

Universal Terminology

CHAPTER 10: UNIVERSAL TERMINOLOGY

This chapter examines the fundamental need to move towards a universal terminology.

The principles of universal terminology are presented and developed successively. Their role is to formalize the fundamental guidelines that govern the development of terminology. The reader is invited to respect them and to verify, during terminology practice, how and where they are applied.

Terminology applies all universal principles. Of course, their perfect implementation depends on several factors, including the availability of a qualified workforce. As a result, several years of work may be required before complete universal implementation.

This document constitutes Chapter 10 of the book *Universal Terminology*, which presents comprehensive documentation on **T_{logy}**.

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10.1 The Universal core

Anatomy is universal, there is no doubt about it. There is only one human species on Earth, homo sapiens, and therefore only one anatomy. In our development of theology, we assert that an ontology must be based on reality (and not on concepts or equations). If reality is universal, then we must logically develop a universal terminology.

The two facets of anatomy are: the observation of reality and its representation. We generally agree that the observation of the human species, knowledge of the human body, and the various sciences involved in this observation are impartial, shared by all scientists, and are the subject of universal consensus. We can certainly imagine a few exceptions here and there, but the global trend towards universality in this regard is clear. This is not the place to discuss this point of view, and we consider it a basis for our developments.

The other side of anatomy is the representation of what has been observed. However, we are far from universal. Indeed, different populations, speaking different languages, have different approaches and, consequently, risk creating numerous biases. Or, the research is funded differently, both financially and humanly, and produces results of highly variable quality. Multiple reasons make the availability of high-quality terminology very uncertain. We observe the existence of multiple terminologies, but we do not achieve universal terminology.

The issue is not to find responsibility for this situation. Most terminology development efforts have been carried out on a scientific basis, but with limited resources and overly specific and limited approaches. We must simply recognize that our terminologies exhibit serious biases. The main bias is language dependence.

In any case, as long and difficult as the path to a universal terminology may be, we are now able to define the main principles on which it must be based. This is the objective of this chapter. The following sections list each of the fundamental principles in turn.

10.2 Principles for a Universal terminology

The fundamental principles of a Universal terminology are the following:

- **Language Independence:** No language should play an influential role in the design or content of the terminology.
- **Reality Principle:** All objects in the terminology are based on the observation of reality.
- **Universal Representation:** The source of the terms in the terminology must be in an abstract digital form, independent of any language.
- **Object Typing:** Entities and relationships are explicitly typed, and types apply basic imperative rules.
- **Vocabulary:** The vocabulary required by the terminology for its expression in a specific language is explained in relation to the universal representation. From this principle, a concordance table between languages is derived.

- **Strict syntax of terms:** Terms in terminology are constrained to an explicit syntax following a formal grammar.
- **Rules for terms:** The selection of words in a term is governed by preference rules based on scientific criteria.
- **Language specificity:** Despite all preference rules, any term may be irregular, in accordance with the history of a language or a local tradition.
- **Explicitness:** All terminology objects are explicit and associated with a unique internal identifier.
- **Completeness:** The terminology defines the field of anatomy down to a predefined level of detail, with no missing objects.
- **Uniqueness:** Every terminology object is unique, with a unique blind identifier, and is therefore never duplicated.
- **Duality of Taxonomy and Partonomy:** Both hierarchies are necessarily present and concordant in scope.
- **Versions:** A tracking functionality is provided, ensuring tracking from one version to another, including TA98.
- **Definitions:** All terminology objects are candidates for explicit definition. The search for language-independent definitions is preferred.
- **Public domain:** All terminology and the specific tools developed for its implementation must be accessible in the public domain, without restriction.
- **Language-specific implementation:** The implementation of universal routines guiding translation into a specific language is publicly available.
- **Documentation:** The universal terminology is documented in detail and publicly available.
- **Testing and validation:** Testing and validation procedures must be documented and publicly available.

In the following subsections, each principle will be developed.

10.2.1 Language independency

This principle takes precedence because it determines all others. If this principle is opposed, Universal Terminology is out of reach. Simply put, any reliance on a specific language renders the terminology non-universal.

This is especially true when considering two languages: Latin and English. Latin is important in many cases, but the terminology must be perfectly presentable without Latin in order to satisfy all countries that do not speak or teach it. English, despite its wide acceptance as a language of global communication and its important place in scientific literature, is not acceptable to the majority of the world's peoples. Furthermore, English is relatively poor in terms of scientific accuracy, due to its reliance on Latin (at least in the field of anatomy)

and other simplifications or ambiguities related to its widespread use. And scientific literature will sooner or later be written and made available in multiple languages thanks to machine translation.

This is not to say that the authors of past terminologies were not aware of this dependency. For TA98, the last release before now, the reference language was Latin. This was clearly an attempt to lighten the language dependency. Latin is a relatively neutral declension language relative to the modern languages. It is convenient for the representation of the $\mathbf{T}_{logy}$.

[Mareckova et al., 2002]

The present paper offers an up-to-date view of the status of Latin as the language of medicine, namely in its terminological component. This is particularly true for anatomical terminology as well as pharmaceutical terminology.

However, the main problem with Latin lies in the fact that, in many countries, its teaching is no longer a priority. This results in a growing number of anatomists with a poor level of Latin. In a recent IFAA referendum addressed to member societies, there was no longer a clear majority in favor of Latin. But since universal terminology is capable of translating its content into several languages, Latin will remain an important language for many people, being one of the main target languages for machine translation.

10.2.2 Principle of reality

A terminology must essentially be a concrete observation of a field, based on the reality of what exists in that field. This assertion is immediately opposed to attempts to base terminology on concepts, ideas, principles, or even equations.

In the field of anatomy, there is the human body at the beginning: reality is the observation of this human body in the dissection room. From this observation arises an abstract representation that must constantly be governed by references to primary reality.

[Smith, 2004]

This essay is devoted to the application of ontology in support of research in the natural sciences. It defends the thesis that ontologies developed for such purposes should be understood as having as their subject matter, not concepts, but rather the universals and particulars which exist in reality and are captured in scientific laws.

10.2.3 Universal representation

To implement language independence, it is necessary to create a formal abstract language capable of representing terminology. For the field of anatomy, this is a reasonable effort in terms of labor, as this language is verbless and a priori has limited cases (nominative and genitive only) as long as the use of prepositions is deferred. This abstract language can be modeled on Latin, but it must be free of its biases and exceptions. Furthermore, such a language does not need to be

represented, except by mathematical formulas visible only to those responsible for implementing the terminology.

The abstract language is defined by a formal grammar, detailed in [chapter 09](#). This grammar defines the use of vocabulary as presented in [chapter 06](#).

Abstract language is only acceptable if a translation process is available for all languages where the $\mathbf{T}_{logy}$ is to be expressed. Applying this process to any universal formula representing a term yields that term in the selected language. Furthermore, the translation is strict and does not tolerate any variation or bias from traditional language usage. This ensures that the terms are truly equivalent in all languages.

Equivalence of terms is important, as divergences have been observed in the past. For example, the term $_{LA}:neura\ corbiformia\ parva$ is not equivalent to its traditional English term $_{EN}:small\ basket\ cell$: it should be $_{EN}:small\ basket\ neuron$. This freedom of language in English corresponds to usage, and in any case, a neuron is a cell. But there is a loss of information. Of course, if the authors of the English version prefer to accept this loss, that is their decision, but it must under no circumstances be propagated to other languages. In the 2022 TNA, English terms containing the word *cell* instead of *neurone* are accepted as synonyms only.

The process of translating terms for all languages of the $\mathbf{T}_{logy}$ has been carefully implemented, currently in five languages: Latin, English, French, Spanish, and Russian. See chapter 18 on implementation for documentation.

It is important to note that abstract language does not overshadow Latin. First, it is modeled on Latin and remains particularly close to it. In particular, it adopts the word order of Latin. Second, it translates perfectly into Latin, with the recommendation to validate universal formulas by their Latin equivalent. One could even say that abstract language is a way to promote Latin, while other currents dispute its existence.

10.2.4 Typing the objects

It is the taxonomy that determines the types of objects in the domain at its higher levels.

At the highest level, entities are divided into physical and non-physical entities. Physical entities directly represent the realization of the reality principle, explained above. All parts of the human body are instantiations of physical entities. Furthermore, the objects of representation in the taxonomy are instantiations of non-physical entities.

At the second level, physical entities are divided into material and immaterial entities. Material entities contain matter, while immaterial entities are spaces or cavities, surfaces, lines, or points.

At a third level, a distinction is made between simple, composite, and paired entities. See chapter 2.

It is essential in anatomical terminology to make all object types explicit. Then, when defining relationships between objects, types must obviously be taken into account: a part of an even object must necessarily be an even object. For example, the ulna (pair) is a part of the bone of the free part of the free upper limb (pair), by the PairOfPset UOV relationship. The entire hierarchy of part-of relationships is determined strictly according to the types of the entities. See in this regard the taxonomic lists of three material relationships.

Conversely, if there is a finite set of permitted relationships between certain types, any relationship that is not on the list is prohibited. For example, it is obvious that an immaterial entity is the child of a material entity or a part of another immaterial entity. But it is prohibited for a material entity to be the child of an immaterial entity: it would be meaningless.

It is undeniable that precise, strict, and explicit typing is a necessary component of modern terminology. Without it, a harmful and highly limiting disorder sets in. TA98, for example, without an explicit typology, has reached the limits of informal presentation. This is also the case for many competing terminologies.

10.2.5 Vocabulary

Vocabulary is the building block for terminology. Terms representing domain entities are sequences of words from the vocabulary. Not all words are good: you should focus on the most specific words describing the domain. By controlling vocabulary entries, you predefine the quality of the terminology.

Choosing the vocabulary for a given language is, however, a difficult task, because languages in general are imprecise and uncontrolled. Languages evolve by region or country according to popular impulses that have nothing scientific about them. Traditions are also expressed in language for purposes other than precision. Sometimes several words are considered perfectly synonymous with little etymological justification. For example, how to choose between *LA:laryngeus* and *LA:laryngealis*? The authors of *T_{logy}* must choose and organize them when possible, but clearly this is not always the case.

The vocabulary is described in detail in [chapter 06](#).

10.2.6 Strict syntax of terms

So far, when analyzing a universal formula, we have been able to identify the lexemes (words) to include in the final term. At this level, this gives in Latin *neuron*, *plumosus*, *bulbus*, *olfactorius* and in English *neuron*, *tufted*, *bulb*, *olfactory*. This is the raw material of the term, but it is not the final term. It remains to apply the syntactic rules.

It is well known that syntax is specific to each language. There are considerable differences between languages. This linguistic aspect is discussed in more detail in Chapters 6 and 18. We will now discuss the translation process of our example, considering first the translation into English and then into Latin. In the upper part of this chapter, we explained the transformation of a term into a universal formula. We now explain the inverse action of the universal formula towards the term.

In English, we start by combining the first two words, a noun and an adjective, and reverse them, because in English, adjectives precede nouns. English adjectives are invariable. The result is *tufted neuron*. We then examine the expansion and apply the same process, which gives us *olfactory bulb*. This term must be presented in the genitive case, which in English simply gives *of olfactory bulb*. Finally, the two parts are added, which gives the correct term *tufted neuron of olfactory bulb*. In English, there is no need to add articles. In partonomy, this term is presented in the plural. This means that the nominative part must be made plural. Simply make the noun plural, which gives *tufted neurons*

of *olfactory bulb*. As this example shows, applying syntactic rules is a fully documented process, perfectly mastered in a suitable computer program.

In Latin, we start by combining the first two words, which gives *neuron, plumosus*, a noun and an adjective. Adjectives follow nouns in Latin. Unlike English, the adjective's gender is variable, which now gives *neuron plumosum* in the nominative singular. Similarly, we recover the expansion entity, which gives *bulbus olfactorius* in the nominative. The transformation to the genitive gives *bulbi olfactorii*. The final term in the singular is *neuron plumosum bulbi olfactorii* and in the plural *neura plumosa bulbi olfactorii*.

In French or Spanish, we may prefer to add definite articles to the term. In Russian, we have a term quite similar to the Latin term.

10.2.7 Rules for terms

When developing an undertaking as important as a terminology, it is recommended to establish a discipline that prevails when creating any new term. This is the way to establish a unified design and ensure overall consistency. However, regardless of the set of rules, it is certain that they will only be applied variably. Indeed, each language remains and will remain unconditionally master of its terms. Each language is free to impose terms outside the rules for specific reasons that are not within the scope of universal terminology. It is therefore clear that the proposed rules are indicative, with a pious recommendation to apply them. But one must expect a waste of rules of the order of 5 to 10% in the most severe cases.

The following rules are formulated:

- **Search for universal terms:** In all cases where a universal formula is present, an attempt should be made to adopt it, either directly or through an inherited term. If no formula is satisfactory, an accessory formula can be created and used.
- **Study terms from other languages:** It is always interesting to see how other languages have named the same term and, if possible, adopt the same solution.
- **Respect etymology:** Use words with the strongest etymological roots and avoid neologisms. Neologisms are often local in scope and have little chance of being recognized in other languages.
- **Definitions:** Formulate definitions for each word as much as possible. One should never assume that the definitions are self-evident and that every user of the $\mathbf{T}_{logy}$ knows them. This is indeed far from being the case, especially in a context that claims to be universal. This goes without saying, but it's better said.
- **Eponyms:** Generally speaking, eponyms are not officially accepted in the $\mathbf{T}_{logy}$.
- **Acronyms:** Avoid acronyms as much as possible; use full words.
- **All in the nominative singular:** All terms are defined in the nominative singular, and it is the $\mathbf{T}_{logy}$ that generates variable forms of universal terms.

- **Irregular Terms:** Irregular terms are not variable and must be specified in as many forms as necessary.

10.2.8 Specificity of languages

Although the first rule concerns language independence, it remains essential to preserve the specificity of each language. The end user of terminology operates primarily in a local context dominated by a single language. This language carries a local culture and tradition that must be preserved. Each actor belongs to their local fabric and depends on their origins. It is undoubtedly through the strength of their roots and their primary culture that an individual can understand and defend the higher level of universal culture. No language is opposed to the universal language, but it is the gateway to it.

Native speakers of a language are encouraged to identify and suggest specific terms used around them that are representative of the field of anatomy in that context. They must then make the connection with the universal terms present. If the final choice is not the universal term, it is advisable to seek to create a bridge. For example, the native term and the universal term can be maintained simultaneously, one as the official term and the other as a synonym. Although the proliferation of synonyms is not recommended, this approach can prove to be a fair compromise.

For example, consider the *LA:sulcus intersphinctericus*, which translates into French as *FR:sulcus intersphinctérien*, strictly following the universal formula. One possible suggestion would be to choose *FR:sulcus anal intersphinctérien*, which adds additional information about the location of this entity. But this information is more or less redundant, because this groove is part of the *canal anal*. In this case, it is advisable to abandon the term different from the universal term. Otherwise, this variant can be made a synonym.

Another example in French comes with *FR:vessie*. In this case, the proposed universal term would be *FR:vésicule urée*, a different proposal from several other languages, as seen below. Even if the universal term is also perfectly correct in French, there is no question of adopting it given the existence of a more specific word.

→TAH3111

LA: vesica urinaria
EN: urinary bladder
FR: vessie
ES: vejiga urinaria
RU:

This term is universal for all languages, except French, which created a specific word. In this case, there is no question of reducing French to the universal form, nor even of making the universal term a synonym.

Muscles in English pose a serious problem. Indeed, in this language, we want to keep track of the Latin name. This results in terms that are neither Latin nor English, but which satisfy this desire. The term *LA: musculus flexor longus pollicis* can be retained as *EN: long flexor muscle of thumb*, which is the universal term. But the authors of the *T_{logy}* decided to add the synonymous term *EN: flexor pollicis longus muscle*, as can be seen [here](#). This compromise has

been systematically applied to the muscular system, but it does not apply to expansions.

10.2.9 Explicitness

Explicitness is the quality of being explicit, clear, and unambiguous. For terminology purposes, this quality should apply particularly to hierarchical lists. Lists must be exhaustive in their enumeration. If we mention the *FR:zygapophyseal joints of the cervical vertebra*, it is necessary to present them all. There are explicitly 6, but not 7, nor 5, as can be verified [here](#). This is well known to all experts, but certainly not to all users of $\mathbf{T}_{logy}$.

10.2.10 Completeness

This rule is difficult to formulate and remains open to interpretation. When describing an organ or any other part of the human body, how detailed should one go? This, of course, depends on the importance of the details, a concept that can change with developments in medicine. Furthermore, it can change depending on the users' specialty: a surgeon, a general practitioner, a student, a radiologist, all judge the importance of details in very different ways. The authors of the terminology are forced to compromise, which will leave many users dissatisfied anyway.

We would at least like $\mathbf{T}_{logy}$ to cover the level that a first-year medical student must achieve in an anatomy class.

Comparing the coverage of $\mathbf{T}_{logy}$ with that of the FMA, we observe that the latter covers more details, by approximately 25 percent.

10.2.11 Uniqueness

The uniqueness rule is imperative and must tolerate no exceptions. Any object in the domain must appear once and only once in the partonomy. If an object is a part of A, it cannot simultaneously be a part of B, if A and B are disjoint.

This rule is not easy to satisfy, as there are many overlaps between systems in the human body. For example, the skeletal system contains the middle ear within the temporal bone. What part of the middle ear is not a part of the temporal bone? The ear surgeon looks for landmarks in the environment where he or she operates, such as the cog. The risk of a double definition is clear.

TA98 didn't even try to avoid the problem. Numerous duplicates were identified. The nose was first defined in general anatomy as part of the three heads, and a second time in the two respiratory systems. A link is always installed on one of the occurrences to reach the other.

The correct remedy is to replace any second occurrence with a reference to the first. In this regard, the reference entity was created, which is simply a pointer between two positions in the hierarchy. The reference means see also and acts as a user guide, but generally has no more precise meaning in anatomy.

10.2.12 Duality of taxonomy and partonomy

Taxonomy and partonomy are two approaches to the same reality of the human body. Each user, depending on their needs, can favor one or the other. How-

ever, complete mastery of terminology requires investment in both disciplines. Neither hierarchy is superior or more important than the other.

By definition, every entity in the terminology must be present in the taxonomy. Therefore, the partonomy is a part of the taxonomy. In fact, the partonomy is made up of the leaves or terminal entities of the taxonomy. The size of the taxonomy is approximately twice the size of the partonomy.

In presenting the $\mathbf{T}_{logy}$, it is strongly recommended to be able to jump from one hierarchy to another whenever possible. To this end, a hyperlink is created in these hierarchical lists for most entities: *tax* links allow you to move from the partonomy to the taxonomy, and *part* links act in the opposite direction. Users are recommended to take advantage of these links to examine each entity in both contexts in turn. This navigation between lists is fundamental: it marks the difference between simple sequences of terms and a true terminological system called an ontology.

10.2.13 Versioning

Anatomical terminology revolves around two versions: the 1998 Terminologia Anatomica (TA98) and the 2025 Terminologia Anatomica Humana (TAH), currently under validation. Between these two versions, the 2021 Terminologia NeuroAnatomica (TNA) was the precursor to the TAH. A documented bridge between the two versions is important: it allows users to understand the evolution of the terminology and its presentation. There are two ways to document the transition between two versions. First, each version must be presented on the same, readily available medium. Second, a trace must be created to track the migration of each entity separately.

The parallel presentation of the three versions mentioned above is provided for the partonomic hierarchy. You can see the [systema respiratorium](#) of TA98 and, in parallel, the [systema respiratorium](#) of TAH.

As for the TA98-TAH tracing, it is currently being developed, but not yet fully available, only for the TNA. An example can be seen [here](#). For each entity, we can see a link to TA98 and to TAH.

10.2.14 Definitions

The most glaring paradox of existing traditional terminologies is the claim to name entities whose definition is not shared. Indeed, the entities discussed are assumed to be known or defined elsewhere. This is certainly not the case, and as soon as a term is contentious, it is likely to represent an entity with an uncertain definition. This state of affairs is obviously due to two factors: 1) the magnitude of the task of creating definitions; 2) its conceptual difficulty. Indeed, there are multiple approaches to definitions, and each is far from unanimous. The problem of definitions in general is addressed in Chapter 14.

The $\mathbf{T}_{logy}$ has developed a concept of taxonomic definitions. New definitions are added regularly. Each definition is created in French, then automatically translated into English, Spanish and Russian using Google Translate. An example is [ovary](#) in English.

10.2.15 Public domain

All information contained in the $\mathbf{T}_{logy}$ is available in the public domain under the [Creative Commons Attribution-ShareAlike 4.0 International](#) regime under the [CC BY-SA 4.0](#) option.

10.2.16 Specific language implementation

Implementing a new language is a relatively important task, but it is greatly facilitated by the existence of several existing languages. One, if possible one that shares similarities, is chosen as a model. For more details, refer to Chapter 23.

The overall task is divided into four parts: - Entering the vocabulary - Adjusting the syntax rules and exceptions - Writing the main functions for processing terms - Adapting the validation tests to the new language All these operations are reviewed below.

10.2.17 Documentation

There are two levels of $\mathbf{T}_{logy}$ documentation: - The help system that accompanies the website presentation. - The *Universal Terminology* book, of which this document is a chapter.

10.2.18 Tests and validations

A wide range of tests is being conducted, the results of which are available on the $\mathbf{T}_{logy}$ website.

10.3 Becoming universal

The challenge is to move from a language-specific representation to a universal presentation, expressed in a universal formula, immediately translatable into any representation language.

We consider a typical term representative of the task at hand, neither too simple nor too complicated. We selected the plural term $_{LA:}$ *neura plumosa bulbi olfactorii*, which is part of the telencephalon's paleocortex. The universal formula is developed from the singular form of the term:

→ [TAH9334](#)

$_{LA:}$ *neuron plumosum bulbi olfactorii*
 $_{EN:}$ *tufted neuron of the olfactory bulb*
 $_{FR:}$ *tufted neuron of the olfactory bulb*
 $_{ES:}$ *neurona penachada del bulbo olfactorio*
 $_{RU:}$

This term is composed of a noun and an adjective, as well as a mandatory development of another term also composed of a noun and an adjective.

Let's first consider the fundamental part *neuron plumosum*. This part is composed of two lexemes. The first lexeme relates to the neuron, an entity in the domain $_{LA:}$ *neuron*. This entity is represented by the lexeme $_{LA:}$ *nomen neuron*, which has three instances: the noun *neuron*, the adjective *neuronal*,

Identifier		Expansion			Administrative			Latin		
UID	TID	Opt	Obl	Pref	Adj	Update	Cat	Src	Latin text	
▶	0					06.04.2022		RB		
Universal										
▶	9334		6195			01.03.2019	mod	HTD	N(12802),A(12143)	
*	0					06.04.2022	mod	RB		
English										
▶	9334	9334	6195			15.03.2019	ofd	RB	bufted cell	
*	0					06.04.2022		RB		
FRENCH SUBDICTIONARY										
French										
▶	0					06.04.2022		RB		
SPANISH SUBDICTIONARY										
Spanish										
▶	0					06.04.2022		RB		
Russian										
▶	0					06.04.2022		RB		

Figure 10.1: View of the database, where a term is defined in all its representation languages. Under the heading Universal, the universal formula is specified with its expansion to the unit 6195. No changes are made in any language except English, where we add a synonym.

and the prefix *neuro*. This lexeme is generally specified in all representation languages. The second lexeme relates to the adjective *plumosus*, represented by LA: *nomen plumosus*, with a single adjective instance.

To represent this fundamental part, we require a noun corresponding to the first lexeme, with identifier 12802, and an adjective corresponding to the second lexeme, with identifier 12143. We specify the noun with the letter N and the adjective with the letter A. Using the identifiers, we create the formula: N(12802),A(12183). This is exactly what we can see in the database where this term is created; see figure 10.1.

We can now consider the expansion on LA: *bulbus olfactorius*. Exactly as above, the formula is created for this entity, giving: N(12092),A(12927). However, in the universal formula, we don't want this value, but a pointer to it. We specify the pointer to a mandatory expansion with &M. The result of the formula is: &M(6195). The final formula is: N(12802),A(12183),&M(6195).

The translation process allows us to formally analyze the formula, follow each pointer to a lexeme or expansion, and generate the term.

10.4 The benefits

An important question arises after this double operation: language to universal, then universal to language. Simply put, this changes nothing. The advantage, of course, lies in the ability to switch languages between the two operations: we obtain a translation from the first language to the second. This is a first advantage.

In figure 10.1, we see that we provide a specification line under Universal and obtain five translations in five languages for presenting the $\mathbf{T}_{logy}$. Without the universal formula, we would have to write five additional lines, as for *tufted cell*. This would multiply the amount of work by five.

A second advantage lies in the guarantee of term equivalence in different languages. Machine translation prevents any divergent translations between languages. If a difference is desired in a specific language, it is necessary to enter a new, explicit term for that language, which overrides the universal formula.

A third advantage lies in the ability to obtain different variants of the same term: machine translation easily accepts any variation. For example, the plural term *olfactory bulb bundle neurons* above can be replaced with the singular term *olfactory bulb bundle neurons* if necessary. Another example is to replace *carotid sinus pair* with *carotid sinus pair*. An example in Latin is to replace *fornix (par)* with *par fornicum*, which shows that generating genitive plural words in Latin is a risky business when performed by casual humans.

A fourth advantage is centralized vocabulary control: each word is defined once and for all. When a word is misspelled in one language, a single correction can be applied to hundreds of terms that use it. For example, the term $_{ES:}porción capsular$ is incorrect in Spanish and must be corrected to $_{ES:}porción cápsular$. This is trivial with universal formulas, because the corresponding lexeme alone needs to be corrected only once!

Bibliography

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10.5 Log of updates

12 Aug 2025 Full revision of this chapter. From now on, this file is a direct translation of the French source version.

03 Apr 2024 Introduction of the universal principles.

05 Apr 2022 Creation of the file.

10.6 Credentials

This document is part of the work *Universal Terminology*, which accompanies the website Terminologia Anatomica. It expresses the vision of the authors of the on the foundations of the science of ontology, supporting the terminology presented here. Although it is as accurate as possible, close to the reality of the terminology database and the software that supports it, approximations, errors, and ambiguities are possible and must be considered beyond their control and intentions.

Any comments regarding the content of the website and its presentation are welcome. An appropriate response will be provided if necessary.

Authentic URL of this file: <https://ifaa.unifr.ch/Public/TNAEntryPage/help/Chap10.pdf>