Universal Terminology

Chapter 5: Units

This chapter examines the units constituting $\mathbf{T}_{logy}$and documents the different types as defined in Chapter 2. The notion of unit supplants the notion of entity for physical entities: it is more natural to describe the field of anatomy as an assemblage of units than as an assemblage of entities. TA98 was a partonomy of units, although this characteristic was never made explicit.

There are five types of physical units: simple units, pair units, set units, pair set units, and mixed set units. The properties of each type are documented and illustrated. In addition, there are seven types of non-physical units.

This document constitutes Chapter 5 of the book *Universal Terminology*, which presents comprehensive documentation on $\mathbf{T}_{logy}$.

Contents

5.1 What is a unit?

The notion of unit, as well as the different types in $\mathbf{T}_{logy}$, were introduced and defined in *chapter 02*. A unit was defined there as an assembly of one to five entities related to a common object introduced by a Def:**generic entity**. This chapter shows how the notion of unit establishes itself and dominates the notion of entity. However, it remains a given that wherever a unit appears, there are one or more entities behind it that are implied. Formally, partonomic and taxonomic hierarchies involve only entities.

The main role of a terminology is undoubtedly to name the objects of a domain. The question then arises: should we name entities or units? Or rather, since both must be named, how do we articulate the terms naming units with the terms naming entities? The answer in terminology is clear: Only units are explicitly named, and entity names are strictly dependent on them according to a fully automated generation process. Such a process is described in *chapter 18*.

There are five types of physical units. Each type has been duly defined. The rest of this chapter consists of documenting and illustrating each type.

5.2 Simple Unit

Unless a unit is a pair or a set, it is necessarily simple. Besides physical units, material or immaterial, there are several kinds of simple units, described as Def:**non-physical units** below. For example: a taxonomic entity, a lexical entity, a vocabulary entity, a reference entity (a duplicated entity in TA98), a deleted unit, or an interface entity. In this section, only physical simple units are considered.

A simple unit corresponds to a single physical object that can be median or asymmetrical. Examples of median units are: EN:*cranial cavity*, EN:*sternum*, EN:*mandible*, EN:*uterus*. Examples of asymmetric units are: EN:*stomach*, EN:*heart*, EN:*spleen*, EN:*portal vein*.

It is obvious, in the case of simple units, that the corresponding generic entity is also a specific entity. This entity is necessarily a terminal entity in the taxonomy.

A simple unit has the identifier of the corresponding generic entity as its identifier. Therefore, it is a value between 1 and 25,000. There are no exceptions to this rule.

The terms of a simple unit are the terms of the generic entity.

5.3 Pair Unit

An pair unit in the human body corresponds to the existence of two entities symmetrical along the central sagittal plane. This is a very common situation for more than half of all physical entities. It is obvious that the human body is largely symmetrical from the very beginning of the embryo. Even the stomach was originally in the midsagittal plane until after the seventh week of gestation, when it rotates 90 degrees and thus becomes asymmetrical.

This observed symmetry is theoretically perfect, but in practice, depending on the evolution of the body before and after birth, distortions of varying degrees

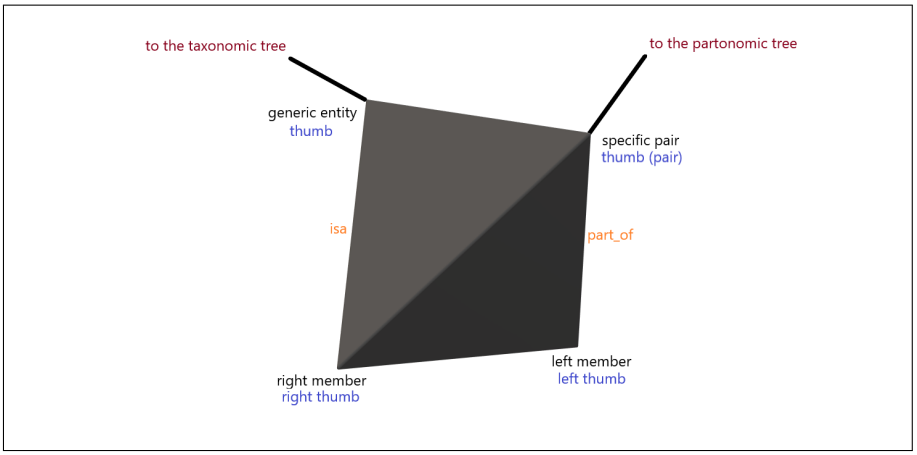

Figure 5.1: The tetrahedron representing pair units. The dark triangle contains the three specific entities, all present in the partonomy. The example chosen is the thumb where it is possible to see the details of the two hierarchical trees mentioned. Please note that the left-hand side and the right-hand side are not included in the hierarchies to avoid cluttering the presentation.

of severity clearly appear, but these are not sufficient to abandon this principle of symmetry. For example, the two EN:*kidneys* are not positioned at the same height on the left and right sides. However, in the case of the lung, the difference in volume and morphology of the two lungs means that we abandon the pair principle and speak of two simple units: the EN:*right lung* and the EN:*left lung*. More generally, we say that the two members of a pair are derived from a single genetic imprint expressed in a right and a left context. Such a statement, however, remains circumstantial at the scientific level. Nevertheless, considering pairs instead of two independent entities reduces the number of units in the terminology by a third, and this reason alone is sufficient to adopt this symmetry. Moreover, even if the left and right sides show differences, they remain essentially the same, and the differences are in any case without real significance to the point of view of terminology.

An pair unit consists of four entities: one generic entity, and three specific entities. The specific entities are the left-hand side, the right-hand side, and the pair of the two above. The pair is to be considered as a unit consisting of two objects. It follows that each member is *part_ of* the pair entity, just as they are linked by *isa* to the generic entity of the pair.

The internal relationships between entities in an pair unit introduce the concept of the tetrahedron, which is illustrated in figure 5.1.

An pair unit corresponds to two symmetrical physical objects. Examples of pair units are: EN:*lateral ventricle*, EN:*femoral artery*, EN:*uterine margin*, EN:*ovarian fossa*.

An pair unit has the ID of its corresponding generic entity. Therefore, it is a value between 1 and 25,000. The IDs of the three specific entities in a pair unit are all greater than 25,000. There are no exceptions to these rules.

The terms of an pair unit are the terms of the specific pair entity.

5.4 Set Unit

A set unit can be thought of as an extension of an pair unit with two elements to sets with many elements. But there is no longer any symmetry to consider in a unit set. The number of elements or cardinality of the set can vary from 2 to any value. The en:*retina* contains some 120 million en:*rod cells*.

A set unit contains two entities: the generic entity and the composite specific entity formed by the juxtaposition of all the elements of the set. The specific entities of each element of the set are not part of the set unit. The reason is simple: most large sets are formed from elements that are absent from the terminology. In the example above, the generic entity *rod cells* exists, but the individual rods are, of course, absent from the terminology. If the elements of the set are present, they will be explicitly listed in the partonomy, because they are all linked to the specific entity set by a member_of link, which is a specialization of part_of. In this regard, we refer to the example lumbar vertebrae.

Formally, for a set unit, the generic entity must be the taxonomic parent of all the elements of the set. This is often the case, but the authors of the $\mathbf{T}_{logy}$have taken some liberties here and there that contradict this statement. This means that the generic entity is given a broader meaning than its formal meaning, such that the set is augmented. For example, in the example above, we find the en:*costiform process*, which is certainly not a *lumbar vertebra*. But obviously this outgrowth is indeed found among the lumbar vertebrae, of which they are a part, so this fantasy is of no direct consequence, and therefore acceptable.

A unit set corresponds to N physical objects that are all (or rather should all be) children of the generic entity, as explained above. Examples of unit sets are: en:*taste glands*, en:*ganglionic gliocytes*, en:*liver lobes*, en:*pontine nuclei*.

A set unit has the identifier of the corresponding generic entity. Therefore, it is a value between 1 and 25,000. The identifiers of the specific set entity of a set unit are greater than 25,000. There are no exceptions to these rules.

The terms of a set unit are the terms of the specific set entity, that is, the terms of the generic entity in the plural.

5.5 Pair Set Unit

An even set unit, or pset unit, is the simultaneous realization of an even unit and a set unit. From a simple generic entity, we generate a generic set entity from which we construct a pair of sets. An even set unit therefore contains five entities: the simple generic entity, the generic set entity, the left set entity, the right set entity, and the even set entity. For example, en:*ribs* is a pset. The specific even entity is the pair of the two sets of right ribs and left ribs, each consisting of 12 ribs.

A set unit has the identifier of the corresponding generic entity as its identifier. Therefore, it is a value between 1 and 25,000. The four identifiers of the other entities are greater than 25,000. There are no exceptions to these rules.

The terms of an even set unit are the terms of the specific even set entity, i.e., the terms of the generic set entity in the plural.

5.6 Mixed Set Unit

A mixed set unit is a variant of the set unit, in the special case where all the elements of the set are a mixture of simple and pair entities. Indeed, there are situations where some elements of the set are simple and others are even. This is, for example, the case of the infratentorial cisterns. In this case, all the simple cisterns are medial.

Normally, a mixed set unit contains elements that are all material or all immaterial, depending on the type of generic entity. There is, however, an exception to this rule, for example, with external morphology entities of the telencephalon. In this case, the mixed unit contains a mixture of physical, material, and immaterial entities.

Just like a set unit, a mixed set unit contains two entities: a generic entity and a specific set entity.

5.7 Non-physical Unit

Non-physical units correspond to the 7 types of non-physical entities. In this documentation, we refer to non-physical units interchangeably as units or entities, because both have the same identifier. The non-physical units are as follows:

- taxonomic unit: This unit corresponds to an entity in the taxonomy that has no instantiation in the partonomy. If such a unit must appear in the partonomy, it becomes a physical unit as described above.
- lexical unit: This unit allows you to define a term that is synonymous with another term, which can be used in a term expansion, because official synonyms are not usable. For example, brain often replaces telencephalon.
- vocabulary unit: Each unit of this type allows for the definition of up to four lexemes for each language: a noun, an adjective, a prefix, and an invariant. The entire vocabulary of $\mathbf{T}_{logy}$must necessarily be specified by such units.
- reference unit: This unit allows you to refer from one position in a hierarchy to another position where an entity is defined. Such an entity is strictly not part of the hierarchy where it appears; it signifies *see also*. For example, *nose* is a reference to the chapter on the respiratory system in head. Where the reference appears, there is a hyperlink to reach the referenced entity.
- duplicate unit (TA98): This unit is the equivalent of the reference unit for TA98.
- deleted unit: This unit has been deleted and is no longer part of the terminology. It remains listed in the database *for memory*. Its identifier must not be reused. See *chapter 03* in this regard.
- interface unit: This unit allows you to define text sequences in all languages used to build the website.

5.8 Log of updates

27 Jul 2025 Full revision of this chapter. This new version is translated from the French source version.

05 Apr 2022 Creation of the file.

5.9 Credentials

This document is part of the work *Universal Terminology*, which accompanies the Terminologia Anatomica website, sponsored by the University of Fribourg, Switzerland. It expresses the authors view of the $\mathbf{T}_{logy}$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 should be considered beyond their control and intentions.

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

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