Growing Up Into Science and Technology: a Translator's Educational Heritage

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Abstract

This paper seeks to understand why it takes young translators who have received their upper school education in the arts and humanities and have gone on to take translation degrees or post-graduate courses in arts faculties and applied language institutes, so long to settle down in and feel comfortable with technical and scientific translation into their own language. The paper also seeks to examine the fact that a growing number of highly trained workers in science and technology are becoming translators, working in their own fields and that their target languages may not necessarily be their own.

Without proposing an essentialist stance or a translation theory, I suggest that we look at the general structure of scientific and technological discourse and the mind frames it constructs, taught as from the middle school. In order to see why students experience such difficulties in science and maths, I shall be raising the idea of a genre-based approach to scientific discourse from a systemic-functional linguistic stance that allows us a better understanding of our reality – in this case, the specific reality of the translator of scientific and technological texts – through the mediation of applied linguistics as a social and cultural tool.

Key words: scientific discourse, genre, training.

Introduction

The fact dawned on me that scientific and technical translation was not only a matter of specialized vocabulary about 25 years ago, albeit in a gradual process of gaining awareness and insights as I traversed the thorny path of mediating technical texts. I had already acquired a certain amount of experience in other kinds of non-literary translation, but the two articles I was asked to translate into English were to be decisive for a future incursion into the theory of scientific translation. After having laboriously translated (on a manual typewriter) two lengthy texts on the psychiatric evaluations of withdrawal symptoms in adults addicted to toxic substances (in this case, nicotine and alcohol), I was told that my work simply would not do; I had changed the meaning of things; I would not get paid, and that was that. Upon asking for examples of how the meaning had been changed the psychiatrist exploded, and gesticulating wildly, shouted that I had changed *everything*! I was angered at his lack of preciseness at first and then puzzled. But in effect, he was right. I had changed everything: I had changed the meaning. I had made what had been a highly technical study written for restricted scientific readership into something laypeople could understand. I had democratized the text in detriment to its scientific value and had transformed it into common-sense, vernacular, or folk knowledge – after all, don't we all know someone who smokes too much or drinks more than is good for him/her? I had changed the precise nature of the psychiatrist's description and explanation in *un-commonsense* terms to use Halliday & Martin's word, not by changing his taxonomy but by changing his genre, his construction of text, his metaphorical grammar. I had re-worked his text to represent not his own – and the medical class' – specialized knowledge about a problem that all of us have some knowledge about, to suit my own purpose having in mind the other 99 % who were like me. Perhaps it was the nature of the subject that lent itself to assumptions I would not normally have dared to make – rather in the manner described by the linguist, Guy Cook, when he discusses the scientific and non-scientific perception of the science involved in genetically modified organisms [1]. It was not so much the voice of the translator taking a stand to assert identity; it was an attempt to understand the representation of knowledge from a layperson's point of view. And it was doomed to failure. I subsequently learned that although we have only one language system to describe other systems such as we find in science and technology, we have to know how to deal with field-specific environments that cannot be unpacked in one-to-one equivalents without causing changes in meaning.

I have mentioned this incident because it sheds light on the nature of the scientific text and the difficulty young translators experience in coming to grips with them after having graduated from their first-degree translation courses in arts faculties and the polytechnics. Given the fact that we are living in a technological age and educational guidelines are seriously concerned with successful learning and outcomes in these spheres, it is necessary to take a look at the nature of scientific languages as a social semiotic that processes meaning and allows students to understand and interpret the mathematical, scientific and technological concepts introduced to them at school so that they can, at a later date, take a full and equal part in the society of the future.

I shall therefore be considering genre as a possible approach to learning these subjects, so that students understand better what and how they are learning in order that they may give written accounts of their success. I will look at this issue from a systemic-functional linguistic approach, which I believe sheds light on the relations between the components of language and meaning and in the way language functions socially in particular fields. In doing so, I will also link up the pedagogical language system with the other semiotic systems that prevail in the science and maths classroom. I will therefore be discussing areas of difficulties experienced by students and translators as they negotiate the genre. However, it will not be my concern to offer any theoretical guidelines to translation practices. Nevertheless, and to end with, some questions will be raised about the kind of competences translators of scientific and technological texts need to have.

Learning the language of science and technology

It is a common belief that far from integrating into the creative, hybrid world of the post-modern with its acceptance of the *other* in multiple universes of signification and cross-referencing, the discourse of science and technology seems to be conservative, highly ordered and therefore exclusive. But is this really so? In order to make sense of the world, students need to acquire the cultural tools and practices of their times, and in our technological age, science as a human activity is very much a part of the social scenario. What students have to learn are the various languages – or the multimodality of the rhetorics

[1] See Guy Cook, pp. 91-120, where key phrases and metaphors are discussed to show the difference between scientific language and unscientific language as handled by the press, politicians, lobby groups and the general public.

of science to use Gunther Kress' term – in order to understand the different systems of signs in a scientific concept. This includes not only understanding the operational and visual representations, the verbal and textual signs, the symbols and codes of science and technology, but understanding them in a synergy that demands a logical movement to-and-fro each of them in a process whereby knowledge is constructed. But as Basil Bernstein pointed out as far back as the early 1970s in his seminal work on elaborated codes, the language of learning at school may also be the language of exclusion owing to the demand that speakers have to know how to deal with the code-switching and ambiguities of institutionalised discourse. Students are assessed on their competence to handle these discourses through their performance and many fail to do so due to the representational breakdowns between words and meanings.

Jay Lemke pointed out that in order to perform in the way the institution and society expects, students need to know "how scientists talk and write and diagram and calculate, how scientists plan and observe and record, how we represent and analyze data, how we formulate hypotheses and conclusions, how we connect theories, models, and data, how we relate our work and results to those of other researchers" (2002:159). Natural language, he stressed, is very limited in its ability to describe the concepts and workings of science and technology. As far apart as in Europe, Australia and the USA, pedagogues and applied linguists have been proving that meaningful maths and science depend on how well students take part the process to build up the semiotic system in the cultural setting of the classroom from different disciplinary and operational perspectives in "a dynamic process of transformative sign-making" (Kress *et al*., 2001:xiii). In other words, the reading and writing of science is only a part of the story.

But it is the part that interests the translator of scientific and technical texts. The fact that its increasingly formulaic, esoteric nature is cause for worry among educators who see in it a factor of social and cultural exclusion, is also of interest to the translator. Unravelling the abstractions, the technicalities and the taxonomies, as well as penetrating the rationalistic mind frames couched in elitist discourses (heavily influenced by Anglo-Saxon formalism) may prove too much for many translators because they have not been trained into them. It is precisely the impenetrability of scientific and technical discourse that is the on-going concern of pedagogues in their wish to open up science education to those who have always traditionally been denied access to it. However, in taking educational measures, the authorities seem to have compounded the problem by confusing the discourse of science – a specialised descriptive discourse of signs, or rather, an experiential *un-commonsense* discourse – with the interpersonal vernacular narrative based on the *expressivism* of imaginative creativity, pseudo-scientific terminology and "quasi-genres" [2].

In an ironical paradox, however, the scientific mode has also become the discourse of power and hierarchy. Far from being esoteric, its influence has spread to other public spheres such as bureaucracy, technocracy, advertising and journalism. At the beginning of the 21st century, the linguistic scaffolding of scientific knowledge has been transformed into the language of literacy. M.A.K. Halliday (1993:10,11) has rightly stated that what started off by freeing and enabling the linguistic *constructual* of experience gained through the new experimental sciences in the 17th century, has ended up by constraining and distorting it. Nevertheless, there is every indication that in future societies, people will be forced to interface with semiotic systems to an increasing degree. Language has already become the vital commodity whereby information is produced and exchanged. And therein lies the second paradox. Our post-modern relativity has already made inroads on scientific genre. The certainties scientific and technical discourse has had up to recently to construe particular realities would seem to be moving in the opposite direction today: from absolutes to relatives;

[2] See USA emancipatory pedagogy and certain currents in cultural studies pushing for expressivism by allowing children to use their own childish semiotic systems unencumbered by genre restraints. See J.R. Martin (1993:167) for an account of the teacher's negative reaction to 8 year-old Ben's scientific essay.

from objects to processes; from deterministic to probabilistic; from stability to flow [3]. The new semiotic systems that are developing new sub-genres (suited to globalization, on the one hand but also unique socio-cultural identities on the other) will need to be deconstructed, however, and will have to undergo testing for comprehensibility. Hopefully, the tendency will be to find new ways to express meaning and to democratise what has hitherto been elitist, even if new elites quickly develop and take their place.

Learning about genre while "doing" science and maths

This brings us back into the pedagogy of the science classroom, to the question of accessibility and the core of the problem with learning maths, physics, chemistry, computer science and the natural sciences. Do the students understand the language in which these subjects are delivered? Or does pedagogy explicitly need to shape consciousness through linguistic and social processes so that they make sense [4]. There is hardly any student writing of text in maths and science in the classroom and, even if accepted genre-constraints are obeyed, much of the input they receive is through oral, visual and kinetic means. Students are often at a loss when cutting through the teacher's discourse and the passages in their textbook to get at meaning. And they are less successful when it comes to writing up descriptions, procedures, arguments and conclusions pertaining to their own elementary scientific practice and in accordance with accepted sub-genres. Robert Veel (in Christie, 1999:169) offers a convincing explanation for this difficulty. He says that,

> without pedagogical recontextualization of science, it would not be learnable. School science reduces, simplifies, generalizes and idealizes centuries of scientific activity, in order for students to assimilate important understandings and to move on to 'real science'. This requires science educators to organize knowledge into taxonomies, axioms, laws and principles to explain phenomena. (…) Progressive science educators often emphasize the need to 'rehumanize' school science (…). This has led to the radical changes in the appearances of many textbooks, *though not of the written language they contain* (my emphasis).

In his article, "Monitoring Semogenesis" (in Christie, 1999:123-155), J.R. Martin offers a 3-dimensional model of change in classroom discourse so as to open up learners' access to genre and enhance the projection of meaning in a semogenetic process. By working through a constructive of discourse interchange between teacher, students, text, action, visual means, gesture and multimedia, teachers have found it useful to get the children to construct meaning and practice through unfolding or deconstructing the genre itself. In other words, as scientific and technological concepts are introduced to the students, the language in which they are couched is checked for understanding and successful reproduction. The process is worked through in textual form (Martin terms this logogenesis) whereby the individual gains awareness of the meaning potential in the text (ontogenesis) in the environment of the evolving culture (phylogenesis). His procedure is primarily concerned with unpacking the written language step-by-step and he teaches the students the genre of what they are learning so that they reproduce it themselves in text form. His classroom strategy is a three-phase one based on: *modelling*, where the social function/context of the genre is discussed and deconstructed; *joint negotiation of the text* where doing things with the language (as for example, observing, researching, note-making, discussing, rehearsing, summarizing and role playing) leads to the preparation phase of new texts in the same genre; finally, *independent construction of text* where students edit and rework their own texts in the genre using appropriate linguistic scaffolding. Here student have to reedit and rework text and critically

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[3] See M. Cronin for an interesting account of multiple modernities and the position of the translator interfacing with new semiotic systems in the shifting economies and geographies of the globalization process.
[4] I am paraphrasing the title of the collection of essays on this subject edited by Frances Christie (1999).

assess the ideas, theory and practice conveyed in the genre. In "doing" science, therefore, students are simultaneously organising scientific information and explaining events scientifically so as to eventually "challenge" science (to use Veel's idea).

Classifying scientific language

Apart from the Australian school, there has been little work done on the actual grammar of scientific genres. Functional grammar has been used as a linguistic foundation for discourse analysis and text and genre studies, but despite the fact that systemic functional linguistics (SFL) is a resource for meaning (and not a system of rules) and offers an explanation about the semogenesis of specific kinds of discourse, it has rarely been used to describe and classify scientific writing and its mediation and translation.

The impressive numbers of glossaries, lexicons, multilingual on-line term banks and dictionaries would appear to confirm the generalised idea that the challenges offered by scientific and technical translation lie merely in the complexity of their terminology. Some translators think that the specialized glossary and dictionary is the single most important work tool (Al-Hassnawi, 2006) because standard texts are highly formulaic and therefore "easier to work with" (Hatim, 2001:167 quoting A. Beeby). But translation novices (and school students) need to know how scientific discourse works through its own lexico-grammar structure within the setting of whole text processing and the projection of meaning (semogenesis) through relationships established across language systems and across metafunctions using contextual correlatives.

An SFL approach to classifying the genres of scientific, technological and mathematical text shows "how the work of science is grammatical: naming, constructing, positioning the social and natural worlds" and how these fit into meaningful "sequences of agents and causes, relations and consequences" [5]. The sentences in the texts realising the discourse, are therefore not only basic units of meaning, they primarily observe the semantic organization of the whole text and their systems of meaning. Halliday (1993) constructed a framework in which the dynamic relationship between the grammar of the text and the meaning potential as a social semiotic could be described in the scientific text. This is not the place to go into detail about it although a few commentaries are necessary to look at some of the issues he raises. It is useful for perceiving the problems that school children have in understanding real-life scientific and technical processes in the way they are described and classified in language. Such problems are carried forward into translators' practices later on.

As a first step, the translator has to be aware of the apparent dichotomy between (1) science as text written from a particular perspective about a wider practice (e.g. the description of valve behaviour in propelling liquid fuel within a class of process descriptions) where meaning is construed through very specific taxonomies in a semiotic process, and (2) science as a social institution that refuses to be confined in formal categories and is more ambiguous and susceptible to social practices (e.g. Guy Cooks' description of science crossing borders into public discourse about genetic modification).

This is not really a problem from an SFL point of view of classifying as the organization of language and social context is treated as functionally diversified along similar lines. The ideational, interpersonal and textual metafunctions carry through this functional diversification [6]. The translator has to negotiate all three metafunctions across field, tenor and mode during

[5] Alan Lake in his Introduction to Halliday & Martin, 1993.

[6] Very succinctly, the ideational metafunction is concerned with representation and is processed through its relationship with field (the topic referring to social action and what is taking place). The interpersonal metafunction that is so important in establishing interaction to enhance semogenesis works within the mood system and is related with tenor (focussing on social relations where things like register are important because they depend on who is taking part and what kind of relations are evident). The textual metafunction, which has to do with information flow, is rooted in identification and correlates with mode (the symbolic organisation of

the course of her work, a task made easier or more complicated in scientific translation depending on the functionality of clear intrinsic relationships. She has to deal with stratification across a content plane composed of discourse semantics and the way terminology works, and the lexico-grammar system. She has to work her way across the expression plane of graphology – text layout, cross-section drawings, tables, graphs, photographs, etc., or phonology if she is translating film and interviews by ear. If elements are unclear, ambiguous or even withheld, meaning and communication may be compromised. For example, one of the major hurdles the translator (and schoolchildren) have to negotiate in crossing the semiotic stratified context plane, is the condensed or distilled language typical of science due to its use of technical terms (rather like the condensed use of acronyms).

Here, scientific discourse is notorious for its use of extended nominal groups that have become objectivised or reified whereby their status as actions, processes, states, qualities and characteristics have been raised into "things" with their own sign systems and meanings. The grammatical metaphor is one of the most difficult aspects students and translators have to face. The art of distilling commonplace words into highly technical taxonomies has been going on for at least 4 centuries in the West, although learned cultures from Asia and Arabia were producing variations of scientific discourse long before Europeans were vilifying Galileo. Common, figurative language was slowly but surely being transferred into a literal lexico-grammatical medium through eliminating the emphasis on transitivity, grouping characteristics and qualities and by use of metaphor. Ideas were now being expressed in a different grammatical and lexical form to give a more precise, abstract meaning. For example, the two nominal groups below are a typical grammatical metaphor converted into «a thing»:

- *the volume of a rectangular swimming pool with sides measuring 8,10 and 12 m* (from an 7th grade school textbook) shows a string containing a pre-numerative, a deictic, a classifier, a thing and a qualifier – all of which are quite normal in terms of classroom discourse in a maths lesson. The second example is:
- *a two-person, ground-launched suborbital rocket plane called Xerus is being developed* [7]
  composed of a deictic, classifier, epithets, an adverb, a qualifier and several things – all in the passive voice. A more natural figurative rendering containing three clauses is likely to be:
- *They're developing a suborbital rocket plane which can be launched from the ground and can carry two people*
  The grammatical metaphor in science is therefore an artefact of abstraction where the «thing» is objectivised. Despite the condensation of terms, the meaning is clear enough if one knows the style (which many school children and young translators do not). However, it is not infrequent to find other nominal groups that are difficult to understand or ambiguous:
- *Numbers alone mean that liquid-fuelled rockets blow up more often*
  We are not sure if this is a sign of internal clause relations or external transitivity relations.

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language – the genre that is usually written but which may resort to other semiotic systems such as graphs, tables, drawings, photographs, etc.).

[7] This example, taken from the Science and Technology section of *The Economist* (13 May 2006:81), shows how the language of science has spread to other domains. *Newsweek* and *Time* magazine have likewise adopted a fondness for large nominal groups not only for reasons of condensation, but also to emphasize the seemingly truthful quality coming across in pseudo-scientific writing that qualifies the subject or «thing».

Areas of linguistic difficulty for learners and translators

Nominalisation downgrades the grammatical status of meanings contrary to spoken discourse which usually has a lot of independent clauses made more dynamic by their verbs and their capacity to undergo syntactic changes and redistribute information. The nominal phrase on the other hand ranks lower than a clause group and is not really open to negotiation. And it is precisely this aspect that has given scientific language its formulaic reputation in a rigid standard that is nevertheless sometimes inexplicit due to the lack of transitivity relations. School children as well as novice translators are perplexed by such phenomena and while the former often become disinterested and give up, the latter have to struggle on if they wish to make a living.

Another cause of despondency among young science learners is the depersonalisation of scientific and technological discourse with passive constructions sometimes using polysemic verbs such as *associated with*, *mean*, etc. that could swing either way between clauses. Patterns have changed and what a student might understand as a dynamic causal relationship between events that happen (*if there's a problem, control the flow of oxidant*) has now become objectivised into an occurrence (*the flow of oxidant can be controlled should a problem occur*). As M.A.K. Halliday has pointed out (1993: 64) in nominalisations, the distillation of representations of processes are packed into themes and rhemes, in Given and New, into backgrounding and foregrounding [8]. While there are hundreds of verbs to link up these nominal processes (expressing causal, circumstantial, transitive, mental and process relations externally connected to each other as in the example above, there are also verbs denoting internal relations and expressing the writer's interpretation of scientific experience (e.g. prove, illustrate, confirm, indicate, etc.). Students (and translators) have to understand why different verbs predicate different metafunctions and they need to know how to relate them in passive constructions with the nominal phrases whether they come in strings of categories or whether they are made into grammatical metaphors. The lexical density of clauses may sometimes be daunting. In current English, a clause may contain 2 or 3 lexical items that are interspersed with grammatical categories but in scientific writing, clauses may contain many more:

- If anyone *phones, say* I'm out. (2)
- The *development* of a *plug-in fuel cell hybrid*, with as little as 20 *miles* of *range* from *rechargeable hydrogen*, (could *cut*) the *quantity* of *gasoline consumed* in the *United States* by more than 50 *percent.* (From Science Daily 15/10/03) (9 +(1)+ 6)

The replacement of one grammar class for another and the implied syntactical reordering is problematic for young learners. It is hard for them to substitute verbs for nouns (*destroy* > *destruction*), or adjectives and adverbials for nouns (*scarce* > *scarcely* > *scarcity*) [9]. Children talk in clauses that are predicated and only later do they start nominalising as the discourse they learn in the classroom with their teachers and from the textbooks introduce them to new genres. For the translator working in any of the Romance languages, like Portuguese, this may not be such a problem as nominalization is a constant even in natural speech and according to Halliday (1993:81), the Greeks and Romans were already describing mathematical experiments and scientific experience in terms of grammatical metaphors. What perhaps is unknown to the translator as it is to school students, is that certain classes of grammar are favoured by metafunctions. While circumstantial reference to time, place, manner, condition rely on prepositional phrases and adverbs to convey meaning,

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[8] In nominal clauses process are represented in summarized constructions where backgrounding implies the Given fact as a theme, while foregrounding has the rhemic material as the New.

[9] See Martin p. 31-33, in Christie & Martin (2000) for a fairly complete list of types of grammatical metaphors involving word-change classes.

and relations linking one process to another do so through conjunctions, while processes may depend on verbs to link causal relations.

Although care is taken in school textbooks not to make assumptions about students' knowledge without checking first, translators are often at a loss when writers of scientific and technological texts leave out what seem to be crucial steps and jump from one semiotic unit to another. The process is clear to the expert but the translator is left to puzzle out what is missing and she has to contrive linguistic mechanisms to do the same into the target language.

If semogenesis sometimes seems disconnected in the conceptual jumps authors make at times, what is also a headache for translators of specialized text is faced with equanimity by very young learners. The taxonomies that have to be learned in the science classroom do not seem to be very troublesome at the beginning. I have deliberately left terminology last because not only does it contain nominal groups but the more specialised it gets, the more it has to obey scientific classification parameters. What students find difficult is placing a term in its category in a hierarchical structure. They find it hard to order because they fail to grasp underlying concepts. This is natural if we think about the names given some species in folk or vernacular language when compared with the names accorded by experts and the terms coming in scientific classifications, usually in Latin, for example:

> Common name: squid (or *calamari,* borrowed from the Spanish)
> Scientific name: Loliginidae
> Classification with Latin and English names: Class *Cephalopoda*; Subclass *Coleoidea*: squid; Superorder *Decapodiformes*; Order *Teuthida*: squid; Suborder *Myopsina*; Family *Loliginidae*: inshore, calamari, and grass squid.

Given the precise nature of terminology – as any glossary will show – there can be no such thing as *plain English* in a scientific or technical text. Be that as it may, Newmark (in Mengzhi, 1999) pointed out that technical terminology occupies between 5 % and 10 % of a text. Although the translator knows to her cost, what it is not to have the right term at hand, it also proves that what is difficult in a scientific text is not the taxonomy itself but the collocation of the taxonomy in the clause, in the sentence, in the text as a whole – in its topography. Lemke explained topography as the "criteria for establishing degrees of nearness or proximity among the members of some category" (in Christie & Martin 2000:14) which help to establish identities of genres/text-types. The segmental or orbital particulates of textual structural providing ideational meaning, the prosodic elements – leading to interpersonal meaning – and the periodic or textual elements of scientific genres all clearly show that meaning is generated in genre. Those who fail to understand the genre risk failing to understand the meaning of the text. In other words, they risk failing to understand the points which maths and science try to make in building up knowledge that may be used as a platform to construct other kinds of knowledge.

I recently heard an angry schoolgirl who had just failed her 12th grade maths exam [10], complain that she had arrived at a "more or less correct" answer to a problem by using a process other than the method demanded by the examiners. She was unable to perceive that she had failed the exam due to the unorthodox path she had taken to her answer which, if applied to other problems, would probably not have stood the test because it was haphazard and not scientific. The same argument could be applied to genre. The body of knowledge empirically proving natural laws is expressed through the language it uses. Those who fail to understand the semogenesis contained within the genre, are barred from a deeper understanding of the practicalities of the world of science and technology.

If the national average of 12th grade new syllabus maths for the 2006 exams rounded out at 7.3 of a possible 20, and the failure rate was 30 %, and if physics and chemistry were

[10] News broadcast on RTP1, 14 July 2006, following the posting of the nation-wide 12th grade exam results.

only able to muster national averages of 6.9 and 7.7 marks of a possible 20 (Portuguese Ministry of Education numbers), then perhaps it is time to take the question of genre as a semiotic system in learning science more seriously. In order to «do» science, students have to understand science! Text is not the only means to learning about science as Gunther Kress so aptly pointed out. And the pedagogic genre – rhetorics – used at school may be composed of many other modes in a build-up of interaction generating meaning. Kress and colleagues defend the idea of the material nature of science where the physical, visual and kinetic world makes more sense to today's students. However, in the end, it all comes down to text and the appraisal of text [11]. Those who do not know how to deal with it are excluded.

Thus it is with our young translators who have failed at science and maths early on at school. Their mind frames are built on other semiotic systems. They struggle with the technical or scientific text, trying to make it more "palatable" by adapting it to the public domain – just as I had once done long ago. They distort its functions that aim at representing, recording, exposing, discussing, proposing, challenging and arguing, by not knowing how to handle particular syntaxes and taxonomies in highly structured texts.

It is not by chance, therefore, that their work has to be carefully revised and often re-worked by experts in the scientific field who collaborate with the translating agencies. In highly specialized fields of knowledge, it is only natural that this is so. Scientific translation is not the only area requiring the services of expert revisers, but it is the area that consistently demands more attention than others. It is therefore not surprising that a growing number of translators who have received their training in science and technology are turning to the translation industry as alternative professions. Many of them are bilingual and translate both ways while others translate into their mother tongues [12]. They are well acquainted not only with the genres but more importantly with the processes of which science and technology speak. They are competent and satisfy an important niche in the service translation sector, as a casual search on the internet will immediately show. If, as Wright alleges [13], scientific writing cannot ignore style, this is a field the experts have to attend to. But what counts as the International Federation of Translators stipulates [14] is, in a last analysis, the preciseness of the translation and not its lyricism.

As a final remark, and as Frances Christie, David Rose, Robert Veel, Cathy Flick and many others have reiterated in support of Halliday, Martin and Lemke's insistence that genre is an important tool for semogenesis in science at the level of learning, translation courses at university could do a lot more to diversify their curricula, giving novice translators more of a fair chance to compete successfully as mediators of scientific and technical texts. But therein lies another paper.

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[11] See J.R. Martin, David Rose and Robert Veel for Appraisal techniques in genre, in Christie & Martin, 2000.

[12] It is not my intention in this article to speak about directionality and its practical and theoretical implications.

[13] Cf. Sue Ellen Wright, "The inappropriateness of the merely correct: stylistic considerations in scientific and technical translation", in Wright & Wright, pp. 69-87.

[14] FIT Articles 6 and 7 of the General Obligations of the Translator: "The translator shall possess a sound knowledge of the language from which he/she translates and should, in particular, be a master of that into which he/she translates. He/she must likewise have a broad general knowledge and know sufficiently well the subject matter of the translation and refrain from undertaking a translation in a field beyond his competence".

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BIOGRAPHICAL NOTE

Vicky Hartnack: currently teaching in the English Department of the Faculty of Letters, University of Lisbon. She worked as an analytical chemist in Southern Africa before moving to Portugal whereupon she changed her profession, took a Masters degree in Culture and Linguistics, started working as an English teacher and became an interpreter. Later she moved into translation – mostly technical but also poetry and the fine arts. She has also taught specialized translation skills at post-graduate level at the FLUL. Her main interests lie in language studies: socio-linguistics, translation studies as well as foreign language pedagogy. She publishes on a regular basis and is one of the founding members of ATeLP.