of the University of Bologna, and a member of the Laboratory for Multilectal Mediated Communication & Cognition (MC2 Lab). His research interests focus on the empirical study of translation processes from the perspective of Cognitive Translatology. His contact email is cesarandres.gonzale2@unibo.it