Universal Terminology

Chapter 2: Basic objects

This chapter considers the basic objects making the $\mathbf{T}_{logy}$and attempts to present formal definitions. The terminology is the language part of an ontology that is supposed to be independent of the representation of its content. It will be shown that the terminology must preferably be language independent to insure its universality regarding different languages.
A definition of what is a $\mathbf{T}_{logy}$is presented on a formal basis. Multiple authors develop lists of terms and other classifications, often without formal background. Indeed, the scientific community is in need of a more formal approach of this domain.
This document is the chapter 2 of the book Universal Terminology which presents a global documentation on the $\mathbf{T}_{logy}$.

Contents

2.1 Introduction

This document aims at defining the basic objects being the components of the $\mathbf{T}_{logy}$, the types of entities entering in the TAH hierarchy, their basic properties and the links governing the hierarchical trees.

In a first part, the most basic definitions are developed: what is a terminology, what are the entities? This exercise is difficult and does not pretend to bring any final solution. However, it introduces the inherent formalism of ontology, which is a science in itself. The interested readers may find additional and deeper information elsewhere (see the bibliography).

The second part is about properties of interest in the domain of anatomy. Here also definitions of the important properties are proposed.

The third part is about entity types of physical entities, based on 3 basic properties: materiality, composition and symmetry. The entity types strictly regulate the TAH partonomic hierarchy, because the hierarchical links are dependent on the type of father and child entities.

The partonomic links are all specializations of the *part_of* relation. This complex relation is considered in details. In particular it is dependent on the types of the father and child entities: each possible co-occurrence must be considered in turn. For example LA:*ossa carpales* *PairSubsetOf* LA:*ossa manus* is a relation between two paired set entities. The relation PairSubsetOf *isa* PartOf is verified and participates to the specialization of the *part_of* relation.

The partonomic links are considered in chapter 14.

2.2 Basic definitions

In this section, all formal definitions of importance in TAH are explicitly settled and briefly discussed.

2.2.1 Entity

Entity
An entity (definition) is a universal ontological term of art embracing objects, processes, functions, structure, time and places, depending on the underlying domain of concern. An anatomical entity is such a universal in the domain of anatomy.

An entity is an abstract object for representation of the reality. Any entity is referencing an object existing in reality. In the domain of human anatomy, the entities are related to parts of the human body, being material objects or boundary limits: LA:*manus* is a material object and LA:*sulcus nasolabialis* is a boundary limit. Altogether, they are what we call the physical entities.

In addition, the complete description of the domain necessitates non physical entities. Indeed, they contribute to the definition of a representation artifact to be call a terminology. The non physical entities are the words of the vocabulary, the relations connecting the entities, and other representation objects. These entities will be formally defined below.

There are two special sub-totalities to be distinguished, called classes and instances, defined thereafter.

2.2.2 Unit

Unit
A unit (definition) is an assembly of entities counting one to five items related to a generic entity and its corresponding specific entities.

The typical example of a unit is a pair unit like LA: *clavicula*. It is the assembly of the specific entiy *clavicula* and the three specific entities *clavicula (pair)*, *clavicula sinistra* and *clavicula dextra*.

Only the units get a term as their name in the $\mathbf{T}_{logy}$. The entities constituting a unit have their respective terms automatically generated from the unit term. This feature is valid for all languages of the $\mathbf{T}_{logy}$.

2.2.3 Class

Class
A class (or universal, type, kind) (definition) is a representation of all possible instances of an object, distributed in space and time.

Classes share a common essence. Each class definition specifies the essence shared by the corresponding instances via the specification of (i) a genus, which is some wider class to which the given class belongs, together with (ii) the differentiae which mark out its instances within the wider class, according to the Aristotle principle.

A class belongs to the domain of representation and not to the reality. A class is an abstract concept for representation of the reality.

2.2.4 Instance

Instance
An instance (definition) is the realization of a class in reality.

An instance is an individual (a particular, a token) of a specified class, located in space and time. Classes exist in their respective instances.

No two instances of the same class are identical in the domain of gross anatomy. They are different in size, form, matter, etc, but they all share a set of common properties.

Instances are largely distributed in space and time. The class LA: *sternum* not only includes as instances the some of 8'000'000'000 sternums actually available on Earth, but also the past and future sternums on a range of time where the human species is considered as stable.

In the TAH documentation, an entity class or an entity instance is often call an entity, and the difference has to be inferred from the context.

See thereafter the definitions of true instances and indirect instances.

2.2.5 ISA link

ISA link
`An ISA link (definition) is the relation between two classes which preserves all specifications and properties.`

The ISA link is the unique relation used when building the taxonomy. In TAH, no ISA link may be present outside of the taxonomy.

2.2.6 Taxonomy

Taxonomy
`A taxonomy (definition) is a mathematical tree with a root (a class or unique maximal genus) connected to all other classes via finite chains of ISA relations satisfying the principle of single inheritance.`

The Foundational Model of Anatomy (FMA) contains a taxonomy, which constitutes an inherent part of the revised TAH. However, this taxonomy had to be modified or updated in order to cope with new features present in this revision.

The principle of single inheritance has been adopted, following the FMA. It means that any entity has one and only one father in the taxonomy, without exception (except the top entity that has no father). Other authors have developed taxonomies with the principle of multiple inheritance, but that's a different approach of the reality, not considered here.

TAH reference taxonomy
`The TAH reference taxonomy (definition) is a revised subset of the FMA taxonomy, either augmented or limited to the entities present in TAH.`

This TAH taxonomy was originally copied from the FMA taxonomy. However, some divergences have been found and corrected.

The issued TAH taxonomy is published in Latin, in conformity of the rules prevailing for the entire TAH. In addition, according to the multilingual capabilities of our $\mathbf{T}_{logy}$, it can be visualized in any interface language.

2.2.7 Specific and generic entities

Entities play different roles depending on their belonging to the partonomy or to their position in the taxonomy.

Specific entity
`A specific entity (definition) is an entity which is a leaf in the taxonomy.`

About half of all entities are leaves in the taxonomy. The specific entities constitute altogether a global partonomy under the top entity LA: *corpus humanum*. The specific entities are to be found in the dissection room. Any entity which

can be physically found in a human body, isolated and put "on the table" is a specific entity.

It should be noted that this definition of a specific entity as a leaf of the taxonomy is only valid in a complete taxonomy of the domain. For example la:*humerus* is not a specific entity, because a complete taxonomy would necessarily add la:*humerus sinister* as a child of the former entity, making it a non leaf entity.

Following the above example, there is another specific entity to mention, the la:*humerus (par)*, that is in fact the partonomic father of Lahumerus sinister and la:*humerus dexter*. The pair of humerus is the composite entity made of the two humeri found in a human body.

The partonomy (to be defined thereafter) is exclusively made of specific entities.

generic entity
`A generic entity (definition) is a non leaf entity of the taxonomy or an entity tagged as such which could become a non leaf entity with future updates.`

All non specific entities are by definition generic entities.

The taxonomy is exclusively made of generic entities, except the leaves that are always specific entities.

True instance
`A true instance (definition) is an instance of a specific entity.`

Within a taxonomy, one can distinguish two different types of classes according to their position in the tree, giving different types of instances. The true instances correspond to the classes which are directly instantiated in reality.

Indirect instance
`An indirect instance (definition) is an instance of a class which subsumes into one or multiple leaf nodes in the taxonomy.`

The indirect instances correspond to classes from which the leaves of the taxonomic tree inherit, but which themselves are partial differentiae in the definition of the leaf entities. An indirect instance does not exist in reality. For example, there is no scapula in reality, no drawing of it, no X-ray. There is only a left scapula or a right scapula. Therefore, a left scapula is an indirect instance of scapula as well as an indirect instance of flat bone.

2.2.8 Partonomy

In this book we use the word partonomy as a synonym of meronomy, that is preferred by some authors. Wikipedia recognizes both words.

Partonomy
`A partonomy (definition) is a partial order of entities related by part_of relationships.`

Maximal partition
`The maximal partition (definition) is a partonomic hierarchy under a top entity, including all specific entities via chains of part_of links.`

The maximal partition includes all specific entities but the generic entities, and which top entity is named corpus humanum. The maximal partition necessarily contains all specific entities of the taxonomy. All their instances are true instances.

Partial partition
`A partial partition (definition) is a partonomic hierarchy under a generic entity, which acts as a model for its descendants in the taxonomy.`

The number of partial partitions is not limited. Partial partitions are defined around generic entities, for example vertebra or costa. By definition, the partonomic links are inherited through the taxonomy. But the importance of partial partitions is increased when considering microspopic entities below the level of tissues. Terminologia Anatomica Humanae (TAH) includes a partonomy. See Figure 1 for an example of TAH hierarchy.

2.2.9 Terminology

Terminology
`A terminology (definition) is a representation artifact providing language independent terms to the collection of relevant entities in a domain, with focus on identification, definition and naming.`

This definition declares a direct connection between a term (to be defined below) and an entity of the domain. In addition it makes explicit the three facets of the terminology: the identifiers (see chapter 3), the definitions (see chapter 14) and the language aspects (see chapters 8 and 9).

This definition can be compared with the one presented in [Smith et al., 2006]. It is said there: *A TERMINOLOGY is a representational artifact consisting of representational units which are the general terms of some natural language used to refer to entities in some specific domain.* The idea of a representation artifacts was introduced by this article. However, the author was not aware at this time of the necessity of the language independence, or at least did not mention it.

[**Smith et al., 2006**]
This paper is a basic introduction to the ontology of the anatomical domain. It insist on the separation of the reality on one side and the representation of that reality on the other side. It defines several basic objects like universals and instances, continuants and occurrents as well as more complex objects like ontology or terminology.

Indeed, the strong statement in this definition is the assertion "language independent". Let ignore it in the first steps of discussion about this definition.

TAH is a terminology for the domain of gross anatomy, including new developments in histology. In its source version of 1998, it contains some 7500 independant entities, which corresponds to the level of knowledge of general medicine, but generally not sufficient for specialties. TAH has been originally published in 1998, under the form of a sequential listing in a book form. The TAH objects were identified by a 11-characters code, which defines an order of presentation, but this code will progressively disappear. Official naming is in Latin and English equivalent are provided. Important synonyms are provided as well as links to eponyms. TAH is intended to be translated in several languages.

Paradoxically, a terminology cannot achieve its goal of naming entities if these entities are not precisely delineated or identified, because in theory a scientific name applies uniquely to a formally well defined entity. Terminologia Anatomiae Humanae meets this problem. Indeed, TAH assumes the existence of a universal anatomical knowledge shared between human beings, which at a first glance acts as universal definition of anatomical entities. But this definitional corpus is hard to make explicit. The paradox lies in the fact that on one side TAH is based on existing definitions and on the other side it contributes to promote and extend these definitions. Together with the FMA, TAH formally specifies relations and properties of anatomical entities in a systematic and scientific approach.

The TA98 11-characters code suggested a partonomy of the domain of gross anatomy. But the lack of a formal basis in the 1998 source version makes hard the task of alignment with other biomedical ontologies and computer interchange applications. This was considered as a major impediment for a large acceptance of this initial version of the anatomical terminology. It is a goal of the revised TAH to resolve this challenge.

A more detailed discussion of what is a term will be undertaken in the chapters 8 and 9, respectively entitled Anatomy of a term and Grammar of terms.

Let now consider the problem of dependency to one or more languages. A terminology is a representation of the reality, in our situation a representation of the human body. Is a human body more Latin or more Mongolian than it is English or French? Is the reality more important in one language than another? Evidently not, because anatomy itself is universal. But the terminologies have always preferred some languages to others. The reason is simple, the authors of the terminologies did not had the knowledge and/or the tools and/or the manpower for the management of multilingual terminologies, or better for the development of a universal terminology.

In this situation, because this essential problem was clear to some authors of terminologies, the Latin was advanced as a relatively neutral language, not dependent on any country and other political considerations. In this way Latin was proposed as a universal language. This is the basis of Terminologia Anatomica. The inconvenient with Latin is the reality that it is not sufficiently taught in several countries and that a number of anatomists do not feel comfortable with Latin. This is a fact, not an opinion! A recent referendum among the National Societies of IFAA has shown a majority not really favorable to Latin.

Facing this dilemma when building the TNA terminology, it became rapidly clear that the development of an abstract, language independent representation was feasible. There are main reasons supporting this statement:

- Neccessity: there is a strong need for a solution.
- Feasibility: the computer tools to support an abstract representation are there.
- Cost or time: the domain of anatomy, to a linguistic point of view, is of a reasonable size.

On this basis, the TNA was implemented under the concept of a Universal Terminology, meaning it is independent of any language. And in order to give a proof of concept, the TNA was immediately made available in 5 languages: Latin, English, French, Spanish and Russian. Other languages are underway. The translation was automatized and the validation by native speakers was performed in relatively short delays. The final quality is at least as good as it is for manually prepared lists of terms.

The adaptation of this Universal Terminology to the whole TA is only a matter of manpower.

The present book is a scientific documentation of what is the Universal Terminology. The programs necessary to support this terminology have been made available in the public domain under GitHub.

2.2.10 Term

Term
`A term (definition) is a ordered sequence of lexemes controlled by a universal grammar, which can be automatically transposed in an equivalent term of any language, where a language grammar has been created.`

This definition is about a universal term and establishes the the principle of automatic translation in any vernacular. To do that, regarding a specific language, one has to rule out the transposition links between the universal grammar and the language grammar. In general, the transposition rules have to solve different problems:

- Sequence of lexemes: the order of the lexemes in the language term is in general different from the order specified by the universal order. For example, adjectives follow the noun in the universal grammar as well as the French and Spanish grammar, but preceed the noun in English and Russian.
- Genitive: the formation of genitive is different in languages with declension than in other languages. For example Latin and Russian have a declension, but English, French and Spanish make the genitive with a preposition.
- Variability of adjectives: the adjectives may be variable in gender, number and/or case depending on the target language.
- Language exceptions: here and there, some language need atypical rules. For example, traditional Latin may position a genitive group within the nominative group which it is depending on.

- Prepositions: the usage of preposition may govern different cases in different languages.

The full discussion of the automatic translation process is given in chapter 10.

2.2.11 Lexeme

Lexeme
`A lexeme (definition) is an atom of a specific language, defined by a vocabulary entity of the domain.`

In general the lexemes are the words of the different vernaculars. But some lexemes are made of more than one word and some words are composed with more than one lexeme.

See below for the definition of a vocabulary entity.

2.3 Properties

A couple of properties are important due to the fact that they enter in the definition of all the variants of the part_of relations. In particular, some of these properties, physical, material, generic, composite and paired, enter in the definition of entity types.

2.3.1 Physical property

Physical entity
`A physical entity (definition) is a dimensional entity, having up to 3 dimensions.`

Most entities in the TAH partonomy are physical entities. They are split into material and immaterial entities. Only the physical entities enter in the composition of the TAH maximal partonomy.

The physical property is true for any dimensional entity from 0 to 3 dimensions. A 0 dimension entity is a boundary entity for a 1 dimension entity: it is an anatomical point.

Non-physical entity
`A non-physical entity (definition) is an entity without mass nor dimension.`

Non-physical entities were not frequent in TA98: they were related to the expression of pattern and relationships and only play a side role.

Non-physical entities are not part of the THA partonomy. They are only present in the taxonomy.

An example is distalis. Another example is abductio. All the part_of links are also to be considered as non-physical entities.

2.3.2 Composite property

composite entity
`A composite entity (definition) is a collection of occurrences of a generic physical entity, called the generator.`

A composite entity is an anatomical set. It is not a set with the mathematical meaning, where any number of set members can be present for a valid set, including the empty set.

2.3.3 Anatomical set

Anatomical set
`An anatomical set (definition) is the maximal collection of all possible occurrences of the generator.`

For example, the set of cervical vertebrae is made of 7 entities. This number is called the cardinality of the composite entity. On the contrary of a mathematical set, an anatomical set is uniquely the set made of all occurrences, excluding any subset. The set containing atlas and axis is not a set of cervical vertebrae! However, any subset can be defined as another distinct entity. In THA, all anatomical sets are given a singular preferred term, under the form of the word classis followed by a plural genitive. For example costae has been replaced by classis cortarum.

generic entity
`A generic entity (definition) is an entity with children entities connected by isa links.`

In practice, TA98 relatively rarely specified the triple made of (1) the generic entity, (2) the composite entity of which it is the generator and (3) the members of the composite entity. A couple of distinct situations may occur. First, the generic entity is implied by the composite entity. This situation is not satisfactory for long term development, in particular the fusion of Terminologia Histologica in Terminologia Anatomica. Many generic entity are found in TH but are absent of TA, and this should necessarily be resolved. Second, the generic entity is given alone and the composite entity is implied (for example: lobulus). Third, the members entities are absent and therefore the true instances are not possible (for example haustrum coli is missing in TAH).

Anonymous occurrence
`An anonymous occurrence of a generic entity (definition) is an undefined occurrence which is representative of any occurrence forming the anatomical set.`

When there are numerous undistinguished occurrences in an anatomical set, or when there is no benefit in ordering and counting the occurrences, an alternative solution is to use the anonymous occurrence. For example, glandulae gastricae has no explicitly defined member. It could be possible here to create an anonymous entity as glandula gastrica simplex.

Anonymous occurrence entities are specifc entities and as such they are often

the top entity of a partial partonomy. However, it is used to make the partial partonomy based on the generic entity. In this way we define a generic partial partonomy applicable to any corresponding specific entity. For example we have in the retina the presence of the entity la:*neura conifera (par)*: a paired set. Then is inserted the partial partonomy starting with la:*neuron coniferum*. This is the generic entity but it can be considered as an anonymous entity representing any cone of the retina.

2.3.4 Generic entity

A generic entity (already defined above) is a partial model for specific entities, which concentrates different inheritable properties. In particular a generic entity is possibly the top of a partial partonomic tree, which will be inherited by its taxonomic children, which are members of the composite entity of which it is the generator.

A generic entity having taxonomic isa children, it cannot be a leaf in the taxonomic tree, therefore it has only indirect instances and no true instances.

Generic entities may be of material or immaterial types. They could also be of composite types, but this never occurs in the THA.

For example os longum is a generic entity. It is a partial model of the reality, by the fact that nobody can draw a representative long bone: is it straight like a radius or curved like a rib! The set of all long bones is absent of THA.

Costa is another generic entity: it is the generator of the set of all 12 ribs classis costarum, one of its member being costa vera secunda. As a consequence, costa vera secunda isa costa, and because inheritance, the property caput costae pof costa becomes caput costae verae secundae pof costa vera secunda. The inherited children of the members of the composite entity are explicitly present in the revised THA, but were absent in the source TA98.

2.3.5 Bilateral property

Bilateral entity
`A bilateral entity (definition) is a generic entity which acts as a generator for a pair of symmetric entities through the central sagittal plane.`

The assembly of two bilateral entities is known as a symmetrical pair or simply said a pair. Entities with the bilateral property set are also call paired entities. A pair is strictly speaking a composite entity of cardinality 2. But this pair having radical different properties not present in composite entities, it is considered as a type in its own.

THA knows about roughly one third of its entities as bilateral. In the TA98, neither the pair nor the two taxonomic children were stated explicitly.

The bilateral property is inherited through the partonomic links.

As a consequence of this definition, it is recommended not to use the “left” and “right” attributes with a different meaning than the symmetry in the vertical central sagittal plane. But the language tradition is not easy to forget: left ventricle or right lung are still present, despite they are not symmetrical !

2.4 Entity type

The goal of this section is to analyze what are the entities in the $\mathbf{T}_{logy}$, in other words what type of entities we are speaking of. The original hierarchy of the terminology is a partonomy, a so-called part-whole hierarchy, with the implicit goal of expressing some global entities and all subordinated entries which are part of the first and entering in its anatomical structure. This procedure is derived of the natural way of presenting gross anatomy in atlases from general to particular.

The partonomy is to be contrasted to a taxonomic hierarchy, like the one proposed by the Foundational Model of Anatomy (FMA). Both hierarchies are complementary.

The part-of relation is possibly intuitive to human beings, but a formal definition is not easy to formulate, in order to be in position to control when it is present or not. There are numerous examples in the hierarchy where one does not fit comfortable with this relation in presence of various kind of entities. In other words, a formal extension of the strict part_of relation is necessary to cope with all situations in anatomy.

Entity types governs hierarchical links of the partonomy and reciprocally. Several constraints on links arises from the types of entities at both ends of the relation. For that reason - a thigh control of hierarchical links - it is necessary to formally define the entity types.

The partonomy applies to dimensional entities only or socalled physical entities. In the following discussion, non physical entities are not included, though they exist in the $\mathbf{T}_{logy}$. They are part of the taxonomy, but absent of the partonomy.

Entity types for physical entities are based on three independent properties: materiality, parity and composition. Each of these property is bi-valued: materiality separates entities in material and immaterial entities; composition separates entities in single and composite entities; parity separates entities in paired and unpaired entities. This schema defined 8 entity types and can be nicely represented under the form of a cube (see Figure 2.1).

In addition, 3 alternate types of entities are documented thereafter. They are necessary for a safe universal presentation of the $\mathbf{T}_{logy}$. They are the lexical entities, the vocabulary entities and the interface entities.

2.4.1 Material entity

Material entity
`A material entity (definition) is a single unpaired physical entity having a mass.`

It is made of some matter, solid, liquid or gaseous. This is the most common entity in $\mathbf{T}_{logy}$. Material entity may be either relatively specific, like sternum,or relatively general like columna vertebralis or even systema urinaria. In all situations we are in presence of singular preferred terms with no composition, nor parity. The usage of general singular term is particularly useful in order to correctly specify the part-whole TA hierarchy.

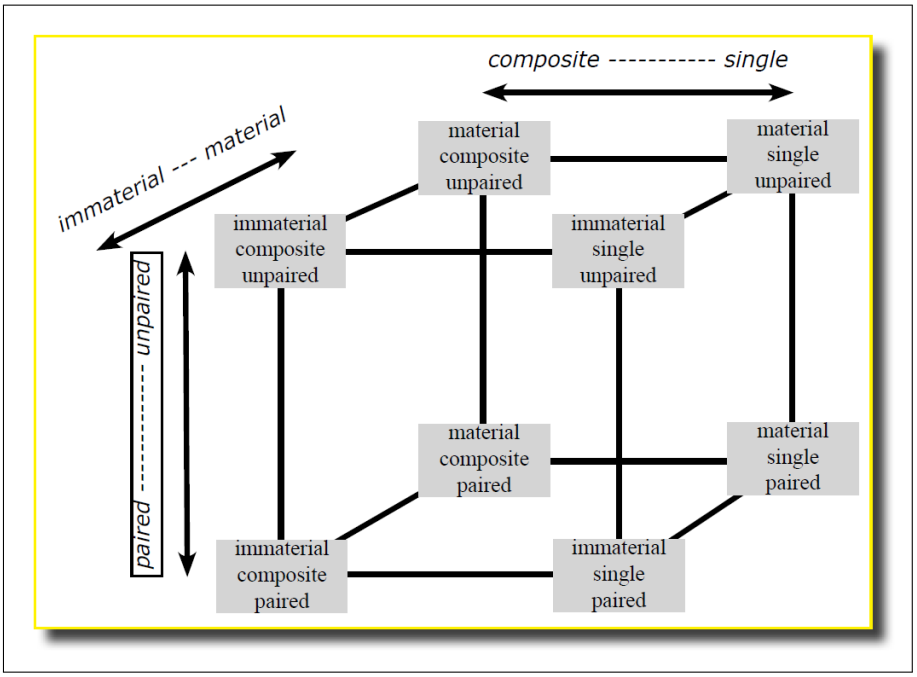

Figure 2.1: The cube of entity types, presenting the 8 types of physical entities.

2.4.2 Immaterial entity

Immaterial entity
`An immaterial entity (definition) is a single unpaired physical entity without mass and with 0 to 3 dimensions.`

It is without matter and can be present as a space, a surface, a line or a point. Consequently it has respectively 3, 2, 1 or 0 dimensions. In the TA, description of the human body by gross anatomy, some 10 % of entities are of this type.

For example, an immaterial entity may have a volume like cavitas laryngis or it may be a two-dimensional surface like facies costalis scapulae, which evidently is not planar. A zero dimension entity is a point, like bregma.

The existence of general singular terms is also verified with immaterial entities.

2.4.3 Composite material entity

Composite material entity
`A composite material entity (definition) is a composite entity with a material entity as generator.`

Example: classis vertebrarum cervicalium.

2.4.4 Composite immaterial entity

Composite immaterial entity
`A composite immaterial entity (definition) is a composite entity with an immaterial entity as generator.`

An example is classis recessuum membranae tympanicae.

2.4.5 Paired material

Paired material
`A paired single material entity (definition) is a pair of symmetrical entities through the central sagittal plane with a material entity as generator.`

This type represents all pairs of symmetric entities through the central sagittal plane, which are some 50 % of the TA. Each pair has necessarily two members, which are due to be call left and right members.

By no mean a paired entity could be considered as a composite entity of cardinality 2, because their partonomic descendants are of different nature according to different applicable links. In a pair, each member can be further partitioned in smaller constituents; in a composite entity, any partition of a member of the set is prohibited and the partition is uniquely done by a distribution of the members as subset or individual member.

Example: par radiorum.

2.4.6 Paired immaterial

Paired immaterial
`A paired single immaterial entity (definition) is a pair of symmetrical entities through the central sagittal plane with a immaterial entity as generator.`

Example: par sulcorum nasolabialium.

2.4.7 Paired composite material

Paired composite material
`A paired composite material entity (definition) is a pair of composite entities, which are symmetrical through the central sagittal plane, with a material entity as generator.`

An example is par classium costarum, which is a specific entity made of 24 occurrences of the generic entity costa.

2.4.8 Paired composite immaterial

Paired composite immaterial
`A paired composite immaterial entity (definition) is a pair of composite entities, which are symmetrica through the central sagittal plane, with an immaterial entity as generator.`

Example: par classium alveolorum dentalis maxillae, which is a specific entity made of 16 occurences of the generic entity alveolus dentalis maxillae.

2.4.9 Lexical entity

Lexical entity
`A lexical entity (definition) is an entity with a synonym term for another entity.`

During expansion of terms from one entity to another, the main term is used. The expansion on a lexical entity allows the usage of a synonym term.

2.4.10 Vocabulary entity

Vocabulary entity
`A vocabulary entity (definition) is an entity instantiating a lexeme in any specified language, as a noun, an adjective, a prefix and/or an invariant.`

Any universal lexeme used in the composition of a universal term must be made available in any language where a term has to be transposed. Depending on the universal term, different categories of word may have to be proposed.

The corpus of all vocabulary entities defines a vocabulary in each modern language used for presentation of the terminology. This corpus is accessible on the website of the website of the $\mathbf{T}_{logy}$.

2.4.11 Interface entity

Interface entity
`An interface entity (definition) is an entity which provides standard interface texts, legends and bubbles for use in the media where the terminology is displayed.`

As for any entity, the texts are available in all languages proposed for the presentation.

2.5 Unit type

2.5.1 Single unit

Single unit
A single unit (definition) is a unit made of only one generic entity.

2.5.2 Pair unit

Pair unit
A pair unit (definition) is a unit made of one generic entity and three specific entities representing a paired object in the domain of anatomy.

2.5.3 Pset unit

Pset unit
A pset unit (definition) is a unit made of two generic entities and three specific entity representing a paired set object in the domain of anatomy.

2.5.4 Set unit

Set unit
A set unit (definition) is a unit made of one generic entity and one specific entity representing a unpaired set object in the domain of anatomy.

2.5.5 Mset unit

Mset unit
A mset unit (definition) is a unit made of one generic entity and one specific entity representing a mixed set object in the domain of anatomy.

Bibliography

[Smith et al., 2006] Smith, B., Kusniercyk, W., Schober, D., and Ceusters, W. (2006). Towards a reference terminology for ontology research and development in the biomedical domain. *In Proceedings of KR-MED 2006*. PDF.

2.6 Log of updates

26 Dec 2023 Extension of definitions for the units.

30 Mar 2022 Standardisation of the file as a chapter.

10 Mar 2021 Creation of the file.

2.7 Credentials

This document is part of the book "Universal Terminology" accompanying the website on Terminologia Anatomica, sponsored by the University of Fribourg, Switzerland. It expresses the vision of the authors of the $\mathbf{T}_{logy}$about the foundations of the science of ontology, supporting the here presented terminology. Despite it is as exact as possible, close to the reality of the database of the terminology and the surrounding software, approximations, errors and ambiguities are possible and should be considered as independent of their willingness and intents.

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