
RACE
triangle
clock
THROMBIN ACTIVATABLE FIBRINOLYSIS INHIBITOR
life
death
SCIENCE
algorithm
UNEMPLOYED
number
Definition
A PRACTICAL GUIDE TO CONSTRUCTING AND EVALUATING DEFINITIONS OF TERMS
VALID
DEMOCRACY
SIGNIFICANT
marriage
SEGREGATED
walkable neighbourhood
RELIABLE
SQUARE
PLANET
water
David Hitchcock

Definition: A practical guide to constructing and evaluating definitions of terms

Definition: A practical guide to constructing and evaluating definitions of terms

David Hitchcock

WINDSOR STUDIES IN ARGUMENTATION 11
WINDSOR, ON

Manuscript editing by Tamilyn Mulvaney

Cover Art by Jonathan Whitehead (https://www.jonathanwhitehead.com/)

To Inga, with love

Contents

"The first thing I'd like to point out is how well the book is crafted. The writing is clear, and, best of all, its synoptic coverage of the topic of definitions will be a very welcome addition to the literature. There are some arresting new points made, and I especially appreciated the range of definition examples considered, from the FBI's Uniform Crime Reporting on murder to the astronomers' attempts to define 'planet'."

Frank Fair
Department of Psychology and Philosophy, Sam Houston State University, Huntsville, Texas
Past editor, Inquiry: Critical Thinking across the Disciplines

"The discussion is excellent for its clarity, detail and comprehensiveness in presenting various types of definitions, the evidence one may give for them, and their criteria of evaluation. I remember one of my professors in graduate school saying that the profession needs an account gathered together in one place of the various types of definition. In *Definition: A practical guide to constructing and evaluating definitions of terms* we now have that account."

James B. Freeman
Professor of Philosophy, Hunter College of the City University of New York, New York, NY
Past president, Association for Informal Logic and Critical Thinking

Preface

This book proposes practical guidelines for constructing and evaluating definitions of terms, i.e. words or phrases of general application. The guidelines extend to adoption of nomenclature. Although these guidelines have a theoretical background, the book is not a scholarly treatise on the theory of definition. Nor is it a textbook; if used as a supplementary textbook to help develop critical thinking skills, it would need exercises. Rather, the book is a practical guide for people who find themselves in their daily lives or their employment producing or evaluating definitions of terms. It can be consulted rather than being read through.

The book's theoretical framework is a distinction, due to Robert H. Ennis (1962, 101-106; 1996, 320-363; 2016; 2019), of three dimensions of definitions: the act of the definer, the content of the definition, and its form. The *act* of a definer is what the definer does in defining a term; the book distinguishes, following Ennis, three basic acts of defining: reporting, stipulating, and advocating. The *content* of a definition is in one sense the information that the definition conveys and in another sense the words in its defining part. The *form* of a definition is the way it is expressed, for example as a definition by genus and differentia.

This book was originally to be co-authored with Ennis. I wrote the first draft, Ennis commented, and we went back and forth until we agreed on a complete manuscript. At that point, however, Ennis decided that he could no longer be a co-author, although the project has his approval. Subsequently, in response to a reviewer's suggestion (for which I am grateful) that I consult additional publications about definition, I revised the manuscript extensively, adding material that Ennis has not seen. I also benefited from careful reading of a later version of the whole manuscript by James B. Freeman and Frank Fair, and I thank them for their helpful suggestions, which I have generally accepted. They are

of course not responsible for any flaws that remain. I would also like to thank Christopher Tindale for his careful proof-reading of the manuscript and Tamilyn Mulvaney for her care and dedication in preparing the manuscript for publication, as well as Jonathan Whitehead for his creative design of the cover (and Leo Groarke and Kathryn Verhulst-Rogers for arranging for him to design it).

I hope that the result will be illuminating and useful for its readers.

David Hitchcock
January 2020

1.

Introduction

Every day, all over the world, people explain what a term means, make vague terms precise, stipulate usage, adopt terminology, and use definitions to advocate a position on an issue.

1.1 Occasions for defining terms

Consider the following examples. A parent answers a child's request to explain what an unfamiliar word means. An author composes a dictionary entry or starts an encyclopedia entry with a definition of its topic. The composer of a labour force survey drafts a question designed to determine whether a person who is not currently gainfully employed should be labeled 'unemployed'.[1] The drafters of a new edition of the *Diagnostic and Statistical Manual of Mental Disorders* reach a decision on the name and diagnostic criteria for a mood disorder. Medical researchers discuss how to define a condition so that results of studies by different research groups can be compared. The drafter of a piece of legislation or a regulation or a contract sets out in the document what its key terms mean. The standardization committee of an academic society recommends a standard nomenclature for a newly discovered compound. Authors of scholarly and scientific articles explain what they mean by their key terms. A school superintendent stipulates how 'segregation' is to be defined for

1. This essay uses single quotation marks to indicate use of the word or phrase within them to refer to itself (including its meaning as well as its sound or shape). The essay uses double quotation marks when quoting someone else's words or as "scare quotes" indicating the apparent oddity of the word or phrase within the quotation marks.

the purpose of ensuring conformity to a court's ban on segregated schools.

The present essay is meant to be useful as a guide to these activities and to evaluation of their results. It makes a number of distinctions, and provides criteria to be taken into account by people who want to make their definitions and terms clear. It does not address the formulation of definitions that introduce new terms to axiomatized scientific theories or that make precise how an existing term like 'force' or 'compound' is to be understood in a scientific theory.

The essay does not consider proper names or acts of assigning them. In general, explaining what a proper name like 'Napoleon Bonaparte' means requires only pointing (literally or metaphorically) to the person or thing named, not a definition.[2] Further, assigning a proper name is largely a matter of free choice, for which general guidelines are neither possible nor helpful.

1.2 The definition of 'term'

The word 'term' in this essay means any word or phrase of general application that is short of a full sentence. Individual words like 'hockey' or 'if' or 'pellucid' or 'grow' are terms. So are phrases like 'major bleeding' or 'in the vicinity' or 'very carefully' or 'well disposed' or 'proof beyond a reasonable doubt' or 'legal system'. Definite descriptions like 'the tallest woman in the room'

2. Some authors (e.g. Gorsky 1981) treat a definite description of the named person or object as a definition of the name. For example, 'Napoleon Bonaparte is the person who was emperor of France from 1804 to 1814' would be a definition of the name 'Napoleon Bonaparte'. Such descriptions are accurate if and only if the description in context fits just the person or thing that the speaker intends to pick out by the name. One can introduce a name when one is uncertain about the existence of anything meeting the description one has in mind by using the term-forming epsilon operator introduced by the mathematical logician David Hilbert (Avigad and Zach 2020), which means roughly: the object or objects meeting the following description, if there are any. For example, one could say that Nessie is the Loch Ness monster (if there are any such monsters).

are borderline cases.[3] Names of individuals, such as ‘Napoleon Bonaparte’, are not terms. Nor are strings of linguistic signs that do not form a syntactic unit, such as ‘clock always’ or ‘guidelines are neither’. Nor are sentences like the one you are now reading. Nor are stretches of text or discourse that include several sentences. In sum, terms are elementary signs or sub-sentential syntactic units of general application. They may be written, spoken, signed, gestured, or otherwise communicated.

The preceding paragraph exemplifies the activity for which this essay makes distinctions and proposes guidelines. It will be used later as an example.

1.3 Three dimensions of definitions

The word ‘definition’ is used both of an activity and of the result of the activity. To define a term is to indicate what it means[4] or should be taken to mean or should mean.[5] I call these activities

3. According to Donnellan (1966), definite descriptions are terms when used “attributively” (to say something about whatever satisfies the description) but not when used “referentially” (to refer to a definite individual). Kripke (1977) argues against Donnellan’s distinction, holding that all definite descriptions are terms.
4. Since this essay is a practical guide for people constructing or evaluating definitions, it does not enter into philosophical debates about the concept of the meaning of a term. It treats a term’s meaning as how the term is used, allowing that some terms have a variety of senses, in which case the term has several meanings, one for each sense. For many such senses, one can distinguish the set of things correctly labeled by the term, traditionally called the “extension” of the term, from the way in which the term picks out those things, traditionally called the “intension” of the term. For example, the extension of the term ‘number’ in its use to specify how many things of a certain kind there are (e.g. the number of sides of a banana) is the set {0, 1, 2, ...}. The intension of the term ‘number’ in this use might be described as what we get when we count the things of a given kind one by one; for example, if we take a banana and call the first side that we notice ‘1’, the next ‘2’, and so on until we get to the last uncounted side, we will discover that we call the last uncounted side ‘5’, so that the number of sides of a banana is 5. The distinction between the intension and the extension of a term is discussed in section 6.4 “Defining terms versus analyzing concepts”.
5. This definition of ‘defining a term’ is quite broad. The word ‘indicate’ covers showing as well as saying. The definition does not require a definition to be complete. The

‘reporting’, ‘stipulating’ and ‘advocating’. To report a meaning is to indicate, correctly or incorrectly, what a term means in a supposed pre-existing use.[6] To stipulate a meaning is to indicate how a term is to be interpreted or used in a specified context. To advocate by means of a definition is to take a position on an issue. These acts are not mutually exclusive. For example, making a vague term precise combines reporting and stipulating (or advocating). Insisting that marriage is by definition a union between a man and a woman may be both reporting and advocating. The basic act of reporting or stipulating or advocating

above definition of ‘defining a term’ is similar in its breadth to Gorsky’s broad sense of defining as “an intellectual method aimed to establish, specify, or explain the meaning of a sign expression in a certain language *S* or to extend the language *S* by introducing <a> new sign-expression” (Gorsky 1981, 95). Establishing, specifying and introducing are kinds of stipulating; and explaining is reporting. Gorsky does not acknowledge a basic definitional act of advocating. According to Doroszewski (1973, 274), “*To define* means ‘accurately, concisely to explain or formulate the meaning of a certain word, term, concept.’” (italics in original) Being accurate and concise are desirable features of a definition, but one is still defining if one explains or formulates the meaning of a word or term inaccurately or verbosely. Doroszewski’s activities of explaining and formulating correspond respectively to the acts distinguished in this essay of reporting on the one hand and of stipulating and advocating on the other. This essay confines itself to defining words and terms, which can be regarded as indirectly defining the concepts signified by them. According to Morscher (2017, 177): “To define an expression :means ... to specify its meaning.” (“Einen Ausdruck definieren :heisst ... seine Bedeutung anzugeben.” The colon before ‘means’ indicates that the sentence is a definition.) The word ‘specify’ is ambiguous between reporting a meaning and stipulating a meaning, for which Morscher uses the nicely resonant German verbs ‘feststellen’ (to note) and ‘festsetzen’ (to lay down); compare the English verbs ‘describe’ and ‘prescribe’.

6. Kripke (1980) has argued convincingly that “some things called definitions really intend to fix a reference rather than to give the meaning of a phrase, to give a synonym” (p. 60). One of his examples is the supposed use of a stick as a standard for being one meter long; to say that a meter is the length of this stick would not be to say what the term ‘meter’ means but rather to fix what the term ‘meter’ refers to. Kripke makes similar claims about terms for natural kinds, such as ‘gold’ or ‘tiger’ or ‘lightning’. On his account, someone who says what gold is or a tiger is or lightning is intends to fix the reference of the terms that name them rather than to report those terms’ meaning. Since the same techniques of counter-exampling apply to attempts to fix a reference as to attempts to say what a term means, in what follows reference-fixing statements will be treated as definitions.

is the definer's immediate purpose in defining a term. Typically, the definer will have less immediate purposes for constructing a definition. For example, the immediate purpose in composing a definition in a monolingual dictionary is to report a meaning. But, if the dictionary is a learner's dictionary, the author may have the indirect purpose of giving good guidance on the contexts in which people use the term. The basic definitional act of this author is reporting; a derivative (non-basic) act is giving guidance on the contexts in which people use the term.[7]

A statement produced by an act of defining is a definition.[8] It is helpful to distinguish the content of a definition from its form.

The *content* of a definition is in one sense the information that it conveys (Atkins and Rundell 2008, 407). It may provide a full account of a term's meaning or a mere hint. It may or may not describe characteristics of the term's referent (e.g. what tigers are like, in a definition of the term 'tiger'), and it may or may not give examples of the term's use in a sentence. In another sense,

7. Other authors divide acts of defining somewhat differently. Robinson (1950) recognizes the difference between reporting and stipulating (35, 59), but makes no provision for advocating. Morscher (2017, 178-187) distinguishes reportive, stipulative and "so-called" persuasive definitions. Macagno and Walton (2014, chap. 4) recognize the difference between reporting and stipulating, but distinguish two kinds of stipulating: (1) imposing a meaning by stipulating a unique or new definition and (2) committing the speaker to a specific language use and the interlocutor to a specific interpretation; this essay discusses both these kinds in section 2.2 on stipulating. Macagno and Walton recognize a distinct act of informing or reminding an interlocutor of a commitment—which is not so much an act of defining as an act of referencing a previous act of defining. They also distinguish explicit from implicit definitions—a distinction which this essay treats as a difference in forms of definition rather than a difference in acts of defining. They note that omitting a definition is an act; since it is not an act of defining but an act of failing to define, this essay does not discuss the act of omitting a definition.
8. One dictionary defines 'definition' as "specification of the semantic content of a word, usually formulated in order to facilitate the proper use of the word, *i.e.* to indicate its range of possible meanings" (Doroszewski 1973, 291). This account of the meaning of 'definition' is too narrow: it is specific to dictionary entries that often distinguish multiple senses of a word, puts constraints on the form of a definition that many definitions do not satisfy, and treats as a typical goal of formulating a definition something that is rather untypical.

the content of a definition is the words used in it. With respect to this dimension, one might, among other things, consider how long a definition should be, whether it is in the same language as the term being defined (and what difference that makes), what kinds of terms one can or should use in one's definition, and when if ever it is legitimate to use a term in its own definition.

The *form* of a definition is its structure. Historically, writers on definition privileged what is traditionally called a definition by genus and differentia (to be explained later, in section 4.4). But there are other forms of definition, such as definitions by synonym or extended synonym, contextual definitions, and range definitions. One can also explain a term's meaning by giving examples of things that are correctly labeled by the term and of things that are not correctly labeled by the term, or by pointing to instances, or by using the term in a sentence.

The next four chapters provide guidelines for the basic acts of defining, for the content of definitions, and for each common form of definition. Chapter six proposes strategies for constructing definitions and adopting nomenclature, and then discusses four theoretical issues: the difference between "real definitions" and nominal definitions, the traditional rules for definitions, the difference between defining a term and analyzing a concept, and the analogous difference between a concept and competing conceptions of it. Chapter seven summarizes chapters two through six. An appendix discusses three seldom used forms of definition.

2.

Acts of the definer

We begin by considering in turn the basic acts that a person performs in defining a term: reporting, stipulating, and advocating. The discussion of stipulation and advocacy includes adoption of nomenclature. This chapter does not explicitly discuss such hybrid acts as simultaneously reporting a meaning and advocating a position. With such hybrid acts, the guidelines for each of the defining acts apply.

2.1 Reporting

The following discussion of reporting starts by identifying the type of claim that a person makes who states (correctly or incorrectly) what a term means in a supposed pre-existing use. In the light of this identification, it characterizes the type of evidence on which one should base one's construction of a reportive[1] definition. It then makes suggestions for constructing or evaluating a reportive definition. Finally, it summarizes the content of this section.

1. The word 'reportive' is coined by analogy to the word 'stipulative'. Other authors call such definitions 'descriptive' (Gupta 2019) or 'lexical' (Copi, Cohen and McMahon 2011; Hurley 2008) or 'reported' (Ennis 1996; 2016). Morscher (2017) uses the German term 'reportive Definition' for a definition that "notes with what meaning an expression is used by certain language users" ("stellt fest, in welcher Bedeutung ein Ausdruck von bestimmten Sprachbenützern ... verwendet wird", 178).

2.1.1 Type of claim

A reportive definition is a definition in which the author claims that the defined term has actually been used with the meaning described in the defining part.[2] It is a hypothesis about what the term being defined has meant. The author of the definition is trying to state what one or more people who have used the term have meant by the term in a supposed pre-existing use.[3] One is not free in constructing a reportive definition to make the term mean whatever one wants it to mean. One needs to be descriptively accurate, in much the same way as one should be descriptively accurate when one describes the person one saw robbing a convenience store or the behaviour of a crowd at a political rally one attended. Unlike these two cases, however, reportive definitions are not reports of one's observations. Reportive definitions are based on one's observations but transcend them as explanations, in the way that a description of a person's mental state (as agitated, excited, worried, calm, or the like) when one last saw them is an explanation of what one directly observed (the way they spoke, their facial expressions, their affect, and so on).

People report meanings of terms for various reasons. One is to help someone who does not know what the term means to understand something they have just heard or read—to "decode" the term. Dictionary definitions serve this purpose. Another is to use the reportive definition for remarks about the things that the defined term refers to—for example, a philosophical analysis of restorative justice or a proposal for scientific investigation of workplace malingering. A third is to provide a basis for someone else to use the term in their own speech or writing. Fillmore (2003) has argued that, for this latter "encoding" function, reportive definitions need to characterize the frame (i.e. the conceptual

2. Thus dictionary definitions are reportive definitions.
3. It will sometimes be appropriate to specify which people use the term with the reported meaning—for example, if the term belongs to a technical field such as aviation engineering or to a certain region or sub-culture or to a certain period in the history of a language. In what follows, this complication will be ignored.

background) of the defined term's sense as well as its specific meaning within that frame; for example, a definition of 'carrion' as meaning the rotting meat of a dead animal would need to be supplemented by an explanation of the behaviour of scavengers, to make clear that one cannot refer to meat left out of the refrigerator for days as 'carrion'.[4] Although Fillmore's proposal makes sense, this essay focuses on reporting a term's specific meaning, and sets aside the task of characterizing the frame in which it has that meaning.

2.1.2 Relevant evidence for a reportive definition

The primary evidence of a term's pre-existing meaning is people's use of it in communicating with each other.[5] In what circumstances and in the context of what sentences do people use this term, and what do their addressees take them to be communicating by using the term in these sentences in these circumstances? To answer this question, lexicographers have traditionally collected examples of previously written sentences containing the word whose meaning they are reporting. The *Oxford English Dictionary* (Murray et al. 1971), for example, gives for each entry a list, for each distinct sense of the headword, of one or more sentences in which the word being defined occurred with that sense, with the date, author and title of the work in which the sentence was found. The *Greek-English Dictionary* by Henry George Liddell, Robert Scott and Sir Henry Stuart Jones (Liddell et al. 1968) does the same thing for classical Greek. Each report of a sense is a proposed explanation

4. Atkins and Rundell (2008, 409) point out that for successful encoding one needs to know not only the term's conceptual background but also its precise semantic features, its collocational and selectional preferences, its sociolinguistic features, and its pragmatic and connotative features. The present essay sets aside these aspects of a comprehensive definition of a term.
5. Introspective evidence by a user of the term is relevant but can be idiosyncratic and incomplete. Atkins and Rundell (2008, 47) invite their readers to retrieve from their mind the meanings of a fairly complex word and then compare the result with a dictionary or corpus. They predict that readers who do so will find gaps and even some misconceptions in their account.

of the headword's use in the illustrative sentences and in all its parallel previous uses. Nowadays, dictionary writers get their data from computer corpora, which can contain as many as 14 billion occurrences of words. Such corpora are samples of usage, in the best cases carefully constructed so as to include spoken discourse as well as written texts and to cover a wide variety of subject domains (Atkins and Rundell 2008).[6] Data from computer corpora are more complete and more reliable than from any other source, are searchable, and can generate a concordance list which shows the frequency of occurrence of a word in each of its senses (Jackson 2002, 167). People preparing a monolingual dictionary use such a corpus to prepare a database for each proposed headword, a database that is in turn used to prepare the dictionary entries (Atkins and Rundell 2008). The generation of the data does not replace the need for human skill in distinguishing senses of a given word and producing a definition for each sense. Landau (2001, 354), for example, says that a good definer must write well and easily, have an analytical mind, have a broad fund of information, and have a feel for the language.

Rarely used words tend to have just one sense, frequently used words more than one (Atkins and Rundell 2008, 265). Isolating and describing these senses requires generalization and abstraction:

> Meanings exist in infinite numbers of discrete communicative events, while the senses in a dictionary represent lexicographers' attempts to impose some order on this babel. We do this by making generalizations (or abstractions) from the mass of available language data. These generalizations aim to make explicit the meaning distinctions which – in normal communication – humans deal with unconsciously and effortlessly. As such, the 'senses' we describe

6. (Atkins and Rundell 2008), as a practical guide to lexicography, take the reader through all the stages of preparing entries for a dictionary. They consider only reportive definitions, and have nothing to say about their logic. (Zgusta 1971), though similar in scope and aim to (Atkins and Rundell 2008), has been superseded by the subsequent emergence of computer-based corpora. Its section on dictionary definitions (Zgusta 1971, 252-259) is however still worth consulting.

> do not have (and do not claim) any special status as 'authoritative' statements about language. (Atkins and Rundell 2008, 311)

People generally have no difficulty in recognizing when a word is used in one sense and when it is used in another. If one person says, "I'm going to the bank to withdraw some money," and a second person says, "Let's go for a walk along the bank," the listener easily recognizes that the first speaker is using the word 'bank' for a financial institution and the second speaker is using the word 'bank' for the side of a waterway. The context makes clear which sense the word has. In more complex cases, uses of a word do not fall so neatly into distinct senses; as an example, Atkins and Rundell (2008, 266-267) invite their readers to compare the way different dictionaries distinguish senses of the word 'overwhelm'. On the basis of the diversity of word-sense disambiguation in such complex cases, they argue that there is no Platonic inventory of senses "out there" and that the senses of a word need not be mutually exclusive or have clear boundaries (272). In principle, a word can have a different meaning in each of its occurrences, and the relation between these meanings can be more complex than that implied by grouping the occurrences into mutually exclusive and jointly exhaustive sets, in each of which the word is supposed to have a single uniform sense distinct from its senses in the other sets.

Despite these challenges, one can be somewhat systematic in distinguishing senses of a word or phrase. Atkins and Rundell (2008, 311-312) report that dictionary makers go through something like the following five-step process:

1. Analyse instances of usage of the word.
2. Provisionally identify different senses.
3. Collect good corpus examples for each provisional sense, storing ambiguous examples for further analysis.
4. For each cluster of examples, identify the features typically associated with it that distinguish it from the other clusters.

5. Refine the inventory of senses if necessary, for example by splitting or lumping, so that all uses of the word that occur frequently in text are accounted for.

Although the second stage (provisionally identifying different senses on the basis of analysis of instances of a word's usage) is intuitive, something can be said about how people do it. Occasionally, a word has completely unrelated senses in distinct sets of occurrences, because it has come into the language in two different ways. For example, the use of the English noun 'punch' for a hard blow with the fist goes back to the Latin word 'punctus', meaning pricked, whereas its use for a drink mixed with various ingredients goes back to the Sanskrit word 'paunch', meaning five—the drink originally having had five ingredients (Atkins and Rundell 2008, 280). Lexicologists treat such etymologically independent groups of occurrences as occurrences of two different words with the same spelling and same pronunciation. They call the two words "homonyms". Words with the same spelling but different pronunciation, such as the verb 'tear' meaning rip and the verb 'tear' meaning weep, are called "homographs".

More commonly, occurrences of the same string of letters are occurrences of the same word. If the word has a different sense in some of those occurrences than in others, the word is called "polysemous". Its different senses have emerged over time from an original sense, in a motivated way. "There is, by definition, a motivated relationship between polysemous senses." (Cruse 2000, 110) This relationship can fit into a pattern of "regular polysemy". In one such pattern, one sense is a specialization of another; for example, the sense in which the word 'dog' is used for a male dog (in contrast to a female dog, called a 'bitch') is a specialization of the sense in which it is used for a member of the species of either sex. In another pattern, one sense is a generalization of another; for example, the sense in which the same word 'dog' is used for the broader *Canis* family that includes wolves, jackals and dingoes is a generalization of the sense in which it is used for the species *Canis canis*. Atkins and Rundell (2008, 140, n. 10) report that their database contains 100 classes of regular polysemy.

Their template (125) for preparing a dictionary entry for a word designating a kind of animal includes 11 possible "lexical uses" in which the word can occur.[7] Not every word for a species of animal has all these lexical uses, but the template can be used as a checklist for the distinct related senses of such a word. Atkins and Rundell claim (127) that as many as 25% of the entries in a dictionary could be written using templates. Templates save time in preparing entries and facilitate systematic and comprehensive coverage of the different senses of words. Atkins and Rundell mention as categories amenable to template treatment academic qualifications, body parts, colours, games, languages, metals, minerals, musical instruments, nationalities, seasons, and titles. Dictionary makers prepare a template for a given category on the basis of a number of independently prepared entries for words belonging to the category (Atkins and Rundell 2008, 128).[8]

People intuitively take account of the following signs of differences of sense:

- differences in the kinds of texts in which a word occurs: the domain (e.g. chemistry vs. social science for the word 'bond'), the region (e.g. Britain vs. the United States for 'wash up'), the time (e.g. 18th century vs. late 20th century for 'gay'), the subculture (e.g. peer-reviewed publications vs. youthspeak for 'random') (Atkins and Rundell 2008, 296-299);

7. The uses are (1) as a count noun designating the specific animal, (2) as a count noun used figuratively, (3) as a modifier indicating something belonging to the species or made from a part of it, (4) as a count noun used figuratively to denote a kind of person, (5) as a count noun designating a genus, (6) as an uncount noun denoting the flesh of the animal in the domain of cooking, (7) as a modifier in the domain of cooking indicating something made with the flesh of the animal, (8) as a capitalized singular noun naming a constellation, (9) as a verb meaning to do something in the way the animal does it, (10) as a verb meaning to give birth to the young of the animal, and (11) as a phrasal verb like 'to rat on' or 'to wolf down'.
8. For example, the template for terms for kinds of animals, with the 11 possible senses of such a term listed in the preceding footnote, would have been prepared by looking at the distinct senses in entries for such terms as 'mouse', 'deer', 'cat', 'wolf', 'rat', 'lamb', and 'worm'.

- having a different opposite in some contexts than in others, as the English adjective ‘light’ is in some contexts the opposite of ‘heavy’ and in others the opposite of ‘dark’;
- labelling a different set of objects when used in different contexts, as the English noun ‘bank’ in some contexts correctly labels a sort of financial institution and in others labels the side of a river, stream or creek;
- distinctive collocations, as in the difference between occurrences of the word ‘horse’ in speaking of gymnastics and in speaking of horse racing (Jackson 2002, 91-92);
- differences in syntactic and lexicogrammatical behaviour (e.g. uses of ‘friendly’ about people vs. uses of ‘friendly’ immediately followed by ‘with’, uses of ‘royalty’ in the singular vs. uses of ‘royalties’ in the plural, transitive vs. intransitive uses of ‘operate’, uses of ‘remember’ followed by a verb ending in ‘-ing’ vs. uses followed by ‘to’ plus a verb) (Atkins and Rundell 2008, 300-301);
- differences in selectional restrictions and collocation, such as uses of the verb ‘forge’ followed by terms for a relationship vs. its uses followed by terms for a document, uses of the adjective ‘fresh’ of fruits and vegetables vs. its uses of such things as perspectives and approaches, transitive uses of ‘build up’ followed by a term for something positive vs. intransitive uses of ‘build up’ preceded by a term for something negative (Atkins and Rundell 2008, 301-304);
- differences in preferences for or against certain forms, structures or positions (e.g. uses of ‘remember’ followed by ‘to’ strongly favouring the imperative vs. other uses not strongly favouring the imperative, uses of ‘astronomical’ as a classifier strongly favouring the attributive position in ‘astronomical observations’ vs. its descriptive uses appearing before or after a modified noun like ‘prices’, uses of the verb ‘acquit’ that strongly favour the passive vs. uses that are only reflexive) (Atkins and Rundell 2008, 304-307).

- oddness of using a word simultaneously in two senses, as in the sentence ‘John and his driving license expired last Thursday’ (Cruse 1986, 61), where the sentence sounds odd because the sense in which a person expires is different from the sense in which a driving license expires;

Text-internal signs of distinct senses have been systematized, for example in the frame semantics of Charles Fillmore (2006) and the concept of lexical functions articulated by Igor Mel’čuk (1996). In some cases, there is a choice of whether to count two occurrences of the same term as having a single general sense or two more specific senses; “lumpers” make the first choice, and “splitters” the second.[9]

Traditionally, in describing each sense of a polysemous word, a definer would look for features that were individually necessary and jointly sufficient for something to be correctly labeled by the term when it has the sense in question. More recently, in accordance with the findings of Eleanor Rosch (described in section 4.6, “Range definitions”), definers tend to look for features that are *typically* associated with each cluster of examples and that distinguish it from the other clusters. Atkins and Rundell (2008, 280) see two advantages to this “prototype” approach. First, by reflecting the way that people create meanings when they communicate, it goes with the grain of the language and accommodates creativity and fuzziness. Second, by permitting focus on the prototype and its common exploitations, rather than requiring prediction of and accounting for every possible instantiation of meaning, it makes the task of word-sense disambiguation more manageable.

Atkins and Rundell warn about two dangers in the process of word-sense disambiguation. One is to over-specialize senses, elevating differences of contexts into differences of senses; they give the example of a dictionary definition of an alleged sense of ‘rot’ peculiar to the sport of cricket, where it supposedly means the

9. Atkins and Rundell (2008, 268) recommend splitting such senses when building a database for dictionary entries, since it is easier at the later stage of preparing the entry to synthesize related senses than to split a coverall sense into smaller units.

falling of several wickets in quick succession (Atkins and Rundell 2008, 312-313). The other is over-attachment to consistency; it is perfectly all right, they write, to distinguish a second sense of 'whisky' as meaning a glass of whisky without distinguishing a second sense of 'grappa' as meaning a glass of grappa, if the word 'grappa' is rarely used with this sense. In other words, if a term is subject to a form of regular polysemy, one distinguishes and describes a sense made possible by this pattern only if the term is actually used with some frequency in that sense.

To report a pre-existing meaning of a term is thus to describe a sense of the term, as exhibited in its occurrence in spoken or signed discourse or written texts. It is relevant to consider what speakers, signers and writers have in mind when they use the term in this way, as well as what listeners, viewers and readers think of when they hear or view or read the term. But the primary evidence for a reportive definition is the actual use of the term in communicative situations. Good-quality dictionaries construct their definitions on the basis of this evidence, which is systematically collected, and in many situations dictionaries will be the main evidence for the meaning of a term in a pre-existing use.

Statements made in accordance with a given sense need not be correct. One might look at a building in the distance, for example, and say, "That's a very peculiar-looking house." On getting close to the building, one might see that it is in fact not a house but a sub-station of the electricity distribution network enclosed by a structure designed to look like a house. Despite one's mistake, one's use of the word 'house' was in accordance with its use for a detached single-family dwelling or duplex; at the time of calling the building a house, one thought that it was such a dwelling.

2.1.3 Constructing and evaluating a reportive definition

Reasoning from a collection of usage data to a report of a pre-existing meaning of a term is a kind of inference to the best explanation. The resulting report is a kind of scientific hypothesis.

It should therefore satisfy the following criteria for an acceptable explanatory hypothesis:

1. An acceptable explanatory hypothesis must explain the phenomena that it is advanced to explain, in the sense that these phenomena are what one would expect, given background assumptions, if the hypothesis were true.
2. The hypothesis must be consistent with all the evidence and background knowledge that one has at one's disposal, in the sense that the combination of the evidence and the background knowledge with the hypothesis does not imply a contradiction.
3. Any competing alternative hypothesis must be inconsistent with facts, in the sense that its combination with some facts implies a contradiction. (Ennis 1962, 91)

The application of these criteria requires that a competent sincere effort has been made to find alternative hypotheses and to find both supporting and opposing data. (See also Niiniluoto (2018).)

The data that a reportive definition is supposed to explain are the occurrences of the term that the reporter groups as having a single sense. To gather such data as the basis for formulating one's hypothesis, one can use search engines on the Web[10] or online corpora.[11] An online corpus will be useful for this purpose if it is a reasonably large[12] sample of a broad range of types

10. Atkins and Rundell (2008, 78) regard the Web as a source of texts from which dictionary makers can assemble a corpus, rather than as a corpus itself. But it can function as a source of data about the uses of a particular term.
11. Atkins and Rundell (2008, 50) suggest reading a page or two of text from a source like a blog and noting a word or phrase or meaning that strikes you as unusual and that you suspect is not currently accounted for in your dictionary. They give advice on how to record the citation, and comment: "Almost everyone who tries this is surprised by how easy it is to find instances of language in use which have not yet been recorded in any dictionary." (p. 50)
12. How large? Zipf (1935) proposed what has become known as Zipf's Law, that the frequency with which a word occurs in a collection of texts is inversely proportional to its ranking in a frequency table. For example, the 10th most frequent word will occur

of communication in the language (Atkins and Rundell 2008, 54-57).[13] term that is part of one's own vocabulary, one can generate data at will. When one is evaluating a reportive definition, one tests it against such data. In an extreme case where the definer has invented a pre-existing meaning, there are no confirming data. Someone might for example report that in French the word 'fastidieux' means fastidious, when in fact it means tedious, irksome, dull, worrisome (according to *The Concise Oxford French Dictionary*). Or someone might invent a word (e.g. in the context of a word game like Scrabble) and claim that it has a certain meaning, such as 'tendles', alleged to mean the same as 'handles'.

about twice as often as the 20th most frequent word, about ten times as often as the 100th most frequent word, about 100 times as often as the 1,000th most frequent word, and so on. Hence most vocabulary items will occur rarely. Atkins and Rundell (2008, 60) conclude from a concordance of the 121 occurrences of forms of the word 'adjudicate' in a corpus of 100 million words that there are enough data to underpin a useful description of the word. Words with many senses will need many more occurrences to support a useful description of each sense. They conclude, "We don't actually know how much data we need in order to account for a given linguistic feature, be it a word, a meaning, or a word combination. What we do know is that the more data we have, the more we learn." (p. 61) They report that writers of dictionaries give priority to the size of the corpus from which they work, over the amount of detail in the headers and the fineness of the linguistic annotation, which are prohibitively expensive to produce in a large corpus (p. 95).

13. As Atkins and Rundell (2008, 61-69) point out, it is impossible to get a random sample from the constantly increasing population (or "universe") of uses of terms in a living language like English, or even to define strata in that population from each of which one could sample randomly. Instead, designers of corpora usually use typologies of texts (such as those in a library book classification system) to construct a sampling frame that can be used as a basis for stratified sampling with random selection from each part of the frame. For sampling from spoken language, one approach is to use a demographic approach for collecting samples of face-to-face spoken conversation and to supplement it with samples from such context-governed spoken texts as lectures, news broadcasts, business meetings, political speeches, parliamentary proceedings, club meetings, and phone-in shows. Designers of corpora also need to take into account the languages or dialects, the time period, the modes and mediums of text production, and the domains and sub-languages from which they take samples (Atkins and Rundell 2008, 69-74).

According to the first criterion for an acceptable explanatory hypothesis, the reportive definition must explain the data, in the sense that they are what one would expect if the reportive definition were correct. That is, if the term really meant what the reportive definition says, then one would expect people to use it as they do. The definition must not be too narrow, in the sense of failing to account for some occurrences of the word in one's data. For example, if one is trying to explain occurrences of the word 'house' that include the sentence 'This duplex is a fine house', the definition of a house as a building designed for accommodation of a single family would be *too narrow*, because it does not explain this sentence (given that a duplex is not designed for a single family).

According to the second criterion for an acceptable explanatory hypothesis, the reportive definition must be consistent with the evidence and one's background knowledge. Consistency with the evidence means that the definition does not imply that people use the term in ways that they actually do not. For example, the definition of a house as a building designed for people to live in would be *too broad*, because it would imply that someone using the word 'house' correctly could truthfully say 'This apartment building is a fine house', which the data exclude.

Thus the first and second criteria for an acceptable explanatory hypothesis incorporate the commonly acknowledged requirement that a good definition must be neither too narrow nor too broad. In dictionary definitions, the occurrences of the defined word that must fit this requirement are its frequent and well-dispersed uses, not idiosyncratic outliers (Atkins and Rundell 2008, 48).

The second criterion also implies that a reportive definition must be consistent with what people know generally about the things correctly labeled by the term. For example, a reportive definition of the term 'water' in its main ordinary usage should be consistent with our knowledge that water is a compound whose molecules each consist of two atoms of hydrogen and one atom of oxygen. (Water is H_20.) The definition does not have to mention this fact, since many people know what 'water' means even though they do not know its chemical composition. (One might for example define

'water' as meaning a clear, colourless liquid that falls from the sky in the form of rain.) But the definition should not conflict with this knowledge. Although a reportive definition need not imply known general facts about the sort of thing signified by the term being defined, any such implication is confirmatory evidence of its accuracy. Such confirmatory evidence is especially relevant if the general fact is part of what people intuitively grasp when they think about what the term means.

On the other hand, reportive definitions do not need to incorporate beliefs about the objects correctly labeled by a general term. For example, if users of a language worship the sky as a god, a definition reporting the meaning of the word for sky in their language does not need to identify it as the name of a god; the word can perfectly well be explained as meaning, for example, the apparently concave vault above the Earth, blue in colour on a cloudless day and starry on a fair night (Doroszewski 1973, 287).

The criterion of consistency with what people generally know about things correctly labeled by the term implies that the truth or falsehood of a reportive definition is not necessarily a purely verbal matter. It is a fact about the world, not just about how English-speaking people use the word 'water', that the clear, colourless liquid that falls from the sky in the form of rain is water.[14] Most reportive definitions are not merely (or not even) providing synonymous expressions but incorporate substantive knowledge about the things correctly labeled by the term being defined.

The third criterion for an acceptable explanatory hypothesis, that any competing alternative hypothesis must be inconsistent with facts, implies that rivals to a proposed reportive definition should be either too narrow or too broad or inconsistent with background knowledge about the things correctly labeled by the term. In evaluating a reportive definition, it is therefore helpful to compare it to its rivals. If two competing definitions of the

14. The factual character of such claims is part of Kripke's argument (Kripke 1980) that their authors intend to fix a reference rather than to describe a meaning. On his account, they are not giving a synonymous definition of the term but providing a way of identifying what it refers to.

same term in one of its senses differ about which individual items are correctly described by the term, then one can compare those implications to the data. An example is a comparison of the implications of the following four dictionary definitions of the term ‘clock’:

- an instrument for measuring and recording time, especially by mechanical means, usually with hands or changing numbers to indicate the hour and minute: not designed to be worn or carried about (http://www.dictionary.com/browse/clock; accessed 2020-01-19)
- a device other than a watch for indicating or measuring time commonly by means of hands moving on a dial (http://www.merriam-webster.com/dictionary/clock; accessed 2020-01-19)
- a mechanical or electrical device for measuring time, indicating hours, minutes, and sometimes seconds by hands on a round dial or by displayed figures (https://en.oxforddictionaries.com/definition/clock; accessed 2021-01-12)
- an instrument other than a watch for measuring or indicating time, especially a mechanical or electronic device having a numbered dial and moving hands or a digital display (http://www.thefreedictionary.com/clock; accessed 2020-01-19)

The first definition does not explain talk about travel alarm clocks, which are designed to be carried about; it is thus too narrow. The second definition protects itself against counterexamples by using the word ‘commonly’, but one can reasonably question how common it is nowadays for clocks to have hands moving on a dial; since digital displays are increasingly common, the second definition seems narrow. The defining part of the third definition is true of watches, which people do not call ‘clocks’; it is thus far too broad. The fourth definition seems most immune to

counterexamples; it protects itself against the possible counterexample of sundials by using the word ‘especially’.

Each of the three criteria for an acceptable explanatory hypothesis needs to be applied with caution to the construction and evaluation of a reportive definition.

As to the first criterion of explanation of usage, a reportive definition that fails to explain some uses of the term to be defined is not necessarily too narrow. The excluded uses may involve a different sense of the term rather than an error in the definition. For example, an objection that a definition of ‘clock’ does not cover talk about chess clocks may reflect a different sense of the term ‘clock’ than the sense involved when people talk about alarm clocks and grandfather clocks.

As to the second criterion of consistency with evidence and background knowledge, a reportive definition that covers occurrences of the term that are beyond one’s data is not necessarily too broad. The inclination to think that those occurrences cannot be part of one’s data may reflect a different meaning of the term. For example, someone might object that a proposed definition of ‘clock’ counts sundials as clocks. But the author of the proposed definition may be reporting on a sense in which people call sundials ‘clocks’. The objection reflects a different sense of the term ‘clock’, one that requires an internal mechanism, its “clockwork”.

Thus one needs to consider whether apparent counter examples of either sort to a reportive definition are really counterexamples or instead belong to a different sense.

As to the third criterion of inconsistency of rival hypotheses with some facts, two different reportive definitions may both be correct. In this respect, reportive definitions contrast to different scientific explanations of a natural phenomenon. In general, only one such scientific explanation is correct. In the 18th century, for example, there were two competing explanations of combustion (burning). One explanation was that a substance was being driven out of a burning object. Another explanation was that a substance was being combined with the object that was burning. Nobody proposed that both explanations might be correct. (In the end, the

second explanation proved to be correct; combustion involves the joining of the burning object with what people now call ‘oxygen’.)

Distinct reportive definitions, however, are not rivals if they both fit the data and are both consistent with known general facts about the things correctly labeled by the defined term. For example, each of the previously mentioned dictionary definitions of the term ‘clock’ could be adjusted to take care of its distinctive counterexamples. The result would be four slightly different definitions, each fitting the central use in English of the term ‘clock’. Some would give more detail than others about the way in which clocks indicate the time. Some would exclude watches by name from the class of clocks, and others by description. Some would have qualifiers like ‘usually’ to allow for odd types of clocks that do not fit a certain part of the definition. But all would be accurate.

Other features besides accuracy can be used to select among acceptable reportive definitions of a given term. For some purposes, a precise definition is preferable to one that uses vague terms or hedging qualifiers. For some purposes, a short definition that is easily understood is preferable to a longer definition that is hard to understand.

If the boundaries of the set of things correctly labeled by a term when it has a certain sense are not sharp or clear, a reportive definition can capture this vagueness with qualifiers like ‘usually’ or ‘generally’ or ‘typically’. Alternatively, the vagueness of the term being defined may be mirrored by the vagueness of the terms in one’s definition, as when one defines a catastrophe as an event that causes immense harm or damage; the vague boundaries of the term ‘catastrophe’ correspond to the vague boundaries of the term ‘immense’ and the uncertainty about what counts as harm or damage.

A term used in a certain sense not only has a (more or less vague) boundary of correct application but also may (1) express its user’s attitude or (2) prompt a negative reaction by someone to whom it is applied or (3) have distinct cultural associations. For example, (1) calling someone ‘pompous’ conveys disapproval of

how they speak and act[15], (2) being told that one is insensitive is often taken as an insult, and (3) the word ‘fraternity’ used of invitation-only social groups on North American campuses has strong cultural associations. For some purposes, especially in dictionaries, it may be appropriate for a definition to report these aspects of a term’s meaning along with those aspects that determine the term’s extension.

2.1.4 Summary on the act of reporting a meaning

The primary relevant evidence for a reportive definition is the use of the term when people communicate with each other. Good dictionaries construct their reportive definitions on the basis of such evidence, and are thus good secondary relevant evidence. If the term is used in different ways, it will be necessary to identify the sense that one is trying to describe. People distinguish such senses easily and intuitively; one can do so systematically, using external cues such as the domains in which a term is used or internal cues such as the difference between transitive and intransitive uses of a verb. Sometimes different senses of an apparently single term are unrelated, because the term has entered the language in two different ways; the senses are really the senses of two terms, called ‘homonyms’. More commonly, the term is “polysemous” and there is a motivated relationship between the different senses, a relationship that often fits into a pattern of “regular polysemy”. Identifying and describing a sense of a term is not a matter of reporting an observation, since one cannot observe directly what a term means when it is being used. Rather, it is a matter of inferring the best explanation of the data.

An acceptable reportive definition must explain the data, in the sense that the observed uses must be what one would expect if the definition were accurate. If there are uses of the term that one

15. Macagno and Walton (2019) classify such “emotive meanings” as they occur in contemporary political discourse. They treat a stable emotive meaning of a term as the result of an implicit inference from its descriptive meaning, an inference that is subject to evaluation.

would not expect, then either the definition is too narrow or the term has a different sense in those unaccounted-for uses.

An acceptable reportive definition must not be inconsistent with the data, given background assumptions. If it implies that the term can be used in a way that the data exclude, then either the definition is too broad or it is capturing another pre-existing meaning of the term. In an extreme case, there may be no uses of the term that correspond to the reportive definition, either because the term is never used with that meaning (as when someone defines the French word ‘fastidieux’ as meaning fastidious) or because the term has been invented and has no pre-existing use. A reportive definition should also be consistent with known general facts about the sort of thing which the term signifies.

Rivals to a proposed reportive definition must be inconsistent with facts. Distinct reportive definitions are only rivals if they have different implications for the sense that each is trying to describe. If they are not rivals in this sense, distinct reportive definitions can both be correct, in the sense that each of them explains the facts of the defined term’s usage and is consistent with these facts as well as with known general facts about the sort of thing signified by the term. In such cases, other considerations may make one definition preferable to another.

If the boundaries of a term’s sense are vague, a definition reporting on the meaning of the term in this sense can reflect the vagueness by using in its defining part either correspondingly vague terms or qualifiers like ‘generally’ or ‘usually’. A report of a term’s meaning may include information about the attitude that its use conveys, how those labeled by the term will react, and its cultural associations.

2.2 Stipulating

To stipulate a meaning of a term is to state how the term is to be interpreted or used in some specified context.

The following discussion of stipulating begins by identifying what type of claim is made by stipulating a meaning; it emphasizes

that a stipulative definition is neither true nor false, though it may be wise or unwise. It identifies types of contexts where people stipulate meanings and discusses an example for each context. Taking these differences of context into account, it then proposes guidelines for constructing a stipulative definition and, derivatively, for evaluating it. It then elaborates on two of the guidelines: choosing a definition that will serve one's purpose and avoiding adoption of a misleading name. The discussion concludes with a summary.

2.2.1 Type of claim

Stipulations of meaning are not reports but are requests, commands, entreaties, commitments, invitations, etc.—that is, non-representative illocutionary acts.[16] Typically, such stipulations combine a commitment by the stipulator to use the term with the specified meaning and a direction to the reader or listener to interpret the term as having that meaning when it is used in

16. Illocutionary acts are acts that speakers and writers perform in uttering and inscribing sentences. Philosophers of language distinguish the "locutionary act" of speaking or writing a given sentence from the "illocutionary act" that one performs *in* speaking or writing it (Austin 1965, 94 and 98). For example, the typing of the immediately preceding sentence was a locutionary act. In typing it, the typist performed the illocutionary act of making an assertion. To assert something is (ordinarily) to indicate one's belief in its truth. Consider another example. Someone says, "Please close the door." In uttering this sentence (a locutionary act), the speaker in most situations is performing the illocutionary act of making a request; the speaker is asking the addressee to close the door. Requests are neither true nor false. The philosopher John Searle has classified illocutionary acts into five basic categories, according to the point of the act (Searle 1976, 354-361). *Representatives* commit the speaker to something's being the case. *Directives* try to get the addressee to do something. *Commissives* commit the speaker to some future action. *Expressives* express an emotional attitude of the speaker to something. *Declarations* bring it about that something is the case. Stipulations of meaning are either commissives or directives, and typically both at once. (Incidentally, Austin and Searle were making stipulative definitions when they defined the terms 'locutionary act', 'illocutionary act', 'representative', 'directive', 'commissive', 'expressive' and 'declaration'. They were also implicitly advocating that others use the terms with the meanings that they stipulated, and many people have done so.)

the specified context. They are typically marked by an indication that their author is laying down a meaning rather than reporting one; for example, in legal documents a string of statements of the form '"x" means y' might be preceded by a phrase like 'in this contract'. Since they are requests and commitments, stipulative definitions are neither true nor false. (One could however report that a particular stipulative definition had been made, and such a report would be either true or false.)

Some stipulative definitions are mere abbreviations, in which a term is introduced as shorthand for a longer phrase. For example, someone discussing the evolution of domestic dogs from wolves might say:

- Let us call wolves *that became more acclimatized to humans and more sociable without yet being domesticated* '**dog-wolves**'.[17][18][19]

17. The naturalist Mark Derr proposed such an abbreviation in an interview on National Public Radio. See https://www.npr.org/templates/transcript/transcript.php?storyId=142100653; accessed 2019 10 17.
18. Throughout this book, I use a system of marking the components of bulleted and indented definitions like the above definition of the term 'dog-wolves'. The term to be defined is always **bold-faced**. The defining part of the definition is generally *italicized*. If there is a need to distinguish different aspects of the defining part of the definition, as in the above definition, the distinguished aspect or aspects are underlined or double-underlined. These more specific ways of highlighting are described in chapters 4 and 5, in the context of discussing the forms of definition to which they apply. In the above definition, the underlined component names the genus of the kind of thing correctly labeled by the defined term, and the italicized component describes the differentia that distinguishing this kind of thing from other kinds belonging to the same genus. Such definitions by genus and *differentia* are discussed in detail in section 4.4, "Definitions by genus and differentia".
19. In the above example, the defined term is in single quotation marks, as an indication that it is being used to refer to itself. The defining part of the definition is not in quotation marks, since it is not used to refer to itself but is used to refer to wolves of a certain sort. This pattern is standard when the linking part of the definition is the word 'means', as in the above example. Other linking words or phrases usually go with different combinations of the presence or absence of single quotation marks. For example, the linking phrase 'means the same as' would be flanked by terms in single quotation marks on either side, whereas a linking word like 'is' or 'are' would be flanked by terms

Such abbreviations are convenient, and ideally should convey on their face the longer phrase that they abbreviate (as the term ‘dog-wolves’ does). Convenience and perspicacity are the only criteria by which they can be judged. But most stipulative definitions are more than mere abbreviations, and need to meet additional criteria. Although neither true nor false, they can be wise or unwise.

2.2.2 Examples of stipulating meaning

This section distinguishes seven types of stipulation of meaning, gives an example of each type, and draws lessons from each example.

2.2.2.1 Scholarly and scientific works.

Authors of a scholarly or scientific work (an article, an essay, an academic thesis, or a book) sometimes announce how they will be using a certain term in the work. For example, section 1.2, entitled “The definition of ‘term’”, explained how the word ‘term’ is to be understood in this essay. The purpose of this explanation was to make clear at the beginning what counted as a term and what did not count as a term in the subsequent discussion of guidelines for defining terms. Facilitating understanding in this way is one reason for stipulating.

A person stipulating a meaning presupposes that they have the right to say how the term being defined is to be interpreted or used in the specified context. For example, I presupposed that I had the

without single quotation marks. These differences are immaterial, since any definition in one such form can easily be transformed into an equivalent definition in another such form. For example, the above definition could be written equivalently as follows: Let ‘**Dog-wolves**’ mean the same as ‘wolves *that became more acclimatized to humans and more sociable without yet being domesticated*’; Let us say that wolves *that became more acclimatized to humans and more sociable without yet being domesticated* are **dog-wolves**. This essay treats all definitions as definitions of a term, traditionally called “nominal definitions”. For justification of scepticism about the existence of so-called “real definitions” that are alleged to say what something is by means of a definition, see section 6.2, “Real versus nominal definitions”.

right, as author of this essay, to say what I mean in it by the word 'term'. In general, authors have the right to stipulate how terms that they use in their own work are to be interpreted.

Stipulations of meaning in scholarly and scientific works often implicitly advocate that the term whose meaning is stipulated be used in this way in other contexts, especially when a new term is being introduced or a new meaning is being assigned to an existing term. For example, in coining the term 'illocutionary act' for an act that a speaker or writer performs in uttering a sentence, the philosopher John Austin (1965) implicitly recommended that others use the term with this meaning—as indeed they have done. Austin did not state that this is how the term is to be used elsewhere – he did not have the right to order other people to use the term as he did. An attempt to give such an order would have failed to satisfy the presupposition and would not be a stipulation, but rather an attempted stipulation, or a failed stipulation. It would however still have been advocating its use with the sense described.

2.2.2.2 Legal documents.

Legal documents such as laws, regulations and contracts often include sections specifying how to interpret some of the terms used in the document. For example, a sub-section of an agreement found by a search on the Web begins with the sentence "The following terms used in this Agreement shall have the meanings set forth below", and includes such statements as the following:

- '**$**' shall mean *the currency of the United States*
- '**business day**' shall mean *any day, except for Saturday and Sunday, or a day on which banks are required or authorized by law or executive order to close in the states of New York or New Jersey* (http://www.wikinvest.com/stock/Mirant_(MIR)/Filing/8-K/2006/Ex-4.1/D3486580, bold-facing and italics added; accessed 2017-02-09).

These stipulations come at the end of a written agreement between two companies. The agreement uses the symbol '**$**' in its common meaning of 'dollar', writing "$21.87 per share" for example rather than '21 dollars and 87 cents per share', for brevity and ease of understanding. The reason for stipulating that '**$**' shall mean the currency of the United States is to make explicit which country's dollar is being referred to. The stipulation is necessary for legal certainty, since many countries other than the United States call their currency a dollar and use the symbol '**$**' to refer to it. The stipulation also serves the purpose of convenience, in the sense of brevity, since the alternative of writing 'US**$**' instead of '**$**' at each place where the dollar sign appears in the agreement would be cumbersome and awkward.

Like the stipulation of the meaning of '**$**' in the agreement, the stipulation of a precise meaning for 'business day' has the function of providing legal certainty. The contract uses the term 'business day' (in such phrases as "on the business day immediately preceding") in its common meaning of a day when non-retail commercial businesses like company head offices are open for business. For certainty about what counts as a business day, it defines the term 'business day' as meaning a weekday that is not a bank holiday in New York or New Jersey. The stipulative definition avoids the need to write 'weekday that is not a bank holiday in New York or New Jersey' at the places where the contract uses the term 'business day', and thus contributes to the conciseness and ease of understanding of the document.

It is quite common for a legal document to stipulate how terms in the document that are in common use are to be interpreted. The reader will probably interpret the terms as the drafter of the document intends, but the stipulations of meaning are designed to make this more likely and to guide courts and tribunals in their interpretation of the document. A term whose meaning is stipulated is typically much shorter than the description of its meaning, so the stipulation also serves the purpose in such contexts of making the document shorter and easier to understand.

2.2.2.3 Collection of descriptive statistics.

Organizations that collect and publish descriptive statistics often prescribe how a certain label is to be used by those who send them information. An example is the definition of ‘criminal homicide—murder and non-negligent manslaughter’ by the Federal Bureau of Investigation (FBI) in its *Uniform Crime Reporting Handbook*, a definition that will be quoted and discussed in section 5.2 (on giving examples, non-examples and borderline cases). Because the United States has dozens of different criminal codes (one for each state, district and territory), which differ from one another in how they define criminal offences, law enforcement agencies need a standard definition of these offences from the Uniform Crime Reporting (UCR) Program as a basis for their reports. The UCR Handbook therefore makes precise the boundaries of the class of things correctly labeled by each term used in reports submitted to the FBI. The FBI has the legal right to tell law enforcement agencies across the country how to use the defined terms in their reports, so its attempts at stipulation satisfy the presupposition of stipulating a meaning and are successful in that respect.

2.2.2.4 Introducing nomenclature.

Writers of scientific articles or theses may announce near the beginning that in the work in question they will use a specified name for some component of the system that they are investigating, as when the authors of an article reporting a regulatory role in human blood for a certain gene product propose to call it ‘thrombin activatable fibrinolysis inhibitor’ or ‘TAFI’ for short (Bajzar, Manuel and Nesheim 1995).[20] Such stipulations are

20. Not knowing the terminology of the field of hematology, the present author can only conjecture from the name that it refers to a substance that can be activated by “thrombin” (whatever that is) and that inhibits (i.e. reduces the amount of) “fibrinolysis”, a word whose etymology suggests that it refers to a process of breaking down (Greek *lysis*, as in the words ‘analysis’ or ‘dialysis’) “fibrin”, which is presumably something present in the

similar to the stipulations of meaning in scientific and scholarly works mentioned in section 2.2.2.1. They differ from those stipulations in that they introduce a new name for a newly discovered entity. The issues in choosing such a term are however similar to those involved in choosing existing terms for something already recognized.

2.2.2.5 Standardizing nomenclature.

Members of the standardization committee of a scientific society sometimes recommend what term should be used by researchers in their discipline for some phenomenon, as when members of a sub-committee of the Scientific and Standardization Committee (SSC) of the International Society on Thrombosis and Haemostasis (ISTH) recommended that, in all future publications about a particular gene product found in human blood, authors include as a keyword the official gene name, 'carboxypeptidase B2 (plasma)', abbreviated as '*CPB2*' or '*Cpb2*' depending on the species, to enable comprehensive literature searches and facilitate cross-referencing (Foley et al. 2015). This gene product is the one mentioned in the previous paragraph as being named 'thrombin activatable fibrinolysis inhibitor' or 'TAFI' for short. The standardization committee noted that researchers had found it hard to find published scientific articles about this gene product, because other labs had assigned different names to the same chemical. Standardization of nomenclature is important as a means to help researchers keep abreast of the current state of knowledge. It can also be important in communication to the general public, who can easily become confused by the use of two different technical names for the same thing.

Strictly speaking, the recommendation of the standardization committee is not a stipulation, since the committee does not have the authority to require scientific journals in the field of thrombosis and haemostasis to insist that any article about the gene product

blood. The Wikipedia article at https://en.wikipedia.org/wiki/Carboxypeptidase_B2 is consistent with the preceding conjecture, but is not fully intelligible to a non-specialist.

in question include its official gene name as a keyword. The standardization committee is advocating rather than stipulating. But its explicit recommendation carries a certain authority, because of its constitutional role within the scientific society of which it is a committee.

2.2.2.6 Setting a numerical threshold.

Among the examples of definition at the very beginning of this essay (section 1.1, entitled "Occasions for defining terms") was a school superintendent's stipulation that having more than 80% of a school's enrollment be of a given minority race constitutes segregation. In selecting a percentage, the superintendent was identifying what was to be regarded as segregation in the superintendent's school district. The United States Supreme Court in *Brown vs. Board of Education of Topeka* (1954) had ruled that segregation is unconstitutional, but had not provided an easily employable criterion for identifying segregation.

The superintendent was not only stipulating this percentage as a guide for his school district but also seemed to be advocating this percentage as a general guide. The two acts, stipulating and advocating, overlap in this situation.

The superintendent presupposed that he had the right to say what was to be judged segregation in his district at that time. As stated earlier, a key feature of a stipulative definition is that the stipulator presupposes possession of the right to state that this is how the term being defined is to be interpreted or used in the specified context.

Stipulations of a numerical threshold for the things labeled by a term are common in administrative decision-making and in social-scientific research. A large organization that keeps an inventory of its major equipment may specify a minimal initial cost of a piece of equipment (e.g. $5,000) for it to be called 'major' and thus included in its inventory. A researcher investigating poverty may set a maximum income level that constitutes living in 'extreme poverty', as World Bank researchers did when they changed the

poverty threshold as measured by daily income (converted to U.S. dollars at purchasing power parity) from $1.25 a day at 2005 prices to $1.90 a day at 2011 prices (Ferreira, Jolliffe and Prydz 2015). The decision to adjust the level to accommodate changes in living costs and exchange rates in dozens of countries around the world involved complex economic calculations. The World Bank's stipulation is used as a benchmark for policy development by governments and international agencies around the world. It is thus implicitly advocacy. One cannot determine what percentage of the world's population is living in extreme poverty until one stipulates what 'extreme poverty' means.

2.2.2.7 Making a term precise as a basis for research.

A working group of the International Association for Research on Cancer defined 'fruit' as meaning "edible parts of plants that contain the seeds and pulpy surrounding tissue, have a sweet or tart taste, and are generally consumed as breakfast beverages, breakfast and lunch side-dishes, snacks or desserts" (IARC working group 2003). This definition partly reports a meaning, since it is based on the use of the term 'fruit' and its equivalents in other languages in food guides in various countries around the world (including for example China and Australia). It also has a stipulative dimension in providing for its own discussion in the volume a uniform global definition that transcends differences in use from one country's food guide to another. Further, it serves an advocacy function, in that its authors, members of a working group on evaluating strategies for preventing cancer, describe it as "applicable in epidemiological studies" (IARC working group 2003, 1). The definition is thus a nice example of how one and the same act of defining can simultaneously report a meaning, stipulate a meaning, and advocate a position.

Another example of making a term precise for research purposes is the definition of an ordered pair $<x, y>$ in set theory as the set $\{\{x\}, \{x, y\}\}$ (Gupta 2019). Such definitions are called "explicative definitions" (Carnap 1956). They aim to respect

central uses of the term but otherwise are stipulative. They are constructed so as to serve a certain function in a certain context. For example, the just-mentioned definition of an ordered pair preserves the property that ordered pairs are equal if and only if their components are equal and occur in the same order, in a set-theoretic context where there is no concept of order (Gupta 2019). Carnap proposed that the defining part of an explicative definition should be similar in meaning to the defined term, exact, fruitful and simple. More recent work (e.g. Cordes 2020, Cordes and Siegwart 2018) has proposed a general structure for the activity of explicating, according to which it includes criteria of explicative adequacy specific to each explicative definition. Cordes (2020, 995) gives the example of an explicative definition of the term 'beauty' (as used in everyday aesthetic assessments) by means of the expression 'x is beautiful for y' (for use in a philosophical theory of beauty). He imagines someone proposing for such an explicative definition the criteria that (1) only perceptible things are beautiful to anyone, (2) not everything perceptible is beautiful to everyone, and (3) beautiful things are pleasing to the senses of the relevant beholder. On the basis of these criteria, the explicator might then propose the following explicative definition:

- Something is **beautiful** to somebody if and only if *it has been perceived by someone and that person is pleased by that perceptive experience*.

This definition can be shown to meet the proposed criteria of adequacy, with the help of such common knowledge as the fact that not everyone is pleased by all their perceptual experiences. The criteria could of course be challenged.

2.2.2.8 Introducing a term into an axiomatized mathematical or scientific theory:

Axiomatized theories like axiomatized arithmetic or plane geometry or Newtonian mechanics typically begin with a small

number of terms and then introduce new terms by definition. For example, axiomatized arithmetic might start with only the numeral '0', the sign '' meaning plus one, and the plus sign '+'. The minus sign '-' can then be introduced by a stipulative definition, as follows:

- $\underline{x} - \underline{y = z}$ if and only if $x = y + z$.

Mathematical logicians regard such stipulations as acceptable if and only if they are conservative (in the sense that they do not permit the proof of any essentially new claims) and the new term is eliminable (in the sense that the definition can be used to translate any sentence using the new term into the language into which it was introduced). They have devised rules for constructing such definitions that guarantee satisfaction of the criteria of conservativeness and eliminability. Precise specification of these criteria and rules go beyond the scope of this book. For details, the interested reader can consult (Gupta 2019).[21]

2.2.3 Constructing a stipulative definition

The examples just discussed exhibit the variety in stipulating meaning. Sometimes one is introducing a new term for a newly discovered kind of entity or phenomenon. Sometimes one is introducing a new label, which may or may not consist of old terms, for something already known to exist. Sometimes one is taking a term with a pre-existing use and making precise the boundaries of the class of things correctly labeled by the term, either through setting a numerical threshold or in some other way. Sometimes one is giving an existing term a new meaning as a label for a newly articulated concept. Sometimes one is just making clear how one is using a term that is ambiguous or vague.

21. Gupta (2018, 185) proposes that such definitions not only should be conservative in the sense indicated above but also should preserve the logic of the theory before the introduction of defined terms and should attribute rich content to the defined terms.

Stipulations vary in another respect. Sometimes they serve merely to indicate how the defined term is to be interpreted in the document where the stipulator announces its meaning. At other times the stipulator is directing that others use the term with the stipulated meaning in the context specified. An intermediate situation is one in which an author stipulates how a term is to be interpreted in the author's own work and simultaneously recommends, either implicitly or explicitly, that others use it that way in similar contexts; in such cases, the author of the definition is stipulating how the term is to be interpreted in the author's own work and is advocating rather than stipulating how others should use the term.

Taking this variety into account, the following guidelines for constructing stipulative definitions seem appropriate.

1. *Have a reason for stipulating*. No sensible person stipulates a meaning for a term without having some reason for doing so. It would not make sense, for example, to make explicit how the phrase 'reason for doing so' is being used in the previous sentence. The phrase has a clear meaning in ordinary English. The reader can reasonably be expected to understand it without being given a lengthy explanation of how it is being used.

2. *Have a good reason for stipulating*. If there is already a term in common use among one's addressees with the meaning one has in mind, do not invent a new term with that meaning. Use the term that is available and understandable.

3. *Be sure that you have the right to stipulate*. As previously stated, stipulating a meaning for a term presupposes that one has a right to say what the term is to mean in the context specified. If one is the author of a work, then one obviously has a right to say how the terms one uses are to be interpreted in that work. If one's stipulation goes beyond the work where the stipulative definition occurs, and includes a recommendation or request or direction to use the term in the way defined in specified contexts, then one must have some

authority to issue such a directive. The author of a scholarly or scientific work has no authority to direct anyone else to use a term in the way that the author uses it, but may have some standing to *suggest* that others use the term in this way. In contrast, a government agency collecting statistics has the authority to *prescribe* how individuals and organizations submitting data to it are to interpret the terms used in their statistical reports. An intermediate situation is one in which an individual or group has some authority to *recommend* what term should be used (or how a certain term should be used) in a specified context, as with the example of the standardization committee of a scientific society. Such a recommendation is a form of advocacy.

4. *Abide by your commitments*. If you commit yourself to using a certain term in a certain way in a given work, do not use the term in any other way in that work. In particular, do not take advantage of emotional or evaluative associations of the term in a pre-existing use different from the meaning that you have stipulated. Also, if the term is somewhat technical, like the term 'definition by genus and differentia', do not use another term with the same meaning. There is an obvious reason for sticking to your commitments in these two respects: doing otherwise risks confusing your readers.

5. *Be precise*. Generally, a stipulative definition should leave no objective uncertainty[22] about whether a particular case is correctly labeled by the term as defined. Stipulation loses its point if the stipulative definition is vague. Precision is

22. The phrase 'objective uncertainty' characterizes a situation where there is no fact of the matter about whether it is correctly labeled by the term. There can be *subjective* uncertainty about the application of the most precisely defined terms, in the sense that a particular individual may not know whether the conditions for its correct use are met in a particular case. For example, in the game of chess the term 'winning strategy' is quite precisely defined, as follows: A player has a winning strategy at a certain point in the game if and only if at that point the player can win the game no matter what the opponent does. At any point in any game, it is *objectively* certain whether a given player has a winning strategy. But it may be *subjectively* uncertain to the two players, in that they do not know whether the given player has a winning strategy.

particularly important in legal contexts, in scientific research, and in the collection of statistical data.

6. *Be unambiguous*. Make sure that the phrase or sentence or sentences that you use have just one meaning in context. In some contexts, it may be necessary to stipulate a meaning in order to remove an ambiguity in a term. In *Frigaliment Importing Co. v. B.N.S. International Sales Corp.* (190 F.Supp.116 (S.D.N.Y. (1960)), a dispute arose over the failure of a contract to specify the meaning of the word 'chicken'. The plaintiff, Frigaliment, who had ordered chickens of two sizes, contended that "'chicken' means a young chicken, suitable for broiling and frying." The defendant, who had supplied stewing chicken rather than broilers of the larger size, insisted that a chicken is "any bird of the genus that meets contract specifications on weight and quality, including what it calls 'stewing chicken'." (Schane 2002) The law suit would have been avoided if the contract had stipulated what it meant by 'chicken'.[23] Such stipulations should in turn avoid having a double meaning.

7. *Pick a meaning that serves your purpose*. Unlike reportive definitions, stipulative definitions are neither true nor false. In general, there is no pattern of pre-existing usage to which one's stipulative definition must conform. Sometimes, however, the purpose for which one is stipulating a meaning can provide criteria to be fulfilled—particularly where one is making precise for use by others which objects are correctly labeled by a term whose existing usage is vague. Section 2.2.5 will discuss four such examples.

8. *Avoid misleading new nomenclature*. If you are inventing a term for some concept, do not choose a term that will mislead people about what it means. Do not choose a technical term for a scientific theory that is already used in the theory with another meaning; Gigerenzer (2017) gives two examples of

23. It would also have been avoided if the contract had used the term 'broiler chicken' instead of 'chicken'.

violation of this rule in cognitive psychology. He reports that researchers use the term ‘overconfidence bias’ for six logically and operationally independent phenomena (137) and use the term ‘availability heuristic’ for five vaguely characterized cognitive processes that appear to be not even empirically correlated (138). If the new term is to be used in communication to the general public, do not choose a term that is already in common use with a different meaning, Ennis (1980) calls the use of such misleading terminology ‘impact equivocation’, a term he invented to capture the property of having the impact of an equivocation. People who use the misleading technical terminology are often not aware of its double meaning or of the danger that their addressees will misinterpret their use of the term. Their use of the term has the impact of an equivocation, even though they are not consciously equivocating. Section 2.2.6 will discuss three examples of such misleading nomenclature: the terms ‘valid argument’ in logic, ‘significant difference’ in statistics, and ‘reliable test’ in psychometrics.

9. *Introduce informative nomenclature.* When introducing new terminology, it is helpful to choose a term that will communicate the intended meaning to addressees without elaborate explanation. For example, when the term ‘business day’ was introduced, it would have taken little effort for readers and listeners to grasp what was intended. The new term ‘thrombin activatable fibrinolysis inhibitor’, mentioned in the previous section, conveys well to specialists in thrombosis and haemostasis that it refers to a substance that can be activated by thrombin and that inhibits fibrinolysis, since those specialists already understand the terms ‘thrombin’ and ‘fibrinolysis’. It is not a requirement for good stipulation that new nomenclature should carry its meaning on its face, but it is helpful. What is a requirement is that one not mislead.

10. *Do not create a contradiction*. Stipulative definitions can create a contradiction. Consider for example the following

stipulative definition:

- A **normal** set is a set *that is not a member of itself*.

This definition of the introduced term ‘normal’ (when said of sets) can be accompanied by examples (e.g. the set of apples, which is not an apple and thus is a normal set) and non-examples (e.g. the set of sets with more than one member, which is itself a set with more than one member and thus is not a normal set). The definition seems clear, and might be useful. However, consider the set of normal sets. If it is a member of itself, then it is not a normal set and thus, by the definition of a normal set, it is a member of itself. On the other hand, if it is not a member of itself, then by the definition of a normal set it is a normal set, and thus is a member of itself. Either way, there is a contradiction (Irvine and Deutsch 2016). A stipulative definition can also create a contradiction when combined with accepted statements. Consider for example the following definition in a law providing for spousal support after the break-up of a marriage or common-law relationship:

- “**spouse**” means *a spouse as defined in subsection 1 (1), and in addition includes either of a man and woman who are not married to each other and have cohabited,*
  (a) continuously for a period of not less than three years, or
  (b) in a relationship of some permanence, if they are the natural or adoptive parents of a child. (*Family Law Act, Revised Statutes of Ontario* 1990, c. F.3; available at https://www.ontario.ca/laws/statute/90f03/v1#BK32; accessed 2020-01-19)

This stipulative definition belongs to a system of law that includes the Canadian Charter of Rights and Freedoms, which the Supreme Court of Canada has interpreted to bar discrimination on the ground of sexual orientation. Since the definition allowed spousal support for a formerly cohabiting common-law partner of the opposite sex but not for one of

the same sex, it discriminated against same-sex common-law couples on the ground of their sexual orientation, and thus created an inconsistency in the law. The Supreme Court of Canada therefore struck down the section that included the definition and gave the legislature six months to replace it with one that was consistent with the Charter (M. v. H., [1999] 2 SCR 3; available at https://scc-csc.lexum.com/scc-csc/scc-csc/en/item/1702/index.do; accessed 2020-01-19). The Ontario legislature replaced the inconsistent definition with the following definition:

- "**spouse**" means *a spouse as defined in subsection 1 (1), and in addition includes either of two persons who are not married to each other and have cohabited,*
  (a) continuously for a period of not less than three years, or
  (b) in a relationship of some permanence, if they are the parents of a child as set out in section 4 of the Children's Law Reform Act. ("conjoint") (*Family Law Act, Revised Statutes of Ontario 1990*, c. F.3; available at https://www.ontario.ca/laws/statute/90f03#BK35; accessed 2020-01-19)

2.2.4 Evaluating a stipulative definition

Evaluating stipulative definitions, whether one's own or those of others, involves applying retroactively the guidelines for constructing them. Each guideline can thus be transformed into a question to be asked about an already constructed stipulative definition, as follows:

1. What is the reason for this stipulation?
2. Is it a good reason?
3. Does the stipulator have the right to stipulate this meaning? If the stipulator is requiring that others use the stipulator's term with the stipulated meaning, does the stipulator have the authority to impose such a requirement?

4. Does the stipulator abide by the commitment implicit in the stipulation? In particular, if the stipulation is an announcement that the stipulator will use a known term in a specified way in a specified context, does the stipulator actually use the term that way? If the stipulation is an announcement that the stipulator will use a specified nomenclature in a specified context, does the stipulator stick to that nomenclature and not switch to some other term for the same thing? Thus there are two confusing deviations to watch for: (1) using the term whose meaning has been stipulated with some other meaning, and (2) using another term with the same meaning instead of the term that the stipulator has committed to use. A subtle variant of the first deviation is to take advantage of associations that the term has in its ordinary meaning and attach them to what the term has been stipulated as meaning. For example, someone using the stipulated technical definition of the term ‘reliable test’ as meaning a test that gives consistent results might report that a certain test of school children’s mathematics skills is reliable, taking advantage of the ordinary meaning of ‘reliable’ as dependable. An example of the second deviation would be switching in the middle of this essay from using the term ‘reportive definition’ to using the term ‘lexical definition’ instead, for the same concept.

5. Is the definition precise? Or, on the contrary, does it leave indeterminate whether some instances are correctly labeled by the term, especially where it is important to know whether the instances are correctly labeled by the term?

6. Is the definition unambiguous? Or, on the contrary, does some word or phrase in the definition have more than one possible interpretation, even when one takes the context into account? Or is there some grammatical ambiguity, such as a relative pronoun ‘which’ that has two possible referents earlier in the definition?

7. If the stipulation makes the meaning of an existing term

precise for use by others, does the meaning specified serve well the purpose for which others are being asked to use this term? Section 2.2.5 will illustrate this sort of question with reference to stipulative definitions of the terms ‘segregated’, ‘poverty’, ‘fruit’, and ‘unemployed’.

8. If the stipulation is a proposed nomenclature for a theoretical concept, does the term chosen avoid impact equivocation? Section 2.2.6 will illustrate the problems that can arise when a misleading name in adopted, with reference to the adoption of the technical terms ‘valid argument’, ‘tests of significance’ and ‘reliable observation’.
9. If the stipulation is a proposed nomenclature for a theoretical concept, does the term chosen communicate accurately the concept being named?
10. Does the stipulation create a contradiction, either by itself or in combination with other components of a system (legal or theoretical) of which it is a part?

2.2.5 Making a term’s meaning precise for a purpose: some examples

This section illustrates the process of making a vague term in ordinary use precise for a specified purpose, with reference to four examples, two of them already mentioned as examples of stipulation in section 2.2.2.

‘**Segregated**’: The superintendent had to provide a usable and defensible basis for adjusting school boundaries so that no school in the district would violate the Supreme Court’s ruling that segregated schools were unconstitutional. He chose to define ‘segregated school’ as meaning a school in which more than 80% of the students are of a given minority race. The 80% cut-off could be challenged as being too high to pass legal muster, on the ground that even a school with 75% to 80% of its students being of the minority race could be regarded as segregated; the defensibility of the 80% cut-off might depend on the percentage of students across

the district that belonged to the minority race. The terms ‘minority’ and ‘race’ could be challenged as vague, since the concept of race is not well established in the field of physical anthropology and can be applied in various ways to categorize human beings.[24]

‘**Poverty**’: The World Bank has set itself the goal of reducing the incidence of extreme poverty in the world to 3% by the year 2030 (Ferreira, Jolliffe and Prydz 2015), and so needs to have a way of assessing the extent of extreme poverty, which it has been trying to do since 1979. Ferreira, Jolliffe and Prydz (2015) explain the World Bank’s successive numerical thresholds for extreme poverty as setting “a demanding line which, first, reflects the standards of absolute poverty in the world’s poorest countries and, second, corresponded [*sic*] to the same real level of well-being in all countries”. Researchers therefore anchored the international poverty line on the national poverty lines of very poor countries and used purchasing power parity exchange rates (PPPs) to convert the lines into the U.S. dollar and then into the currencies of each developing country. A recent adjustment from $1.25 a day at 2005 exchange rates to $1.90 a day at 2011 exchange rates was designed to reflect improvements in the system for measuring PPPs while at

24. The United States Census Bureau, following the 1979 standards of the Office of Management and Budget, gives those completing its census forms a choice among five “races”, labeled as such: White, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander (https://www.census.gov/topics/population/race/about.html; accessed 2021-01-12). Each category is defined, but respondents self-identify. As of the 2000 U.S. census, but not before, the census allowed a person to be classified as being of more than one such “race”. In Canada, the 2006 long form census asked, “‘What were the ethnic or cultural origins of this person’s ancestors?”, allowing more than one response and providing some examples (http://www12.statcan.gc.ca/census-recensement/2006/ref/dict/overview-apercu/pop4-eng.cfm; accessed 2021-01-12). The most common response, chosen by 32% of respondents in the 2016 census, was Canadian, which is not an ethnic status (https://en.wikipedia.org/wiki/Demographics_of_Canada#Ethnic_origin; accessed 2021-01-12). The 2016 long form census added the question (without using the term ‘race’ or defining any of the choices) whether a person was White, South Asian, Chinese, Black, Filipino, Latin American, Arab, Southeast Asian, West Asian, Korean, Japanese, or Other, with the opportunity to mark more than one of them (http://www12.statcan.gc.ca/nhs-enm/2016/ref/questionnaires/questions-eng.cfm; accessed 2021-01-12).

the same time keeping the international poverty line the same in real terms (Ferreira, Jolliffe and Prydz 2015). This explanation of the new stipulative definition seems both clear and convincing.

'**Fruit**': The working group on the evaluation of cancer-preventive strategies justifies its definition of 'fruit' (quoted in section 2.2.2.7) with comprehensive and careful reference to what the food guides of various countries define as fruit. The definition thus reports a meaning: the central tendency of the use in various countries' food guides of the term 'fruit' (and its equivalents in other languages). It stipulates how readers are to interpret the authors' use of the term 'fruit' in the volume in which the definition appears. And it implicitly advocates its use by others by describing its definition as "applicable in epidemiological studies" (IARC working group 2003, 1).

'**Unemployed**': Another example of stipulative definition constrained by its further purpose is the definition of 'unemployed' by government agencies collecting statistics. In the United States, the Bureau of Labor Statistics classifies people as unemployed if "they do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work" (https://www.bls.gov/cps/cps_htgm.htm#unemployed; accessed 2020-01-19). In Canada, Statistics Canada uses a somewhat more nuanced definition of unemployed persons as "those who, during reference week, <either> were on temporary layoff … with an expectation of recall and were available for work; or were without work, had looked for work in the past four weeks, and were available for work; or had a new job to start within four weeks and were available for work" (http://www.statcan.gc.ca/pub/71-543-g/2010001/part-partie2-eng.htm, punctuation altered; accessed 2020-01-19). Both definitions have been the target of criticism for not counting people as unemployed if they have given up looking for work but are available for work and would look for work if economic conditions improved, as well as for failing to provide a category for "under-employed" people who are working part-time but are actively seeking full-time work, which they would prefer. The economic historian David Card characterizes the emergence of the modern globally used definition of unemployment in terms

of active search as “a remarkable triumph of practical measurement needs over persistent concerns about the absence of theoretical underpinnings” (Card 2011, 552). The debates among statisticians in the 1930s about how to measure unemployment illustrate the possibility of having reasoned discussion about how to give a precise meaning to a vague term in common use. The legitimate objections to the stipulative definition of ‘unemployed’ in terms of active search can be accommodated by collecting information about whether those working are employed full-time or part-time and by tracking the labour force participation rate.[25]

2.2.6 Impact equivocation

Section 2.2.3.8, entitled “Avoid misleading new nomenclature”, cautioned against introducing nomenclature that already has a different meaning in ordinary use. To adopt such nomenclature is to run the risk of so-called ‘impact equivocation’, i.e. having the impact of speaking ambiguously and exploiting the ambiguity. This section draws to the reader’s attention three examples of such bad choices of technical nomenclature, which unfortunately have become deeply and perhaps irremovably entrenched in the fields that adopted them.

‘Valid argument’: In the Hellenistic period of Greek and Roman antiquity, logicians needed a term for the property of some arguments that their conclusion follows necessarily from their premisses. They picked the Greek word for ‘healthy’ (‘*hugiês*’, from which comes the English word ‘hygiene’), which was duly

25. The website of the United States Department of Labor defines ‘labor force participation rate’ as follows: "The labor force is the sum of employed and unemployed persons. The labor force participation rate is the labor force as a percent of the civilian noninstitutional population." (https://www.bls.gov/cps/lfcharacteristics.htm#laborforce; accessed 2021-01-12). This definition is an inaccurate report of the definition that the department uses in calculating the rate, as can be seen by looking at the graph of the labour force participation rate over time at https://www.bls.gov/charts/employment-situation/civilian-labor-force-participation-rate.htm. The department calculates the rate as a percentage of the population aged 16 and over, not as a percentage of the entire population.

translated into the Latin word for 'healthy' ('*validus*'), which in turn was borrowed by most European languages, including English. As a result, logicians writing in English use the term **'valid argument**' for an argument whose conclusion follows necessarily from its premisses. The term is seriously misleading, since in ordinary speech 'valid' means legitimate, as when one speaks of a "valid passport" or "valid driver's license". In ordinary speech, then, a valid argument would be understood to be an argument with merit, one that probably deserves to be accepted or at least given serious consideration. An argument with an obviously false premiss whose conclusion follows necessarily from its premisses is a "valid argument" only in the logician's sense; ordinarily, for example, one would not label as 'valid' the argument that pigs can fly, because they have wings and all winged animals can fly. Thus, calling an argument 'valid', using the logician's sense of the word, runs a serious risk of being misunderstood. To avoid such impact equivocation, careful writers and speakers use the term 'deductively valid' to indicate that they are using the term 'valid' in the logician's and not the ordinary sense. The reader might wonder what other term ancient logicians might have used to characterize an argument whose conclusion follows necessarily from its premisses. In Greek, they had the word '*sunagôn*', which means leading together, and would be translated into Latin as '*conducens*', conducting. A "conducting" argument would be one which led the premisses together to get to the conclusion.

'Significant difference': R. A. Fisher, in his seminal book *Statistical Methods for Research Workers* (1925), proposed a number of tests that could be used to determine on the basis of observation of two samples whether there was a difference in the populations from which they were drawn. If the second sample does not conform to the expectation created by the first sample, he wrote, then we infer (for example):

> that the treatment to which the second sample of organisms had been exposed did in fact make a material difference, or that the climate (or methods of measuring it) had materially altered. Critical tests of

> this kind may be called tests of significance, and when such tests are available we may discover whether a second sample is or is not significantly different from the first. (Fisher 1925, 43)

The phrase "may be called" suggests that this passage is the origin of the use of the term 'significant' in statistics to mean 'probably not due to chance'.[26] A significant difference is a difference that one would be very unlikely to find if there was no difference at all in the populations from which the samples were drawn. In ordinary speech, however, the word 'significant' either means important or means meaningful. Reports in the mass media of the discovery by researchers of a "significant difference" are thus likely to be interpreted as reports of the discovery of an important or meaningful difference. However, if samples are large, differences will be "significant" in the statistician's sense even if they are quite small and therefore unimportant, and meaningless for practical purposes. To avoid such impact equivocation, medical researchers identify the statistical use of the term by speaking of "statistical significance", which is contrasted with "clinical significance" or "clinical importance" (e.g. in Todd 1996 and van Tulder et al. 2007). Educational researchers sometimes contrast statistical significance to practical significance (e.g. Keselman et al. 1998). The qualifying adjective 'statistical', needed to avoid ambiguity, is however often omitted in reports of research results disseminated to the general public. The qualification would have been unnecessary if Fisher had chosen a less misleading term for the property of an observed difference in a sample being probably not due to chance. He might for example have called his tests 'tests of genuineness'.

'**Reliable test**': The theory of measurement distinguishes the accuracy of a test from its stability over repeated administrations. A bathroom scale is accurate if it gives a reading when a person steps on it that is the actual weight of the person. It is stable

26. The term 'significant' occurs in statistics much earlier, for example in the remark that, "when the probable error of random sampling is known we can tell whether the various drops taken show significant differences" ("Student" 1907, 351). But in such uses the term appears not yet to have the technical meaning that it acquired later.

if it will give the same reading if the person steps off it and then steps on it again. Obviously, accuracy and stability are two different things; if the bathroom scale is not set to zero when nothing is on it, it may be stable but will be inaccurate. For accuracy, psychometricians use the term 'validity' (Babbie 1998, 132).[27] For stability, they use the term 'reliability' (Babbie 1998, 129-133). The adoption of the term 'reliability' appears to go back to the 1920s. Thurstone (1932) reports: "A test that is subject to relatively small chance factors in its score is said to be reliable while a test with considerable variation from one occasion to another is said to be unreliable." (1932, 1) The phrase "is said to be" indicates a pre-existing use of the term 'reliable' in something like its contemporary meaning in psychometrics. Kelley (1921) uses the term 'reliable' in a technical sense in which it is contrasted to validity, but defines it in an unusual way:

> Many methods have been used in measuring the reliability of tests. By reliability is to be understood the extent to which the test measures that which in reality it does measure—not necessarily that which it is claimed to measure. (370)

But earlier writers on measurement (e.g. Spearman 1904, 239, 243; Watson 1904, 537; Ruediger and Hulbert 1914, 113) use the term 'reliable' in its ordinary sense of something that can be relied on; they assume that a reliable test is one that gives the correct result. Nowadays, however, the technical sense of the term 'reliable test' has become so entrenched that writers in psychometrics think that it is the ordinary sense. Trochim et al. (2016), for example, write: "In its everyday sense, reliability is the consistency or stability of an observation. You can infer the degree of reliability by asking the question—does the observation provide the same results each time?" (section 5.2a) On the contrary, 'reliability' in its everyday

27. They distinguish 'face validity', 'predictive validity', 'construct validity' and 'content validity'—distinctions ignored here.

sense means being something that one can rely on.[28] A reliable witness of an event is a witness who describes accurately what the witness observed. Reliable transportation is transportation that gets people where they want to go according to the scheduled timetable and without breaking down on the way. People unfamiliar with measurement theory are therefore likely to take a claim that a test or observation is reliable as meaning that it is accurate. The claim therefore has impact equivocation, since a grossly inaccurate observation can nevertheless be "reliable" in the technical sense, i.e. producing the same results each time, as with the bathroom scale not set to zero. A much better choice of nomenclature when the concept was introduced into measurement theory would have been the term 'consistency', which is used to explain what 'reliability' in its technical sense means. There seems to be no impact equivocation in referring to the different kinds of so-called "reliability" as test-retest consistency, inter-rater consistency, inter-item consistency, and so forth. Alternatively, the terms 'repeatability' or 'agreement' or 'stability' might have been used.

2.2.7. Summary on the act of stipulating a meaning

In summary, stipulating a meaning is stating how a term is to be interpreted or used in a specified context. When one stipulates a meaning of a term, one presupposes that one has the right to say how the term shall be interpreted or used in the context. A definition by a would-be stipulator who does not have this right is not a successful stipulation, but rather an attempted stipulation or a failed stipulation. The would-be stipulator in this case is advocating a position rather than stipulating a meaning.

Stipulations of meaning are common. They include statements by writers of what they will mean by a term, definitions at the beginning or end of legal documents, specification by agencies collecting statistical data of how the terms in the reports submitted

28. Trochim et al. (2016) later concede, at the beginning of section 5.2b, the difference in meaning between the everyday sense of 'reliability' and its sense in psychometric research.

to them are to be understood, introducing and standardizing nomenclature for technical or theoretical concepts, setting a numerical threshold for the things correctly labeled by a vague term, and making vague terms precise in non-numerical ways. In constructing a stipulative definition, one should consider first whether one has a reason for stipulating a term's meaning, if so whether it is a good enough reason, and whether one has the right to stipulate. Assuming positive answers to these questions, one should be precise and unambiguous, and should fit the specified meaning to one's purpose in stipulating. If the stipulation is the introduction of new nomenclature, one should first consider whether a new name is necessary. If it is, one should pick a name that will not be misunderstood as meaning something else, so as to avoid impact equivocation. Ideally, one should pick a name that uses familiar terms in a way that will communicate accurately its intended meaning. Although stipulative definitions are neither true nor false, they can be evaluated for acceptability using the criteria just mentioned for constructing them.

2.3 Advocating

2.3.1 Type of claim

In defining a term, one may be taking and advocating a position on an issue. Such definitions include so-called 'persuasive definitions' (Stevenson 1944), 'programmatic definitions' (Scheffler 1960) and 'theoretical definitions' (Papineau 1996). Following (Ennis 1996, 346-349), they will all be called 'positional definitions'.

Stevenson coined the term 'persuasive definition' as a name for the advocacy of ethical positions through the use of such phrases as 'true courage' or 'real terrorism'. Stevenson introduced his terminology in the context of a philosophical position known as emotivism, according to which value judgments, including ethical judgments, are expressions of emotion, with no truth-value. This

position is controversial. Even if one rejects it, one can recognize that Stevenson correctly identifies a type of definition that is used to advocate positions on value questions. Some writers (e.g. LeBlanc 1998, 125-127) count such definitions as a logical fallacy, on the ground that they disguise a controversial substantive position as if it were an uncontroversial definition of a term. A less extreme position is that such definitions have their place but need support, especially when a term has strong positive or negative emotional associations and the definition shifts the usual boundaries of the class of things labeled by the term.

Scheffler coined the term ‘programmatic definition’ as a contrast to Stevenson’s term ‘persuasive definition’, to label definitions whose primary role is practical and action-guiding rather than emotion-guiding (Scheffler 1960, 20, n. 9). Terms such as ‘profession’ and ‘curriculum’, Scheffler pointed out, single out things to which social practice is oriented in a certain way; for example, professions have a privileged status, and the curriculum constitutes the things that are to be taught. A programmatic definition of such a term either alters or endorses the range of objects currently labeled by a term linked to a social practice.

Theoretical definitions (Papineau 1996; Hurley 2008, 93) are supported by reference to a scientific theory, such as definitions in physics of ‘atom’ and in biology of ‘bear’.

The three just-mentioned types of definitions have in common that the definer takes and advocates a position on an issue. Persuasive definitions channel the emotions aroused by a term like ‘courage’ or ‘terrorism’ in a specific direction, programmatic definitions specify a program to be carried out in the name of the defined term, and theoretical definitions incorporate components of a scientific theory. Ennis (1996) introduced the term ‘positional definition’ as a general label for acts of defining that take and advocate substantive positions,

If a positional definition endorses an existing use of the term being defined, it is either explicitly or implicitly reporting what the term means in that use. If it proposes a new meaning for the term, or introduces the term for the first time, or shifts the boundaries of the class of things currently labeled by the term, it is

advocating that the term should be used in a specified context with the proposed meaning. The author may be stipulating that the term is to be interpreted that way in what the author says or writes. Thus positional definitions are sometimes also reportive definitions and sometimes also stipulative definitions.

What makes a definition positional is that it takes and advocates a position on an issue. If the issue concerns the boundaries of the class of things correctly labeled by an emotionally loaded term like ‘courage’ or ‘democracy’ or ‘terrorism’ or ‘profligacy’, then the positional aspect of the definition is its expression of, and invitation to, a specific sort of approval or disapproval of the character traits or political arrangements or actions signified by the defining part of the definition. In terms of Searle’s taxonomy of illocutionary acts (Searle 1976), such definitions are partly expressive and partly directive.

If the issue concerns the boundaries of the class of things correctly labeled by a term like ‘profession’ or ‘curriculum’ that is tied to a social practice, then the positional aspect of the definition is its recommendation that the social practice should include all and only the things which the defining part of the definition describes. For example, the definition of a school’s curriculum as “all the educational experiences of the pupils under the influence of the school” (cited by Scheffler 1960, 23, n. 11) implies an extension of a school’s responsibility from a formal course of study to include the individual social and psychological development of its pupils. In terms of Searle’s taxonomy of illocutionary acts (Searle 1976), such definitions are directives.

If the issue concerns the definition of a term that is embedded in a scientific theory, then it makes a factual claim whose justification is the justification of the theory in which it is embedded. In this respect, such a positional definition is the kind of illocutionary act that Searle (1976) calls a representative.

If the issue concerns how people should use a term, and the author of the definition does not have the authority to stipulate that others use the term in a certain way but is merely recommending this use, such a positional definition is what Searle (1976) calls

a directive, in this case not an order or command but a request. Accordingly the advocacy of the position is in need of defence.

2.3.2 Examples of positional definitions

The following section gives some examples of positional definitions and draws lessons from each example, in each case entitling the example by the type of positional definition that it illustrates.

2.3.2.1 Persuasive definition:

Consider the following persuasive definition:

- **True freedom**, from this standpoint, is the capacity *for acting according to one's true character, to be altogether one's self, to be self-determined and not subject to outside coercion*. (Lamont 1967, 114)

As the phrase "from this standpoint" indicates, Lamont is not himself endorsing the conception of freedom articulated in this persuasive definition.[29] The standpoint in question is that of a determinist who admits that thinking plays a causal role in human decision-making but holds that thought is causally determined like everything else, so that any choice made by a human being is just as causally determined as a sunrise by a chain of previous events, going back ultimately to factors over which the person has no control. For such a determinist, Lamont claims, freedom must be re-defined as the ability to act as one chooses, without external constraints. Lamont on the other hand argues for freedom of choice, in the sense of an ability to choose, within constraints, among alternative courses of action. Thus Lamont contrasts two competing conceptions of personal freedom, each requiring justification and having implications. It is no proof of either

29. Citations of this statement on the Web omit the phrase "from this standpoint", thus giving the misleading impression that Lamont endorses its content.

conception to insist, like a small child stamping its feet, that one of these conceptions is "true freedom". If one's positional definition of freedom is to deserve acceptance, it needs defence. The same holds for other definitions that prefix the term defined with a word like 'true' or 'real'.

Sometimes a persuasive definition is disguised as a reportive definition. For example, Ayn Rand writes as follows in her book *The Virtue of Selfishness*:

> In popular usage the word 'selfishness' is a synonym of evil; the image it conjures is of a murderous brute who tramples over piles of corpses to achieve his own ends . . . and pursues nothing but the gratification of the mindless whims of any immediate moment. Yet the exact meaning and dictionary definition of the word 'selfishness' is: concern with one's own interests. This concept does not include a moral evaluation; it does not tell us whether concern with one's own interests is good or evil; nor does it tell us what constitutes man's actual interests. It is the task of ethics to answer such questions. (quoted at https://aynrand.org/novels/the-virtue-of-selfishness/; accessed 2020-01-19)

Rand thus proposes the following definition as a correct report:

- **Selfishness** is concern *with one's own interests*.

A different picture emerges when one looks at the following online dictionary definitions:

- **Selfish**: devoted to or caring *only for oneself*; concerned primarily with *one's own interests, benefits, welfare, etc., regardless of others*. (https://www.dictionary.com/browse/selfishness; accessed 2020-01-20)
- **Selfishness**: the quality *of thinking only of your own advantage* (https://dictionary.cambridge.org/dictionary/english/selfishness; accessed 2020-01-20)
- **Selfishness**: the condition *of putting one's own interests before those of others* (https://www.yourdictionary.com/selfishness; accessed 2020-01-20)

In promoting selfishness as a virtue, Rand has removed from the common meaning of the term ‘selfishness’ the important qualifier ‘only’. As a reportive definition, her claim is false. As a persuasive definition, shifting the boundaries of application of the term so that it can be argued to name a virtue rather than a vice, it needs justification, especially given the danger that she will be misunderstood as advocating selfishness as it is ordinarily understood—namely, as caring only for one’s own interests when the situation calls for taking the interests of others into account as well. Rand’s redefinition of ‘selfishness’ can usefully be contrasted with the definition of the same term by the biologist Richard Dawkins in his book *The Selfish Gene*:

> An entity … is said to be altruistic if it behaves in such a way as to increase another such entity’s welfare at the expense of its own. Selfish behaviour has exactly the opposite effect. “Welfare” is defined as “chances of survival”, even if the effect on actual life and death prospects is … small … It is important to realize that the above definitions of altruism and selfishness are behavioural, not subjective. (Dawkins 1976, 4-5)

Dawkins is here stipulating how he will use the words ‘altruistic’ and ‘selfish’ in his book, which is a popular presentation of a version of the theory of biological evolution that takes the unit of evolution to be the gene (which is the postulated unit of heredity in the genetic makeup of a living organism). He defends his stipulation in Humpty-Dumpty fashion[30] on the ground that “words may be redefined in special ways for technical purposes” (Dawkins 1981, 557). He thus presents his definition as a theoretical definition, which is a type of positional definition. His choice of the terms ‘altruistic’ and ‘selfish’ for behaviours that differentially favour respectively the chances of survival of another organism or of the organism engaging in the behaviour is however tendentious and potentially misleading. It runs the risk of

30. “‘When I use a word,’ Humpty Dumpty said, in rather a scornful tone, ‘it means just what I choose it to mean—neither more nor less.” (Lewis Carroll, *Through the Looking-Glass*)

impact equivocation (discussed in section 2.2.6, entitled "Impact equivocation").[31]

2.3.2.2 Programmatic definition:

Consider the following definition:

- **Learning** is the lifelong process *of transforming information and experience into knowledge, skills, behaviors, and attitudes*. (Jeff Cobb, "Definition of learning", at http://www.missiontolearn.com/definition-of-learning/; accessed 2020-01-20)

The author of this definition remarks that it drives his efforts at his website Mission to Learn. Thus it clearly constitutes a programmatic definition in Scheffler's sense of a definition that is meant to guide a social practice, in this case the practice of learning from one's personal experience and from information one acquires. The author does not claim to report the ordinary meaning of 'learning', and indeed in ordinary speech one can refer to someone learning something (e.g. learning that birds are reptiles) without supposing that in so doing the person is transforming information or experience into knowledge, skills, behaviors or attitudes. In ordinary speech, learning is sometimes just getting information, without any transformation of it. Further, it may be just a single event, not a lifelong process. Cobb is implicitly directing his readers to interpret the word 'learning' when it appears on his site as having the meaning that he ascribes to it, and in this sense he is stipulating a meaning for the term. But he has no authority to require or even officially recommend that his readers use the word 'learning' as he does. Rather, he is advocating that they do so. Cobb's definition invites his readers to view their episodes of getting new information and new experiences as part of a lifelong process in which they transform these inputs into

31. I thank Frank Fair for bringing to my attention these definitions of 'selfishness' and 'selfish'.

a coherent complex. As with other programmatic definitions, it needs to be judged by its implications for the social practice that it seeks to guide.

Here is another example of a programmatic definition:

- **Critical thinking** is *reasonable reflective* thinking *that is focused on deciding what to believe or do* (Ennis 1987, 10).

This definition is programmatic, because it is advanced as a basis for educational policy. It is also a reportive definition, because its author (Ennis) claims that the term 'critical thinking' is generally used with this meaning. His definition shows how a definition can be both positional and reporting.

2.3.2.3 Positional definition proposed to guide policy:

Suppose that a state department of education proposes the following definition of 'segregated':

- *A percentage greater than 80% of a school's population's being of a given minority race* means that **the school is segregated**.

This is a contextual definition of the term 'segregated'. Assuming that segregated schools are illegal, the definition is a positional definition. By implication it expresses the position that a school with more than 80% of its students of a given minority race is in violation of the legal ban on segregated schools, but that a school with 80% or fewer of its students of a given minority race is not. It is a definition that takes a position on an issue. In this case, the position is one that would guide policy if it is accepted, in particular the policy of school districts in the state with regard to setting boundaries for school catchment areas. The adequacy of this proposed definition was discussed earlier in section 2.2.5 on making a term's meaning precise for a purpose.

A definition of 'marriage' that requires that it be a union of a man and a woman is a positional definition, typically put forward

in debates over legal or religious recognition of same-sex committed unions as ‘marriage’. Its advocates defend the definition by appeal to a set of values concerning people and sexual orientation, as well as by appeal to statements and decisions by some authorities. They also appeal to the fact that it is the traditional definition of ‘marriage’, and in doing so are reporting its meaning. Their definition is both positional and reporting.

Carter et al. (2016) propose for health policy and practice the following definition of overdiagnosis:

- **Overdiagnosis** is occurring in respect of that condition [a condition prevalent in a population that is customarily labeled with diagnosis A—DH] in that population when *(1) the condition is being identified and labelled with diagnosis A in that population (consequent interventions may also be offered); (2) this identification and labelling would be accepted as correct in a relevant professional community; but (3) the resulting label and/or intervention carries an unfavourable balance between benefits and harms.*

This definition has a reportive aspect, in that the authors are defining the term ‘overdiagnosis’ in a way that corresponds roughly to its sense in discussions of health policy. It is not purely stipulative; the authors are not just announcing how they use the term or ordering other people over whom they have authority to use the term in that way. Rather, it is advocacy. The authors are advocating use of their definition as a basis for discussions about the ethics of overdiagnosis and its prevention. Hofmann (2016) praises their contribution in the following words: “Clarification of overdiagnosis is strongly needed as there are heated debates on overdiagnosis, both with regards to its existence, extension and its effects.”

Debates about definitions are often guided by their policy implications. Schiappa (2003) discusses in illuminating detail the policy implications of debates over how to define the terms

'death'[32], 'rape', 'wetlands', 'person' and 'obscenity'. Such debates can lead to a confusing proliferation of definitions; Miles (2017) identifies 593 different definitions of the term 'stakeholder' as used in business ethics, and proposes a system for classifying them. Schiappa's proposal for what he calls a "pragmatic approach" to definition fits such debates well. It is of less relevance to definitions that report or merely stipulate a meaning or to theoretical definitions, to be mentioned next.

2.3.2.4 Theoretical definition:

Consider the following definition:

- The smallest unit *that an element can be divided into and still remains identifiable as that element* is called the **atom**. (Chandrasekharan and Gupta 2006, 3)

This definition reports the accepted definition of the term 'atom' in contemporary physics and chemistry. The original definition that it reports is positional, because it takes a position on the structure of matter. Its defense is the defense for the theory in which it plays a role. It is part of the total scientific theory being advanced.

There can be controversies concerning theoretical definitions. In the early stages of modern chemistry, for example, Antoine-Laurent Lavoisier and John Dalton proposed competing definitions of the term 'element'. Lavoisier wrote as follows:

> … if, by the term *elements*, we mean to express those simple and indivisible atoms of which matter is composed, it is extremely probable we know nothing at all about them; but, if we apply the term *elements*, or *principles of bodies*, to express our idea of the last point which analysis is capable of reaching, we must admit, as elements, all the substances into which we are capable, by any means, to reduce bodies by decomposition. (Lavoisier 1790/1789, xxiii)

32. Veatch and Ross (2016), for example, argued that the definition of death should focus on "what change in a human being is so fundamental that we can say the individual is no longer with us as a member of the human community bearing rights such as the right not to be killed." (p. 22)

Dalton on the other hand argued for:

> the importance and advantage of ascertaining *the relative weights of the ultimate particles, both of simple and compound bodies, the number of simple elementary particles which constitute one compound particle, and the number of less compound particles which enter into the formation of one more compound particle*. (Dalton 1808, 213)

Dalton's conception of an element as something composed of an ultimate particle or atom proved to be more fruitful than Lavoisier's conception of an element as a substance into which we are able to decompose bodies. In general, when choosing between extensionally equivalent but intensionally different theoretical definitions, a researcher should choose concretely rather than abstractly, in the light of such factors as the researcher's goal, the task at hand, the researcher's knowledge, and the system of science in which the research is being done. Further, such a researcher should choose a definition whose defining part offers more possibilities for transition to a quantitative analysis and for deducing corollaries about the things correctly labeled by the term being defined (Gorsky 1981, §6.6). These criteria for a theoretical definition take the place of the traditional demand that a theoretical definition should state the essence of the kind of thing to which the defined term refers. Section 6.2, "Real versus nominal definitions", makes a case for doubting the existence of essences.

A contemporary controversy over a theoretical definition concerns the definition in biology of the term 'life'. Trifonov (2011) assigned to nine groups the terms used in 123 definitions of life, noted that some groups implied others, and used these implications to propose the following concise two-component definition:

- "**Life** is self-replication *with variations*." (Trifonov 2011, 262)

This definition, he noted, corresponds to the current biological consensus that life began on Earth in two stages—first exact

replication, then variance in subsequent replications. The variance is necessary for evolution. Trifonov's definition is applicable not just to the life on Earth that biologists know about but also to extraterrestrial life, which might be based on a different chemistry, and to artificial life. In contrast, a panel organized by the National Aeronautics and Space Administration (NASA) of the United States proposed the following more complex definition:

- "**Life** is a *self-sustaining* chemical system *capable of Darwinian evolution*." (https://astrobiology.nasa.gov/research/life-detection/about/; accessed 2020-01-20)

NASA's definition, although intended to guide its missions to detect life beyond Earth, is explicitly grounded in the observed characteristics of life as we know it on Earth. Its selection of chemical systems as the genus to which life belongs excludes artificial, non-chemical systems from being life. Its inclusion of being self-sustaining as part of life's differentia appears to exclude viruses from being alive, since they are not self-sustaining, and also appears to require some sort of metabolic process to sustain life. Cleland (2012, 2019) argues that analysis of humans' concept of life cannot establish what life as a natural kind is like; for one thing, our conception of life has changed over the centuries with the progress of scientific inquiry. Further, she argues, it is not clear that life, if it is a natural kind, is constituted by a set of individually necessary and jointly sufficient conditions. In the terminology of the present essay, a theoretical definition of the term 'life' is not a reportive definition of how biologists use the term 'life'. It is a positional definition, whose defence requires its embedding in a well-supported complex theory. At the moment, there is no such theory. Biologists believe that all known living organisms on Earth descend from a last universal common ancestor (Cleland 2019, 135). Their proteins are all constructed from the same subset of 20 (directly genetically encoded) amino acids out of the more than 100 amino acids in the natural environment, and the molecule that encodes their genetic information (deoxyribonucleic acid, or DNA) is based on carbon (Cleland 2019, 107-114). In principle,

life forms could emerge whose proteins were constructed from a different set of amino acids or whose encoding molecule was based on a different element, such as silicon (Cleland 2012, 126). A universal theory of life would have to embrace such unknown possibilities. There is an obvious circularity in trying to construct a definition of the term 'life' that encompasses living organisms unlike those known to exist on Earth. We only know that such strange entities are living if we have a conception of life that is broader than the one based on familiar living organisms, but acquiring such a broader conception requires examples of non-Earth-like life. Knuutila and Loettgers (2017) have argued, however, that definitions of the term 'life" are useful for highlighting the difference among biologists between focusing on individual organisms and focusing on networks of organisms, for loosely bridging different disciplinary perspectives on the same set of phenomena (without integrating them into any theoretical system), and for seeking out unfamiliar examples within the domain. Astrobiologists look for signs of the presence of life that one would expect given a host of theoretical principles from different disciplines (Knuutila and Loettgers 2017, 1197-1199). But these expectations depend also on a partial criterion for life in general, such as metabolism. In opposition to such a dependence on a theoretically ungrounded quasi-definitional criterion, Cleland (2012, 2019) argues for a different approach of searching for anomalies, using alternative tentative criteria that only some life-forms on Earth may meet, as well as unusual formations that are thought unlikely to arise without living organisms to produce them. She points out that scientific progress in the past has depended on abandoning folk concepts and generating new ones, as in Newton's replacement of the concept of impetus (an internal cause keeping an object in motion) with inertia (continuing in a state of rest or motion in a straight line unless acted on by a force). Something similar, she argues, may be necessary in biology to arrive at a universal theory of life. Freezing current conceptions of life through the construction of a definition may impede scientific progress.

Kuhn (1970) argued that in scientific revolutions, such as the displacement of Newton's mechanics by Einstein's theory of special relativity, the new theory is incommensurable with the old one, because it uses the same theoretical terms with a different meaning. For example, Newtonian mass is conserved, whereas Einsteinian mass is convertible to energy. The example indicates that Kuhn takes a theoretical definition to be provided by the axioms of the theory to which it belongs.[33] Because advocates of the competing theories use the same terms in different ways, neither can prove their theory to the other; to understand the other point of view, each advocate must translate it into their own terminology, a process that can lead to an appreciation of its merits and defects with respect to such factors as fruitfulness and scope. The new theoretical definitions, Kuhn contends, are accepted as a result of persuasion and conversion rather than proof.

Gorsky (1981, §7.2) distinguishes three ways in which scientific investigation comes to reject a theoretical definition. (1) It may be discovered that the extension of the term being defined differs from the extension of the defining part of the definition, in either direction. An example is the change in physics in the definition of the term 'velocity', in order to accommodate the theory of special relativity, which made velocity relative to a frame of reference. (2) It may be discovered that, although things exist that are correctly labeled by the defined term, nothing satisfies the defining part of the definition. An example is the abandonment of the definition of a whale as a kind of fish, since whales exist but it was eventually realized that none of them are fish. (3) It may be discovered that nothing is correctly labeled by the term being defined and nothing satisfies the defining part of the definition. An example is the definition of phlogiston as the element of combustibility contained in substances capable of burning; once it was discovered that burning is the combination of the thing burnt with oxygen

33. Cleland (2012) claims on the contrary that Kuhn's argument for the incommensurability of rival theories with different "paradigms" (Kuhn 1970, 43-51) rests on an assumption that terms for natural kinds refer to concepts in the minds of those who use them. However, Kuhn seems to regard such concepts as internalizations of the definitions implied by the axioms of an accepted theory.

rather than the driving out of something from the thing burnt, science abandoned both the term ‘phlogiston’ and its definition. Other examples of such abandonment are the terms ‘caloric’ (a supposed internal substance responsible for body heat) and ‘ether’ (in its former use to label a supposed medium filling all space and supporting propagation of electromagnetic waves).[34]

Gigerenzer (2017, 138-141) illustrates another way in which scientific discoveries can change theoretical definitions. He distinguishes two ways in which a person can make diagnostic decisions. One way is through a fast and frugal decision tree.[35] Another way is to set a decision criterion for a positive diagnosis.[36] The two methods, it was discovered, are functionally equivalent ways of balancing misses and false alarms. Hence it became necessary to stop treating the terms ‘balancing misses and false alarms’ and ‘setting the decision criterion’ as interchangeable, since balancing misses and false alarms can also be modeled by an exit structure for a decision tree. In general, then, scientific discoveries can show that terms formerly regarded as equivalent must be given distinct non-equivalent definitions.

34. Gorsky (1981, §7.2) points out that a classical universally quantified biconditional expressing such definitions (such as ‘for any x, x is phlogiston if and only if x is the element of combustibility in substances capable of burning’) is true, because both sides of any instance of such a biconditional are false. Hence classical universally quantified biconditionals are inadequate representations of theoretical definitions.
35. One of Gigerenzer’s examples is a recommended procedure for deciding in Afghanistan whether a car approaching a checkpoint is a suicide attacker. One determines first if the car has more than one occupant (meaning it is not a suicide attacker), then (if the car is occupied by one person) whether it is approaching at high speed (meaning it is a suicide attacker), then (if the car is occupied by one person and not approaching at high speed) whether there is a match with intelligence information (meaning it is a suicide attacker but otherwise is not). His other examples are deciding whether to grant unconditional bail, deciding whether to refer a patient with severe chest pain to a coronary care unit for treatment of a suspected heart attack, and deciding on the basis of a series of tests whether someone has an HIV (human immunodeficiency virus) infection.
36. This method comes from signal detection theory, and fits situations where the decision-maker knows the probabilities of false positive diagnoses and of false negative diagnoses given a specified value of the diagnostic criterion.

Cellucci (2018) has challenged a contemporary consensus among philosophers of mathematics that definitions in mathematics are mere stipulative abbreviations. According to this consensus, mathematical theories are axiomatic systems whose theorems reveal what follows if the axioms are accepted and whose definitions introduce new terms as convenient abbreviations; such definitions must be eliminable and non-creative.[37] According to this consensus, a mathematical definition merely stipulates the meaning of a term, is an abbreviation, is always correct, can always be eliminated, and says nothing about the existence of the thing defined (Cellucci 2018, 606). Cellucci objects that the consensus conception applies to formal abstractions from mathematical practice, and ignores the creative work of mathematicians in arriving at their theories. Creative mathematics, he asserts on the basis of examples, is a heuristic activity (an activity of discovery) in which mathematicians use non-deductive means like analogy and metaphor to find hypotheses that solve problems. Among these hypotheses are definitions, which play a role in discovering solutions to problems (a "heuristic" role, in Cellucci's terminology). For example, in antiquity there were two rival definitions of a sphere. According to one definition:

- A **sphere** is [a solid figure] with its centre equidistant from its extremes in all directions. (Plato, *Timaeus* 33b4-5; similarly Aristotle, *On the Heavens* II.14.297a23-25; and Theodosius ([c. 2nd century BCE] 1852, I, Def. 1)

Euclid on the other hand defined a sphere in terms of motion:

- A **sphere** is the figure *comprehended when, the diameter of a semicircle remaining fixed, the semicircle is carried around and restored again to the same position from which it began to be moved*. (Euclid, *Elements*, Book XI, Definition 14; similarly Archimedes, *On sphere and cylinder*, I, Prop. 23).

37. Suppes (1957, 152-155) articulates and justifies these two criteria. Gupta (2019) discusses them at length.

According to Cellucci, Euclid preferred his definition of a sphere because it helped him to find solutions to problems that he had set himself concerning the five Platonic solids (pyramid, cube, octahedron, dodecahedron, icosahedron): to construct them, to comprehend them in a sphere, and to characterize the relation between the length of an edge of the figure and of the diameter of the sphere in which it was comprehended. Archimedes used Euclid's definition of a sphere because it helped him to find a solution to the problem of computing the area of the surface of a sphere. A "heuristic" conception of mathematical definitions, Cellucci holds, can account for the way a suitable definition can help to solve a problem, for mathematicians' use of concepts for a long time before they find a suitable definition for them, for definitions turning out to be incorrect, for the usual inability to eliminate a definition, and for mathematicians' assumption that the thing defined exists. Further, it can account for five facts that he demonstrates:

a. Two extensionally equivalent definitions of the same concept may have different heuristic values.
b. Definitions in mathematics are not starting points but arrival points in the solution to problems.
c. There is no circularity of definitions and theorems.
d. Many definitions are proof-generated.
e. Definitions in mathematics can be justified.

The stipulative conception of definition, he contends, can account for none of these things. Thus on Cellucci's account many definitions in mathematics are in the terminology of the present essay not stipulative but positional.

2.3.2.5 Stipulative definition of a term by a scientific community:

Theoretical definitions usually come to be accepted as part of the give-and-take of communication among scientists, with each

scientist in a field deciding independently which definition of a theoretical term to accept. They are rarely decided by a vote. In 2006, however, the International Astronomical Union (IAU) adopted, in a split vote, the following positional definition by genus and differentia of 'planet':

- A **planet** is a celestial body that *(a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and (c) has cleared the neighbourhood around its orbit*. (International Astronomical Union 2006)

According to this definition, Pluto is not a planet, because it does not meet criterion (c). There is a nearby large mass called Eris. The positional definition was adopted in order to restrict the scope of the term 'planet'. The discovery of more and more Sun-orbiting celestial objects created a felt need to draw a line between those that would be called 'planets' and those that would be given another name. The same IAU resolution that adopted the just-mentioned definition of 'planet' decided to use the term 'dwarf planet' for celestial bodies other than human-made satellites that met conditions (a) and (b) but not (c) and to use the term 'small solar system bodies' for celestial bodies other than human-made satellites that met condition (a) but not (b) or (c).

Despite this decision, there has been controversy on how astronomers should use the term 'planet'. In an interview with the German broadcaster Deutsche Welle, planetary scientist Phil Metzger reported conflicting usage with a contrasting position: "We are free to call it [Pluto] a planet right now. The planetary science community has never stopped calling bodies like Pluto 'planets'" (Metzger 2015). Metzger describes the IAU decision as a decision on "the bookkeeping method it would use for keeping track of planets", and calls the definition a "bad definition". Metzger's reasons for challenging the IAU definition indicate how positional definitions can be challenged:

> Several billion years ago, Neptune's position in the universe was changed a couple of times. By the IAU's definition, Neptune was a planet, then it wasn't, and then it was again. Does that make sense? Does that tell us anything intrinsic about the composition or structure of Neptune? No way!
>
> Another of the absurdities of the IAU's current definition is that a tiny body would be considered a major planet under certain conditions, while a much larger body like Earth could be considered a dwarf planet under other conditions. (Metzger 2015)

Metzger raises two objections. If there is to be a distinction between major and minor planets in the solar system, he assumes, it should (1) keep any object orbiting the Sun in the same category throughout its existence and (2) ensure that any major planet is larger than any minor planet. These assumptions make sense, but could be rejected.

The IAU definition applies only to objects orbiting the Sun. Since astronomers talk about planets orbiting other stars, the IAU definition needs to be extended. Among the proposals for such an extension is the following:

> Here, we propose a simple metric that allows for the quantification of the third requirement [of the IAU definition: that the body has cleared the neighbourhood around its orbit–DH] and the extension of the definition to planets orbiting other stars. It must be emphasized at the outset that a planet can never completely clear its orbital zone, because gravitational and radiative forces continually perturb the orbits of asteroids and comets into planet-crossing orbits. What the IAU intended is not the impossible standard of impeccable orbit clearing; rather the standard is analogous to … a dynamical-dominance criterion. In this article, we use the IAU orbit-clearing language even though the dynamical-dominance language seems less prone to misinterpretation. (Margot 2015, 185)

Margot thus proposes a quantitative criterion for determining whether a celestial body orbiting a star *can* clear the neighbourhood around its orbit. Further, he criticizes the wording of the IAU definition for its susceptibility to misinterpretation. The wording of the third criterion in the IAU definition, "has cleared

the neighbourhood around its orbit", thus exhibits a form of impact equivocation.

The controversy over how astronomers should define the term 'planet' has implications for the *extension* of the term, i.e. for what objects are to be regarded as correctly labeled 'planets'.

2.3.2.6 Recommendation of a standard nomenclature or of a precization of a vague term:

Section 2.2 on stipulating mentioned two examples of recommendations for use of a term that fell short of stipulating their usage, because their authors lacked the authority to say how others should use the term. One example was the recommendation of the standardization committee of a scientific society that authors of future articles concerning a certain component of human blood include among the keywords at the beginning of the article the name of this component that reflects its method of production. Another was the implicit recommendation of a committee of scientists with expertise in cancer prevention that epidemiological studies of the effects of eating fruit on human health use their definition of 'fruit'. In both cases, a major reason for the recommendation was to achieve comparability of research results: a standard nomenclature for the blood component would enable researchers to locate all previous published studies of this component, and use in epidemiological studies of a single definition of the term 'fruit' would facilitate amalgamation of the results of different studies in meta-analyses and synthetic reviews.

2.3.3 Constructing a positional definition

In constructing a positional definition, one needs to work out what position on the issue it addresses is justified. In making the definition public, one may need to makes one's justification explicit.

If the definition is what Stevenson calls a persuasive definition, and the term defined has positive or negative emotional

associations, one needs a rationale for endorsing, shifting or limiting the usual boundaries of the class of things correctly labeled by the term. For example, if one wants to point to whistle blowers and victims of sexual assault who report the crime as better examples of "true courage" than soldiers risking death on a battlefield, then one should be able to appeal to the real dangers that whistle blowers and those who report sexual assaults knowingly face and the reasons why blowing the whistle on nefarious activities and reporting sexual assaults make positive social contributions.

If the definition is a programmatic definition, one needs a justification for reinforcing or altering an existing social practice. Consider for example the following widely cited definition of the term 'health' by the World Health Organization (WHO):

- **Health** is *a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*. (http://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf?ua=1; accessed 2020-01-20)

This ambitious but vague definition gives the WHO a broad mandate that, taken literally, includes development of guidelines for social welfare policy as well as health care policy narrowly conceived. Further, if poor health justifies medical care, then the WHO definition implies the medicalization of life, with health care professionals tasked with helping people through the whole range of difficulties they face. Thus one can easily object to this definition as giving health care professionals responsibilities for which they are not well trained and as giving the WHO a mandate that intrudes into personal decision-making. A group of academic specialists in public health focused on a different objection: the unsuitability of the static WHO definition for the management of increasingly prevalent chronic conditions. This group proposed as an alternative the following dynamic definition:

- **Health** is the ability *to adapt and to self-manage*. (Huber et al. 2011, 236)

The authors justify this definition as giving health care professionals a mandate to help people to cope with chronic conditions when there is no prospect of restoring them to a "complete state of physical, mental and social well-being".

If the definition is a theoretical definition, one needs a justified theory in which the term has the proposed meaning. For example, contemporary physical chemistry justifies the theoretical definition of the term 'water' (when it is used to refer to a pure substance like distilled water) as referring to a chemical compound whose molecules each consist of two atoms of hydrogen and one atom of oxygen. (Water is H_2O.)

In addition to advocating a justified position, a positional definition should meet the guidelines for its content (to be discussed in chapter 3) and for its form (to be discussed in chapters 4 and 5).

2.3.4 Evaluating a positional definition

In evaluating a positional definition, whether one's own or someone else's, one needs to consider the adequacy of its proposed justification (if one is offered) or the possibility of justifying it (if no justification is proposed). Section 2.3.2 ("Examples") illustrated the sorts of considerations that may be relevant in considering such justifications, and section 2.3.3 ("Constructing a positional definition") summed up these considerations. They have specific implications for evaluating positional definitions of the various types. A persuasive definition is only acceptable if it can be justified using defensible ethical assumptions; thus, when one encounters a definition of "true courage", "real terrorism", or the like, one should think about the acceptability of the likely underlying ethical (and other) assumptions. To evaluate a programmatic definition of a term, one needs to think about its practical implications and compare them to the practical implications of alternative programmatic definitions of the term. To evaluate a theoretical definition, one needs to consider how well supported is the theory in which this definition is embedded;

if one is not a specialist in the field to which the theory belongs, one may need to rely on the testimony of those who are specialists or who have enough knowledge to critique the specialists' theory. Evaluating other types of positional definitions may require consideration of the pros and cons of the proposed definition and of alternative possible definitions, as in the definition of marriage as a union between a man and a woman. Or it may require some judgment of how a court would rule, as in the school board official's definition of a segregated school as one in which more than 80% of a school's enrolment is of a given minority race, a definition proposed in the context of a Supreme Court ruling that declared segregated schools unconstitutional. In general, justifying acceptance of a positional definition requires a supporting argument with the definition as a conclusion, ultimate premisses that deserve to be accepted, and reasonable inferences in the chain of reasoning to the conclusion—perhaps along with consideration of arguments for alternative positional definitions and of possible objections and criticisms.

2.3.5 Summary on the act of advocating through a positional definition

A positional definition is a definition that takes a position on an issue. If the issue is the boundaries of the class of things correctly labeled by an emotionally charged word like 'liberty' or 'courage' or 'terrorism', the positional definition may take the form of what Stevenson (1944) calls a "persuasive definition"; one can recognize the existence of such definitions while rejecting the emotivist theory of the meaning of ethical terms that underlies his label. If the issue is the boundaries of the class of things correctly labeled by a term that is tied to a social practice, like 'learning' or 'critical thinking' or 'health', the positional definition is what Scheffler (1960) calls a "programmatic definition". If the issue is the meaning of a term in a scientific theory, the positional definition is what is sometimes called a "theoretical definition" (Hurley 2008, 93). Since the issues on which positional definitions

take a stand are often controversial, there may be competing positional definitions of the same term, as with competing definitions of the term ‘marriage’ as used in law and religion or of the term ‘segregated’ as used in school district administration. If the issue is what name to give a certain phenomenon or how to make a vague term precise for research purposes, the positional definition is a quasi-stipulation if its author has the authority to recommend officially, but not to decree, what name shall be used or how to make the vague term precise. A positional definition sometimes also reports a meaning (if its author claims that the defined term already has the recommended meaning), sometimes also stipulates a meaning (if its author announces an intention to use the term as defined or legitimately requires that others use the term as defined), and sometimes neither reports nor stipulates a meaning.

Positional definitions need justification, which should be worked out when one is constructing a positional definition and may need to be articulated explicitly along with the definition, depending on the situation. In evaluating a positional definition, one needs to evaluate its justification if one is proposed and otherwise to consider arguments for and against it. Both the construction and the evaluation of a positional definition should follow the guidelines for reporting or stipulating a meaning (if one of them is involved) and the guidelines for the content of a definition articulated in chapter three, which follows immediately, as well as the guidelines for the chosen form of the definition, to be discussed in chapters four and five.

3.

Content of the definition

In one sense, the content of a definition consists of the words chosen in its defining part to express the meaning of the term being defined. The marked examples in this work use underlining or italics to highlight those words, whose choice should be guided by general guidelines, the addressees' knowledge, and theoretical constraints. In another sense, the content of a definition is the information conveyed by the defining part: how much and what sort of information should a definition convey?

3.1 Choice of words in the defining part of a definition

As far as possible, the content of one's definition should consist of words that in context are clear, unambiguous and not objectionably vague. Someone who is proficient in the language and familiar with the words in a definition's defining part ought to be able to assign just one meaning to those words, in the light of the context. Further, this meaning should be precise enough that one's definition will make as clear as necessary exactly which objects are correctly labeled by the defined term. Further, the single meaning and precision should be what one intends when advancing the definition. Some definitions fall short in these respects.

As to ambiguity, consider again the definition of 'planet' by the International Astronomical Union (IAU):

- A **planet** is a <u>celestial body</u> that *(a) is in orbit around the*

> *Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and (c) has cleared the neighbourhood around its orbit*. (International Astronomical Union 2006)

As previously noted, this definition is at best ambiguous, and probably misleading, in its choice of the phrase "has cleared the neighbourhood around its orbit" to mean: dynamically dominates the neighbourhood around its orbit.

Macagno and Walton (2014, chap. 4) note, with supporting examples, that political speeches often base their definitional moves on ambiguity. The speaker may redefine a crucial term without acknowledging the redefinition or giving it argumentative support; the redefinition may be implicit, with the term simply being used with a new meaning that is taken for granted. The listener may not realize that the term is being redefined, and is unfairly manipulated by the speaker's treatment of the new definition as commonly accepted. The manipulation is especially hard to detect if the redefined concept resembles the commonly shared concept. As an example of such manipulation, Macagno and Walton cite the implicit redefinition of the term 'hostilities' in a letter sent on June 15, 2011 from the administration of United States President Barack Obama to the United States Congress about United States military operations in Libya. The letter included the following paragraph about the legality of those military operations:

> Given the important U.S. interests served by U.S. military operations in Libya and the limited nature, scope and duration of the anticipated actions, the President had constitutional authority, as Commander in Chief and Chief Executive and pursuant to his foreign affairs powers, to direct such limited military operations abroad. The President is of the view that the current U.S. military operations in Libya are consistent with the War Powers Resolution and do not under that law require further congressional authorization, because U.S. military operations are distinct from the kind of "hostilities" contemplated by the Resolution's 60 day termination provision. U.S. forces are playing a constrained and supporting role in a multinational

> coalition, whose operations are both legitimated by and limited to the terms of a United Nations Security Council Resolution that authorizes the use of force solely to protect civilians and civilian populated areas under attack or threat of attack and to enforce a no-fly zone and an arms embargo. U.S. operations do not involve sustained fighting or active exchanges of fire with hostile forces, nor do they involve the presence of U.S. ground troops, U.S. casualties or a serious threat thereof, or any significant chance of escalation into a conflict characterized by those factors. (Obama administration letter to Congress, June 15, 2011, 25; this paragraph available at https://en.wikipedia.org/wiki/US_domestic_reactions_to_the_2011_military_intervention_in_Libya#Relevance_to_the_War_Powers_Resolution; accessed 2020-01-20)

The War Powers Resolution (50 US Code Chapter 33[1]) required the President to get Congressional approval for continuing to use United States armed forces in "hostilities" elsewhere within 60 days of the start of the involvement of those forces. The resolution did not define the term 'hostilities'. At the time, United States armed forces were acting as part of a NATO coalition that was bombing Libya and enforcing a no-fly zone with authorization from the Security Council of the United Nations. To many observers, including the United States Office of Legal Counsel in its legal advice to the U.S. President, American forces were being used in hostilities. Rather than seek the required Congressional approval or overtly defy the law, the President implicitly redefined hostilities as operations that involve or threaten to involve sustained fighting or active exchanges of fire with hostile forces, with the presence of United States ground troops and United States casualties. Although in this case the redefinition did not go unnoticed, Macagno and Walton (2014, 116 and 142) fault President Obama for failing to justify in his letter to Congress his implicit redefinition of the term 'hostilities'.

Avoidance of ambiguity is a requirement not only for definitions but also for adoption of nomenclature, as pointed out in section

1. The resolution is available at https://www.law.cornell.edu/uscode/text/50/chapter-33; accessed 2019 12 20.

2.2.6 (on impact equivocation). It is unwise to choose a technical term that future addressees are likely to misunderstand because it has a different meaning in ordinary speech. What non-specialists understand by ‘valid argument’ or ‘significant difference’ or ‘reliable test’ is quite different from what the logicians, statisticians or psychometricians meant by these terms when they adopted them for their technical concepts. The result has been confusion. In general, one should choose labels for technical concepts that the general public is not likely to misunderstand.

As to vagueness, it is appropriate to define vague terms either with correspondingly vague words or with qualifiers like ‘generally’ or ‘as a rule’ that indicate exceptions. But vagueness in the defining part of a definition may be objectionable. Almost all terms are vague, in the sense that it is not clear whether some borderline cases are correctly labeled by the term. Vagueness is objectionable if the purpose of the definition requires a definite verdict on some of those borderline cases or if the definition is so vague that it does not make clear at all what is correctly labeled by the term and what is incorrectly labeled by it. Consider for example the following widely quoted definition of ‘evidence-based medicine’:

- **Evidence-based medicine** is *the conscientious, explicit, and judicious* use of current best evidence *in making decisions about the care of individual patients*. (Sackett et al. 1996, 71-72)

This definition has prompted the following critique of its vagueness:

> If we want to use this definition to distinguish between who is a practitioner of EBM [evidence-based medicine—DH] and who is not, we need to clarify in operational terms, perhaps with inclusion and exclusion criteria, what is a conscientious use, an explicit use, and a judicious use of the term, and in extremis, what is evidence and which evidence is the best. Without such distinctions between adjectives in this case, the definition may be excellent from a

> motivational and ideological perspective, but its operational uses are limited. (Jenicek 2014, 68)

Jenicek is here using the word ‘operational’ in the broad sense of having observable criteria of application. His complaint is that the words in the defining part of the quoted definition of ‘evidence-based medicine’ are so vague that they do not provide a basis for distinguishing who is practising evidence-based medicine and who is not.

In addition to being unambiguous in context and not objectionably vague, the words one uses should not presuppose knowledge of the meaning of the term being defined. For example, a definition of ‘courage’ as meaning the quality of being courageous is hardly illuminating, unless it is accompanied by a definition of ‘courageous’ that does not presuppose knowledge of what ‘courage’ means.

The style of a definition, especially one meant for a general reader or listener, should be simple and unaffected (Doroszewski 1973, 275), using simpler words in the defining part than the word being defined. Atkins and Rundell (2008, 433-434) point out that this useful guideline is usually unrealizable with the core high-frequency words of a natural language.

Other things being equal, one should use a shorter word in preference to a longer one (e.g. ‘help’ rather than ‘assistance’), words with Germanic origins in preference to words with Latin or Greek origins (e.g. ‘angry’ rather than ‘irate’ or ‘thymotic’), and a single word or phrase instead of two or more with the same meaning (e.g. ‘confident’ rather than ‘confident and self-assured’).

If one wishes the defining part of one’s definition to be substitutable for the term being defined, then it must be in the same grammatical category as the term being defined: a noun or noun phrase if the term being defined is a noun or noun phrase, a verb or verb phrase if the term being defined is a verb or verb phrase, and so on. However, substitutability is not a universal requirement for

good definitions.[2] Consider for example the following previously mentioned stipulative definition by extended synonym:

- '**$**' shall mean *the currency of the United States*.

Suppose that the agreement for which this meaning of '**$**' is stipulated contains the following sentence:

> All payments under this agreement shall be made in United States dollars (US**$**).

Substitution in this sentence of the defining part of the above-quoted definition of '**$**' produces the following nonsense:

> All payments under this Agreement shall be made in United States dollars (US the currency of the United States).

The substitution at the end of the sentence produces gibberish between the parentheses. Nevertheless the form of the definition is perfectly acceptable.

Atkins and Rundell (2008, 435-436) list economy of expression as a traditional principle for dictionary definitions, a principle

2. Weinrich (1967/ 1962, 39) objects to the supposed convention that the defining part of a dictionary definition should be functionally equivalent to the term being defined—a convention that "seems due to a claim of interchangeability between the term and its definition, which is preposterous for natural languages" (p. 39). He notes that dictionary definitions do not always follow this convention—for example, when the defining part specifies the role of a defined term like 'not' in a sentence. Further, he objects that following the convention leads to treating relational terms as if they are absolute—for example, when a dictionary defines 'between' as meaning: in the space or interval which separates. Atkins and Rundell (2008, 435) remark that substitutability is a fine principle when it works well but that it would be pointless to require all dictionary definitions to conform to it. In contemporary discussion of so-called "real definitions", where the thing being defined is not a term but a real entity like a property, Elgin (forthcoming) has argued that the substitution principle conflicts with the principle that no real definition is reflexive. In other words, if truth is always preserved when the defining part of a correct real definition is substituted in a true sentence for the name of the thing being defined, then some things are by definition themselves (e.g. knowledge is by definition knowledge).

dictated more by the space limitations of printed dictionaries than by the needs of the user. Conciseness can conflict with the more important principle of intelligibility. Consider for example a dictionary that defines the verb ‘bribe’ concisely by using in its defining part the word ‘bribery’, whose definition in turn achieves concision by using in its defining part the noun ‘bribe’; presumably a user who did not know what the verb ‘bribe’ meant would also not know what the noun ‘bribery’ or the noun ‘bribe’ meant, and so would have to look up three entries before being enlightened. In general, it is more important that prospective users of a definition can understand it than that the definition be concise. But, given that two definitions are equally intelligible and accurate enough for the purpose, a shorter definition is better than a longer one. To put the same point another way, if you can shorten a definition with no loss of intelligibility or accuracy, do so.

3.2 Choice of words suitable for the addressees of a definition

The words and phrases in the defining part of one’s definition should be understandable to the readers or listeners to whom one’s definition is addressed.[3] “… whatever information the definition sets out to supply must take account of the user’s prior knowledge, linguistic competence, and understanding of reference conventions.” (Atkins and Rundell 2008, 411) It is no good using precise and well-defined technical terminology in one’s definition if the people to whom one is communicating the definition have no idea what the technical terminology means. If one’s addressees cannot reasonably be expected to know the meaning of a term in the defining part of one’s definition, then one should explain what it means. In general, one must keep in mind what terms one’s intended readers or hearers already understand. If one uses a polysemous word in the defining part of a definition, one must

3. Zgusta (1971, 257), for example, says that a dictionary definition should not contain words that are harder to understand than the defined term.

use it in a sense that is frequent and typical rather than marginal or untypical (Atkins and Rundell 2008, 412).

The anticipated situation of the addressees of a definition can have implications for its length, the difficulty of its vocabulary, and its degree of precision. Entries in a dictionary meant for a general reader should be brief and easy to read, whereas a definition in an encyclopedia meant for scholars should be as long and complex as is needed to explain the term's meaning carefully. Dictionaries meant for learners use a "defining vocabulary" of high-frequency words in the defining parts of their definitions (Atkins and Rundell 2008, 449). Definitions in a dictionary meant for intermediate learners of a language should be shorter and simpler than definitions in a dictionary meant for advanced learners (Atkins and Rundell 2008, 388-389). In general, definitions in dictionaries meant for learners will generally be reminding the user of a concept with which the learner is already familiar through their native language, so that intelligibility is more important than precision (Atkins and Rundell 2008, 451). A definition of a scientific term like 'parsec' can use technical terminology if it appears in a scientific textbook or article, but must be understandable to the general reader if likely users of the definition will not understand the technical terminology (Doroszewski 1973, 273-274; Atkins and Rundell 2008, 411). A definition of 'comparability' as 'being the potential passive subject of the activity of comparison' is unsuitable for readers of a general dictionary, who will not understand it and would understand quite easily its definition as 'ability to be compared' (Doroszewki 1973, 275). A definition in a law, regulation or contract should be precise and unambiguous, whereas a definition in a phrase book for travellers needs to give only a rough idea of what term in one language corresponds to a given term in the other language.

3.3 Theoretical constraints on the choice of words in a definition

A striking example of attention to what one's addressees already understand is the proposal of the linguist Anna Wierzbicka (1996) to explain the meaning of all words in all languages on the basis ultimately of a core of indefinable "semantic primes" that are lexicalized in all human natural languages, along with some universal grammatical principles indicating how the semantic primes can be combined. This core mini-language she calls a "natural semantic metalanguage" (Wierzbicka 1996, 22-23). Explanation of meaning by a natural semantic metalanguage[4] (NSM) avoids circularity in a collection of definitions (as in a dictionary) and makes it possible to do cross-cultural comparisons without imposing the cultural perspective of the person making the comparison. At the time of writing this essay, researchers using the NSM approach had identified 65 semantic primes, without claiming that the list is complete. The words used to express these semantic primes (called "exponents" of the primes) of course vary from one language to another. Table 1 shows the exponents in English of the 65 semantic primes identified as of 2014. The following is an example of the use of NSM to report the meaning of a word, in this case the meaning of the word 'friend' in 19th century Britain and America, with the English exponents of the semantic primes underlined:

> I think about this person like this:
> I want this person to know what I think.
> I want this person to know what I feel.
> I don't want many other people to know these things.
> I know this person thinks the same about me.
> (Wierzbicka 1997, 41)

4. A metalanguage is a language used to talk about another language. If we use a fragment of English to talk about the French language, then the fragment of English that we use for this purpose is a metalanguage with respect to the French language.

The syntax and the non-underlined words (‘about’, ‘to’, ‘what’, ‘do’) are in accordance with NSM’s grammatical principles. Wierzbicka claims that her reportive definition, which consists of several sentences, is equivalent to the expression ‘this person is my friend’, as it would have been used in 19th century Britain and America.

Some monolingual dictionaries try to make their definitions understandable, as well as non-circular, by using a restricted “defining vocabulary” of listed common words in the defining parts of their definitions, supplemented if necessary by marked words (e.g. in small capitals) that could be looked up in the dictionary (Jackson 2002, 130). This strategy lacks the cross-cultural universality at which Wierzbicka was aiming.

Table 1
Semantic primes (English exponents), grouped into related categories

I, you, someone, something~thing, people, body	substantives
kinds, parts	relational substantives
this, the same, other~else	determiners
one, two, some, all, much~many, little~few	quantifiers
good, bad	evaluators
big, small	descriptors
know, think, want, don’t want, feel, see, hear	mental predicates
say, words, true	speech
do, happen, move	actions, events, movement
be (somewhere), there is, be (someone/something)	location, existence, specification
(is) mine	possession
live, die	life and death
when~time, now, before, after, a long time, a short time, for some time, moment	time
where~place, here, above, below, far, near, side, inside, touch	place
not, maybe, can, because, if	logical concepts
very, more	augmenter, intensifier
like	similarity

Note. 1. Exponents of primes can be polysemous, i.e. they can have other, additional meanings.
2. Exponents of primes may be words, bound morphemes, or phrasemes.
3. They can be formally, i.e. morphologically, complex.
4. They can have combinatorial variants or allolexes (indicated with ~).
5. Each prime has well-specified syntactic (combinatorial) properties.
Source: Goddard and Wierzbicka 2014, 12.

Similar constraints operate in the introduction of defined terms in the construction of an artificial formal language. Such languages are usually constructed with a minimal initial stock of symbols (to which meanings are assigned in the language’s semantics), and further symbols are introduced by definition. Definitions of this sort can use only symbols that have already been introduced into the language. Further, the term defined cannot be used later to explain the meaning of a term used in the defining part of its definition. In scientific contexts in general, as Gorsky (1981) puts it, “if a new term … is introduced instead of some complex description …, no term in the complex description can be introduced earlier or explained later through the term introduced.” (102)

3.4 Choice of information to convey

A definer has a choice of content in another sense: the information that the definition conveys (Atkins and Rundell 2008, 407). How much and what sort of information should a definition convey? The short answer is: just enough for the purpose. A definition can fall short by excluding information that its addressees would like or need to know; for example, a child learning what kind of animal the word 'tiger' refers to might want to know not only that it is a large member of the cat family with stripes but also what parts of the world it lives in, what it eats, and something about its habits. A definition can go to excess in adding information of no use or interest to its addressees, information that may even obscure the main point; for example, an explanation to one's conversational partner of what one meant by an unfamiliar term (such as 'catalyst') should give the minimum information needed for understanding. A definition can have both too much and too little information simultaneously, by including unneeded information but leaving out information that the addressees need or want; for example, defining 'catalyst' to a conversational partner who is unfamiliar with the term by talking in detail about how catalytic converters in cars work but without explaining what in general a catalyst is includes too much information about catalytic converters but not enough information about what in general a catalyst is.

4.

Forms of definition: normal forms

A definition in a so-called "normal form" begins with the term being defined (traditionally called the *definiendum*[1]), follows that term by some linking word or phrase like 'is' or 'means' that indicates equivalence,[2] and ends with a description of the meaning attributed to the term (traditionally called the *definiens*). A simple example is the following reportive definition:

- **'Recondite'** means esoteric.

1. Gupta (2019) distinguishes the *definiendum* from the term being defined. For him, the *definiendum* is the entire string of words preceding a definition's indication of equivalence. In most forms of definition, this string is as a matter of fact identical to the term being defined; he calls such definitions "regular definitions". In so-called "contextual definitions" (to be discussed in section 4.5), however, the initial string of words is an expression that includes the term being defined as a proper part; Gupta notes that this expression is usually of a different grammatical category than the defined term, and calls definitions where the *definiendum* is of a different grammatical category a "heterogeneous definition". In contrast, this essay does not use the term '*definiendum*' and proposes no label for the initial expression in a contextual definition in which the term being defined occurs in a context. It does not use the terms 'regular definition' and 'heterogeneous definition', which are Gupta's innovations.
2. To make explicit that one is offering a definition, one should use a link like 'means'. Statements of equivalence with 'is' or 'if and only if' or the like as the indicator of equivalence are ambiguous as to whether they are defining the subject term or making a substantive claim. For example, the statement that an organism is a device by which the genes in its DNA replicate themselves has the form of a definition, but is a somewhat controversial substantive claim in evolutionary theory. It is not a definition of the term 'organism'. Morscher (2017, 187-189) uses a colon before a linking word like 'means' or 'is' or 'if and only if' as an extra-linguistic indication that the sentence is a definition; the odd placement of the colon makes its significance unambiguous. His convention is a useful signal, but cannot be used in spoken language.

This essay has been calling the first part of such a definition 'the term being defined' and the last part 'the defining part'. In the above example, the term being defined is 'recondite' and the defining part of the definition is 'esoteric'. If the definition uses 'is' or 'if and only if' as the link between the term being defined and the defining part, these two parts of the definition should have the same grammatical structure; for example, both can be noun phrases, both adjectives, or both sentences.[3] Normal definitions usually[4] provide a complete basis for understanding the meaning of the term being defined in one of its senses. This chapter distinguishes the following seven normal forms of definition:

1. Definitions by synonym
2. Definitions by antonym
3. Definitions by extended synonym
4. Definitions by genus and differentia
5. Contextual definitions
6. Range definitions
7. Extensional definitions

The chapter describes each form in turn, with the help of examples, and provides guidelines for constructing or evaluating a definition of the given form. These guidelines apply whether the definer is reporting, stipulating or advocating. For reporting, the touchstone of adequacy is an actual pre-existing use of the term being defined. For stipulating, it is the meaning intended by the definer. For advocating, it is the position being advocated.

3. When the link is the verb 'means', the quoted name of the term being defined is a noun or noun phrase, and the defining part of the definition can be a different part of speech, as in the above definition of the word 'recondite', whose defining part is an adjective.
4. Contextual definitions sometimes define a term only for some of the contexts in which it occurs.

4.1 Definitions by synonym

The simplest way to define a term is to provide a synonym, i.e. a word or short phrase with roughly the same meaning as the term being defined. The following definitions by synonym mark the term being defined by **bold facing** it and the alleged synonym by putting it in *italics*:

- '**Biased**' means *prejudiced*.
- '**Neige**' means *snow*.[5]
- '**Illuminate**' means *light up*.
- '**Irascibly**' means *angrily*.

A definition by synonym has the structure: '<Term being defined>' means <synonym>. It can define any part of speech; the four definitions just given define an adjective, a noun, a verb, and an adverb.

Definitions by synonym are rough explanations of *a sense* of a term as used *in an assumed context*. Thus the two components of a definition by synonym are not the term as such and the allegedly synonymous word or short phrase as such, but the term when it has a certain sense and the allegedly synonymous word or short phrase when it has a certain sense—what writers of dictionaries call "lexical units" (Atkins and Rundell 2008, 131). The alleged synonym should be substitutable for the term being defined in any sentence where the term has the sense that the definition tries to

5. Such claims of equivalence of a term in one language to a term in another might better be called a translation rather than a definition (Gorsky 1981; Fillmore 2003; Atkins and Rundell 2008). Atkins and Rundell (2008, 500) illustrate the difference between a definition and a translation by contrasting the entries for the word 'column' in a monolingual dictionary and a bilingual (English-French) dictionary; the monolingual dictionary distinguishes nine senses of 'column', each of which is defined, whereas the bilingual dictionary has just the single word 'colonne' as the French equivalent, since the same word is used in all nine senses in French. Where bilingual dictionaries define terms, they do so in the term's language, typically as a guide to which sense of a term is in question.

capture, without making the sentence ungrammatical; this implies that it should be the same part of speech as the term being defined: an adverb if the defined term is an adverb, a verb if it is a verb, and so on. Further, generally speaking, such a substitution should not change the truth-value of the sentence. The qualification 'generally speaking' reflects the fact that terms rarely have exact synonyms,[6] so that sometimes the substitution of a defining synonym for the term being defined may change a true statement into a false one, or vice versa. But such changes of truth-value should happen rarely. The qualification also allows for exceptions when the term occurs in what philosophers call a "non-extensional context"—that is, a context where substitution of words or phrases with the same "extension" (i.e. where the same things are correctly labeled by each of the two words or phrases) does not necessarily preserve the truth-value of the sentence. One such non-extensional context is a 'that' clause governed by what philosophers call a "verb of propositional attitude", i.e. a verb that expresses the attitude of one or more people to the proposition expressed by the 'that' clause. Examples of such verbs are 'hopes', 'knows', believes', 'doubts', 'wishes', and 'fears'. Consider the above-mentioned definition by synonym:

- '**Illuminate**' means *light up*.

Suppose Chris does not know that 'illuminate' means light up. If we substitute the word 'light up' for the word 'illuminate' in the just-mentioned sentence, we get the sentence: Chris does not know that 'light up' means light up. We can suppose that this sentence is false. On these quite possible suppositions, the substitution of 'light up' for 'illuminate' turns the sentence from a true sentence into a false one. But this possibility is no objection

6. Atkins and Rundell (2008, 135) describe true synonyms as "extremely rare, if they exist at all", and remark that alleged synonyms in dictionary definitions often turn out to be cohyponyms (words describing a different species of the same genus) or superordinates (words describing a genus of the species named by the defined term). They add that pure synonymy is rare across languages, except for names of concrete objects shared by the cultures of two linguistic communities.

to the definition, because the substitution is made in a non-extensional context—namely, in a ‘that’ clause governed by the verb phrase ‘do not know’.

Definitions by synonym are useful in explaining a term’s meaning to somebody who does not know what the term means but does know the meaning of the alleged synonym. They have the advantage of brevity. One of their disadvantages is their lack of exactness, which can be acknowledged by qualifying the defining part of the definition with a word like ‘roughly’:

- ‘**Algorithm**’ means, roughly, *a recipe*.[7]

Here and elsewhere, qualifying phrases in or before the defining part of a definition will be indicated, as above, by double underlining. The lack of exactness makes definitions by synonym unsuitable for conveying accurately the precise meaning of a term. As the editor of a Polish-language unilingual dictionary writes: “Synonymous definitions are never accurate.” (Doroszewski 1973, 291) According to Atkins and Rundell (2008, 421), using synonyms in a dictionary as the sole indicator of meaning is reasonable when, and only when, the words differ only in register or dialect (e.g. when defining ‘dosh’ as an informal British word

7. This definition of ‘algorithm’ gives a rough sense to a layperson of what people mean when they talk (for example) about the algorithms that select relevant pages on the Web in response to a search phrase (as described at https://www.google.com/search/howsearchworks/algorithms/; accessed 2019 04 21). More technically, an algorithm is an effective procedure for computing the value of a function for given inputs. A simple example is the procedure for adding by hand a column of numbers written in Hindu-Arabic notation (such as 23, 37, and 139). Mathematical logicians have proposed various exact definitions of the informal concept of a computable function. Since the informal concept is not mathematically precise, it is not possible to prove that any of these definitions exactly captures the informal concept. However, mathematicians have proved that all the proposed exact definitions are equivalent to one another, thus providing some assurance that their exact definitions capture what people informally understand by an algorithm. For details, the interested reader can consult the article “Computable functions” in the online *Encyclopedia of Mathematics*, available at https://www.encyclopediaofmath.org/index.php/Computable_function (accessed 2019 04 17).

for money) or they are a technical and non-technical pair (e.g. when defining ‘patella’ as the medical term for kneecap). They regard synonyms, however, as sometimes a useful complement to a longer definition. Dictionaries sometimes compensate for the unsuitability of definitions by synonym by providing a string of rough synonyms for a defined term, with the idea that the user will somehow infer its sense from the commonality among the rough synonyms. Atkins and Rundell comment as follows:

> This [relying on a number of semi-synonyms to transmit a word’s meaning—DH] is convincing if you know what the word means already, but at best can only be complementary to a paraphrase definition. At worst it makes it impossible for anyone to learn from such entries the difference between these partial synonyms. (Atkins and Rundell 2008, 209)

Atkins and Rundell’s “paraphrase definition” is a definition of one of the forms to be discussed in later sections of this chapter, such as definition by extended synonym, definition by genus and differentia, and contextual definition.

Another is the risk of circularity, implicitly assuming that a complex term’s meaning is already understood by using its core component in the defining part of the definition, as in the following dictionary definition:

- **Hopeful**: *full of hope*. (https://www.dictionary.com/browse/hopeful; accessed 2020-01-20)

Someone looking up the word ‘hopeful’ in order to find out what it means is not likely to know already what ‘hope’ means. Thus the above definition by synonym is not helpful by itself. Dictionary.com solves this problem by having a hyperlink in its definition of the word ‘hopeful’ to the following definition of the word ‘hope’:

- **Hope**: the feeling *that what is wanted can be had or that events will turn out for the best*. (https://www.dictionary.com/browse/hope; accessed 2020-01-20)

This definition is not a definition by synonym but a definition by genus and differentia, a form discussed in section 4.4, "Definition by genus and differentia". For further discussion of the need to avoid circularity in definitions, see section 3.1, "Choice of words in the defining part of a definition", as well as sub-section 6.3.2, "Not circular", of section 6.3, "Traditional rules for definition".

Not all terms have synonyms. For example, it would be hard to find synonyms for the words 'cheese', 'unsatisfactory', 'eat', 'hastily', 'towards', 'or', or 'a'.

Definitions that claim equivalence between a term being defined and a defining part can be challenged by providing *counterexamples*, which are of two kinds. The first kind of counterexample is a case that is correctly labeled by the term being defined but not by the defining part. Such a counterexample shows that the definition is *too narrow*. Consider for example the following (inadequate) definition by synonym:

- '**House**' means *single-family dwelling*.

A duplex is a counterexample, since it is correctly labeled by the term being defined ('house') but not by the defining part ('single-family dwelling'): a duplex is a house but is not a single-family dwelling. The proposed definition of 'house' is therefore too narrow, and needs to be broadened if it is to be accurate.

The second kind of counterexample is a case that is correctly labeled by the defining part of the definition but not by the term being defined. Such a counterexample shows that the definition is *too broad*. Consider for example the following (inadequate) definition by synonym:

- '**Ravenous**' means *hungry*.

A person who is only mildly hungry is a counterexample, since this person is correctly labeled by the defining part of this definition ('hungry') but not by the term being defined ('ravenous'). The proposed definition of 'ravenous' is therefore too broad, and needs to be narrowed if it is to be accurate.

A definition can be simultaneously too narrow and too broad, too narrow in one respect and too broad in another. Consider for example the following (inadequate) definition by synonym:

- '**Gesticulate**' means *wave*.

To gesticulate is to gesture in an exaggerated way. Hence an exaggerated gesture other than waving, such as an exaggerated nodding of the head, is a counterexample of the first kind: gestures other than waving are correctly labeled by the term being defined ('gesticulate'), but not by the defining part ('wave'). This counterexample shows that the definition is too narrow. In another respect, however, the definition is too broad. It has a counterexample of the second kind: a normal wave. A normal wave is correctly labeled by the defining part of the definition ('wave'), but not by the term being defined ('gesticulate'). Thus the definition needs to be broadened in one way, to include gestures other than waves, and narrowed in another, to confine it to exaggerated gestures. There may be no adequate synonym of 'gesticulate', in which case a definer of this term needs to use another form of definition.

Since a synonym needs to be only a rough equivalent, single counterexamples of either kind are not enough to show that a definition by synonym is incorrect. One needs a whole family of counterexamples. The counterexamples in the preceding three paragraphs are of this type, since there are whole families of duplexes, of mildly hungry people, of exaggerated nods of the head, and of non-exaggerated waves.

The method of counterexampling definitions applies not just to definitions by synonym but to all forms of definition that consist of a term being defined, a claim of equivalence, and a defining part. Looking for counterexamples is useful when one is constructing any such definition, as a way of checking the definition's adequacy. If one thinks of a counterexample, one can revise the definition to accommodate the counterexample, and one can reiterate this process until no counterexample comes to mind. Looking for counterexamples is also useful when one is evaluating

someone else's definition: it is the obvious way to check its adequacy. One can cultivate the habit of such checking, so that eventually it becomes automatic.

Counterexamples to definitions do not need to be actual cases. They can be purely imaginary. The reason is that terms can be true of new cases. Hence the defining part of their definition must be true of those cases as well. Also, the term must be true of possible new cases that the defining part of the definition is true of. Looking for counterexamples to a definition is thus as much an exercise of the imagination as of the memory.

Interchangeability is an alternative test of the adequacy of a definition that claims equivalence between the defined term and the defining part of the definition. If the two parts of the definition are really equivalent, then replacement of the defined term in a sentence by the defining part, or vice versa, should not change the truth-value of the sentence—provided the context is "extensional". For example, one could show the inadequacy of the above-mentioned definition of 'gesticulate' as meaning wave by pointing out that in many situations 'he waved good-bye' might be true but 'he gesticulated good-bye' false (or even nonsensical). The qualification that the context must be extensional is important, since only extensional contexts guarantee that substitution of an equivalent expression preserves a sentence's truth-value. In non-extensional contexts, on the other hand, substitution of an equivalent expression need not preserve a sentence's truth-value, as illustrated previously by the sentence 'Chris does not know that 'illuminate' means light up'.[8]

It might be doubted whether definitions that have no counterexamples are necessarily accurate. The absence of counterexamples shows only that the things correctly labeled by the term defined are exactly the same as the things correctly

8. Gorsky (1981, 96) limits "definitions in the proper ... sense" to definitions that aim to satisfy the interchangeability requirement when the structure of the definition and the level of social knowledge permit its satisfaction. Such definitions include explicit complete definitions, implicit axiomatic definitions (discussed in section 5.4, "Use of a term in a sentence"), and implicit definitions that can be reduced to explicit complete definitions.

labeled by the defining part. Theoretically, there can be such a coincidence of extent even if the two parts of the definition mean different things. A possible example is the following definition of the term ‘winter’:

- **Winter**: the property of a crop *consisting in the necessity of sowing it in the autumn*.[9]

Doroszewski (1973, 274) accuses this definition, which was sent to the editorial office of the dictionary that he edited, of committing the logical mistake of identifying as a property what is only a consequence of the property; the property of being a winter crop, he asserts, is the property of suffering no harm during the winter period when there is no vegetative growth. Nevertheless, something is a winter crop if and only if it must be sown in the autumn. Counter-exampling will therefore not show that the definition is mistaken. For practical purposes, however, absence of counterexamples is a good enough indication that a definition is adequate, especially since counterexamples can be imaginary rather than actual cases.[10]

4.2 Definitions by antonym

An effective way of conveying the meaning of a term, parallel to that of providing a synonym, is to provide an antonym—a term that has the opposite meaning, as in the following examples:

- ‘**Uptight**’ is the opposite of ‘*relaxed*’.

9. This example is chosen to illustrate the possibility of a bad definition without counterexamples. It is obviously not a definition by synonym. Its form, definition by genus and differentia, will be discussed in section 4.4, “Definitions by genus and differentia”.
10. In the terminology explained in the footnote at the beginning of section 1.3, entitled “Three dimensions of definition”, Doroszewski is objecting that the definition submitted to his office describes incorrectly the intension of the term ‘winter’ when used as an adjective modifying the noun ‘crop’, even though it gets the extension correct.

- '**Rudely**' is the opposite of *'politely'*.
- '**Humility**' is the opposite of *'pride'*.[11]

Definitions by antonym have the structure: '<Term being defined>' is the opposite of '<defining part>'. One can define by antonym any word or phrase that has an opposite; the three just-mentioned definitions define an adjective, an adverb and a noun. One cannot define a word or phrase by its opposite if it has no opposite.

The antonym should be substitutable for the term being defined in any sentence where it is used with the meaning that the definition tries to capture, without making the sentence ungrammatical. It should be a genuine opposite of the term being defined, in the sense that the term and the alleged antonym cannot be true of the same thing at the same time, in the same part of that thing, and in relation to the same other thing.[12]

The antonym in a definition by antonym can be either the contradictory or contrary opposite of the term being defined. Contradictory opposites exhaust the possibilities, in the sense that either the term or its opposite is true of any case within the term's range.[13] For example, the terms 'separate' and 'together' are contradictory opposites, because at any time, any two things are either separate or together, with no in-between status. Contrary opposites, in contrast, do not exhaust the possibilities; there are cases within the range of the term of which neither term is true. For example, the terms 'pride' and 'humility' are contrary opposites:

11. In bulleted definitions by antonym, the term being defined is in **bold face** and the defining opposite is in *italics*.
12. The qualifying phrases are necessary to avoid counterexamples like things that have opposite characteristics at different times (e.g. a short child who grows up to be a tall adult), in different parts (e.g. a peach with soft flesh and a hard stone), or in relation to different other things (e.g. sea-water that is drinkable by fish but not by humans).
13. A term's range is the class of cases to which it makes sense to apply the term. For example, the range of the term 'rudely' is human actions; it makes sense to describe a person as acting rudely, but makes no sense to describe someone as seeing a sunrise rudely or to describe a dog as having barked rudely.

a person can be neither proud of some achievement nor humble about it, instead regarding it as a mere matter of fact.[14]

The main requirement for an adequate definition by antonym is that the two terms are genuine opposites, with the same range. To test whether the terms are genuine opposites, one should look for cases of which both terms are true. Consider for example the following (inadequate) definition by antonym:

- '**Thrifty**' is the opposite of '*generous*'.

A person can be simultaneously careful about spending money on themselves (i.e. thrifty) but willing to spend it helping others (i.e. generous). Hence the above definition is faulty. A better opposite of the term 'thrifty' is the term 'wasteful'.

To test whether the terms in a definition by antonym have the same range, one should look for cases to which it makes sense to apply one term but not the other. Consider, for example, the following (inadequate) definition by antonym:

- '**Helpful**' is the opposite of '*helpless*'.

To be helpless is to be incapable of helping oneself. Hence it makes sense to talk of a mouse just caught by a cat as being helpless. But it makes no sense to talk of a mouse being helpful, unless one is using the word 'helpful' in an extended sense that

14. Cruse (1986, 223-243) distinguishes directional opposites (e.g. 'up' and 'down'), antipodal opposites (e.g. 'top' and 'bottom'), counterparts (e.g. 'hill' and valley'), reversives (e.g. 'advance' and 'retreat'), and conversives (e.g. 'master' and 'servant'). These kinds all share the common property of opposites, that one cannot truly predicate both of them to the same individual at the same time in the same part of itself in the same respect and in the same relation. In general, they are contraries rather than contradictories. For example, a person can be going neither up nor down, a location can be neither at the top nor at the bottom, a geographical feature of a landscape can be neither a hill nor a valley, a military unit can be neither advancing nor retreating, and one person can be neither a master nor a servant of another person. In each such pair, one could use either opposite to define the other; for example, one could say that up is the opposite direction to down.

includes inadvertent help. Thus, despite superficial appearances, ‘helpful’ is not the opposite of ‘helpless’.

It is not possible to test the adequacy of a definition by antonym with counterexampling methods. In some contexts, substitution of a term by its antonym will change a sentence’s truth-value, but in others it will not. Take for example the opposites ‘tall’ and ‘short’. Substituting ‘short’ for ‘tall’ in the true sentence ‘The Empire State Building is a tall building’ changes it into the false sentence ‘The Empire State Building is a short building’. But the same substitution changes the true sentence ‘Some people are tall’ into another true sentence: ‘Some people are short’. Only in some types of sentences will substitution of a term by an opposite of that term change the truth-value of the sentence.

Definitions by antonym are useful if the addressee does not know the meaning of the term being defined but does know the meaning of the antonym. They are useful as well in clarifying the sense in which one is using an ambiguous term with more than one opposite For example, the adjective ‘light’ has two opposites, ‘dark’ and ‘heavy’, corresponding to two of its senses. If the context leaves it unclear in which sense one is using the term ‘light’, one might say, “I mean ‘light’ as opposed to ‘heavy’, not ‘light’ as opposed to ‘dark’.”

Like definitions by synonym, definitions by antonym have the advantage of brevity.

4.3 Definitions by extended synonym

Extended synonyms are long phrases (rather than single words or short phrases)[15] equivalent in meaning to a given term. The following are some examples of definitions by extended synonym:

- ‘**Even-tempered**’ means *not prone to anger*.

15. One might hesitate to use the term ‘synonym’ for a long phrase, on the grounds that a synonym must be a single word or a short phrase. To that extent, the term ‘extended synonym’ uses the word ‘synonym’ in a broader sense than usual.

- '**Objective**' means *not influenced by personal feelings, interpretations, or prejudice*. (http://www.dictionary.com/browse/objective; accessed 2020-01-20)
- '**To walk**' means *to move along by putting one foot in front of the other, allowing each foot to touch the ground before lifting the next*. (https://dictionary.cambridge.org/dictionary/english/walk; accessed 2020-01-20)[16]

Definitions by extended synonym thus have the structure: '<Term to be defined>' means <synonymous phrase>. They can be used to define any part of speech or any type of phrase. If possible, the extended synonym should be substitutable for the term being defined in any sentence where it is used with the meaning that the definition tries to capture, without making the sentence ungrammatical and without changing its truth-value (as long as the term occurs in an extensional context).[17] However, in some cases it is not practical to formulate an extended synonym with the same grammatical status as the term being defined, as when a commercial agreement specifies that in the document:

- '**$**' shall mean *the currency of the United States*

If the agreement specifies an amount of $10,000 to be paid, the symbol '**$**' would be read as a plural noun ("10,000 dollars"). But the defining part of the above definition is a singular noun phrase, which cannot be substituted for the symbol '**$**' without making the sentence ungrammatical; '10,000 the currency of the United

16. As usual, the term being defined is in **bold face**. In bulleted definitions by extended synonym, the entire extended synonym is in *italics*, except that in the special case of definitions by genus and differentia, to be discussed in the next section, the part of the extended synonym that names the genus is underlined.
17. As explained in section 4.1, "Definitions by synonym", an extensional context is a context in which substitution of a word or phrase that refers to the same object or set of objects does not change the truth-value of the sentence. The contrast is with an "intensional context", where substitution of a word or phrase with the same reference may change the sentence's truth-value.

States' makes no grammatical sense. To get a substitutable phrase, one would need a plural noun phrase, as in the following example:

- '**$**' shall mean *United States dollars*

But it would be pedantic to insist on such similarity of grammatical status. The definition of '**$**' as meaning the currency of the United States is perfectly clear and unambiguous.

The defining part of a definition by extended synonym can give an *analysis* of the thing meant by the term being defined, as in the above definition of 'even-tempered' as meaning not prone to anger. Or it can describe the *relation* of the thing meant to other things, as in the following definition by extended synonym:

- '**Red**' means *the colour of blood, cherries and claret*.

Or it can describe a *rule* that determines whether an object is correctly labeled by the term, as in the following definition by extended synonym, taken from a memorandum in August 1945 from United States President Harry Truman to the Deputy Military Governor of the United States zone in Germany[18]:

- As used in this article, the term '**German citizen**' means *individuals who (a) have had full rights of German citizenship under Reich law, at any time since January 1, 1942, and have been within any territory while such territory was under the control of the Reich Government, at any time since January 1, 1942; or (b) have been designated by the Commission to be German citizens for the purpose of this decree*.

Robinson (1954, 96-106 and 126-137) calls these three variants the method of analysis, the method of synthesis, and the rule-giving method. They apply also to definitions by genus and differentia (which are a special case of definitions by extended synonym), contextual definitions, and some range definitions.

18. The memorandum can be found at https://history.state.gov/historicaldocuments/frus1945Berlinv02/d1003; accessed 2019-11-07.

Definitions by extended synonym are common in dictionaries, where they are used to report the meanings of terms. They are also common in legal documents, such as legislation, regulations and contracts, where they stipulate what the defined terms are to be taken to mean in the legal document in question.

Counterexamples can show that a definition by extended synonym is too narrow or too broad. In either case, the definition needs modification to take care of the counterexample. The length of the phrase in the defining part of a definition by extended synonym makes exact equivalence more achievable than in a definition by (non-extended) synonym.

4.4 Definitions by genus and differentia

Definitions by genus and differentia[19] are a kind of definition by extended synonym, distinguished by the fact that their defining part names a general class (the genus) and describes one or more features (collectively, the differentia), as in the following definition:

19. The words come from Latin; 'genus' (plural 'genera') means kind, and 'differentia' (plural 'differentiae') means difference. Ennis (1962, 103; 1996, 329; 2016, 2) proposed to replace the traditional name by the term 'classification definition' and to replace the term 'genus' by the term 'general class' and the term 'differentia' by the term 'distinguishing features'. His proposal has the merit of making it more clear what is meant. Furthermore, although (as argued in section 2.2 on stipulating) one should not introduce new terminology to signify something for which there is already adequate accepted and recognized terminology, the term 'definition by genus and differentia' is not widely recognized. It also has the drawback that the singular term 'differentia' gives the misleading impression that in this form of definition one mentions only one feature of the things to which the term being defined applies; in fact, definitions of this form often mention more than one such feature. Despite its merits, Ennis's proposal has not been adopted (e.g. by writers of textbooks that include a section on definitions). Furthermore, the phrase 'distinguishing features' might be misinterpreted to mean that each of a number of features in a definition of this form distinguishes the things to which the term applies from other things in the general class (or genus); in fact, it is often only the features as a group that distinguish them. When Ennis was to be a co-author of this book, we agreed to use his terminology. After he declined the role, I reverted to the traditional terminology. I would not be unhappy if Ennis's terminology replaced it.

- ‘**Triangle**’ means plane figure *bounded by three straight lines*.[20]

Such definitions are more commonly written without quotation marks around the defined term, as follows:

- A **triangle** is a plane figure *bounded by three straight lines*.

Although they are a sub-class of definitions by extended synonym, definitions by genus and differentia deserve separate treatment because of their frequency, their historical importance, and the distinctive issues in constructing and evaluating them. Traditionally, dictionary definitions are (if possible) definitions by genus and differentia (Atkins and Rundell 2008, 436-437). But not all terms can be defined in this way, because not all terms pick out a class in a hierarchy of kinds of items.

This section describes and illustrates the three components of a definition by genus and differentia (the term being defined, the genus, and the differentia), and articulates the logic of such a definition. It discusses the scope of such definitions, and offers suggestions for choosing the genus and then the differentia when one constructs a definition of this form. It concludes with a summary.

20. In bulleted examples of definitions by genus and differentia, the bold-faced term is the term being defined, the underlined term names the genus and the italicized words describe the differentia. The genus and differentia are in general non-linguistic items. The relation between the defined term and the linguistic item that names the genus is called “hyponymy”; the defined term in a correct definition by genus and differentia is called a “hyponym” of the name of the genus (Atkins and Rundell 2008, 133). Terms that name coordinate species of the same genus, such as the English words ‘rose’ and ‘tulip’ when used to name flowers, are called “cohyponyms” (Atkins and Rundell 2008, 134). Some dictionary definitions define generic adjectives like ‘strange’ by listing their cohyponyms (e.g. the words that label different ways of being strange), because of the difficulty of finding a higher genus suitable for a definition by genus and differentia. Atkins and Rundell (2008, 134) report that newer dictionaries try to avoid such definitions.

4.4.1 The components and logic of definitions by genus and differentia

A definition by genus and differentia consists of (1) the term being defined, (2) a linking word or phrase, (3) a noun or noun phrase that names a genus (i.e. a general class), and (4) one or more adjectives, phrases or clauses that describe one or more features (collectively, the differentia). Consider again the definition of the term 'triangle':

- A **triangle** is a plane figure *bounded by three straight lines*.

The definition consists of (1) the term "a **triangle**" (the term being defined), (2) the linking word "is", (3) the noun phrase "a plane figure" (the name of the genus), and (4) the phrase "*bounded by three straight lines*" (a description of the differentia).

The author of a definition by genus and differentia claims that each component mentioned in the defining part (i.e. the genus and each feature of the *differentia*) is a necessary condition for something to be correctly labeled by the term being defined. For example, an author of the above definition of the term 'triangle' would be claiming that being a plane figure is a necessary condition for being correctly called a triangle, and also that being bounded by three straight lines is a necessary condition for being correctly called a triangle. The author of a definition by genus and differentia also claims that the components mentioned in the defining part (i.e. the genus and each feature of the *differentia*) are jointly sufficient conditions for something to be correctly labeled by the term being defined. For example, an author of the above definition of the term 'triangle' would be claiming that the combination of being a plane figure and being bounded by three straight lines is a sufficient condition for being correctly called a triangle. If the differentia consists of more than one feature, the author of a definition by genus and differentia does *not* claim that the combination of the genus and each of those features by itself is

a sufficient condition for being correctly labeled by the term being defined. Consider for example the following definition by genus and differentia of the term ‘square’:

- A **square** is a plane figure *bounded by four straight lines of equal length and with four right angles.*

In this definition, the differentia consists of two features: being bounded by four straight lines of equal length, and having four right angles. An author of this definition does not claim that being a plane figure bounded by four straight lines of equal length is a sufficient condition for being a square; indeed, although the definition accurately reports the meaning of the term ‘square’ in one of its senses, there are plane figures bounded by four straight lines of equal length that are not squares, such as any rhombus whose interior angles are not right angles. Likewise, an author of the given definition of the term ‘square’ does not claim that being a plane figure with four right angles is a sufficient condition for being a square; here too there are counterexamples to such a claim, namely, rectangles with adjacent sides of unequal length. What the author of this definition does claim is that the combination of the genus and *both* features (i.e. being a plane figure bounded by four straight lines of equal length and with four right angles) is a sufficient condition for being correctly called a square.[21]

4.4.2 The scope of definitions by genus and differentia

If a definition by genus and differentia is expressed in a complete sentence, the genus is named by a noun or noun phrase. If one is expressing one’s definition in a complete sentence and wants to use this form to define other parts of speech, such as the verb ‘runs’ or the adjective ‘brave’ or the adverb ‘quickly’ or the

21. Traditionally, definitions by genus and differentia were regarded as so-called “real definitions” that specified the supposed “essence” of the species named by the term. For the case against the existence of essences and thus against the existence of real definitions, see section 6.2, “Real and nominal definitions”.

conjunction ‘or’, then one must do so indirectly by defining a corresponding noun, such as the gerund ‘running’ for ‘runs’, or the noun ‘bravery’ for ‘brave’, or the noun ‘quickness’ for ‘quickly’, or the noun ‘disjunction’ for ‘or’. Similarly, one would have to define phrases like ‘sheds its leaves in the fall’ or ‘prone to fits of depression’ or ‘with all deliberate speed’ indirectly, by defining a corresponding noun phrase, such as ‘shedding its leaves in the fall’ or ‘proneness to fits of depression’ or ‘deliberate speed’. Definitions by genus and differentia of such artificially constructed substitutes are sometimes more awkward, and thus less preferable, than some other form of definition of the original term.

Dictionary definitions, however, do not express their definitions in complete sentences. They show the term being defined, then the defining part of the definition, without joining them in a sentence. This style permits direct definition of adjectives, adverbs and verbs by genus and differentia without transforming them into a noun or noun phrase. Here are some examples, taken from online dictionaries:

- **brave**: possessing or exhibiting *courage or courageous endurance* (https://www.dictionary.com/browse/brave?s=t; accessed 2020-01-20)
- **run**: to go *quickly by moving the legs more rapidly than at a walk and in such a manner that for an instant in each step all or both feet are off the ground* (https://www.dictionary.com/browse/run; accessed 2020-01-20)
- **well**: in a *good or satisfactory* manner (https://www.dictionary.com/browse/well?s=t; accessed 2020-01-20)

The rest of section 4.4 uses as examples definitions of nouns or noun phrases, but the same points apply to definitions by genus and differentia of adjectives, verbs and adverbs.

4.4.3 The construction of definitions by genus and differentia

Constructing a definition by genus and differentia has two components: selecting the genus and selecting the differentia. The genus must include all the things that are correctly labeled by the term being defined. Within this constraint, the definer should choose a genus that makes it easy to pick out the differentia, for example by choosing a genus that includes the things commonly grouped with the things correctly labeled by the defined term.

Each feature in the differentia must belong to all the things correctly labeled by the defined term. Further, all the things in the genus that have all the features in the differentia must be correctly labeled by the term. If the differentia consists of more than one feature, then those features *when taken in combination* must distinguish the things correctly labeled by the term from other members of the genus. But it is not necessary, or even usual, for each feature by itself to distinguish the things that are correctly labeled by the term.

The following sub-sections elaborate on these points.

4.4.3.1 Selection of a genus in constructing a definition by genus and differentia

The genus must include all the things that are correctly labeled by the term being defined. A good question to ask about a proposed genus for a definition by genus and differentia, then, is whether any items that do not belong to the proposed genus are correctly labeled by the term being defined. If so, a broader class must be selected. It would be a mistake, for example, to define ‘oak tree’ as signifying a kind of deciduous tree, since the term ‘deciduous’ is commonly used of leafed trees that drop their leaves in the fall and are leafless until the spring. Not all oak trees are deciduous in this sense; live oaks do not drop their leaves in the fall, but lose

them briefly in the spring and are described as “semi-deciduous” or “nearly evergreen”. A better genus for defining ‘oak tree’ would be trees, or perhaps leafed trees.[22]

A definer should think of the task as selecting *a* genus rather than as selecting *the* genus, because there is no single correct answer to the question what genus some set of objects belongs to. The triangles spoken about in geometry, for example, are a kind of plane figure. More generally, they are a kind of figure; less generally, they are a kind of rectilinear plane figure. Hence one would not make a mistake if one started the defining part of one’s definition by genus and differentia of the term ‘triangle’ with either ‘a figure’ or ‘a plane figure’ or ‘a rectilinear plane figure’.[23] It makes sense, however, to select a genus that is neither so wide that the differentia needs to include many features nor so narrow that it almost coincides with the class of things correctly labeled by the term being defined. For example, the class of figures is for most purposes too wide a genus as a basis for defining the term ‘triangle’, since it includes figures in more than two dimensions and figures that are two-dimensional but not in a single plane (such as the surface of a lampshade); a list of distinguishing features that rule out those classes of figures would be hard to understand.

22. This example illustrates an important point about definitions of terms, that they often incorporate substantive claims about the world. A definition can be false because it gets the facts wrong. Unless a definition is introducing a term as an abbreviation for a complex phrase or is providing a one-word synonym, it usually makes claims about the world that go beyond reporting or stipulating or advocating a particular use of the term defined.
23. Historically, the task in constructing a definition by genus and differentia was to find first what was called “the proximate genus”, meaning the smallest general class to which the things correctly labeled by the term belong. In defining the term ‘triangle’, for example, one would be advised to pick rectilinear plane figure as the genus. The advice reflects a preoccupation with classification by division from an ultimate genus (e.g. figure) to a lowest species (e.g. triangle), a preoccupation that does not always produce the clearest result. It is more important to be clear in defining a term than to fit some antiquated theoretical straitjacket. Further, there can be more than one proximate genus, since there can be more than one classification tree into which one can fit a species; for example, triangles could be classified as a kind of mathematical abstraction, like numbers.

At the other extreme, the class of rectilinear plane figures might be too narrow a genus as a basis for defining the term ‘triangle’, since it might be hard to figure out what class of objects the phrase ‘rectilinear plane figure’ picks out, because of the unfamiliarity of the word ‘rectilinear’.

The legitimate variations mentioned so far concern the degree of generality with which one identifies a genus. But there are also legitimate differences of content. It is to some extent a matter of choice how one classifies a set of objects. All triangles are plane figures, but they are also all angular figures, in the sense of being figures with interior angles; in this respect, they are like cubes and parallelograms but unlike circles and spheres. Hence one could define a triangle as an angular figure of a certain sort. The difficulty of doing so concisely, clearly, understandably and accurately is a good reason for preferring plane figures to angular figures as the genus in which one is situating triangles. As a general guideline, then, one should locate the things correctly labeled by the term one is defining in a classification hierarchy that will make it easy to pick them out from other things in the genus in a way that is clear, concise, understandable and accurate. One way of doing so is to think of other things that most closely resemble the things correctly labeled by the term one is defining—that is, the things from which one would want to distinguish the things correctly labeled by the term. For example, if one were defining the term ‘square’, one would want to distinguish squares from rectangles and circles, which resemble squares in being plane figures. Hence it would make sense to choose plane figures as the genus to which squares belong, as in the following definition:

- A **square** is a plane figure *bounded by four straight lines of equal length and with four right angles.*

Similarly, if one were defining the term ‘courage’, one would group courage with patience and prudence, which like courage are human virtues. Hence it makes sense to choose human virtues as the genus to which courage belongs, as in the following definition:

- **Courage** is a human virtue *of doing what one thinks one should despite perceived danger to oneself in doing so*.

On the other hand, it is not a good choice to classify clocks as free-standing devices, as in the following definition:

- A **clock** is a free-standing device *that indicates the time*.

Clocks are most similar to watches but watches are not (in general) free-standing devices. It would be better to use a genus that includes just clocks and watches, such as the class of time-keeping devices. That would generate something like the following definition:

- A **clock** is a time-keeping device *that is not designed to be worn or carried on one's person*.

In some cases, there is controversy about what genus to select. Such controversies may be scientific disputes, as for example the disagreement at one time among zoologists as to whether to classify giant pandas as raccoons or bears. Or they may be legal disputes, as for example the disagreement as to whether to classify a licensed same-sex union as a kind of marriage. Or they may be philosophical disputes, as for example a possible disagreement in political philosophy as to whether to classify representative democracies as democracies or as mixed systems of government. Depending on the context and one's purposes, it may be necessary, if one is defining a term by genus and differentia, to address such a controversy directly by justifying one's choice of genus. It seems hard to formulate general rules for such justifications, since the required evidence and argument differ from case to case. But one can give examples of how justification works for the three disagreements just mentioned. For giant pandas, since biologists classify species of organisms according to the evolutionary history of their emergence, the best evidence is DNA analysis (which turned out to show that giant pandas are bears, not raccoons). Thus, one might define 'giant panda' as follows:

- A **giant panda** is a *large, black-and-white* bear *that is native to certain mountain forests of central and western China and that feeds almost entirely on bamboo*.

For licensed same-sex unions, people may appeal to traditional usage of the term ‘marriage’, to religiously based prohibitions on homosexual behaviour, to constitutional prohibitions of discrimination on the grounds of sexual preference, and to legally defined consequences of being called ‘married’ for such things as inheritance, employee benefits and substitute consent for medical procedures; these criteria pull in opposite directions, and people who appeal to those that pull in one direction tend to reject or ignore those that pull in the opposite direction. In Canada, the Civil Marriage Act of 2005 included the following definition:

- **Marriage**, for civil purposes, is the lawful union *of two persons to the exclusion of all others.*

The qualification “for civil purposes” emphasized that the legislation was not defining what religions should count as marriage. For representative democracies, the justification of its classification may turn on the theoretical neatness of a system of pure types of government. Representative democracies count as democracies if something like the following broad definition of ‘democracy’ is adopted:

- **Democracy** is a system of government *in which ultimate power rests with the people who are governed.*

There is a problem in constructing counterexamples to show that a genus is incorrect when the term being defined is empty, in the sense that nothing exists that is correctly labeled by the term. Consider for example the terms ‘unicorn’ and ‘centaur’, each of which refers to a non-existent kind of animal. A unicorn is a horse with a horn in the middle of its forehead, and a centaur is an animal with the head, arms and upper body of a human and the lower body and legs of a horse. There is no such horse as a unicorn, and

there is no such animal as a centaur. Suppose then that somebody switched the definitions and defined the term ‘centaur’ as follows:

- A **centaur** is a horse *with a horn in the middle of its forehead*.

The genus in this definition by genus and differentia is clearly incorrect; a centaur is not a kind of horse. But how could one show this by counterexampling? To show that deciduous trees are not the correct genus for oaks, we gave live oaks as an example of an oak that is not a deciduous tree. So, by analogy, to show that horses are not the correct genus for centaurs, one would need to give an example of a centaur that is not a horse. However, since there are no centaurs, there is no such example. The solution to this problem is to extend the concept of a counterexample to cover purely imaginary cases. If there were any centaurs, they would not be horses. So an imaginary centaur is a counterexample showing that the genus of the definition is incorrect.

4.4.3.2 Selection of the differentia in constructing a definition by genus and differentia

In selecting the differentia, one needs to meet two criteria.

In the first place, each feature in the differentia must belong to *all* the things correctly labeled by the term being defined. A useful way to ensure this inclusiveness is to consider a variety of things correctly labeled by the defined term, as in the listing of examples of terms in section 1.2. By considering a variety of things correctly labeled by a defined term, one provides a basis for finding inclusive features that each belong to all the things correctly labeled by the term. For example, as a preliminary to identifying distinguishing features for a definition by genus and differentia of ‘triangle’, it would help to bear in mind that there are equilateral, isosceles and scalene triangles, and that some triangles have an obtuse angle (greater than a right angle).

To take a more complicated example, if one were constructing a definition of the term ‘clock’ with time-keeping device as the

genus, and one wanted to find features of time-keeping devices that belonged to all clocks, one might bring to mind that clocks include digital clocks, clocks in clock radios, grandfather clocks, clocks that hang on a wall, and travel alarm clocks. One might want to make a decision as to whether to count sundials or chess clocks or time clocks as clocks in the sense in which one is defining the term ‘clock’. Keeping in mind the variety of kinds of clocks that must all have each feature in one’s differentia, one would be less likely to include in the differentia the features of having moving parts (which would exclude digital clocks) or of being non-portable (which would exclude travel alarm clocks). In general, having in mind a variety of things correctly labeled by the defined term helps to avoid constructing a definition that is *too narrow*, in the sense that it fails to include some things correctly labeled by the term being defined.

In the second place, the differentia should belong *only* to those members of the genus correctly labeled by the defined term. A useful way of avoiding an overly inclusive set of distinguishing features is to consider a variety of things in the genus that are *not* correctly labeled by the defined term. To continue with our clock example, if one is defining the term ‘clock’ with time-keeping device as the genus, one might bring to mind time-keeping devices that are not clocks, such as wrist watches and pocket watches. Thus one would be less likely to pick not being worn on one’s person as the differentia (since this choice would mistakenly count pocket watches as clocks). In general, having in mind a variety of things in the genus that are *not* correctly labeled by the term being defined helps to avoid constructing a definition by genus and differentia that is *too broad*, in the sense that it includes some things that are not correctly labeled by the term being defined.

If one’s differentia consists of more than one feature, and one wishes to avoid redundancy, then each feature must belong to other things in the genus, i.e. things not correctly labeled by the defined term. The following (previously mentioned) definition of the term ‘square’ meets this requirement:

- A **square** is a plane figure *bounded by four straight lines of*

equal length and with four right angles.

As previously pointed out, the feature of being bounded by four straight lines of equal length belongs not only to all squares but also to some plane figures that are not squares (namely, rhombuses with no interior right angles), and the feature of having four interior right angles belongs not only to all squares but also to some plane figures that are not squares (namely, rectangles with adjacent sides of unequal length).

Sometimes, however, redundancy is a good idea. One can accurately define a bird as follows:

- A **bird** is a *non-extinct feathered* vertebrate.

But one would give a more complete sense of what birds are like if one mentioned more features of birds, such as their building of nests in which the females lay eggs, the hatching of the eggs, and the feeding by the parents of the hatchlings until they can fend for themselves.

It is simpler to pick a differentia that consists of just one feature. For example, one might define 'square' in one of the following ways:

- A **square** is a plane figure *whose area is the square of the length of any side*.
- A **square** is a rectangle *with sides of equal length*.

These definitions are correct, but may not fit one's purposes as well as the previously mentioned definition:

- A **square** as a plane figure *bounded by four straight lines of equal length and with four right angles.*

The first of the above three definitions uses a distinguishing feature that is not obvious when one looks at a square, and so is hard to apply and perhaps hard to understand. The second of them requires that its reader or hearer already understand the term

'rectangle'. Simplicity is a virtue of a good definition, but it is not the only such virtue. Sometimes a more complex definition is better, all things considered. Ease of understanding is more important in selecting a differentia than the simplicity of having just one feature that distinguishes the things correctly labeled by the term being defined from other things in the genus.

As pointed out in the discussion of extended synonyms in section 4.3, the features that make up the differentia need not be properties of the things correctly labeled by the term being defined. They can be relations of those things to something else, as in the following definition by genus and differentia of the north pole of a rotating body in the solar system:

- **The north pole [of a rotating body in the Solar System]** is that pole of rotation *that lies on the north side of the invariable plane of the Solar System*. (Archinal et al. 2010, 5)

Or they can be operations rather than observable features, as in the following definition:

- A **bishop** is *the* piece in chess *that moves along the diagonal.*

Or they can be descriptions of how the things correctly labeled by the term being defined are formed or constructed, as in the following definition of the term 'zygote':

- A **zygote** is a diploid cell *resulting from the fusion of two gametes*.

To challenge a differentia by counterexampling, one produces either a case that is correctly labeled by the term but not by the differentia (thus showing that the differentia is too narrow) or a case that is correctly labeled by the differentia but not by the term (thus showing that the differentia is too broad). As with counterexampling a genus, one may need to appeal to imaginary cases. These imaginary cases need not be logically possible. For example, in ancient times mathematicians tried to figure out how

to use a ruler and compasses to square a circle and to trisect an angle. Squaring a circle is constructing a square whose area is the same as a given circle. Trisecting an angle is producing two more lines between the two given lines in such a way that the three angles so created are equal. It was later proved that neither operation can be performed with a ruler and compasses. Now suppose that somebody switched the definitions and defined the term 'trisecting an angle' as follows:

- **Trisecting an angle** is constructing *a square whose area is the same as a given circle*.

To show by counterexampling that the differentia is incorrect, one needs to imagine someone trisecting an angle with a ruler and compasses (which is impossible) and to note that in this situation there is no given circle. The differentia is too narrow; in fact, it does not cover any of the (imaginable but impossible) cases of trisecting an angle.

In the discussion of selecting the genus, the following definition of the term 'clock' was mentioned:

- A **clock** is a time-keeping device *that is not designed to be worn or carried on one's person*.

This definition raises the question of whether it is legitimate to use the absence of some characteristic as the differentia—in the above case, the absence of being designed to be worn or carried on one's person. A negative feature is perfectly acceptable as a differentia, as long as it picks out all and only those objects in the genus that are correctly labeled by the term being defined. Thus the above definition of the term 'clock' is perfectly acceptable. So is the following definition:

- An **evergreen tree** is a tree *that does not shed its leaves or needles in the fall*.

This definition could be challenged on the ground that it counts trees that briefly shed their leaves in the spring (such as live oaks) as evergreen trees. Usage among horticulturalists appears to vary on this point; some count such trees as evergreen, while others call them ‘nearly evergreen’.

4.4.3.3 Precision in definitions by genus and differentia

The examples discussed so far are terms with a precise meaning, such as ‘triangle’ and ‘clock’. There are few borderline cases where usage leaves it indeterminate whether something is a triangle or something is a clock. In everyday language, however, many terms are not precise. They have vague boundaries of application; in other words, there are borderline cases where ordinary usage leaves it indeterminate whether they are correctly labeled by the term. Examples of such terms are ‘bush’, ‘evening’, and ‘sport’. For such terms, a definition by genus and differentia will need to include in the description of the differentia a qualifier like ‘probably’, ‘usually’, or ‘generally’ that allows for the vagueness of the term. Such qualified definitions are discussed in section 4.6, entitled “Range definitions”.

4.4.4 Analogues of definitions by genus and differentia

Two forms of definition are similar to definitions by genus and differentia: definitions by whole and part, and definitions by group membership.

4.4.4.1 Definitions by whole and part

Terms that name a part of some whole are commonly defined by naming the class of whole objects that have the part and then specifying which part the term names. Consider for example the following (inadequate) definition by whole and part of the term ‘root’:

- A **root** is the part of a plant *that is below the ground*.[24]

An adequate definition by whole and part must correctly identify the class of whole objects (which is like the genus in a definition by genus and differentia) and must correctly pick out the part (which is like the differentia). A definition by whole and part can thus go wrong either with respect to the name of the class of whole objects or with respect to the specification of the part.

Consider first various ways of picking out the wrong class of whole objects, as in the following example:

- A **root** is the part of a tree *that is below the ground*.

This definition picks out too narrow a class of whole objects. It ignores plants that are not trees, all of which have roots. One can also go wrong by picking out too broad a class of whole objects. In this respect, definitions by whole and part differ from definitions by genus and differentia, where the genus can be as broad as one likes. In definitions by whole and part, in contrast, one must be careful that the class of whole objects is not too broad. It must include only whole objects that have the part in question. Consider for example the following definition:

- A **root** is the part of a stationary organism *that is below the ground.*

The class of stationary organisms includes mushrooms, which have a part below the ground that is not a root but a vegetative part called 'mycelium'.[25] Thus the above definition picks out too large a class of whole objects. One can also pick out a class of whole

24. In bulleted definitions by whole and part, the term being defined is bold-faced, the name of the class of whole objects is underlined, and the specification of the part is italicized. The name of the part is called a 'meronym' of the name of the whole (Atkins and Rundell 2008, 137). In the example, the word 'root' is a meronym of the word 'plant'.
25. See the article on mycelium in *Wikipedia*, available at https://en.wikipedia.org/wiki/Mycelium (accessed 2019-08-10).

objects that is too narrow in one respect and too broad in another, as in the following example:

- A **root** is the part of a stationary tall organism *that is below the ground*.

The vaguely specified class of stationary tall organisms excludes low-growing ground covers, which have roots, and is thus too narrow in that respect. At the same time, it might include some tall mushrooms, which lack roots, and is thus too broad in that respect. In general, when constructing or evaluating a definition by whole and part, one should ask about the named class of whole objects whether any of them lack the part whose name one is defining (in which case the class is too broad in that respect) and whether it excludes any objects that have the part whose name one is defining (in which case the class is too narrow in that respect). If one is constructing the definition, one should make adjustments to correct any such errors.

Now consider ways of specifying the part incorrectly. Here again one can go wrong either by being too narrow or by being too broad (or both, in different respects). Consider the following previously mentioned definition:

- A **root** is the part of a plant *that is below the ground*.

Thinking about the italicized part of this definition, one might recall that some plants have roots in the air. Such roots are clearly not below the ground, but nevertheless they are roots. Also, one can take a cutting from a plant, put the cutting in water, and watch the cutting grow roots. Also, there are hydroponic growers who grow plants in water, whose roots are thus not below the ground. Also, when a plant is uprooted, its roots are above the ground; eventually such a plant will die, but if it is replanted soon enough it can continue to live. Thus there are lots of counterexamples showing that the phrase “that is below the ground” is too narrow a specification of what part of a plant is its root. The above definition needs to be revised to take these counterexamples into account. It

also needs to take account of other counterexamples that show that the specification of the part is in other respects too broad. Some plants have part of their stem below the ground, as well as their root. So the specification of the part is too broad in that respect. Fixing the specification of the part requires abandoning the attempt to use a root's location to specify what part of a plant it is. The following definition in the *Wikipedia* article on roots uses the fact that, unlike other parts of a plant, a root does not have leaves or nodes:

- A **root** is the *non-leaf, non-nodes bearing* parts of the plant's body. (https://en.wikipedia.org/w/index.php?title=Root&direction=prev&oldid=981106166; accessed 2021-01-12)

This example illustrates the way in which definitions of quite common terms incorporate substantive knowledge (or, if they are inaccurate, substantive false beliefs).

4.4.4.2 Definitions by group membership

Definition by group membership is another form of definition analogous to definition by genus and differentia. One can define a term designating a group by describing the group's members, as in the following example:

- A **pod** is *a group of* whales *that swim together*.

(This definition will turn out to be inaccurate, as will be explained later.) The converse type of definition, in which one defines a term designating a member of a group by naming the group, can be treated as a kind of definition by genus and differentia, as in the following example:

- A **juror** is a member *of a jury*.

The underlining indicates that the genus to which jurors belong is members and that the differentia is belonging to a jury. The definition is not very helpful, since a person who needed to know what the word ‘juror’ means would probably not know what the word ‘jury’ means. The word ‘jury’ can however be defined as the name of a certain kind of group, without using the word ‘juror’, as in the following example:

- A **jury** is *a group of* lay people *who are selected to make a decision in a legal case on the basis of the evidence, testimony and argument presented to them*.

The underlined component of the above definitions of ‘pod’ and ‘jury’ is the analogue of the name of the genus in a definition by genus and differentia. In a definition of a term designating a group, the analogue of the genus is the larger class to which the group belongs (whales in the case of a pod, lay people in the case of a jury). As with definitions by genus and differentia, one key substantive requirement for a definition by group membership is to identify a larger class that includes all the individuals that can belong to a group correctly labeled by the term being defined. Consider again the previously mentioned definition of the word ‘pod’:

- A **pod** is *a group of* whales *that swim together*.

Whales are not the only animals that form pods. Other animals do so, including dolphins, seals, and pelicans.[26] Thus the class of whales is too narrow. To define the word ‘pod’ as it applies within the broader class, it might be better to take the broad class as marine animals and use the specification of group membership to narrow down which marine animals form pods. A first try at such a revised definition might look as follows:

26. Some sources restrict pods to groups of marine mammals. However, articles on pelicans report that they form pods. Thus the term ‘pod’ is used in a narrower and in a broader sense. To illustrate the process of accommodating counterexamples, the definitions are taken to report the broader sense that recognizes pods of pelicans.

- A **pod** is *a group of* marine animals such as whales, dolphins, seals, or pelicans *that swim together*.

The reader may notice that the italicized part of the above definition is too broad, since it counts schools of fish as pods, whereas schools of fish lack the distinctive features that make a group of marine animals swimming together into a pod. This inadequacy leads naturally to a consideration of the remaining part of the definition of the name of a group: the specification of criteria for group membership.

The criteria for group membership are the analogue of the differentia in a definition by genus and differentia. As with the differentia, the criteria for group membership must be neither too narrow nor too broad. That is, they must include *all* groups of members of the broad class that are correctly labeled by the term being defined, and they must include *only* groups of members of the broad class that are correctly labeled by the term being defined. Consider for example the previously mentioned definition of the term ‘jury’:

- A **jury** is *a group* of lay people *who are selected to make a decision in a legal case on the basis of the evidence, testimony and argument presented to them*.

The italicized phrase specifies which groups of lay people are correctly labeled by the word ‘jury’. The specified criteria seem to be neither too narrow nor too broad. It would be too narrow to use the phrase ‘in a criminal case’ rather than ‘in a legal case’, since civil suits are legal cases and sometimes have juries. It would be too broad to omit the phrase ‘in a legal case’, since there are groups of lay people selected to make recommendations (which are arguably a kind of decision), such as the British Columbia Citizens Assembly on Electoral Reform, a group of randomly selected citizens who investigated and then recommended changes

to British Columbia's electoral system.[27] The assembly made a decision on the basis of evidence, testimony and argument presented to it, but it was not a jury. In the definition of the word 'pod', the following definition might specify the criteria for being members of a pod without being either too narrow or too broad:

- A **pod** is *a group of* marine animals such as whales, dolphins, seals, or pelicans *that travel together over a period of time for social engagement and protection from predators*.

This definition excludes schools of fish from being called 'pods', since the fish in a school of fish have no social engagement with one another.

4.4.5 Summary on definitions by genus and differentia

To sum up, a definition by genus and differentia names a genus and describes a differentia. The genus is a general class to which, according to the definition, all the things correctly labeled by the term being defined belong. The differentia consists of one or more features that, according to the definition, collectively distinguish the things correctly labeled by the term being defined from other things in the genus. If a definition by genus and differentia is a sentence of the form 'A <term to be defined> is a <genus> <differentia>', then the term to be defined and the name of the genus must both be nouns or noun phrases. If it has the form of a dictionary definition ('<**term**> <genus> <differentia>'), then the term to be defined and the name of the genus can be either both nouns and noun phrases or both adjectives and adjective phrase or both verbs or verb phrases or both adverbs and adverb phrases.

In constructing a definition by genus and differentia, one must select a genus to which all the things correctly labeled by the term being defined belong. A good way to ensure such inclusiveness

27. See https://en.wikipedia.org/wiki/Citizens%27_Assembly_on_Electoral_Reform_(British_Columbia) (accessed 2021-04-18).

is to consider first a variety of kinds of things that are correctly labeled by the term. To make it easier to understand the differentia, it helps to pick a genus that is neither too specific nor too general and that includes things that closely resemble the things correctly labeled by the term being defined (such as a class that includes squares if one is defining 'triangle' or a class that includes watches if one is defining 'clock').

In choosing a differentia, it helps to think of a variety of things in the genus that are correctly labeled by the term (so as to include all of them) and also of a variety of things in the genus that are *not* correctly labeled by the term (so as to exclude all of them). In this way, one will avoid constructing a definition that is either *too narrow* or *too broad*. There is no objection in principle to a negative differentia.

Definitions by whole and part and definitions by group membership are analogous to definitions by genus and differentia. The class of wholes named in the defining part of a definition by whole and part must include all and only the wholes to which the part in question belongs, and the description of which part is in question must be neither too broad nor too narrow. The class named in the defining part of a definition by group membership must include all the individuals that can form groups correctly labeled by the term being defined, and the description of the criteria for membership in such a group must be neither too narrow nor too broad.

4.5 Contextual definitions

4.5.1 The structure of contextual definitions

A contextual definition[28] provides an expression equivalent in meaning to expressions in which the term being defined occurs

28. Ennis (1996, 333; 2016, 2) calls a definition of this form "an equivalent-expression definition". When this book was to be co-authored, we agreed to use his term. However, nobody else uses the term, and the term 'contextual definition' is widely used and widely

in some context.[29] It is thus a kind of definition by extended synonym, but of an expression in which the defined term appears rather than of the defined term by itself. Here are two examples:[30]

- To say ‘a branch of study is a **science**’ means *its researchers study its subject-matter with careful observation and rigorous analysis*.
- ‘**To prove** a proposition **beyond a reasonable doubt**’ means *to offer enough evidence in its support that it would not make good sense to deny that proposition*.[31]

The first of these examples is not a good definition, as will be pointed out.

In these examples, a contextual definition has the structure: ‘<context> <**term to be defined**>’ means <equivalent expression>. Other structures are possible. In scientific,

recognized among philosophers. Since a definition of this form provides an expression alleged to be equivalent to an expression in which the term being defined occurs in some context, either label communicates its distinctive feature. I have therefore reverted to the commonly used label.

29. This characterization follows that of Hempel, who writes: “A definition which introduces a symbol *s* by providing synonyms for certain expressions containing *s*, but not for *s* itself, is called a contextual definition.” (Hempel 1952, 4) Linsky (2016) writes: “In a contextual definition ... terms ... are eliminated through rules for defining the entire sentences in which they occur.” Hempel’s definition is more inclusive in two respects than Linsky’s, because it allows both for equivalent expressions that are phrases rather than sentences and for non-comprehensive contexts.
30. In bulleted contextual definitions, the term being defined will be **bold-faced**, its context underlined, and the equivalent expression *italicized*.
31. This definition illustrates the usefulness of skill at constructing definitions. Ennis (1991, 2015) invented and effectively used this contextual definition in a murder trial for which he was a juror. The jury did not have a definition; a particularly sceptical member demanded a definition; and the jury did not know what to do. The jury had asked the Bailiff to ask the Judge for a definition of the phrase, and the Judge had sent back a reply to the effect that there is no definition and that the jury should do the best it could. The jury was about to become a hung jury. However, the jury was satisfied by the definition (because its members really already knew the meaning of the term, but felt unable to state it), and proceeded to deliberate further and reach verdicts.

mathematical and logical contexts, the symbol '$=_{df}$' is used instead of 'means', as in the following example:

- **Average density** of *x* $=_{df}$ *mass of x in grams / volume of x in cc.*[32] (Hempel 1952, 5)

If the equivalent expressions are sentences, one can use the structure 'to say that … is to say that …,' as in the following example:

- To say that an inherited trait is **polygenic** is to say that[33] *several genes must be present for the trait to be inherited*.

Dictionaries sometimes express contextual definitions in a complex sentence with a conditional clause with the defined term embedded and a main clause that gives the meaning of the conditional clause, as in the following example:

- When something such as a contract, deadline, or visa **expires**, *it comes to an end and is no longer valid*. (quoted by Atkins and Rundell (2008, 441))

Or they may express them in a simple sentence, as in the following example:

- An **innocent** question, remark or comment is *not intended to offend or upset people, even if it does*. (quoted by Atkins and Rundell (2008, 446))

One can get the same effect as a contextual definition by indicating the type of things of which an adjective or adverb is said. For example, the above definition might be rephrased as follows:

32. By convention, the symbol '$=_{df}$' indicates that the expressions on either side of it are being used to refer to themselves, so there is no need to put quotation marks around them.
33. People commonly use the structure 'to say that ... means that...' But 'means that' could mean 'implies that' rather than 'means the same as'. Hence 'is to say that', which is unambiguous, is preferable.

- **Polygenic** (said of inherited traits): *resulting from several genes*.

The following remarks on contextual definitions apply equally to definitions of this form.

Contextual definitions are particularly attractive when the term to be defined is an adjective, but they can be used to define any part of speech or any phrase, as the examples show. Unlike definitions by genus and differentia, they do not require that one find a genus that includes the things correctly labeled by the term being defined. They are particularly helpful for abstract general terms (like the word 'the') that do not pick out a species of a genus and for terms (like the word 'plus') that signify functions. They work best when the defined term occurs in a limited range of contexts, as is the case with many adjectives and many intransitive verbs (Atkins and Rundell 2008, 443).

In some cases, one can transform a contextual definition into a definition by genus and differentia. Consider for example the following contextual definition of 'growth':

- '<u>x</u> **grows**' means *x gets bigger*.

One could transform this definition into the following definition by genus and differentia:

- **Growth** is a <u>change</u> *from being smaller to being bigger*.

In other cases, such transformations are difficult and perhaps impossible, as in the following definition:

- '**Between** *<u>y and z</u>*' means *with y on one side and z on the other side*.

Whether or not such a transformation is possible, a good contextual definition makes clear the meaning of the term being defined, because it enables us to transform an expression in which

the term occurs into an equivalent expression in which the term does not occur.

Even when a definition by genus and differentia is possible, contextual definitions have the advantage of avoiding the problem of having to find and lean on a genus that may be awkward, confusing or uninformative. For example, a definition by genus and differentia of 'biased' calls for first converting the word into a noun (perhaps 'bias') and then deciding what noun to use for the genus. One might choose the noun 'quality' and produce the following awkward-sounding definition:

- **Bias** is the quality *of letting one's prejudices influence one's judgment*.

The word 'quality' is rarely used in this sense outside of dictionary entries (Atkins and Rundell 2008, 448). In comparison, it is easier to construct and understand the following contextual definition:

- '*A person is* **biased**' means *the person is letting his or her prejudices influence his or her judgment*.

In this case, an extended synonym might be even easier to construct and understand:

- '**Biased**' means *influenced in judgment by prejudice*.

All three definitions of 'biased' convey the same meaning, and thus are equally correct. They differ only in ease of construction and understanding.

4.5.2 Identification of the context in constructing a contextual definition

A good contextual definition should provide an understandable equivalent for at least some expressions containing the term being defined. In constructing such a definition, therefore, one needs to

consider what sorts of expressions contain the term. If the term is used only in very restricted contexts, it may be possible to find a context that covers all such contexts and thus construct a comprehensive contextual definition, such as the definition of the term ‘polygenic’ in the next paragraph. More commonly, the term being defined occurs in a wide variety of contexts and one can only find a context that accounts for some of them, as in the definition in the next paragraph of the term ‘biased’. Identification of a context often happens intuitively, without requiring much thought, and often happens at the same time as one finds an equivalent expression. One can search a corpus for occurrences of a term in context. But the following guidelines may help if a context for the defined term does not immediately come to mind or one does not have access to a searchable corpus.

If the term is an adjective, or a phrase or clause used to modify nouns, one should consider what sorts of entities it can describe. The term ‘polygenic’, for example, is used to describe inherited traits. It is not used to describe people, animals, things, sentences, events, or indeed anything other than inherited traits. Hence it is possible to construct a comprehensive contextual definition of ‘polygenic’, one that covers all contexts in which that term appears, by choosing as the context the phrase ‘An inherited trait is …’, as in the following (previously mentioned) definition:

- To say that an inherited trait is **polygenic** is to say that *several genes must be present for the trait to be inherited*.

Consider by contrast the earlier contextual definition of the term ‘biased’:

- ‘A person is **biased**’ means *the person is letting his or her prejudices influence his or her judgment*.

The term ‘biased’ is used to describe not just people but also decisions, opinions, samples and other things. Hence the context ‘A person is …’, used in the above definition, is not comprehensive. It is good enough, however, for reporting the

meaning of ‘biased’ when it is used of people. One can defend limiting the context for the definition of ‘biased’ to people on the ground that biased decisions and opinions are definable as decisions and opinions resulting from a person’s bias. A different context would be needed for samples, because they are biased in a sense that is independent of the sense in which people are biased. Samples do not have prejudices, nor are their biases necessarily a reflection of a person’s prejudices. The following might be a good contextual definition of the term ‘biased’ as it applies to samples:

- To say that a sample is **biased** is to say that *the sample has been selected from a universe in a way that makes it systematically likely to be different from that universe*.

This definition would usefully be supplemented by some examples of biased samples and what makes each of them biased. For example, a sample of products from an assembly line would be biased if it was selected by removing every 1000th product for testing and there were 10 parallel processes in the production process (e.g. simultaneous capping of 10 soft-drink bottles), because it would include in the sample only products made in one of the 10 parallel processes.

If the term is a noun or a noun phrase, one should consider what kinds of items it makes sense to apply the term to. In other words, in a sentence of the form ‘*x* is a <noun or noun phrase>‘, to what sorts of things can the replacement for ‘*x*’ refer? Consider for example, the previously mentioned definition of the term ‘science’:

- ‘A branch of study is a **science**’ means *its researchers study its subject-matter with careful observation and rigorous analysis*.

This definition reflects the judgment that a sentence of the form ‘*x* is a science’ makes sense if ‘*x*’ is replaced by the name of a branch of study. One could defend as an alternative context ‘A branch of knowledge is a …’ This alternative reflects a different

way of looking at sciences, as bodies of knowledge rather than as systematic inquiries into different aspects of reality. It might result in the following rather restrictive contextual definition of 'science':

- To say that a branch of knowledge is a **science** is to say that *it has been given an axiomatic formulation in which all the general truths about its subject-matter can be deduced from its axioms without any additional information.*

In the case of a verb or verb phrase, one should likewise consider what kinds of things the verb or verb phrase can apply to. The context selected for a comprehensive contextual definition of the verb 'grow', for example, should reflect the variety of things that are said to grow: not just living organisms but also crystals, relationships, economic output, incomes, and so forth. The very broad and neutral context 'x …' might do, as in the following (previously mentioned) definition:

- 'x **grows**' means *x gets bigger*.

On the other hand, the verb 'wonder' applies only to people and perhaps to some animals, and takes as its object only embedded interrogatives. For simplicity, one could restrict the context to a person wondering whether something is true, as in the following definition:

- To say that a person **wonders** whether some proposition is true is to say that *the person does not know the truth-value of the proposition but is thinking about what that truth-value might be.*

In the case of an adverb or adverb phrase, one should consider what kinds of statements reporting the occurrence of an event or the existence of a state of affairs can be qualified by the adverb or adverb phrase in question. Consider the following contextual definition of 'slowly':

- ‘A person does something **slowly**’ means *the person takes more time to do it than most people take*.

This definition uses ‘a person does something …’ as the term’s context, and is good enough for that context. If one wants a comprehensive definition, however, one needs to cover statements about other processes. A rock can fall slowly down a hill, a train can pass slowly by a level crossing, a tree branch can move slowly in a gentle breeze, and so on. A contextual definition that captures the full range of uses of the term ‘slowly’ should therefore use a more general context, and the equivalent expression should be correspondingly more general. It might read as follows:

- ‘A process occurs **slowly**’ means *the process takes more time than such processes usually take*.

It is easier to find a comprehensive context for terms like ‘polygenic’ that have a narrow application than for terms like ‘slowly’ that have a broad application. A non-comprehensive context in a contextual definition is not a mistake, just a limitation of the applicability of the definition.

4.5.3 Formulating the equivalent expression in a contextual definition

The equivalent expression is the defining part of a contextual definition. It must fit the use of the term in the chosen context. One thus needs to be on the alert for possible counterexamples of two types.

The first type is a possible situation that is correctly described by the first part of the definition but not by the supposedly equivalent expression. Consider for example the following contextual definition of the term ‘legal duty’:

- ‘X has a **legal duty** *to do Y*’ means that *X is required to do Y by a contractual relationship that would be upheld in a court*

of law (Memidex; available at http://www.interglot.com/dictionary/en/en/translate/contextual%20definition; accessed 2021-01-12)

However, the legal dictionary on the website of ALM (American Law Media) proposes the following definition of 'legal duty' by genus and differentia:

- **legal duty** n. the responsibility *to others to act according to the law*. (available at http://dictionary.law.com/Default.aspx?selected=1130; accessed 2020-01-20)

The entry gives as an example of a legal duty the duty to keep premises safe. This duty can arise independently of a contractual relationship; for example, one has a legal duty to keep the steps to one's front porch safe, even if one has no contractual relationship with a person using them. This duty is thus a counterexample to the interglot definition: one has a duty to keep the steps to one's front porch safe, but one is not required to do so by a contractual relationship that would be upheld in a court of law. The counterexample shows that the interglot definition is *too narrow* and needs to be broadened.

Sometimes an apparent counterexample of this first type turns out not be a real counterexample, because it uses the term with another meaning. Consider the following (previously mentioned) contextual definition of the term 'biased':

- 'A person is **biased**' means *the person is letting his or her prejudices influence his or her judgment*.

Someone might object that people are sometimes said to be biased if they have a definite opinion on an issue, even if that opinion is based on a careful and unprejudiced consideration of all the available relevant evidence. Since this situation is correctly described by the first part of the definition (the person is biased) but not by the allegedly equivalent expression (the person is not letting his or her prejudices influence his or her judgment), it

would show that the definition is too narrow if it were a genuine counterexample. In fact, however, it is not a genuine counterexample, because it appeals to a different sense of the word 'biased'. The definition reports the pejorative use of the word 'biased', according to which to call a person biased is to say something negative about that person. The supposed counterexample, on the other hand, uses the word 'biased' in its non-pejorative sense of having a definite opinion.

The second type of counterexample to a contextual definition is a possible situation that is correctly described by the supposedly equivalent expression but not by the first part of the definition. Consider for example the following (previously mentioned) contextual definition:

- '**Between** *y and z*' means *with y on one side and z on the other side*.

Someone might object to this definition that New Orleans has New York City on one side and Los Angeles on the other side, but is not between New York City and Los Angeles. This counterexample shows that the definition is *too broad*. The equivalent expression needs to be tightened up so as to require something that is spatially between two things to be situated on (or close to) a line joining them.

Like definitions by genus and differentia, contextual definitions can be simultaneously too narrow and too broad, in different respects. Consider the following (previously mentioned) contextual definition:

- 'A branch of study is a **science**' means *its researchers study its subject-matter with careful observation and rigorous analysis*.

On the one hand, this definition requires that a science makes careful observations, but theoretical physics is a science whose researchers do not make observations. In this respect, the definition is too narrow. On the other hand, the definition would

count pseudo-sciences like phrenology and cryptozoology as sciences, because researchers in those branches of study use careful observation and rigorous analysis. In this respect, the definition is too broad. It is in fact quite a challenging task to say what 'science' means. Section 4.6, which introduces the concept of a range definition, considers a definition of 'scientific method' that captures better the vagueness of the word 'science' as it is most commonly used nowadays.

Contextual definitions can also be inadequate if they presuppose the existence of something non-existent or the uniqueness of something that is not unique. Consider for example the following contextual definition of the word 'quotient' as it is used in arithmetic:

- The **quotient** of a natural number x divided by a natural number y (x/y) is *the number z such that z times y is x (z x y = x)*.

If y is zero, then either there is no such number z (if x is not zero) or there is an infinite number of such numbers z (if x is zero, since any natural number multiplied by zero is zero). There are two ways to repair the above definition to meet the requirements of existence and singularity. One is to restrict the divisor y to natural numbers other than zero, i.e. to what are called 'positive integers', as in the following revised contextual definition of 'quotient':

- The **quotient** of a natural number x divided by a positive integer y (x/y) is *the number z such that z times y is x (z x y = x)*.

The other is to make the definition conditional on y being non-zero:

- If a natural number y is not zero ($y \neq 0$), the **quotient** of a natural number x divided by y (x/y) is *the number z such that z times y is x (z x y = x)*.

The problem of false presuppositions, which can arise with any form of definition, rarely presents itself outside mathematical and logical contexts.[34]

4.5.4 Summary on contextual definitions

A contextual definition has the structure: '<context> <term to be defined>' means <equivalent expression>. It can be used to define any part of speech or phrase. A comprehensive contextual definition enables one to replace any expression in which the defined term may occur with an expression with the same meaning in which the defined term does not occur. A less comprehensive contextual definition covers only some contexts in which the defined term occurs; it may be good enough for some purposes. In constructing a contextual definition, one needs to identify the contexts in which the term to be defined may occur. If a comprehensive definition is desired, one needs to include all those contexts in the first part of the definition. Such comprehensiveness is more feasible with words of restricted application like 'polygenic' than with words of diverse application like 'slowly'.

The expression in the second part of the definition must fit the meaning that one has in mind. A situation that is correctly described by the first part of the definition but is not correctly described by the second shows that the definition is too narrow. In that case, the expression in the second part needs to be broadened. A situation that is correctly described by the second part of the

34. (This footnote is for readers familiar with the concepts of quantifier, bound variable, function, value, argument and sequence. Other readers can safely ignore it.) The above definition of 'quotient' could be expressed arithmetically as follows: If y ... 0, then x/y = z $=_{df}$ *z x y* = *x*. Gorsky (1981, 116) points out that such contextual definitions with variables must satisfy three requirements: (1) Each variable should occur only once in the expression containing the defined term; (2) A variable on one side of the '=df' symbol should be bound by a quantifier if and only if it is bound by a quantifier on the other side; (3) If the expression on the left side of the '=df' symbol is a functional expression, then there must be exactly one value of the function for each sequence of arguments.The definition of 'quotient' that allows the divisor to be zero violates the third requirement.

definition but is not correctly described by the first part shows that the definition is too broad, in which case the expression in the second part needs to be restricted. A contextual definition can be simultaneously too narrow and too broad, too narrow in one respect and too broad in another. In that case, it needs to be made broader in the first respect and narrower in the second. A contextual definition can also be inadequate if the allegedly equivalent expression has a false presupposition.

4.6 Range definitions

This chapter has now discussed five forms of definition.[35] Its guidelines for constructing and evaluating definitions of these five forms often presuppose that the things correctly labeled by the term being defined are sharply distinguished from things not correctly labeled by it. For example, a plane figure is assumed to be either definitely a triangle or definitely not a triangle, with no borderline cases in which the meaning of 'triangle' leaves it indeterminate whether a given plane figure is a triangle. For many terms, such an assumption is questionable. The things that are correctly labeled by the term being defined are not a sharply bounded class, but are more like a mountain range, whose boundaries are indeterminate. One can indicate the fuzziness of such boundaries either by using correspondingly fuzzy words in the defining part of the definition or by qualifying one or more components of the defining part by words like 'usually' or 'generally'. This essay will use the term 'range definition', introduced by Max Black (1954, 13-14 and 24-37), for definitions qualified in this way.

On Black's account, a fully specified range definition describes (1) one or more typical cases, which he calls 'paradigms'; (2) a set of criteria, capable of variation and each present in at least one of the paradigms, criteria which he calls 'constitutive factors'; and (3) rules for determining from variations in the constitutive

35. It has discussed definitions by synonym and by antonym, definitions by extended synonym, definitions by genus and differentia, and contextual definitions.

factors the degree of distance from the paradigms (Black 1954, 29). Black introduced his concept of range definition in the context of clarifying some problems involved in trying to define scientific method. Although he does not produce a fully specified range definition of the term 'scientific method', his remarks about defining it illustrate his approach to formulating a range definition. He takes scientific method to be the method used historically in scientific investigation. He counts as paradigms methods used in such recognized branches of science as astronomy, mathematics, geography, archeology and biology. Among the constitutive factors of these branches of science are observation, generalization, the hypothetico-deductive use of assumptions, measurements, the use of instruments, and mathematical construction. None of these factors, however, is a necessary condition for being a scientific method, since each of them is absent in at least one of the paradigms. Rather, the degree to which an activity is scientific varies according to how many of the factors it involves (Black 1954, 13).

The cognitive psychologist Eleanor Rosch proposed a similar idea on the basis of her discovery that people regard some members of a basic category[36] like red or chair or bird as being more typical than others, which were thought of as peripheral or borderline cases (Rosch 1978). She coined the term 'prototypes' for the clearest cases of membership in such a category, "defined operationally by people's judgments of goodness of membership in the category" (Rosch 1978, 36). For example, for participants in her studies, robins and sparrows were prototypical birds, pheasants

36. A basic category is a category in a culture's taxonomy to which people in that culture spontaneously assign an individual thing. For example, in North American culture, if one points to an object in someone's kitchen and asks them, "What is that?", in most contexts the answer will be "a chair" and not "a kitchen chair" (a subordinate category) or "a piece of furniture" (a superordinate category). If one asks the same question of an object in the person's garden, the answer in most contexts will be "a tree" and not "a silver maple" (a subordinate category) or "a plant" (a superordinate category). According to Rosch's studies, the level of abstraction chosen in each hierarchy as the basic category is the one that provides the most information about individuals in the category, given what is common knowledge in the culture.

and ducks were much less typical, and ostriches were hardly birds at all. In accordance with her underlying hypothesis that categories in a culture are structured so as to provide maximum information at the least processing cost (a principle of cognitive economy) in a way that respects the perceived world's correlational structure (e.g. feathers found along with wings more often than fur), Rosch discovered that, for both basic and superordinate natural categories, the more prototypical a member of a category was rated, the more attributes it shared with other members of the category and the fewer attributes it shared with members of contrasting categories. Thus cultures distinguish kinds of things (such as red things, birds, or cars) on the basis of clear instances of the kind that are markedly different from clear instances of contrast kinds (such as blue things, cats, or buses), without worrying too much about boundary cases. They do not distinguish kinds of things on the basis of a set of attributes that are individually necessary and jointly sufficient for being a member of a kind. Rosch's prototypical members of a category are like Black's paradigms, with the difference that the prototypical members of a category closely resemble one another,[37] whereas Black's paradigm cases have overlapping features but may be quite different from each other (as for example pure mathematics and paleontology differ from each other). This essay adopts Black's approach. If a term (in one of its senses) has a core meaning that can be characterized by individually necessary and jointly sufficient conditions, then that core meaning can be communicated by an unqualified definition of one of the five forms already discussed in this chapter. Less typical uses of the term can be accommodated by supplementary definitions that indicate how the core meaning is modified in such uses (Atkins and Rundell 2008, 279 and 439-443).

This book uses Black's term 'range definition' in a broad sense, for any definition of a term that indicates by explicit qualifiers that

37. Rosch resists the suggestion that prototypes in a category share a set of individually necessary and jointly sufficient attributes. The suggestion, she objects, falsely reifies prototypes, which she describes as a grammatical fiction. The real reference, she writes (Rosch 1978), is to judgments of prototypicality.

the boundaries of the class of things correctly labeled by the term are fuzzy. If the qualifiers are removed, the defining part of such a definition will be of one of the five previously discussed forms, and the guidelines for constructing and evaluating those forms apply—with the qualification that borderline cases are allowed for. In the following example of a range definition that is a qualified definition by genus and differentia, and in other such examples in this section, the term being defined is **bold-faced**, the genus is underlined, the differentia is *italicized*, and the qualifying words that indicate the vagueness of the term are *double-underlined*:

- **The scientific method** is a method of investigation characteristically *involving a substantial number, but rarely all, of the following characteristics: observation, generalization, experimentation, measurement, calculation, use of instruments, formulating and testing hypotheses that get support from their being able to explain the facts and their competitors' being inconsistent with the facts, and being more or less tentative when concluding.* (Ennis 2016, 3)

Qualified definitions by genus and differentia have the structure: <Term to be defined> is <genus> <qualified differentia>. The above range definition identifies a genus (method of investigation) of the things correctly labeled by the term being defined ('scientific method'), identifies characteristics that typically distinguish them from other things belonging to the genus, and allows for untypical exceptions.

The differentia in a definition by genus and differentia can be qualified in various ways. One can allow for indefiniteness in the number of typical attributes required for something to be correctly labeled by the defined term, as in the just-mentioned definition of 'scientific method'. One can allow for variation in the composition of the things correctly labeled by the defined term, as in the following definitions of 'chopsticks' and 'chili powder'.

- **Chopsticks** are eating utensils *commonly made of wood, bone or ivory, somewhat longer and slightly thinner than a lead-*

pencil.

- **Chili powder** is a mixture of spices *sold for use in making chili, typically a blend of dried chillies, garlic powder, red peppers, oregano, and cumin*.

One can allow for vagueness in the size of the thing being defined, as in the just-mentioned definition of ‘chopsticks’. One can even mention, without any claim of typicality, characteristics that *may* belong to a thing correctly labeled by a term, as in the following definition of ‘schizophrenia’:

- **Schizophrenia** is a severe mental disorder *in which people interpret reality abnormally. Schizophrenia may result in some combination of hallucinations, delusions, and extremely disordered thinking and behavior that impairs daily functioning, and can be disabling.* (by Mayo Clinic staff, https://www.mayoclinic.org/diseases-conditions/schizophrenia/symptoms-causes/syc-20354443; accessed 2021-01-12)

The following range definitions are qualified variants of definitions by synonym, by antonym, and by extended synonym; and contextual definitions:

- ‘**Recondite**’ means, roughly, *esoteric*.
- ‘**Stingy**’ is, roughly speaking, the opposite of ‘*generous*’.
- ‘**Weary**’ means *very tired, especially as a result of working hard*.
- To say that a person is **kind** is to say that *the person is tender, considerate and helpful, typically out of genuine concern for the other person rather than out of a desire to be liked by that person*.

In the above definitions, the term being defined is **bold-faced**, the defining part is *italicized*, and the qualifiers are double-underlined.

One should construct range definitions in the same way as one constructs the type of definition that is qualified. Black (1954, 25-26) suggests that one begin with a variety of cases that are clearly correctly labeled by the term, as a way of generating criteria that make it clear that something is correctly labeled by the term—criteria that might vary in importance. Before qualifying one or more of these criteria by a word like 'usually' or 'typically', one should reflect on whether the term is really vague. If the meaning is quite sharp, it is more accurate to use an unqualified definition than a range definition. Considerations of brevity may however justify a range definition even of a precise term. For example, one might propose the following range definition of the term 'fruit' in its botanical sense:

- 'F**ruit**' in its botanical sense means the *fleshy* part of a seed-bearing plant *that as a rule contains seeds*.

The qualifier 'as a rule' avoids the need for a lengthy accommodation of seedless fruit. If the range form is chosen, one should use the appropriate qualifying word or words in the appropriate place, so as to capture accurately the vagueness of the term.

Single counterexamples can show that a range definition is too broad. A range definition is too broad if there is even just one thing that has the characteristics claimed to be typical but is not correctly labeled by the term being defined. Consider again the previously-mentioned definition of 'scientific method':

- **The scientific method** is a method of investigation *characteristically involving a substantial number, but rarely all, of the following characteristics: observation, generalization, experimentation, measurement, calculation, use of instruments, formulating and testing hypotheses that get support from their being able to explain the facts and their competitors' being inconsistent with the facts, and being more or less tentative when concluding.*

If a method of investigation was not a scientific method even though it had all the characteristics mentioned in the definition, then the definition would be too broad. A possible counterexample of this sort is the method of investigation used in a pseudo-science like phrenology.

Although a single counterexample can show that a range definition is too broad, it cannot show that a range definition is too narrow. Consider for example the following previously mentioned definition of 'chili powder':

- **Chili powder** is a mixture of spices *sold for use in making chili, typically a blend of dried chillies, garlic powder, red peppers, oregano, and cumin.*

Chili powder made from a blend of somewhat different spices does not show that the above definition is too narrow, because the qualifier 'typically' allows for different blends. To show that a characteristic claimed to be typical is not really typical, one needs to show that a large proportion of things correctly labeled by the term do not have that characteristic. For example, if someone included in a definition of 'clock' the phrase 'typically with an internal mechanism', that definition could be challenged as too narrow, since nowadays digital clocks in such locations as cars and bedside clock radios are probably more common than clocks with an internal mechanism.

4.7 Extensional definitions

Extensional definitions define a term by listing the individuals that are correctly labeled by the term or by listing the species that are included in the genus that the term names. The list may be only partially explicit, with an indication of how it is to be completed, as in the following definition of the term 'natural number':

- The **natural numbers** are *the numbers 0, 1, 2, and so on.*

It is sometimes convenient to explain what genus an unfamiliar term refers to by listing the familiar species that belong to it, as in the following (inadequate) definition of the term ‘corvid’:

- A **corvid** is *a crow or raven or jackdaw or jay or magpie*.

It is however easy to leave out some species when using this strategy, thus making one’s definition inaccurate. There are in fact 120 species of corvids (Madge and Burn 1994). The best one can do to fix up the above definition is to treat the species as examples, as in the following definition:

- **Corvids** are a family *of birds that includes crows, ravens, jays and magpies*.

A more adequate definition would specify the intension of the term ‘corvid’ by describing some of the common features of corvids that distinguish them from birds of other families. As the example illustrates, it is risky to define a term that names a genus by listing the species of that genus, since one may easily leave something out.

5.

Forms of definition: other forms

The previous chapter discussed normal forms of definition, in which the term being defined (or an expression containing it) is followed by a linking word or phrase (like ‘is’, ‘are’, ‘if and only if’, ‘means’, or ‘equals by definition’), which is followed by the defining part of the definition. Not all definitions have this normal form. This chapter discusses four common other forms of definition. It starts with:

1. Operational definitions.

It then considers three ways of indicating a term’s meaning by showing (rather than saying) what things are correctly labeled by it (and sometimes what things are not correctly labeled by it):

2. Examples, non-examples and borderline cases
3. Ostensive definitions
4. Use of a term in a sentence

Three rarely used forms (inductive definitions, recursive definitions, and role-specifying definitions) are discussed in an appendix.

5.1 Operational definitions

Operational definitions explain the meaning of a term by describing the result of applying one or more operations. They answer the question: What must I do in order to decide if a certain

concept is to be applied to something or to decide what value a variable has in a particular case? (Rößler 1998, 324) Thus, although the term 'operational definition' is primarily used in psychological and educational research, people in fact use operational definitions all the time in their everyday life. They lay the foundation for understanding them when they learn in early childhood that one can name things that cannot be observed but merely deduced (Rößler 1998, 330). Whether in everyday life or in scientific work, construction of an operational definition is a prelude to investigation; it has an exploratory goal. Linguistically, it is a means of deciding on how a term is to be used. On the side of reality, it is a means of bringing things into experience (Rößler 1998, 325).

Consider the following examples of operational definitions:[1]

- If you sniff a cantaloupe and shake it and press down on the stem area at the top with your thumbs, then the cantaloupe is **ripe** if and only if it *has a fragrant, sweet, vaguely musky scent that's easily detectable through its thick rind, you can feel seeds flopping around inside it when you shake it, and the stem area is firm rather than hard as a rock and gives a little with pressure.* (https://www.leaf.tv/articles/how-to-tell-if-your-cantaloupe-is-ripe/; accessed 2020-01-20)
- If you put an object on one side of a balance scale, then the **mass** of the object is *x* grams if and only if *the scale is balanced when the objects on the other side have a total mass of x grams.*
- If the California Test of Mental Maturity is administered to a person under standard conditions, then that person probably has an **IQ** of approximately *n* if the person *gets a score of n.*
- If a person puts an electronic thermometer under their tongue and leaves it there with their mouth closed for three minutes or until the device beeps, then that person has a **body**

1. In bulleted operational definitions in this essay, the description of the operation is underlined, the term being defined is in **bold face**, and the result of applying the operation is in *italics*

temperature of approximately *n* degrees Celsius if and only if *the device reads n degrees Celsius at the end of that period*.

- If the Beck Depression Inventory Second Edition is administered to a person under standard conditions, then that person is **severely depressed** if and only if the person's *score is in the range 29-63*.
- If a person's brain is scanned while the person listens to a variety of recorded sequences of sounds, then a sequence of sound in the recording is **music** if and only if *it activates and excites music-specific neural functions or circuits.*[2]

Thus operational definitions as they are displayed above have the structure: If <operation> is performed on something, then <**term to be defined**> has a specified value for (or correctly labels) that thing if and only if <*result*> is observed. There are other ways of expressing such definitions. For example, one could express the definition of 'severely depressed' as follows: A person is **severely depressed** if[3] their *score* on the Beck Depression Inventory Second Edition when it is administered under standard conditions is *in the range of 29 to 63*. Further, one can supplement an operational definition by instructions on how to use the test instrument and under what circumstances. The key feature that makes a definition operational, regardless of its verbal structure and the presence or absence of supplementary information, is the explanation of a term's meaning by the observed result of applying a test.

The just-mentioned operational definitions sometimes use the conjunction 'if and only if' to indicate a two-way relationship between a result and either the value of a variable or the correct applicability of the term, but at other times use the conjunction 'if' to indicate a one-way relationship from the result to a variable's value or the term's correct applicability. In the definition of 'IQ',

2. Davies (2012) argues that such an operational definition of music is not plausible at the present stage of scientific knowledge of the brain's processing of music.
3. The word 'if' (rather than 'if and only if') allows for severely depressed people who have not taken the test but would get a score of 29 to 63 if they took it.

the one-way relationship reflects the fact that under standard conditions the same person can get slightly different results on different IQ tests and even on the same test taken at different times (Matarazzo et al. 1980); hence a score slightly different from *n* on a recognized test of IQ also implies that a person has an IQ of approximately *n*.

Operational definitions have the advantages of effectiveness, close link with physical activity, and definition of more abstract entities through more concrete ones. They are common in academic investigations that require measurement of the value of some variable. For such investigations, it is necessary to determine in advance what measurement instrument will be used. It may even be necessary to design and build such a measurement instrument. Operational definitions are also implicit in using any measuring instrument to determine the value of a variable or the presence of a characteristic, whether in scientifically based testing of such things as blood sugar level or fecal coliform count or vehicle speed, or in everyday testing of such things as height, weight or length.

The concept of an operational definition was first proposed by the physicist Percy Bridgman (1927), who identified the meaning of a term with the operation to be applied:

> The concept of length involves as much as and nothing more than the set of operations by which length is determined. In general, we mean by any concept nothing more than a set of operations; *the concept is synonymous with the corresponding set of operations*. (Bridgman 1927, 5; italics in original)

Inspired by this perspective, S. S. Stevens proposed something similar for psychology:

> A term or proposition has meaning (denotes something) if, and only if, the criteria of its applicability or truth consist of concrete operations which can be performed… Properly, a definition is the sum total of the criteria (operations) by which we determine the

> applicability of a term in any particular instance. (Stevens 1935, 517-519)[4]

As these quotations indicate, Bridgman and Stevens identified a term's meaning with the set of operations used to determine its value or correct applicability in a particular case. Taken literally, this identification makes the defining part of an operational definition consist of a set of actions rather than a string of words, and thus makes impossible the substitution of the defining part of the definition for the term defined as a test of the adequacy of the definition (a test discussed in section 4.1, "Definitions by synonym"). However, as Rößler (1998, 324) points out, post-Bridgman treatments of operational definition have universally treated its defining part as the description of a set of operations rather than as the operations themselves. A more fundamental objection is that the conception of Bridgman and Stevens is incomplete, since it does not include the result of applying the operations; for example, the length of an object is not just the operation of placing a ruler against it but the observed result of this placement.

If two different measuring operations are used, the question arises as to whether they are measuring the same thing. Bridgman proposed as two necessary conditions for such a conceptual identity that (1) the two procedures give the same result when they are applied to the same object in the same circumstances and that (2) each procedure gives a different result when it is applied to different objects with a different value of the variable being measured (Gorsky 1981, §4.2). Conceptual identity must be established if scientific laws using the concept are to be applicable across different ways of measuring the concept; if conceptual identity is not established, then the different measuring operations may be measuring different things.

In psychology and education, the identification of the meaning of terms like 'intelligence' with a set of operations led to an

4. Ribes-Iñesta (2003) has argued that Bridgman was proposing only operational analysis as a matter of pragmatics (how language is used), whereas Stevens was proposing operational definitions as a matter of semantics (what terms mean). This essay rejects both types of reductionism.

extreme behaviorism that banned any talk of unobservable entities. Emotions, thoughts and other apparently mental phenomena were reduced to "concrete operations". This reductionism persists in the fields of education and educational policy, even though Ennis (1964) articulated long ago powerful arguments against it, which can be summarized with reference to the concept of length (which Bridgman used as his main example). First, the length of an object is the measurement that one gets when one applies a ruler to it, not the operation of applying the ruler. Second, length as measured by a ruler is (in the view of most people) the same concept as length determined by a combination of measurement by a ruler and triangulation. Thus, in contrast to the views of Bridgman, Stevens and their followers, an operational "definition" does not describe the meaning of a term but rather one way of determining its correct applicability or value in a particular instance, while leaving open that there may be other ways. This essay calls them 'definitions' nevertheless, following common usage.[5]

A loose approach to operational definitions allows for "standard conditions", leaves room for human judgment, and handles exceptions, variations, and unexpected developments. An example of such loosening is the insertion of the terms 'under standard conditions', 'probably' and 'approximately' in the above-mentioned definition of 'IQ', repeated here:

- If the California Test of Mental Maturity is administered to a person under standard conditions, then that person probably has an **IQ** of approximately *n* if the person *gets a score of n*.

Constructing an operational definition usually has a reporting basis, but adds a stipulative component. The term to be operationally defined is typically already in use, either in everyday

5. Gorsky (1981, §4.3), however, says that, contrary to some philosophers, operational definitions are definitions. Hibberd (2019, 44-48) in contrast argues forcefully that the concept of an operational definition is incoherent, because it confuses the property being measured with the result of measuring it. She distinguishes legitimate operationism, which specifies testing procedures, from the illegitimate identification of the result of a testing procedure with what the testing procedure is supposed to be measuring.

communication or in the context of scientific theorizing. The test instrument must therefore give a result under defined conditions that corresponds to this pre-existing use. In the terminology of test design, the instrument must be 'valid'. The radar device must record accurately the speed of the vehicle that it tracks. Lines marked on the ruler as one inch apart must in fact be one inch apart. The IQ test must measure general intelligence accurately.[6] At the same time, there is a stipulative component to constructing an operational definition, in that the definition's author is choosing what operation is to be used to determine when something is correctly labeled by a term or to measure its value.

If one can determine by direct observation whether something is correctly labeled by a term, then one can construct an operational definition of the term by comparing the results of applying a proposed test to what one observes directly. For example, one can tell by cutting open a cantaloupe and looking at its insides whether the cantaloupe is ripe. In the supermarket, one cannot cut open cantaloupes in order to find one with the desired ripeness that one is willing to buy. Instead, one must rely on an indirect test, such as the combination of smelling, shaking and touching the cantaloupe. The validity of this test can be checked by taking a number of cantaloupes, testing them, and comparing the results to the observed ripeness of the cantaloupes when one cuts them up. The test is valid if and only if it gives the result that a cantaloupe is ripe when and only when the cut-up cantaloupe is observed to be ripe.

If one is dealing with an abstract concept like length, which cannot be directly observed, then the accuracy of an operational definition is relative to a complex theoretical background, such as the scientifically accepted definition of a standard meter, the assumptions used in the process of making a ruler that measures

6. It is controversial whether there is such a thing as general intelligence. Psychologists base their postulation of it on statistical analysis of the correlations among various tests requiring performance of intellectual tasks and also on multiple correlations between the postulated common factor "*g*" and a range of biological traits, cognitive behaviours, educational and job attainment, and important social outcomes (Plucker and Shelton 2015).

length in the metric system, and the assumption of the rigidity of solid bodies. Rößler (1998, 330) refers to such theoretically embedded operational definitions as "sediments" extracted from theoretically grounded sources of knowledge, and treats them as valid relative to such sources. With such theoretically embedded terms, a person needs domain expertise to construct an accurate and appropriate operational definition. Indeed, many operational definitions require domain knowledge even to be understood.

In the social sciences, there is some controversy about how to construct operational definitions, especially in the measurement of attributes of human beings, as in psychology and education. Borsboom, Mellenbergh and van Heerden (2004) emphasize getting clear about the causal relationship between the attribute being measured and the measurement outcomes. However, it is more common in the current mental measurements literature (e.g. Kane 2006) to find a reluctance to talk about the validity of tests at all, and instead to talk about the validity of test scores, their interpretations, and their uses. As Lee Cronbach (1971) put it in an oft-quoted statement, "Because every interpretation has its own degree of validity, one can never reach the simple conclusion that a particular test 'is valid'", but rather "One validates not a test but an interpretation of data arising from a specified procedure" (p. 447).

To the extent that the interest of the general public (including people in legal situations) really is in tests, it makes sense to speak of the validity of tests (qualified appropriately, as is done in the above operational definition of 'IQ', in terms of particular situations or types of situations, such as 'under standard conditions'). But, as Cronbach says, "One can never reach the **simple** conclusion that a particular test 'is valid'" (emphasis added) without appropriate qualifications.

In the natural sciences, researchers cross-validate measurement instruments with each other and with reference to a "gold standard", such as the definition of a meter by the International Bureau of Weights and Measures by the statement that "the speed of light in vacuum c is 299 792 458 m/s [meters per second—DH]" (https://www.bipm.org/utils/common/pdf/si-brochure/SI-

Brochure-9-concise-EN.pdf; accessed 2021-01-12).[7] Outside the field of psychology, natural scientists do not use the term ‘operational definition’, even though in effect they produce such “definitions” whenever they specify how the value of some variable is to be measured.

In evaluating an operational definition whose construction involved domain expertise, a person who lacks the domain expertise must evaluate the proposer’s arguments for that definition, with attention to available objections by qualified critics. For example, general acceptance by those with recognized expertise in the domain is good indirect support for the accuracy of an operational definition. A test manual accompanying a standardized test of some psychological characteristic (such as level of depression or conditional reasoning ability) may have detailed statistical information that will enable a careful reader without domain expertise to come to a reasoned judgment of the degree of support for the accuracy of the test.

Some writers use the term ‘operational definition’ of a definition that provides observable criteria for something to be correctly labeled by a term, even if it does not mention any operation that the observer performs with a test instrument.[8] Rößler (1998, 326) calls such a definition an “implicit operational definition”, on the ground that the observation concepts in the defining part of the definition communicate implicitly that the operation of observation is to be made; his proposal stretches the extension of the term ‘operation’ to include observation as a kind of operation, but does so in accordance with contemporary usage of the term ‘operational definition’. Moudon et al. (2006), for example, describe as an “operational definition” of the term ‘walkable neighborhood’ a set of threshold criteria that correlated in their survey with how much walking people reported doing: minimum

7. This definition is clearly not an operational definition, since it does not define ‘meter’ as the observed result of performing an operation. It is rather a theoretical benchmark against which operational definitions of length in meters would be validated.
8. For example, Jenicek (2018), as quoted in section 3.1 on choice of words in the defining part of a definition, objected that a standard definition of the term ‘evidence-based medicine’ did not lend itself to “operational uses”.

residential density, maximum block area, maximum distance to a grocery store, minimum total length of sidewalks within a certain radius, and so forth. But their suggested definition of a walkable neighborhood as one meeting 12 threshold criteria is not an operational definition in the strict sense, because no test instrument is applied in putting together a neighborhood's input values on the 12 criteria to determine how walkable it is. (Each of the threshold criteria might be defined operationally, but that is another matter.) The definition of a walkable neighbourhood as one meeting a number of such threshold criteria is in the terminology of this essay a contextual definition of 'walkable' for contexts where 'walkable' modifies 'neighbourhood'. If the observable criteria in such a definition are loosely articulated, with qualifying words like 'generally' or 'to a considerable extent', then the so-called operational definition is in the terminology of the present essay a range definition, of the contextual sort.

Some people have called examples operational definitions. As Ennis (1964) pointed out long ago, this extension of the concept of operational definition obscures its central feature of connecting the meaning of a term to an operation/observation pair. However, examples are a useful way to convey meaning, as the next section points out.

5.2 Giving examples, non-examples and borderline cases

The next three forms of definition to be discussed communicate a term's meaning by showing rather than saying what the term means. Hence they do not provide a basis for replacing occurrences of the term (or of the term in context) by a defining part of the definition. For this reason, some may be reluctant to call them definitions. This essay, in contrast, uses the term 'definition' in a broader sense, for any statement or act that indicates what a term means or should be taken to mean or should mean.

One can indicate the meaning of a term through examples of things correctly labeled by a term, of things incorrectly labeled by a term (henceforth "non-examples"), and of borderline cases, without explicitly describing that meaning. Non-examples and borderline cases can be especially instructive because they indicate limits. Examples, non-examples and borderline cases are also useful supplements to definitions of the seven previously discussed normal forms. As supplements to such explicit definitions, they attest to the word's occurrence in a language, elucidate its meaning, and illustrate its contextual features (Atkins and Rundell 2008, 453-455).

In indicating a term's meaning by giving examples, non-examples and borderline cases, it makes sense to pick:

- a variety of typical examples,
- non-examples that might mistakenly be labeled by the term, and
- borderline cases that reveal the term's vagueness.

If one is using this method of indicating meaning as a supplement to a definition of one of the seven previously mentioned normal forms, it often helps the reader to provide the examples, non-examples and borderline cases first. That way, the definition is likely to be more easily understood.

This approach was used in section 1.2 ("The definition of 'term'"). The section started with a rough stipulative definition of the word 'term' as "any word or phrase of general application that is short of a full sentence" (page 2). It then gave as examples of terms four individual words that were different parts of speech (a noun, a conjunction, an adjective and a verb) and six multi-word phrases of different grammatical types. It then mentioned a borderline case (definite descriptions, where philosophers of language disagree about whether all or only some of them are used attributively rather than as a kind of name). It listed four types of non-examples of terms: names of individuals (one example), strings of symbols that do not form a syntactic unit (two

examples), sentences (one example), and multi-sentence stretches of text or discourse. Finally it repeated the initial definition of 'term' in somewhat different and more accurate language, defining terms as "elementary signs or sub-sentential syntactic units of general application" (page 3). As a coda, it clarified that a term could be written, spoken, signed, gestured, or otherwise communicated.

The aim in combining a definition by genus and differentia of 'term' with examples, non-examples and borderline cases was to give the reader a clear sense of how the word 'term' was going to be used in this essay. The examples, non-examples and borderline cases probably did a better job of conveying what 'term' means than the explicit definition of a term as an elementary sign or sub-sentential syntactic unit of general application.

The U.S. Federal Bureau of Investigation's *Uniform Crime Reporting* [UCR] *Handbook* (FBI 2004) uses examples, non-examples and borderline cases skilfully to complement definitions by genus and differentia. The UCR Program collects statistics from 17,000 law enforcement agencies, operating in more than 50 state and territorial jurisdictions, each with its own distinct criminal code. The validity of the UCR's aggregate statistics depends on the accuracy of these agencies' reporting, which in turn depends on their correct understanding of the meaning of the terms in the FBI's classification system. The handbook's section on criminal homicide (FBI 2004, 15-18) can be taken as a model of how to combine definition by genus and differentia (or one of the other previously mentioned seven normal forms) with provision of examples and non-examples.

The section on criminal homicide in the FBI handbook begins with a clearly separated and identified definition by genus and differentia of the term '**criminal homicide—murder and non-negligent manslaughter'**:

Definition: The *willful (nonnegligent)* killing *of one human being by another*. (p. 15)

The genus in this definition is killing. The differentia consists of three features that are individually necessary and jointly sufficient for a killing to be correctly reported as 'criminal

homicide—murder and non-negligent manslaughter': the killing must be (1) willful (equivalently, not negligent), (2) of a human being (not of a human embryo or fetus or a non-human animal or a plant), and (3) by another human being (not by the same human being or by a non-human animal).

To make clear what the definition includes, the handbook lists types of death (examples) that reporting agencies might think do not fall under the definition but must "as a general rule" be so classified: "any death caused by injuries received in a fight, argument, quarrel, assault, or commission of a crime" (p. 15). There follow 10 scenarios (examples) of incidents that law enforcement agencies must report as "criminal homicide—murder and non-negligent manslaughter"—for example, "A man was in a fight on the second floor of a building. During the fight, he was knocked through a window and fell to his death. No arrest was made[9]" (p. 16). The section then lists types of deaths (non-examples) that must *not* be classified as "criminal homicide—murder and non-negligent manslaughter" (such as suicides, traffic fatalities, fetal deaths, accidental deaths, and attempts to murder). It gives four scenarios (non-examples) of incidents that law enforcement agencies must *not* classify as "criminal homicide—murder and non-negligent manslaughter"; for example, "A man was despondent over the breakup of his marriage. Police officers discovered his body in his home office with a bullet wound to his head and a revolver still in his hand. They also found a suicide note in the victim's handwriting on his desk." (p. 17)

If one is combining explicit definition with examples, non-examples and borderline cases, one would do well to follow the principles used by the editors of the FBI handbook (FBI 2004, iii):

- Strive to be user-friendly.

9. The point of mentioning that nobody was arrested in this hypothetical case is presumably to indicate that it makes no difference to the classification of a death caused by injuries received in a fight that nobody was arrested for causing those injuries. The death still counts as an instance of criminal homicide—murder and non-negligent manslaughter, according to the stipulation of the FBI.

- Present one concept at a time.
- Be accurate.
- Use examples and non-examples that cover the range of cases to be encountered.

In mathematical and scientific contexts, the production of an example may be intimately connected with the provision of an explicit definition. For example, the definition of the term 'triangle' in Euclidean geometry may use a drawn triangle as a reference for the concept of a shape on a plane bounded by three straight lines, with reference to labeled lines AB, BC, and AC in the drawing that abstracts from the particular lengths and angles of the drawn triangle. Such "exemplary definitions" (Gorsky 1981, §6.4) are useful for teaching what a mathematical or scientific term means, for introducing a new term into a scientific theory, for making specific where an existing term is to be applied, and for formulating explicitly the meaning of a contextually given existing term.

This essay's definition of the word 'term', the FBI *Handbook*'s definitions and definitions of mathematical and scientific terms are all stipulative definitions, where the supplementary examples are invented. When one is reporting a term's meaning, one needs to make sure that supporting examples use the term as it is actually used in human communication. But the examples need not be real. Dictionary makers usually find in their source corpus a string of four to six words in which the defined term occurs in a typical context. They then make adjustments to the rest of the sentence, with the aim of exhibiting a typical and natural use of the term in a way that the dictionary's users can understand. Hence:

- the phrase containing the defined term should be common rather than rare,
- the sentence should be self-contained and have a consistent register,[10]

10. The register of a word or phrase is, roughly speaking, its degree of formality or

- the user should be able to infer from the sentence what the defined term means,
- the information in the example should not conflict with what the definition says,
- the example should add useful information lacking in the other examples, and
- it should avoid unnecessarily difficult word choice and grammatical structure (Atkins and Rundell 2008, 457-461).

5.3 Ostensive definitions

So-called ostensive definitions convey the meaning of a term by pointing (literally or metaphorically) to one or more things that are correctly labeled by it. Ostensive definitions link the term directly to the kind of thing that it signifies, and are especially appropriate in teaching small children what words mean, especially words meaning things that the eye can easily distinguish from other things—such as colours, shapes, kinds of plants and animals, and kinds of artefacts. They need to fit the intended meaning, in the sense that the thing pointed to is indeed among the things correctly labeled by the term when it is used with this meaning. They should be as unambiguous as possible. Pointing to several objects that differ in all respects except the intended one is a useful way of avoiding misunderstanding—a method used in picture books for small children that teach the meaning of common words like ‘yellow’ or ‘parrot’ or ‘car’. Another useful way of avoiding misunderstanding is to point successively to objects that are the same in all but one respect, using for each the word that picks out

informality. A sentence has a consistent register if its constituents have the same degree of formality. The sentence ‘He opened his trap and launched into a grandiloquent soliloquy’ has an inconsistent register, because the word ‘trap’ is a crude word for a person’s mouth but the phrase ‘grandiloquent soliloquy’ is highly affected and formal. The interested reader can find detailed advice on how to use an appropriate register when speaking or writing English at https://www.really-learn-english.com/language-register.html (accessed 2019-11-09).

the respect in which it differs from the others—as when one points to a succession of differently coloured but otherwise identical crayons, calling the yellow one ‘yellow’, the green one ‘green, and so forth. Parents spontaneously use these techniques in teaching words to their small children. Ostensively acquired understanding of a word’s meaning is limited to the sphere in which it was acquired, and may be falsely extended beyond that sphere, as when a child calls a whale or a dolphin a fish.

Definitions in words may be called ‘semi-ostensive’ if they refer to what is observed under certain conditions, as in the following definition of the Zeeman effect:

- The **Zeeman effect** is what is observed to happen to a yellow line on a spectrogram *when a solenoid magnet is switched on.* (Gorsky 1981)

This definition is informative to someone watching while the magnet is switched on. Otherwise it is totally mysterious. For those not in a position to observe the effect, a better definition might be the following:

- The **Zeeman effect** is the splitting *of a single spectral line into two or more lines of different frequencies observed when radiation (such as light) originates in a magnetic field* (https://www.merriam-webster.com/dictionary/Zeeman effect; accessed 2020-01-20)

5.4 Use in a sentence

Using a term in a sentence is a more complicated way than pointing of showing (rather than saying) what a term means. Unlike pointing, it requires understanding of language and complex inferential ability. The reader or hearer is meant to infer what the term means from the rest of the sentence, the surrounding discourse, and the situation in which the sentence is uttered. Dictionaries often convey meaning in this way, as a supplement

to an explicit definition of a term, as in the following helpful meaning-conveying use of the term ‘objective’ in the online *Cambridge Dictionary*:

> I can’t really be **objective** when I’m judging my daughter’s work. (http://dictionary.cambridge.org/dictionary/english/objective; accessed 2020-01-20)

The reader can infer that being influenced by personal feelings like those one has for one’s daughter is incompatible with being objective, which must therefore mean not being influenced in one’s judgment by personal feelings. The end of section 5.2 (“Giving examples, non-examples and borderline cases”, pages 158-159) lists desirable features of such dictionary examples.

Everybody has the experience, especially in childhood, of learning the meaning of new words and phrases, or new meanings of already known words and phrases, by noticing how they are used in sentences—without the benefit of explicit definitions. If someone says, “What a delicious sense of Schadenfreude I got from seeing that corrupt politician being taken off to jail,” a listener who has never before encountered the word ‘Schadenfreude’ might be able to infer that it signifies a pleasant feeling that one gets from observing someone else’s misfortune.

If one is consciously using a term in a sentence as a way of conveying its meaning, the sentence must be chosen so that the addressee will unambiguously infer the meaning that one intends to convey. One way of testing for lack of ambiguity is to consider what terms one could put in place of the term whose meaning one is trying to convey and still have a sentence that makes sense. In the examples just given of sentences using the words ‘objective’ and ‘Schadenfreude’, the only replacements that produce sensible sentences seem to be synonyms or extended synonyms: ‘unbiased’ or ‘unprejudiced’ in the sentence with ‘objective’, ‘joy at someone else’s misfortune’ in the sentence with ‘Schadenfreude’. In contrast, the sentence, “She gave an objective assessment of the evidence”, does not convey the meaning of the term ‘objective’, because the sentence would make sense if the term were replaced

with the word ‘subjective’, which has the opposite meaning. Likewise, the sentence, “Schadenfreude is an emotion whose name English has borrowed from German,” does not convey the meaning of the word ‘Schadenfreude’, since the sentence would make sense if it were replaced with the word ‘Weltschmerz’, which has a quite different meaning. In essence, one needs a sentence that could in principle be transformed into an explicit definition, in something like the following ways:

- **Objectivity** is *something that I can’t really have when I am judging my daughter’s work.*
- **Schadenfreude** is the *delicious* emotion *that I got from seeing that corrupt politician being taken off to jail*.

Using a term in one or more sentences is a common way of defining terms in mathematical theories. For example, suppose one is constructing a mathematical theory of the so-called “natural numbers”, the numbers 0, 1, 2 and so on (elementary arithmetic). To define the term ‘natural number’, one can construct a simple language, using as symbols the numeral ‘0’ for zero, a sign ‘′’ for adding one (so that ‘0′’ means one, ‘0″’ means two, and so on), a predicate ‘is a natural number’, and logical symbols. Then one can define ‘natural number’ by a set of axioms due to the Italian mathematical logician Giuseppe Peano:

1. 0 is a **natural number**.
2. If n is a **natural number**, then so is n′.
3. If m and n are **natural numbers** and m′ = n′, then m = n.
4. If n is a **natural number**, then n′ ≠ 0.
5. If 0 is in P and for any n that is in P so is n′, then P is the set of **natural numbers**.[11]

11. This formulation of Peano’s axioms comes from Gorsky (1981). As Gorsky points out, one can abstract from the intended meaning of ‘0’ and ‘′’, in which case the axioms have many true interpretations. For example, one can interpret them as a definition of ‘even positive integer’ by interpreting ‘0’ as meaning two and ‘′’ as meaning adding two.

This definition is complete, in the sense that anything true of natural numbers that can be expressed in this simple language follows from the axioms. It is also accurate, in the sense that anything that follows from the axioms is true of natural numbers.

One can also define a new term that one introduces into a mathematical theory by adding axioms in which the new term occurs. For example, one can add a plus sign '+' (for addition) to the language in which 'natural number' is defined, and one can define the new symbol '+' by the following axioms, also due to Peano:

- $n + 0 = n$.
- $n + m' = (n + m)'$.

This definition amounts to defining addition as counting one by one. It is complete, in the sense that any true statement expressible in the language follows from the axioms. It is also accurate, in the sense that anything that follows from the axioms is correct.

6.

Strategies and theoretical issues

This chapter recommends some general strategies for defining terms and addresses some theoretical issues about definition.

6.1 Strategies for defining terms

A person or group that sets out to define a term should be clear and accurate about their purpose or purposes, their intended audience, and the use of the term that they intend to report or stipulate or advocate. They should use a form of definition that is appropriate for the term being defined and that the intended audience will find easy to understand. It is often helpful to mention examples, non-examples and borderline cases of the correct application of a term as a supplement to a formulaic definition. The definer should justify the definition to the extent that the situation demands. If it is important to have a good definition, it makes sense to have a draft version reviewed by one or more competent people not involved in its preparation.

For example, the definition of the word ‘term’ in section 1.2 (on the definition of ‘term’) reflected the goal of making clear to future readers how the word ‘term’ would be used in this essay. This purpose was stipulative, although the stipulated meaning of ‘term’ was a common meaning of this word. Hence, incidentally, the stipulative definition was simultaneously a reportive definition, although nothing depended on whether the definition was a correct report. The future readers were thought of as reasonably intelligent people with a good general education, equal at least to that of the graduate of an academically-oriented secondary school

curriculum, and as readers hoping to get insight into and guidance for the construction and evaluation of definitions. The main purpose of the definition of the word ‘term’ was to make it clear what sorts of words and phrases would be classified as terms and what sorts of words, phrases and other strings of linguistic symbols would be excluded from the class of terms. For this purpose, it made sense to give examples of terms, with a range that covered different parts of speech and that covered phrases as well as words. And it seemed helpful to complement the list of examples with a range of “non-examples”—words, phrases or other strings of linguistic symbols that were not going to count as terms. It also seemed helpful to point out a borderline case, definite descriptions. Besides giving examples, non-examples and a borderline case, the section included two explicit definitions–a loose definition at the beginning to orient the reader and a more precise definition at the end. Both definitions were definitions by genus and differentia. The choice of this form made sense in the light of the goal of distinguishing terms from other strings of symbols in languages. The initial definition named a genus (words and phrases) that would be understandable in advance of the examples and non-examples to be supplied later. The differentia of the initial definition included two characteristics: being of general application and falling short of being a full sentence. The initial definition, then, was designed to give the reader a rough sense, without worrying about precision, of what this essay was going to mean by ‘term’ when it talked about defining terms. The goal of making the stipulated meaning understandable to the reader took precedence over the goal of being technically precise. The final more precise definition used as its genus the class of elementary signs and sub-sentential syntactic units—a more technical concept than the concept of words and phrases used in the initial definition. The differentia was just the single characteristic of being of general application. The final definition was more precise and used more technical language, on the ground that the examples, non-examples and borderline case had given the reader a good sense of the scope of this essay. As recommended when it is important to have a good definition, drafts were reviewed by someone not

involved in their preparation (Robert Ennis) and modified in the light of his comments.

The above-mentioned general strategic guidelines complement the specific guidelines in chapter 2 for the basic acts of defining, in chapter 3 for the content of definitions, and in chapters 4 and 5 for the various forms of definition.

6.2 Real versus nominal definitions

This essay has consistently construed definitions as definitions of terms. Such definitions have been called "nominal definitions", in contrast to so-called "real definitions". Nominal definitions report how a term is used, or stipulate how it is to be interpreted, or advocate how it is to be used. Real definitions supposedly describe the "essence" of the kind of thing signified by a term.[1] In ancient Greece, the philosophers Plato and Aristotle construed a definition as an account of the essence of a kind of thing (and, derivatively, of a thing of the given kind when it is a "lowest kind"—Latin "*infima species*"). For example, Socrates in Plato's *Euthyphro*, who is about to be tried on a charge of impiety, asks the title character, who claims to be an expert on religious matters, to describe "that form itself that makes all pious actions pious" (*Euthyphro* 6d). Aristotle writes, "A definition is a phrase signifying a thing's essence." (Aristotle 1984/4th century BCE, *Topics* I.5.101b38) He explains: "The essence of each thing is what it is said to be in virtue of itself." (Aristotle 1984/4th century BCE, *Metaphysics* VII.4.1029b14) The essence of a thing, such as the essence of an individual human being or of an individual Lady tulip or of

1. Rather astonishingly, Rigotti and Greco (2019, 252) reserve the term 'definition' for such real definitions. They make no provision for nominal definitions of any of the forms discussed in this essay, or for purposes of defining other than that of describing the essence of a thing. They justify this restriction on the basis that even in contemporary debates legislation tries to arrive at essentialistic definitions, e.g. when defining life in laws concerning bioethical issues (p. 11, n. 22). The example is problematic. Further, even if it is accepted, there are many other contexts in which definitions are put forward with a different intention than that of describing the essence of something.

an individual Masai giraffe, is a postulated set of characteristics that make it the kind of thing that it is, that are describable by naming a genus to which that kind of thing belongs and describing the features that as a group distinguish that kind from other kinds of things in the genus, and that are causally responsible for the thing having all the other characteristics that belong necessarily to everything of that kind and only to things of that kind. For example, to claim that the essence of a human being is to be an animal possessing reason is to claim that being a rational animal is what makes human beings human and causes them to have all other universal distinctively human characteristics, such as being able to learn to read and write and having a sense of humour. In his *Essay concerning human understanding*, the 17th century English philosopher John Locke retained this concept of a real essence as the source of all the properties of each sort or species (Locke 1689, III.vi.2), but insisted that "as to the real essences of substances, we only suppose their being, without precisely knowing what they are" (III.vi.6) and that we group things into sorts or species on the basis of what he called the "nominal essence", i.e. the complex of characteristics that we take the name of the given sort or species to signify.[2]

2. Fine (1995a) has developed a formal logic for the concept of being true "essentially", in the sense of being true in virtue of "the nature" (241-242) of the objects correctly labeled by a term. For example, if it is true essentially that water is a liquid at temperatures between 0 and 100 degrees Celsius, then this would be true in virtue of the nature of the objects correctly labeled by the term 'water'. What Fine means here by "the nature" of objects correctly labeled by a term is what philosophers have traditionally called 'essence'. His conception relativizes the essence of an individual thing to the term used to classify or describe it, and does not imply that individual things have essences independently of how they are described. For example, a drop of rainwater would be essentially a liquid at temperatures between 0 and 100 degrees Celsius in so far as it was an object correctly called 'water', and it would essentially have a volume 4/3 times π times the cube of its radius in so far as it was an object correctly called 'spherical'. Fine's conception also does not restrict things that are essentially true to things that are true only of things correctly labeled by the term; for example, it might be essentially true of objects correctly called 'water' that they are chemical compounds, but other objects are also chemical compounds. In a companion article that presupposes the distinction in (Fine 1995a) between the logic of essence and the logic of necessity,

Do individual things have essences that make them the kind of thing that they are, and because of which they possess all the distinctive properties common to all (non-defective) members of the kind? The progress of scientific inquiry has made the postulation of such essences highly dubious. In physics, we can perhaps attribute to basic particles like electrons some fundamental defining characteristics like their mass, charge and spin. In chemistry, we can perhaps treat as fundamental to the identity of an element the number of protons in the nucleus of an atom of this element (so that hydrogen for example would be defined as an element whose atoms each had a single proton in their nucleus) and to the identity of a compound the number of each kind of atom found in a molecule of this compound (so that water for example would be defined as a compound whose molecules each consisted of two atoms of hydrogen and one atom of oxygen). But it is problematic whether the supposed fundamental defining characteristics are causally responsible for all the other distinctive properties belonging to a given natural kind like an electron or hydrogen or water. In biology, the evolution of kinds of living organisms through a process of what Darwin called "descent with modifications" (Darwin 1859) enables us in principle to identify a complex of characteristics shared by all members of broad genera, such as all eukaryotes or all reptiles or all dinosaurs or all birds. But in practice such definitions are elusive. Consider for example the controversy in biological taxonomy about how to define the class of reptiles. One contribution to this controversy proposes to define Reptilia as "the most inclusive clade[3] containing *Lacerta agilis* Linnaeus 1758 and *Crocodylus niloticus* Laurenti 1768, but not *Homo sapiens* Linnaeus 1758" (Modesto et al. 2004, 819). This definition hardly picks out a set of essential attributes, and it

Fine (1995b) distinguishes various senses of essence, including consequential versus constitutive essence, mediate versus immediate essence, reflexive essence and reciprocal essence. The details of his carefully made distinctions go beyond the scope of the present practical guide to defining terms.

3. A clade is a branch on an evolutionary tree. It includes a common ancestor and all its descendants. For example, if all birds are descended from a single species of bird, and no other organisms are descended from that species, then birds form a clade.

explicitly refuses to characterize reptiles as a species of a broader genus like vertebrates.

Hence there is no advantage in postulating essences and searching for real definitions of those essences. A scientific description of what an electron or water or a bird is can be treated as a theoretical definition of the term ‘electron’ or ‘water’ or ‘bird’, a kind of positional definition that advocates using the proposed description as the meaning of the term in the context of the theory to which it belongs. From the point of view of scientific theorizing, it makes sense to choose for such descriptions characteristics thought to be causally basic, from which one can in principle infer other characteristics common to the kind of thing signified by the term. But any description that accurately picks out all and only those things belonging to the kind, according to well-established theory, is a satisfactory definition.

There are contemporary defences of the notion of a real definition. Rosen (2015), for example, proposes that a condition is a real definition of a property if and only if, as a matter of necessity, something has the property if and only if, *and because*, it satisfies the condition (p. 199, my italics). For example, as a matter of necessity, something is a prime number if and only if, *and because*, it satisfies the condition of having only itself and the number 1 as factors. Hence the condition of having only itself and the number 1 as factors is a real definition of the property of being a prime number. The word ‘because’ in this conception of a real definition refers to a metaphysical grounding relation articulated by Kit Fine (2001, 2012) and by Rosen himself (2010). Rosen’s account of real definition (which is supposed to apply to definitions of kinds and relations as well as of properties) has two advantages over traditional essentialism. First, it allows that a single property can have more than one real definition. For example, if to be a square is to be an equilateral rectangle and to be a rectangle is to be a right quadrilateral, then (in virtue of the transitivity of the grounding relation) to be a square is also to be an equilateral right quadrilateral. Or it might be that to be a prime number is not only to be a number that has only itself and the number 1 as factors but also to be a number that, when

it divides the product of two numbers *p* and *q*, either divides *p* or divides *q*; these would be distinct but mathematically equivalent real definitions of the property of being prime (Rosen 2015, 202). Second, Rosen's account does not require that the condition that defines a property entails everything that goes along with having the property. For example, it allows that the real definition of hydrogen (which would presumably be something like being an element the nucleus of whose atoms contains only one proton) might not entail (for example) the specific gravity of hydrogen. With these qualifications, Rosen's concept of a real definition is not too different from the present essay's conception of a theoretical definition of a term.[4]

In the field of psychology, Hibberd (2019) has argued for the recognition of real definitions on the basis of two realist assumptions: (1) that things in the world are what they are independently of human thinking and language and (2) that each particular situation is an instance of a kind. What she calls a "scientific definition" she takes to be an attempt to say what it is to be a certain kind of thing.[5] She takes definitions by genus and differentia (discussed in section 4.4, "Definitions by genus and differentia") to be such attempts, and gives the following example:

- **Dissociative identity disorder** is <a dissociative disorder> characterized by *(a) the presence of two or more distinct personality states or an experience of possession and (b) recurrent episodes of amnesia.* (American Psychiatric Association 2013, 219)

4. The details of Rosen's account (in particular, the notion of a metaphysical grounding relation) are too technical to be discussed in this practical guide. (Steward 2017) and (Ayars 2017) discuss the complication needed to account for real definitions of impossible properties like being a round square. Elgin (forthcoming) challenges proposed substitution principles for real definitions, on the ground that they imply that some real definitions are reflexive. For example, knowledge might turn out to be by definition knowledge.
5. Gigerenzer (2017), whose work Hibbert extends, speaks rather of "theoretical definitions" of concepts (p. 138).

In the terminology of the present essay, this definition would be classified as a theoretical definition of the term ‘dissociative identity disorder’, i.e. as a kind of positional definition recommending that psychiatrists use the term with the quoted meaning. The acceptability of the definition would depend on the defensibility of a theoretical framework to which the defined term belongs—for example, well-established accounts of how such disorders are caused, what effects they have, and what kinds of treatment will cure them. It is not clear that there is any theoretical advantage to regarding the definition as an attempt to say what the disorder is rather than an attempt to recommend how the term should be used in psychiatric theory. Further, if the concept of a real definition is to be accepted, it should be recognized that not every attempt to say what a kind of thing basically is will take the form of a definition by genus and differentia[6] and also that not every definition by genus and differentia is an attempt to say what a kind of thing basically is.[7]

6.3 Traditional rules for definition

In the European logical tradition, textbooks often included rules for the construction of definitions by genus and differentia. These rules derive from a conception of definitions as real definitions, in the sense discussed in the previous section. If definitions define terms rather than essences, these traditional rules need re-assessment to see whether they are still reasonable. A popular introductory logic textbook, for example, gives the following rules for definition by genus and differentia:

6. In particular, it is impossible to define by genus and differentia the highest genus in a hierarchy, since by definition it is not a species of a higher genus.
7. For example, the definition of water as a clear, colourless liquid that falls from the sky in the form of rain is a definition by genus (liquid) and differentia (clear, colourless, falling from the sky as rain), but is obviously not an attempt to say what water is. Rather, it picks out some of its observed characteristics (clear, colourless, liquid) and indicates one place where people notice it (falling from the sky as rain).

> Rule 1: A definition should state the essential attributes of the species.
> Rule 2: A definition must not be circular.
> Rule 3: A definition must be neither too broad nor too narrow.
> Rule 4: Ambiguous, obscure, or figurative language must not be used in a definition.
> Rule 5: A definition should not be negative when it can be affirmative. (Copi, Cohen and McMahon 2011, 96-98)[89]

Let us consider each of these rules in turn.

8. Another popular introductory logic textbook includes the same five rules, with slight variations, in a list of eight "criteria for lexical definitions" (Hurley 2008, 106-110), meaning by a lexical definition what this essay calls a "reportive definition". The three other criteria are "proper grammar", avoidance of "affective terminology", and indication of the context to which the defining part of the definition pertains. By "affective terminology", Huxley means word usage that plays upon the emotions of the reader or listener, such as sarcastic and facetious language. Hurley's additional three criteria make sense.
9. Morscher (2017, 209-223) describes 10 "traditional rules for definition", including the five stated above; he cites no sources for his list. The additional five that he mentions are that a definition should (6) specify the genus proximum and differentia specifica, (7) specify a good sense, (8) if possible be evaluatively neutral, (9) contain no disjunction, and (10) be consistent both in itself and as part of a chain of definitions. Requirements (6) and (9) are arbitrary and unjustifiable. The other three requirements make sense, and can be given a more precise formulation. Morscher himself characterizes the rules as often helpful practically but insufficient and unusable as a methodological foundation for definitions that introduce a new term into an axiomatized theory—the kind of definitions that his book focuses on (p. 219). In particular, he faults the traditional theory of definition to which these rules belong for failing to distinguish the criteria for a good definition from rules for constructing a definition that are individually necessary and jointly sufficient for meeting those criteria. The contemporary theory of definition of terms introduced into an axiomatized theory proposes two individually necessary and jointly sufficient criteria for being a good definition of that sort. First, the term being defined must be *eliminable*, in the sense that using the definition one can deduce that any formula containing the defined term is logically equivalent to a formula containing only terms that were part of the theory before the defined term was introduced. Second, the definition must be *non-creative*, in the sense that the definition cannot be used to prove any theorem that was previously unprovable. These criteria are satisfied if certain rules are followed for introducing terms by definitions expressed as equivalences ('if and only if' statements) or as identities. For details, the interested reader can consult (Suppes 1957, 151-173) or section 2 of (Gupta 2019). As a practical guide for constructing and

6.3.1 Essential attributes:

There are at least two objections to the rule that a definition should state the essential attributes of the species. First, the rule makes the highly dubious presupposition that there is a single set of attributes of any species that can be considered "essential" in the sense of being responsible for an individual's belonging to the species and for all the other characteristics that are common to all (non-defective) members of the species. As pointed out in section 4.4 (on definition by genus and differentia), one has a choice of the genus to which to assign individuals correctly labeled by a term and a choice of the characteristics that (as a group) distinguish these individuals from other individuals in the genus. A triangle, as noted there, is a plane figure bounded by three straight lines. But one can equally well define 'triangle' as meaning a rectilinear plane figure with three interior angles. Even when one defines a term signifying a natural kind, one has choices. For example, it fits most people's understanding of the word 'water' better to say that it refers to a colourless, odourless liquid that falls to the ground in the form of rain than to say that it refers to H_2O. There may or may not be such an entity as *the* essential attributes of water. Even if there are such attributes (i.e. even if water has a unique set of attributes that make it what it is and are the cause of all its other properties), a satisfactory definition of the term 'water' does not have to mention all, or even any, of these attributes.[10]

evaluating definitions expressed in a natural language, this essay does not go into those details.

10. Hurley (2008, 107) rewords the traditional requirement of describing *the* essential attributes of a species as that of conveying "the essential meaning of the word being defined". He does not explain what he means by "the essential meaning" of a word. He illustrates the rule with reference to its violation by a proposed definition of 'human' as meaning a featherless biped. In criticizing this definition for saying nothing about "the important attributes that distinguish humans from the other animals—namely, the capacity to reason and to use language on a sophisticated level" (Hurley 2008, 107), he invokes the theoretically problematic concept of "the important attributes" of a species. The problematic character of this concept becomes clear once one tries to work out what are the important attributes that should be included in the definition of such terms as

Second, even if one modifies the requirement by replacing the word "essential" by the word "necessary", the requirement of mentioning necessary attributes does not apply to such forms of definition as definitions by synonym or extended synonym, contextual definitions, and operational definitions. Consider for example the following definition by synonym:

- '**Algorithm**' means *a recipe*.

This definition by synonym adequately describes, for many purposes, the meaning of the term 'algorithm'. But it does not mention a single necessary attribute of an algorithm.

It is helpful, however, to define a term in a scientific theory in a way that facilitates derivation of many characteristics of the things correctly labeled by the term. For example, the accepted definition in chemistry of water as a chemical compound whose molecules each consist of two atoms of hydrogen and one atom of oxygen (H_2O) makes possible the derivation of many other characteristics of water, such as its production as the result of burning natural gas, where each molecule of methane (CH_4) combines with two molecules of oxygen (O_2) to produce one molecule of carbon dioxide (CO_2) and two molecules of water (H_2O). Such a derivation would be impossible if the term 'water' was defined in chemistry as a colourless, odourless liquid that falls to the ground in the form of rain. In the limiting case of a mathematical theory, the definition of a basic term (such as 'number' in arithmetic or 'line' in geometry) should logically imply, in combination with other basic parts of the theory, all the attributes belonging to things correctly labeled by the term defined (even if it is logically impossible to deduce them all).[11] Even this strict requirement does

'wren', 'daffodil', 'pencil', 'rock' or 'ocean'. Importance is subjective in a way that being essential is not.

11. The reason for this requirement is that objects defined by a mathematical theory are pure postulations of the theory, with no extra-theoretical reality (until the theory is applied). Hence the definition of a kind of mathematical object should specify the properties of that object completely. In axiomatized arithmetic, for example, the definitions of the term 'natural number' and of the plus sign should logically imply, along with the axioms

not mean that the defining part of the definition describes the essence of the things correctly labeled by the term defined. For there can be more than one way to define a basic term in a mathematical theory so as to logically imply all the attributes belonging to things correctly labeled by the term defined.

6.3.2 Not circular:

The rule against circularity forbids use, in the defining part of a definition, of either the term being defined or a term that presupposes understanding of its meaning. Chapter 3 (on the content of definitions) endorsed a version of this rule, in the form of the principle that "the words one uses should not presuppose knowledge of the meaning of the term being defined" (page 80). This principle does not necessarily rule out using the term being defined in the defining part of a definition. For example, someone might define the term 'valid argument', as used in logic, as meaning an argument in which denying the conclusion requires denying one or more of the premises. This definition uses the word 'argument', which is part of the term being defined, in the defining part of the definition. The repetition is not circular, because the definition is best construed as a contextual definition of the term 'valid' for contexts where it is said about arguments.[12]

and other definitions, all the "addition facts" about natural numbers—for example, that $(x + y) + z = x + (y + z)$. In other words, if one adds three natural numbers together, one gets the same result whether one adds the first two and then adds the third one to their sum or one adds the last two and then adds that sum to the first number.

12. Repetition in the defining part of the term being defined is also legitimate in inductive definitions, as pointed out in section A.1 on inductive definitions. It is also legitimate in the recursive definitions discussed in section A.2. Gupta and Belnap (1993) argued that some concepts are circular, so that definitions of those concepts are legitimately circular. They developed a general theory of definitions, based on revision sequences, within which circular definitions make sense. Rivello (2019) proposes an alternative general theory of definitions which addresses criticism of revision sequences while preserving the notion of revision. Bruni (2019) claims that circular definitions are common and hard to avoid; he argues that circular definitions get a plausible justification from theories like those of Gupta and Belnap and of Rivello. The details of these theories go beyond the scope of this essay.

Dictionaries run the risk of violating the principle that the words used in the defining part of a definition should not presuppose knowledge of the meaning of the term being defined. If one looks up the meaning of a word in a dictionary, does not understand the meaning of the words used in the defining part of its definition, looks up the definitions of those words, and then looks up the definitions of the words used in the defining part of those definitions, and so on, one may eventually be brought back to the beginning of one's search.[13] Anna Wierzbicka's "natural semantics metalanguage" (1996), described in section 3.3 ("Theoretical constraints on the choice of words in a definition") is an impressive attempt to avoid this sort of difficulty.

6.3.3 Neither too broad nor too narrow:

This essay has endorsed the rule that a definition must be neither too broad nor too narrow. With a reportive definition, the benchmark for accuracy is the use that one is trying to report. With a stipulative definition, the benchmark is the set of objects that one intends to be correctly labeled by the term. With a positional definition, the benchmark is the position that one wishes to take on an issue by advancing the definition. The benchmark must be met for possible as well as actual cases. Hence one can use purely imagined situations as counterexamples to proposed definitions.

However, the rule that definitions should be neither too broad nor too narrow needs qualification. As stated, it assumes that the term being defined has a precise meaning, with no borderline cases where it is objectively uncertain whether they are correctly labeled by the term. In fact, many commonly used terms are vague, with

13. Readers who consult dictionaries are likely to have had this experience, despite advice to makers of dictionaries to avoid defining two or more terms in relation to each other (Jackson 2002, 93). Atkins and Rundell (2008, 434-435) endorse this traditional principle but think that circularity is sometimes unavoidable if dictionary definitions are to be intelligible to their users; for example, the words 'father' and 'parent' are hard to define intelligibly without using each in the definition of the other. They think that most ordinary people are relaxed about the fact that the process of defining words by means of other words sometimes involves some circularity.

indeterminate borderline cases. This vagueness is not necessarily a fault. People need vague terms like ‘big’ or ‘cold’ or ‘hill’ to communicate useful information to each other efficiently. Definitions of such terms should be correspondingly vague, either by using vague terms or by using qualifiers like ‘as a rule’ or ‘generally’. This essay distinguished range definitions as a distinctive form of definition (in section 4.6 on range definitions), in order to highlight the need to take account of vagueness, especially in a reportive definition. Stipulative or positional definitions generally should give a precise definition of the term being defined, but even here there are exceptions. Positional definitions of emotionally loaded but vague terms like ‘liberty’ or ‘democracy’ or ‘murder’ or ‘art’ can legitimately use general terms that are themselves vague. The vagueness of one’s definition might for example reflect inability to foresee all the possible situations in which the question might arise of whether they are correctly labeled by the term.

6.3.4 Not expressed in ambiguous, obscure or figurative language:

This rule requires that definitions use language that is unambiguous, clear and literal. Each of these requirements needs qualification.

As to being unambiguous, it is too demanding to require that the terms used in the defining part of a definition should be unambiguous in themselves, since many terms that people use in everyday communication are ambiguous in themselves. (Consider for instance the words ‘since’ and ‘terms’ in the previous sentence, each of which each has many distinct meanings, but which seem unambiguous in context.) The requirement to avoid ambiguous language should be qualified as a requirement that the terms used in the defining part of a definition must be unambiguous *in context*.

As to not being obscure, one needs to recognize that whether the language used in a definition is obscure depends partly on the person to whom the definition is addressed. Consider for example

the following contextual definition of the term ‘mutually exclusive’:

- To say that two sets are **mutually exclusive** is to say that *the intersection of the two sets is empty*.

The phrase ‘intersection of two sets’ is obscure to those unfamiliar with its use in set theory, but quite clear and well-defined to those with even elementary knowledge of set theory. The ban on using obscure language therefore needs to take into account both the words themselves and the addressees of the definition. The words used in the defining part of a definition should objectively have a clear meaning in context, and this meaning should be discernible by the intended audience. The words can be vague, in the sense of admitting borderline cases, if that vagueness corresponds to the vagueness of the term being defined.

As to avoiding figurative language, there is nothing wrong in principle with using figurative language in a definition, as long as the language communicates accurately to the intended audience the meaning of the term being defined. It would need to be clear to this audience that the figurative language is meant figuratively and not literally. Consider for example the following definition by synonym:

- ‘**Expressionless**’ means *wooden-faced*.

This definition is quite acceptable, even though the word ‘wooden-faced’ is being used metaphorically. No reasonable person would interpret the word ‘wooden-faced’ in this context as meaning that an expressionless person actually had a face made of wood. Definers should avoid figurative language if there is a risk that it will be misinterpreted, e.g. by being taken literally. But there is no need for an explicit ban on misleading use of figurative language, since that sort of ban is already covered by the ban on using language that is ambiguous in context.

6.3.5 Affirmative if possible:

As argued in section 4.4.3.2 (on selection of the differentia in constructing a definition by genus and differentia), there is nothing intrinsically wrong with using a negative distinguishing feature in a definition by genus and differentia, as in the case of the definition of 'clock' as meaning a timepiece that is not designed to be worn or carried on one's person. One could use an affirmative distinguishing feature instead, for example by defining 'clock' as a timepiece that is stationary or usually resting on a piece of furniture. In this example, there seems to be no particular reason to prefer the affirmative definition to the negative one. The main criterion is that one's definition should communicate clearly and accurately to the intended audience the intended meaning of the term that one is defining. Sometimes a negative definition can communicate a meaning better than an affirmative one. Consider for example the following definition by genus and differentia:

- A **prokaryote** is an organism *whose cells do not contain a nucleus*.

The negative differentia seems to make the meaning clearer than any affirmative alternative would, and is quite accurate. Here is another example where it seems quite satisfactory to use a negative defining characteristic, in this case a definition by synonym:

- '**Difficult**' means *not easy*.

6.4 Defining terms versus analyzing concepts

In defining a term, one provides a basis in principle for determining about any particular case whether it is correctly labeled by the term. For example, if one defines 'democracy' as meaning a political system in which every adult person belonging to that system has a voice in how it is run, one can determine that the United States has been a democracy since it extended votes

to women but that North Korea has never been a democracy. A definition thus fixes the so-called *extension* of a general term: the set of objects correctly labeled by it. But it does not do so by creating a list of those objects. Rather, it does so by specifying a set of criteria that collectively determines the extension—commonly called the *intension* of the term. This essay has focused on constructing definitions that produce the right extension, i.e. that are neither too broad nor too narrow. It has said nothing about getting the intension correct. In fact, it has allowed for alternative intensions for the same word with the same meaning, as with the equally acceptable definitions of 'water' as meaning a clear, colourless liquid that falls from the sky in the form of rain and as meaning a compound whose molecules each consist of two parts of hydrogen and one part of water. These two definitions are not logically equivalent, but they fix the same extension (the same set of objects correctly labeled by the term 'water') in virtue of the scientific discovery of the composition of the liquid that falls as rain.[14]

The intension articulated in a definition is also commonly called a *concept*. A concept is an abstract entity. It is what people grasp when they understand the defining part of a definition. It is not their mental act of grasping, since each person's mental act is private to them but the same concept can be grasped by more than one person. The definition of a term thus brings a certain concept to the attention of its addressees.[15] But the highlighting of

14. Gupta (2019) proposes to call a reportive definition "extensionally adequate" if and only if it has no actual counterexamples, "intensionally adequate" if and only if it has no possible counterexamples, and "sense adequate" if and only if it endows the term with the right sense. This essay takes a different approach, since it judges the extensional adequacy of a definition in terms of possible counterexamples as well as actual counter examples. It uses the term 'intension' for what Gupta calls 'sense', but without supposing that there is a "right" intension that a reportive definition must capture. Thus, although the above-mentioned definitions of the word 'water' pick out different intensions, they are both descriptively adequate; there is no "right sense" or "right intension" of the word 'water'.

15. In a widely cited classic article entitled "The meaning of 'meaning'" (Putnam 1975), Hilary Putnam has argued that for some terms one cannot consistently hold both that knowing the meaning of the term is grasping a concept and that the meaning or intension

this concept may be only the beginning of a deeper philosophical investigation, the analysis of the concept. For example, political philosophers and political theorists who write about democracy have a much deeper task than defining the term ‘democracy’. They aim, at least in part, to provide an analysis of the concept of democracy, i.e. an understanding of what it means in some deeper sense for a political system to give a voice in how it is run to every adult person that belongs to it. Another example of the distinction between defining a term and analyzing the concept that is its intension is found in Alfred Tarski’s description of a method for constructing a definition of the term ‘true sentence in language *L*’ for any formal language *L*. Although Tarski takes himself to be “grasping the intentions which are contained in the so-called *classical* conception of truth (‘true – just agreeing with reality’)”, he says that “a thorough analysis of the meaning current

of the term determines its extension. He imagines a Twin Earth just like Earth, except that the substance on Twin Earth that looks and behaves like water on Earth has a different chemical composition. On Twin Earth a hypothetical exact duplicate of an English-speaking Earthling who understood the term ‘water’ would grasp the same concept as the Earthling, but the term ‘water’ would have a different extension on that planet than it does on Earth. The present essay accommodates Putnam’s point by distinguishing a reportive definition from a theoretical definition. The term ‘water’ would have the same reportive definition on Twin Earth as on Earth—for example, as referring to a clear, colourless liquid that falls from the sky in the form of rain. But it would have a different theoretical definition; on Earth water is H_2O, but on Twin Earth it is XYZ. Putnam takes his argument to apply not only to natural kind terms like ‘water’ but also to names of artefacts (like the word ‘pencil’) and to some adjectives (like the word ‘red’). On the approach of the present essay, he is claiming that a word like ‘pencil’ or ‘red’ has one definition that describes how people use the word (in one of its senses) but another definition that articulates a theory-based understanding of the inner structure of the objects correctly labeled by the word when used in that sense; the first definition reports a meaning, but the second one takes a theoretical position. Putnam himself proposes (p. 190) that “the normal form description of the meaning of a word” should include four components: (1) its “syntactic markers” (e.g. ‘noun’), (2) its “semantic markers” (e.g. ‘liquid’), (3) a description of the conventional ideas associated with the word (e.g. ‘clear, colourless, tasteless’), and (4) a description of its extension (e.g. ‘H_2O’). Dictionary entries often include these components. Putnam comments that users of a term need not know its extension and that different descriptions of the extension are acceptable if they get the extension correct.

in everyday life of the term ‘true’ is not intended here.” (Tarski 1983, 153; translation modified as suggested by Gruber (2016, 11); italics in original) Thus there is a difference between defining a term and analyzing a concept. This essay offers no criteria for determining where definition of a term ends and analysis of a concept begins.

6.5 Conceptions of a concept

Both the example of non-equivalent definitions of the term ‘water’ and the existence of rival analyses of a single concept raise the question of whether two verbally different definitions of a term are characterizing the same thing. If the definitions are logically equivalent, then the answer is clear: these two definitions are different ways of expressing the same concept. An example is the logical equivalence of the two definitions of ‘triangle’ as meaning a plane figure bounded by three straight lines or as meaning a rectilinear plane figure with three interior angles. If the definitions are not logically equivalent but are extensionally equivalent in virtue of necessary features of the universe, then the definitions express different concepts but single out the same set of objects. An example is the extensional equivalence of the two definitions of the term ‘water’ mentioned in the preceding section. A harder case comes when the definitions incorporate some conceptual analysis that goes beyond the definition of the term. Are these alternative definitions characterizing the same concept but offering different conceptions of it, or are they proposing different concepts? Here one cannot use the test of extensional equivalence that was used to determine the compatibility of the two definitions of the term ‘water’. For, in the case of evaluative terms with programmatic implications, such as ‘justice’ or ‘democracy’ or ‘law’ or ‘critical thinking’, alternative definitions that incorporate different conceptions of the same concept will probably not be extensionally equivalent. Consider for example the way in which

the philosopher John Rawls[16] distinguishes the concept of justice from rival conceptions of it:

> Men disagree about which principles should determine the basic terms of their association. Yet we may still say, despite this disagreement, that they each have a conception of justice. That is, they understand the need for, and they are prepared to affirm, *a characteristic set of principles for assigning basic rights and duties and for determining* what they take to be *the proper distribution of the benefits and burdens of social cooperation*. Thus it seems natural to think of the concept of justice as distinct from the various conceptions of justice and as being specified by the role which these different sets of principles, these different conceptions, have in common. (Rawls 1971, 5; italics added)

The italicized expression is Rawls's articulation of the single concept of justice that rival conceptions specify. This articulation is however an abstraction from any specific conception. A utilitarian conception of justice might for example define a just society as one that is organized so as to produce the greatest average well-being. Rawls on the other hand proposes the following two principles for the justice of institutions:

> Each person is to have an equal right to the most extensive total system of equal basic liberties compatible with a similar system of liberty for all.
>
> Social and economic inequalities are to be arranged so that they are both (a) to the greatest benefit of the least advantaged, consistent with the just savings principle, and (b) attached to offices and positions open to all under conditions of fair equality of opportunity. (Rawls 1971, 302)[17]

16. Rawls cites H. L. A. Hart (1961, 155-159) as the inspiration for his distinction. Hart uses the words 'principle' and 'criteria' rather than 'concept' and 'conception', but the distinction is similar. Hart notes that the principle of justice can be summed up in the precepts "treat like cases alike" and "treat different cases differently", but that "the criteria of relevant resemblances and differences may often vary with the fundamental moral outlook of a given person or society" (p. 158).
17. Rawls adds two priority rules, one affirming the priority of liberty and the other the priority of justice over efficiency and welfare.

The two definitions have different implications for what counts as a just political system. Rawls's definition implies that it is unjust to sacrifice the liberty of some individuals for the sake of the greater average well-being of the whole society, whereas the utilitarian definition implies the opposite. Thus the two definitions have different extensions. Nevertheless, they are both conceptions of the same concept, once one abstracts from them something like the italicized description of the concept of justice in the preceding quotation from Rawls. In considering whether alternative definitions of a term are describing the same concept but incorporating different conceptions of it, one needs to consider whether there is an abstract general description of which the two definitions can be regarded as rival specifications. If so, then both definitions are attributing the same meaning to the term, i.e. taking it to signify one and the same concept. They differ in their specific proposals for implementing the concept. If on the other hand there is no abstract general description of which the two definitions can be regarded as specifications, then the definitions are assigning different meanings to the term.

Ennis (2016) has listed 14 scholarly definitions of the term 'critical thinking', as well as three dictionary definitions of it, and has claimed that all 17 definitions are definitions of the same concept, expressing different conceptions of it. Among these definitions are the following (for which only the defining part of the definition is quoted):

- "*Active, persistent, and careful* consideration of any belief or supposed form of knowledge *in the light of the grounds that support it and the further conclusions to which it tends*" (Dewey 1933, 9)
- "*Reasonable reflective* thinking *that is focused on deciding what to believe or do*" (Ennis 1987)
- "*Purposeful, self-regulatory* judgment *which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that*

judgment is based" (Facione 1990, Table 1)

- "The *objective* analysis and evaluation of an issue *in order to form a judgment*" (Oxforddictionaries.com 2016)

Hitchcock (2018) has proposed that the concept common to the various conceptions in these and other definitions of the term 'critical thinking' is that of careful thinking directed to a goal, and that the conceptions differ with respect to the scope of such thinking, the type of goal, the criteria and norms for thinking carefully, and the thinking components on which they focus.

Gerring and Barresi (2003) have proposed a somewhat similar distinction between a minimal definition of a concept and an "ideal-type" definition. A minimal definition specifies the attributes that ordinary usage and scholarly discussion generally include in the concept. For example, the term 'culture' is used of any phenomenon that has the four attributes of being social, ideational or symbolic, patterned, and shared. An ideal-type definition adds further attributes. For example, in the context of social science research, cultural phenomena are taken to be not only social but exclusive to human beings; to have the additional characteristics of being enduring, cumulative, coherent, differentiated, comprehensive, non-interest-based and implicit; and to have causal and constitutive functions. A minimal definition is thus a broad definition that covers many phenomena, whereas an ideal-type definition is a narrow definition with a smaller extension. Gerring and Barresi recommend a "min-max strategy" in social scientific research of constructing first a minimal definition of a key concept and then specifying it further in an ideal-type definition for research purposes. In Rawls's terminology, the minimal definition would describe the basic concept and the ideal-type definition would specify a conception of that concept. In the terminology of the present essay, a minimal definition reports a meaning and an ideal-type definition stipulates a meaning that is a further specification of the reported meaning.

7.

Summary

This essay has proposed guidelines for constructing and evaluating definitions of terms, meaning by ‘term’ a syntactically complete expression of general application that falls short of being a sentence.

It distinguished three dimensions of definitions: the act of the definer and the content and form of the definition. The act of a definer is what the definer does in defining a term, for example stipulating how the word ‘term’ in this essay is to be interpreted. The content of a definition is the information it conveys and the words of which its defining part is composed. The form of a definition is the way it is expressed, for example as a definition by genus and differentia.

7.1 Acts of defining

There are three basic acts of defining: reporting, stipulating, and advocating. These acts are not mutually exclusive; in defining a term, a person can combine any two or even all three of them. For example, a person who defines the adjective ‘brave’ might be simultaneously trying to capture actions that most people would take to be brave (an act of reporting), to indicate precisely what the definer should be interpreted to mean when describing an action as brave (an act of stipulating), and to express approval of any action correctly described by the defining part of the definition (an act of advocating).

A reportive definition states (correctly or incorrectly) what a term means in a supposed pre-existing use. An example is the following definition:

- '**Fruit**' in its botanical sense means the *seed-bearing* structure in flowering plants *formed from the ovary after flowering*.

A reportive definition is a kind of explanatory hypothesis, for which the primary evidence is the use of the term in a specific sense when people communicate with each other. Good dictionaries construct their definitions on the basis of such evidence, and are thus good secondary evidence. An acceptable reportive definition must accurately describe the use of the term with the sense in question. If a reportive definition does not include some cases that people label by the term, then either the definition is too narrow or those cases reflect a different meaning. If a reportive definition includes cases that people would not label by the term, then either the definition is too broad or it is capturing some other pre-existing meaning. To evaluate a reportive definition, one considers whether it explains the data of the term's use, whether it is consistent with these data and with known general facts about the sort of thing which the term signifies, and whether its rivals are inconsistent with facts. Distinct reportive definitions are rivals only if they are trying to capture the same sense of the same term and have different implications for which items are correctly labeled by the term when it has that sense. In contrast to distinct scientific explanations of a general natural phenomenon, distinct reportive definitions can both be correct, in the sense that they both explain the facts of the defined term's use and are both consistent with these facts and with known general facts about the sort of thing signified by the term. In such cases, other considerations may make one definition preferable to the other.

Stipulative definitions state how a term is to be interpreted or used in a specified context, as with the explanation in section 4.3 on definitions by extended synonym of how the term 'extended

synonym' is to be interpreted in this essay. When one stipulates a meaning, one presupposes that one has the right to say how to interpret or use the term in the specified context. Stipulations of meaning include authors' statements of what they will mean by a term in something they are writing, definitions in legal documents, definitions by agencies collecting statistical data of the terms to be used in reports sent to them, adoption of nomenclature, making vague terms precise, and introducing a new term into an axiomatized theory. In constructing a stipulative definition, one should consider first whether one has a reason for stipulating a term's meaning, if so whether it is a good enough reason, and whether one has the right to stipulate. Assuming positive answers to these questions, one should be precise and unambiguous, and should fit the specified meaning to one's purpose in stipulating. In introducing nomenclature, one should make sure that a new name is necessary. If it is, one should pick a name that will not be misunderstood, and ideally a name that will communicate accurately its intended meaning. Although stipulative definitions are neither true nor false, they can be evaluated for acceptability using the criteria just mentioned.

Positional definitions take a position on an issue, as when someone defines 'marriage' as meaning a union between a man and a woman. If the issue is the boundaries of the class of things correctly labeled by an emotionally charged word like 'liberty' or 'courage' or 'murder', the positional definition may take the form of what Stevenson (1944) calls a "persuasive definition". If the issue is the boundaries of the class of things correctly labeled by a term that is tied to a social practice, like 'learning' or 'critical thinking', the positional definition is what Scheffler (1960) calls a "programmatic definition". If the issue is the meaning of a term in a scientific theory, the positional definition is what is sometimes called a "theoretical definition" (Hurley 2008, 93). Since the issues on which positional definitions take a stand are often controversial, there may be competing positional definitions of the same term. A positional definition is also a reportive definition if it claims that the definition is what people already mean by the defined term. A positional definition is also a stipulative definition if the definer

uses it to say how the definer's use of the defined term should be interpreted or if the definer prescribes that specified others use the term as the definer defines it in specified contexts and the definer has the authority to issue such an order. Many positional definitions are neither reportive definitions nor stipulative definitions. Any positional definition needs justification of the position advocated through it, a justification which should be worked out when one is constructing a positional definition and may need to be stated. In evaluating a positional definition, one needs to evaluate the justification of the position advocated through it if one is proposed and otherwise to consider arguments for and against the position. Both the construction and the evaluation of a positional definition should follow the guidelines for the content of a definition and for the chosen form.

7.2 Content of the defining part of a definition

The content dimension of a definition consists in one sense of the information it conveys and in another sense of the words in its defining part. The words should be suitable in themselves, suitable for the addressees, and suitable theoretically. *In themselves* the words should be unambiguous in context and as precise as is necessary to achieve the definer's purpose. Understanding the words in the defining part should not presuppose knowledge of the meaning of the term being defined. The language should be simple and unaffected, using words with Germanic roots in preference to those with Latin or Greek roots. It is more important to be understandable than to be concise. *For the addressees*, the words should be understandable. For example, a definition constructed for a general reader should if possible avoid technical terms, and if not possible should explain them in words understandable by a non-specialist. Dictionary definitions can sacrifice accuracy and precision for brevity, but definitions in an encyclopedia meant for scholars can be lengthy if accuracy and precision require length. Phrase books for travellers need only rough equivalents in the traveller's language for the words and phrases of the target

language. *Theoretically*, constraints on the words chosen arise when there is an effort to construct a language from the ground up, introducing new terms by definitions that use only the terms introduced so far. A striking example is the natural semantic metalanguage (NSM) constructed by the Australian linguists Anna Wierzbicka and Cliff Goddard as a means of making inter-cultural comparisons without imposing the cultural background of the investigator. NSM is a mini-language, currently with 65 basic concepts ("semantic primes"), for which Goddard and Wierzbicka (2014) claim all natural languages of human beings have words or simple phrases. Definitions of words used in a given human language (e.g. English or Tagalog or Mandarin Chinese) are to be expressed ultimately in the concepts of NSM using its elementary grammar. Another example of introducing new terms by definitions that use only the terms introduced so far is the construction of formal languages, where a small stock of primitive terms is expanded by definitions that ultimately use only the undefined terms in their defining part.

7.3 Forms of definition

One can identify 11 commonly used forms of definition.

1. *Definitions by synonym* provide a single word or short phrase that is claimed to be roughly equivalent in meaning to the term being defined. Here is an example:

- '**Algorithm**' means *recipe*.

The bold-faced word is **the term being defined**, and the italicized word is the *alleged synonym*. Definitions by synonym can be used to define any part of speech or type of phrase. They have the advantage of brevity, and are useful in conveying a rough idea of what a term means. They rarely provide exact equivalents, and so cannot be criticized on the basis of a single counterexample. Rather, a whole group of counterexamples is needed.

2. *Definitions by antonym* provide a word or phrase that is opposite in meaning to the term being defined. An example is the remark:

   - I mean **light** as opposed to *dark*, not **light** as opposed to heavy.

The bold-faced word is **the term being defined**, and the italicized word is *the alleged antonym*. As this example shows, definitions by antonym can be useful in clearing up ambiguities. They can be used of any part of speech or type of phrase that has an opposite.

3. *Definitions by extended synonym* provide a phrase that is claimed to be equivalent in meaning to the term being defined. An example is the following definition:

   - '**Even-tempered**' means *not prone to anger*.

The bold-faced word is **the term being defined**; the italicized phrase is *the alleged extended synonym*. Definitions of this form can be used of any part of speech. Definitions by extended synonym are common in dictionaries and in legal documents. They can be criticized as too broad or narrow by providing counterexamples.

4. *Definitions by genus and differentia* name a genus and describe a differentia (which is a set of one or more characteristics). An example is

   - A **triangle** is a plane figure *bounded by three straight lines*.

The bold-faced word is **the term being defined**, the underlined phrase names the genus, and the italicized phrase describes *the differentia*. When written as complete sentences, definitions by genus and differentia apply only to nouns; in a dictionary-style definition, however, where the defined term is followed by the defining part with no linking word or phrase, they can be used also for adjectives, verbs and adverbs. In constructing a definition by

genus and differentia, one must pick a genus that includes all the things correctly labeled by the term being defined. It would be a mistake, for example, to define ‘oak tree’ by putting as the genus deciduous tree, since the term ‘deciduous’ is commonly used of leafed trees that drop their leaves in the fall and are leafless until the spring, and not all oak trees are deciduous in this sense. It may be necessary to justify one’s choice of genus if the choice is controversial, as with the choice of classifying giant pandas as raccoons or bears. It makes sense to pick a genus of intermediate generality that includes species similar to the one signified by the term to be defined—for example, in defining ‘triangle’ to pick as the genus plane figure rather than figure or rectilinear plane figure, and in defining ‘clock’ to pick as the genus timepiece rather than device. In picking the differentia, it makes sense to consider a number of different things that are correctly labeled by the term, so as to make sure that the differentia belongs to *all* such things. Failure in this respect means that one’s definition is *too narrow*. It also makes sense to consider things in the genus that are not correctly labeled by the term, so as to make sure that the differentia belongs *only* to things correctly labeled by the term. Failure in this respect means that one’s definition is *too broad*. A definition by genus and differentia can be simultaneously too narrow and too broad, in different respects. An example is the following definition:

- A **clock** is a timepiece *with moving parts that is not designed to be worn on one’s person*.

This definition is simultaneously too narrow in leaving out digital clocks and too broad in including pocket watches. A differentia may be described negatively, as when one defines ‘clock’ as meaning a timepiece not designed to be worn or carried on one’s person.

5. *Contextual definitions* have the structure: ‘<context> <term to be defined>’ means <equivalent expression>. An example is the following definition:

- '**To prove** a proposition **beyond a reasonable doubt**' means *to offer enough evidence in its support that it would not make good sense to deny that proposition*.

The bold-faced phrase is **the term being defined**, the underlined word is the context, and the italicized phrase is the *equivalent expression*. Contextual definitions can be used to define any part of speech or type of phrase. A comprehensive contextual definition covers all contexts in which the term being defined occurs. A less comprehensive contextual definition covers only some contexts in which the defined term occurs. In constructing a contextual definition, it makes sense to start by identifying the contexts in which the term to be defined may occur, making sure (if a comprehensive definition is needed) to include all those contexts in the first part of the definition. The equivalent expression in the second part of the definition must fit the meaning that one has in mind, being neither too narrow nor too broad.

6. *Range definitions* are definitions of any of the aforementioned forms that are strongly qualified by words like 'typically' or phrases like 'as a rule' indicating that there are exceptions. Such qualifications are appropriate when the things that are correctly labeled by the term being defined are not a sharply bounded class, but are more like a mountain range, whose boundaries are indeterminate. A fully specified range definition describes typical cases ("paradigms'"), criteria ("constitutive factors"), and rules for determining the degree of distance from the paradigms (Black 1954, 29). The following is an example of a range definition:

- **The scientific method** is a method of investigation *characteristically involving a substantial number, but rarely all, of the following characteristics: observation, generalization, experimentation, measurement, calculation, use of instruments, formulating and testing hypotheses that get support from their being able to explain the facts and their competitors' being inconsistent with the facts, and being more*

> *or less tentative when concluding.* (Ennis 2016, 3)

One should construct range definitions in the same way as one constructs the form of definition that one is qualifying. A useful strategy is to begin with a variety of cases that are clearly correctly labeled by the term, as a way of generating criteria on the basis of which cases are labeled by the term. One should use the appropriate qualifying word or words in the appropriate place, so as to capture accurately the vagueness of the term. Single counterexamples can show that a range definition is too broad. To show that it is too narrow, one needs a substantial group of things that are correctly labeled by the term even though they do not have a characteristic claimed to be typical.

7. *Extensional definitions* list the individuals correctly labeled by a term or the species of a genus. A list of individuals may be incomplete, with an indication of how to continue the list, as in the definition of 'natural number' as a member of the series 0, 1, 2 and so on. Listing species of a genus risks leaving out some species, as in the definition of 'corvid' as referring to crows, jays or magpies; there are in fact 120 species of corvids.
8. *Operational definitions* explain the cases correctly labeled by a term or the value of a variable by the result of performing an operation. The following operational definition explains when someone is correctly labeled by the term 'severely depressed':

   - If the Beck Depression Inventory Second Edition is administered to a person under standard conditions, then that person is **severely depressed** if and only if the person's *score is in the range 29-63*.

The underlined part of this definition describes the operation to be performed, the bold-faced part is **the term being defined**, and the italicized part describes *the result of performing the operation that makes it correct to apply the term*.

The following operational definition explains the value of the variable length:

- The **length of a rigid body** is *the number on a ruler that is next to one end of the body* when the number zero on the ruler is next to the other end of the body.

The bold-faced part of this definition is **the term being defined**, the italicized part describes *the result that is the basis of the value of the variable*, and the underlined part describes the operation to be performed.

Operational definitions describe one way (typically, among others) of determining in a particular case whether the case is correctly labeled by a term or what the case's value of a variable is. They need to be validated as accurate with reference to the concept signified by the term, such as severe depression or length. Some researchers in psychology and education wish to reduce the meaning of terms like 'depressed' or 'intelligent' to the results of applying operations, or even just to the operations; this reduction is highly controversial. To evaluate an operational definition, one typically needs domain knowledge. Without such knowledge, one must rely on the consensus of specialists in the domain as an indication that a certain operational definition is valid. A loose approach to operational definition recognizes that the operation needs to be performed under standard conditions, that human judgment is required, and that there may be exceptions to the general validity of a test.

Some people extend the meaning of 'operational definition' to include definitions by observable criteria. This extension obscures the central point of operational definitions, which is to take the result of applying an operation as the basis for something being correctly labeled by a term or having a specified value of a variable. But it seems to be increasingly common.

9. *Examples, non-examples, and borderline cases* can convey the meaning of a term quite accurately. They can help to make an explicit definition understandable. It makes sense to pick

examples that are clearly correctly labeled by the term and that cover the range of cases that one's addressee is likely to encounter. Non-examples should include cases which one's addressee might mistakenly label by the term. Borderline cases should be ones likely to be encountered.

10. *Ostensive definitions* show what a term means by pointing, literally or metaphorically, to things that are correctly labeled by the term. They are particularly useful in teaching small children the meaning of words that signify something visible, such as a colour or a kind of plant or animal. To help with abstraction of the meaning, one can use several examples that differ in all respects except the desired one (yellow car, yellow crayon, yellow sun, etc.) or several examples that are the same in all respects except the ones signified by a variety of terms (yellow crayon, red crayon, blue crayon, etc.).
11. *Using a term in a sentence* shows rather than says what a term means. To convey meaning, the sentence must use the term in such a way that replacing it would make the sentence nonsensical unless the replacement is a synonym. A special case is the so-called "implicit definition" of a basic term in an axiomatized theory by the theory's set of axioms.

7.4 Strategies and theoretical issues

A person or group that sets out to define a term should be clear and accurate about their purpose or purposes, their intended audience, and the use of the term that they intend to report or stipulate or advocate. They should use a form of definition that is appropriate for the term being defined and that the intended audience will find easy to understand. It is often helpful to mention examples, non-examples and borderline cases as a supplement to a formulaic definition. The definer should justify the definition to the extent that the situation demands. If it is important to have a good definition, explanation or name, it makes sense to have a draft version reviewed by one or more competent people not involved in

its preparation. The definition of ‘term’ in section 1.2 of this essay used this strategy.

Real definitions are supposed to describe the essence of a kind of thing, as opposed to nominal definitions that merely say what a term means. This essay talks about nominal definitions. It is doubtful that things have essences. If a thing had an essence, it would be a set of attributes that are responsible for its being the kind of thing that it is and that are causally responsible for all the other attributes that all non-defective instances of the kind possess. In the case of natural kinds like electrons or hydrogen or water, one can perhaps identify a set of common attributes that are somehow causally basic, such as the mass and spin and charge of an electron, the existence of a single proton in the nucleus of a hydrogen atom, or the composition of a molecule of water as consisting of two atoms of hydrogen and one atom of oxygen. But it is doubtful that all the attributes common to one of these kinds are due to the identified basic attributes. Further, when one gets to more complex entities like living organisms or their parts, postulation of causally basic attributes shared by all members of a kind becomes increasingly problematic. Contemporary scholarship includes renewed defences of real definitions, without all the baggage of traditional essentialism. Nevertheless, the legitimate interests of scientific researchers in identifying causally basic attributes of genuine natural kinds can be accommodated without postulating real essences, by allowing for theoretical definitions as a class of positional definitions in which a theorist takes a position on how a certain term is to be interpreted when it is used in a scientific theory.

Five traditional rules for constructing definitions by genus and differentia are based on the assumption that definitions are supposed to describe essences—a dubious assumption. Nevertheless, the rules deserve consideration to see whether and how they apply if one treats a definition as an explanation of the meaning of a term. The first rule, that a definition should state the essential attributes of the species, should be rejected, on the ground that it is inextricably tied to a questionable essentialism. The second rule, that definitions must not be circular, is acceptable

in a modified form, as the rule that a definition should not presuppose understanding of the meaning of the term being defined. The third rule, that a definition must be neither too broad nor too narrow, is central to this essay's guidelines for constructing and evaluating definitions, with the important qualification that breadth and narrowness are to be determined differently according to whether the person defining a term is reporting, stipulating, or advocating. Also, there must be recognition that many terms are vague, with borderline cases that make it difficult to tell whether a definition is too broad or too narrow. The fourth rule, that a definition should not use ambiguous, obscure or figurative language, is acceptable with some qualifications; vagueness is acceptable if it corresponds to the vagueness of the term being defined, and there is nothing wrong with figurative language if its figurative character and intended meaning are clear to the addressees of the definition. The fifth rule, that a definition should not be negative when it can be affirmative, should be rejected, since a negative definition that clearly and accurately conveys which objects are correctly labeled by the defined term is perfectly acceptable even if an affirmative definition is also possible.

Analyzing a concept that a term signifies is different from defining the term. A reportive definition describes a concept, but analysis of the concept indicates in more depth what the concept involves. Consider for example the following reportive definition by genus and differentia:

- **Democracy** is a political system *in which every adult person governed by the system has a voice in how it is run*.

This definition provides a rough idea of what makes a political system democratic, but is only the beginning of a more profound analysis of the concept of democracy.

Conceptions of a concept are different proposals for implementing one and the same concept—for example, different conceptions of democracy, or of justice, or of truth. Distinct definitions of terms may incorporate different conceptions of the same concept. In order to determine whether two distinct

definitions of a term are taking it to mean the same concept, one may need to explore whether they have in common some abstract general principle which they specify in different ways.

7.5 Rarely used forms of definition

In addition to the 11 commonly used forms of definition mentioned in section 7.3, one can identify three rarely used forms of definition.

1. *Inductive definitions* pick out a class of objects that form a sequence, with one or more initial objects and one or more ways of reaching the remaining objects in a step-by-step (inductive) fashion. An example is the term 'ancestor', which initially refers to a person's parents and then, step by step, their parents (the person's grandparents), the parents of those parents (the person's great-grandparents), and so on. The base clause of an inductive definition should pick out all and only the beginning members of the sequence. The inductive clause should include all and only the ways in which one can add more objects. The closure clause says that nothing else is correctly labeled by the defined term. One can reformulate inductive definitions as normal definitions by describing the set of objects picked out by the defined term as the smallest set whose members include those covered by the base clause and those reachable by one or more applications of the inductive clause to members of the set.
2. *Recursive definitions* are used to define function-names or predicates with respect to a domain generated by an inductive definition. They have a step-by-step character that follows the step-by-step generation of the domain with respect to which they are defined. A simple example is the following recursive definition of the plus symbol '+':

- $x + 0 = x$. $(x + y') = (x + y)'$.

This definition defines the function-name '+' with respect to the domain generated by an inductive definition of natural numbers using the numeral '0' and the function symbol '′' for adding one. As with inductive definitions, there is a base clause (indicated by underlining) and a recursion clause (indicated by italics). Since the term is being defined with reference to a domain that has already been generated, recursive definitions do not need a closure clause.

3. *Definitions that state how a term is used* are particularly useful for explaining the meaning of determiners, articles, prepositions, conjunctions and other words that primarily play a role in forming all or part of a sentence into a whole.

Appendix: more forms

This appendix discusses three rarely used and rather specialized forms of definition: inductive definitions, recursive definitions, and role-specifying definitions. It thus completes the treatment in chapters 4 and 5 of 11 commonly used forms of definition.

A.1 Inductive definitions

Inductive definitions (Kleene 1974, 20 and 258-260; Gorsky 1981, §3.4) are used to define terms that pick out a set of objects in which there is a sequence from one or more initial objects to subsequent objects that can be reached step by step ("inductively") from the initial object or objects.[1] An example is the term 'ancestor'. A person's ancestors are the person's parents, grandparents, great-grandparents, and so on. The initial objects in the set are the person's parents, and the remaining objects can be reached step by step, by adding a generation of parents again and again.[2]

1. Such definitions are sometimes called 'recursive definitions', as by Krabbe (2007, 7) and Hitchcock (2017, 523). Following Kleene (1974, 258-261), and in accordance with the practice of such authors as Tarski (1983, 177) and Krabbe (2017, 106), the term 'recursive definition' will be reserved in this essay for definitions of functions and predicates over an inductively defined set of objects. Such definitions are discussed in the next section, A.2, "Recursive definitions".
2. Fundamental inductive definitions generate a domain of objects (Kleene 1974, 259; Gorsky 1981); an example is the inductive definition of 'natural number' in axioms 1, 2 and 5 of Peano arithmetic, listed in section 5.4, "Using a term in a sentence". Non-fundamental inductive definitions single out a subset in a previously generated domain. An example is the above definition of the term 'ancestor', which singles out a subset of the domain of people. In mathematical contexts, fundamental inductive definitions establish the range of a variable, and non-fundamental inductive definitions define predicates that hold of some objects (or n-tuples of objects) in that range, such as the predicate 'even' as applied to natural numbers (or the two-place predicate 'is less than' ('<') as applied to pairs (2-tuples) of natural numbers) (Kleene 1974, 21 and 259).

Inductive definitions can be set out in various ways. The clearest way has three clauses[3], a *base clause* that describes the initial objects, an *inductive clause* that describes one or more procedures for constructing subsequent objects, and a *closure clause* stating that nothing else is correctly labeled by the term. For example, the following is an inductive contextual definition of the term 'ancestor', with the term being defined in **bold face**, the base clause underlined, the inductive clause *in italics*, and the closure clause doubly underlined:

- Each parent of a person *x* is an **ancestor** of *x*.
- If *y* is an **ancestor** of *x*, then *each parent of y* is an **ancestor** of *x*.
- Nobody else is an **ancestor** of *x*.

Despite appearances, there is no improper circularity in using the term being defined ('ancestor') in each of these clauses. Even someone who had never before encountered the word 'ancestor' would understand how to work out who a person's ancestors were. The base clause makes clear that each parent of the person is an ancestor of that person, applying the *inductive clause* to these two parents makes clear that the person's grandparents are also ancestors of that person, applying the *inductive clause* a second time to each of these grandparents makes clear that the person's great-grandparents are ancestors of the person, and so on. (One can only go back so far in identifying who these ancestors are, but that is just a practical limitation. The inductive definition explains the meaning of 'ancestor' quite clearly.)

To avoid the impression of improper circularity, one can reword any inductive definition as a normal definition that begins with the defined term, follows it with a linking term indicating equivalence, and ends with a defining part that does not include the term being defined. The defining part describes the set of items correctly

3. The word 'clause' is used here in the sense used in speaking of the clauses of a legal document, such as a contract or a law or a regulation. A clause is a sentence or a string of sentences.

labeled by the term being defined as the smallest set whose members include both the objects defined by the base clause and the objects reached from them by applying the inductive clause. The following definition of 'ancestor' is an example, with the term being defined in **bold face**, the initial objects correctly labeled by the term underlined, and the method of reaching subsequent objects correctly labeled by the term *in italics*:

- The set of **ancestors** of a person is the smallest set whose members include both the parents of that person and *the parents* of every member of the set.

Other terms that can be defined inductively are 'descendant', 'natural number', 'sentence', and 'argument' (Hitchcock 2017, 523).

The base clause of an inductive definition should identify all and only the beginning members of the sequence of objects to which the term refers. The inductive clause should generate all and only the subsequent objects in the sequence. Inductive definitions are too narrow if they fail to generate some beginning or subsequent objects that are correctly labeled by the defined term and too broad if they generate objects that are not correctly labeled by the defined term.

In constructing an inductive definition, it makes sense to start with the base clause, making sure that it includes all and only the initial objects correctly labeled by the term. Then one should formulate the inductive clause, making sure that the procedure or procedures that it describes will generate all and only the non-initial objects correctly labeled by the term. The closure clause is the same for all inductive definitions.

A.2 Recursive definitions

Recursive definitions are used to define function-names or predicates with respect to a domain generated by a fundamental inductive definition (Kleene 1974, 260). They have a step-by-step

character that follows the step-by-step generation of the domain with respect to which they are defined. A simple example is the following recursive definition of the plus symbol '+' with respect to the domain of natural numbers generated by axioms 1, 2 and 5 of Peano arithmetic, as listed at the end of section 5.4, "Using a term in a sentence":

- x + 0 = x. *(x + y′) = (x + y)′*.

In the above definition, the variables 'x' and 'y' are to be understood as ranging over the natural numbers generated by Peano's fundamental inductive definition, from which the symbols '0' and '′' are taken. The symbol '+' which is being defined is **bold-faced**, the base clause is underlined, and the recursion clause is *italicized*. In contrast to an inductive definition, there is no need for a closure clause, since the limits of the domain over which the variables range have already been established. To apply the above definition, one starts with the base clause and then works step by step using the recursion clause until one gets the result, as follows:

A. 2 + 0 = 2. (base clause)
B. 2 + 0′ = (2 + 0)′ (recursion clause)
C. 2 + 0′ = 2′. (from A and B, by substitution in B using the equality in A)
D. 2 + 0″ = (2 + 0′)′. (recursion clause)
E. 2 + 0″ = 2″. (from C and D, by substitution in D using the equality in C)

Since 0″ is two and 2″ is four, we have just used the recursive definition of '+' to work out that two plus two equals four. This is hardly news, but is reassuring.

One can also define predicates recursively, as in the following simple example:

- '0' is a **numeral**. *If 'n' is a* **numeral**, *then 'n′' is a* **numeral**.[4]

Here again, the variable ‘n’ is to be understood as ranging over the natural numbers generated by Peano’s fundamental inductive definition, from which the symbols ‘0’ and ‘′’ are taken. The term ‘numeral’ which is being defined is **bold-faced**, the base clause is underlined, and the recursion clause is *italicized*. From this definition, one can establish using the base clause that ‘0’ is a numeral and then step by step using the recursion clause and previous results that ‘0′’ is a numeral, ‘0′′’ is a numeral, and so forth. As with recursive definitions of function-names, there is no need for a closure clause, since the fundamental inductive definition of the term ‘natural number’ has already established the limits of the domain over which the variables range.

Recursive definitions are useful in theoretical investigations of domains generated by inductive definitions, such as the definitions of predicates like ‘variable’, ‘term’ and ‘proof’ applied to the components of an inductively defined formal language (Kleene 1974, 252-254). The classic monograph on truth by the mathematical logician Alfred Tarski defined the term ‘true sentence’ for a particular formal language as a sentence that every sequence of objects satisfies, using a recursive definition of ‘satisfies’ (Tarski 1983, 193 and 195); his definition of ‘true sentence’ made possible theoretical investigation of semantic concepts like truth as applied to formal languages.

4. A numeral is a linguistic expression that signifies a number. For example, the numeral ‘2’ signifies the number two. Putting a numeral in single quotation marks indicates that one is using it to refer to itself rather than to the number that it signifies. The difference between numerals and numbers can be indicated by contrasting Roman numerals with Hindu-Arabic numerals. The Roman numeral ‘XXIII’ refers to the same number as the Hindu-Arabic numeral ‘23’, but does so within a different system of signifying numbers. The system of numerals created by the above recursive definition is not practically usable, but is theoretically elegant in using only two symbols, the name ‘0’ and the symbol ‘′’ meaning roughly: plus one.

A.3 Role-specifying definitions

One can define a term like ‘of’ or ‘and’ by specifying its role in phrases or sentences. Instead of using the term in a sentence, or using a contextual definition, one specifies a type of context in which the term appears and says what the term contributes in such a context to the meaning of the phrase or sentence of which it is a part. This form of definition is particularly useful for prepositions, conjunctions, articles and other words that perform a linking role.

The following are some examples of role-specifying definitions, taken from online dictionaries, with the defined term in **bold-face**, the defining part in *italics*, and the examples of the described use underlined:

- **of**: (*used to indicate derivation, origin, or source*): a man of good family; the plays of Shakespeare; a piece of cake. (http://www.dictionary.com/browse/of?s=ts; accessed 2020-01-20)
- **the**: (*used, especially before a noun, with a specifying or particularizing effect, as opposed to the indefinite or generalizing force of the indefinite article ‘a’ or ‘an’*): the book you gave me; Come into the house. (http://www.dictionary.com/browse/the?s=t; accessed 2020-01-20)
- **and**: (*used to connect grammatically coordinate words, phrases, or clauses*)*; along or together with; as well as; in addition to; besides; also; moreover*: pens and pencils. (http://www.dictionary.com/browse/and?s=t; accessed 2020-01-20)

The colon after each defined term plays the role of a linking word like ‘means’ or ‘is’. The examples seem necessary to make clear what the abstract description of the use is trying to communicate.

A reporting role-specifying definition is good if it clearly and accurately describes a use of the term in a way that fulfills the

definition's communicative purpose. Each of the above-quoted definitions would help someone who already knows how to use the word being defined to understand explicitly one way in which it is used. For philosophical purposes, however, such as understanding how to symbolize English sentences containing the word 'and' in a formal language with a symbol like 'and' whose meaning is precisely defined, the definitions are inadequate.[5]

One could also use a role-specifying definition to stipulate how a term is to be interpreted or used, as in the following example:

- In this work, the word '**or**' is *used exclusively, to indicate that exactly one of the alternatives holds.*

5. Typically, the symbol 'and' is used in formal languages as a connective linking two sentences. A sentence of the form '*p* and *q*', where *p* and *q* are sentences, is true if and only if both *p* and *q* are true. Not all English sentences with the word 'and' are correctly symbolized using the symbol 'and'. For example, the sentence 'John and Mary are friends' does not mean that John is a friend and Mary is a friend. It means that they are friends of each other. Thus, for purposes of symbolizing the logical structure of English sentences, the meaning of 'and' in the sentence 'John and Mary are friends' needs to be distinguished from its meaning in the sentence 'John and Mary are students'.

Glossary

The entries in this glossary summarize the information at the cited pages in the book. They are listed here for ease of reference.

Act of defining (p. 3): An activity of indicating what a term means or should be taken to mean or should mean. These acts are respectively acts of reporting, stipulating and advocating a meaning. They are the basic acts of defining a term, in the sense that they incorporate the immediate purpose of someone who produces a definition. They are not mutually exclusive; someone can simultaneously report, stipulate and advocate the meaning of a term in a single definition. People who define terms often have additional derivative purposes, such as helping learners of a non-native language appreciate contexts in which it would be appropriate to use a term. See *positional definition*, *reportive definition* and *stipulative definition*.

Base clause (pp. 201-203): The initial clause in an inductive or recursive definition. In an inductive definition, it describes the initial object or set of objects signified by the term being defined. In a recursive definition, it describes the initial value of the function signified by the term being defined or the initial object or n-tuple of objects correctly labeled by the predicate being defined. *Examples*: The base clause of an inductive definition of the term 'ancestor' in contexts where it is said of a person is that a parent of a person is an ancestor of that person. The base clause of a recursive definition of the symbol '+' as used in arithmetic is that, for any number x, $x + 0 = x$. The base clause of a recursive definition of the predicate 'numeral' as applied to expressions of Peano arithmetic is that '0' is a numeral. See *inductive definition*, *recursive definition*, *inductive clause*, *recursion clause* and *closure clause*.

Basic category (p. 138, n. 36): A category in a culture's taxonomy to which people spontaneously assign an individual thing. According to studies by Eleanor Rosch (1978), the basic category in each hierarchy is the one that provides the most information about individuals in the category, given what is common knowledge in the culture. *Example*: In North American culture, if one points to an object in someone's kitchen and asks them, "What is that?", in most contexts the answer will be "a chair" and not "a kitchen chair" (a subordinate category) or "a piece of furniture" (a superordinate category). See *subordinate category*, *superordinate category* and *prototype*.

Broad definition (pp. 16-19, 93-94): One definition of a term is broader than another definition of the same term if the defining part of the first definition covers more cases than the defining part of the second definition. Hence a definition of a term is broad if its defining part covers more cases than are covered by the defining part of most other definitions of the same term. A definition of a term is too broad if its defining part covers cases that are definitely not correctly labeled by the term. A definition can be too narrow and too broad at the same time, in different respects. *Examples*: The definition of life as self-replication with variations (Trifonov 2011, 262) is broader than NASA's definition of life as a self-sustaining chemical system capable of Darwinian evolution, because the defining part of Trifonov's definition ("self-replication with variations") covers viruses and non-chemical artificial life, which the defining part of the NASA definition ("a self-sustaining chemical system capable of Darwinian evolution") does not cover. The present essay's definition of defining a term as indicating what the term means or should be taken to mean or should mean is quite broad, because in contrast to most definitions its defining part ("indicating what the term means or should be taken to mean or should mean") covers partial indications of the meaning of a term, which most definitions of defining a term do not. The definition of a clock as a device for measuring time is too broad, because its defining part ("a device for measuring time") covers watches, which are ordinarily not called clocks. The

definition of ‘gesticulate’ as meaning wave is both too narrow and too broad—too narrow because its defining part (“wave”) fails to cover exaggerated gestures other than waving, which are gesticulations; and too broad because its defining part covers ordinary waves, which are not correctly labeled as gesticulations. See *narrow definition* and *counterexamples.*

Circular definition (pp. 80, 92, 175-176): A definition that assumes that a complex term is already understood by using its core component in the defining part of the definition. A traditional rule bans use in a definition’s defining part of the term being defined or of a term that presupposes understanding of that term’s meaning. This traditional rule is too extreme, since the defining part of inductive and recursive definitions can use the defined term without objectionable circularity. This essay endorses a version of the ban on circular definitions in the form of a recommendation that the words one uses in the defining part of a definition should not presuppose knowledge of the meaning of the term being defined. *Example*: A definition of ‘hopeful’ as meaning full of hope is circular, because it assumes that the reader already understands the word ‘hope,’ which is the core component of the word ‘hopeful’.

Closure clause (pp. 201-202): The clause in an inductive definition that says that nothing is correctly labeled by the term being defined unless it can be determined to be correctly labeled by it on the basis of the base clause and inductive clause of the definition. *Example*: In the inductive definition of the term ‘ancestor’ as used in contexts where it is said of a person, the closure clause is that nobody is a person’s ancestor unless they are either a parent of that person or a parent of an ancestor of that person.

Cohyponym (p. 103, n. 20): Two terms are cohyponyms if they are hyponyms of a term for a single genus and name two coordinate species of that genus. Some dictionaries define terms that resist definition by genus and differentia by listing their

cohyponyms. Newer dictionaries reportedly avoid this form of definition. *Example*: The terms ‘tulip’ and ‘rose’ are cohyponyms of the term ‘flower’. See *hyponym* and *definition by genus and differentia*.

Commissive (p. 26, n. 16): An illocutionary act that commits the speaker to some future action. Commissives include promises, oaths and announcements of one’s plans. *Example*: Stipulating how one will use a term in a specified context is a commissive, because it commits the speaker to using the term with that meaning in that context. Such stipulative definitions are neither true nor false, but can be violated. See *illocutionary act*.

Concept (pp. 179-182): A concept is what someone grasps when they understand the defining part of a normal definition. Since two people can grasp the same concept, concepts are not private mental entities. They are abstract objects signified by terms. A concept is an “intension” of the term being defined, as contrasted to the term’s “extension”, which is the set of objects correctly labeled by the term. There can be different conceptions of the same concept, such as different conceptions of democracy or justice or critical thinking. Distinct definitions of the same term are pointing to the same concept if either they are extensionally equivalent (in virtue of either logical principles or necessary features of the universe) or can be regarded as rival specifications of the same concept. The sort of conceptual analysis characteristic of philosophy can be regarded as an attempt to arrive at a conception of a concept. *Examples*: Rawls (1971) takes someone’s concept of justice to be that of “a characteristic set of principles for assigning basic rights and duties and for determining what they take to be the proper distribution of the benefits and burdens of social cooperation” (p. 5). Rawls’s own conception of this concept consists of a principle of liberty and a principle of equality, along with two priority rules (described on p. 101 of the present essay). A rival utilitarian conception specifies justice as whatever produces the greatest average well-being. Different programmatic definitions of the term ‘critical thinking’ can be interpreted as specifications of a single

concept of careful thinking directed at a goal. See *intension*, *extension*, *conception* and *conceptual analysis*.

Conception (pp. 182-185): A conception of a concept is a specification of the concept. Conceptual analysis in contemporary philosophy articulates such conceptions. *Examples*: The theory of justice advanced by the philosopher John Rawls (1971) is a conception of principles for assigning basic rights and duties and for determining the proper distribution of the benefits and burdens of social cooperation—which is what the term 'justice' means. A conception of democracy advanced in political theory would specify the concept of a political system that gives a voice in how it is run to every adult person that belongs to it—which is what the term 'democracy' means. See *concept*.

Conservativeness (p. 36): One of two criteria for the formal correctness of a stipulative explicit definition of a new term introduced into a mathematical or logical theory as an abbreviation. Such a stipulation is conservative if and only if it does not permit proof within the theory of any essentially new claims. The other criterion for formal correctness of such a definition is eliminability. Mathematical logicians have worked out rules for constructing such abbreviating definitions that ensure that they are conservative and that the newly introduced term is eliminable. *Example*: In an axiomatization of arithmetic that has a plus sign '+' with its usual meaning, the minus sign '-' can be introduced as an abbreviation by means of the following definition: $x - y = z$ if and only if $x = y + z$. Any sentence with a minus sign that can be proved in the expanded theory can be translated using the definition into a sentence without a minus sign that can be proved in the original theory. In that sense, the definition of the minus sign is conservative. See *eliminability*.

Constitutive factor (p. 137): A criterion for correctly labeling something by a vague term. It is present in at least one of the "paradigms" correctly labeled by the term and is capable of variation. Black (1954, p. 29) proposes that a fully specified range

definition should describe (1) one or more paradigms, along with (2) a set of constitutive factors and (3) rules for determining from variations in the constitutive factors the degree of distance of a case from the paradigms. *Example*: In his discussion of how to define the vague term 'scientific method', Black identities in such paradigmatic sciences as astronomy, mathematics, geography, archeology and biology the following constitutive factors of their methods: observation, generalization, the hypothetico-deductive use of assumptions, measurements, the use of instruments, and mathematical construction. None of these factors is a necessary condition for being a scientific method, since each of them is absent in at least one of the paradigms. Rather, the degree to which an activity is scientific varies according to how many of the factors it involves. See *range definition* and *paradigm*.

Content of a definition (pp. 5-6, 76-86): In one sense the words used in a definition; in another sense the information that a definition conveys. The words used in a definition should in context be clear, unambiguous and not objectionably vague. They should not presuppose knowledge of the meaning of the term being defined, should be as simple and unaffected as possible, and should not sacrifice intelligibility to conciseness. They should be understandable to the readers or listeners to whom one's definition is addressed. They should be words that either do not need definition or are defined elsewhere in a non-circular fashion. There are systematic attempts to avoid circularity in a set of definitions, such as the natural semantic metalanguage proposed by Wierzbicka (1996) or the introduction by definition of new terms into an artificial formal language. The information that a definition conveys should be just enough for the purpose, neither too much nor too little.

Contextual definition (pp. 124-137): A normal definition that provides an expression that is claimed to be equivalent in meaning to expressions in which the term being defined occurs in a specified context. It is a definition by extended synonym of an expression in which the term being defined occurs in that context.

In formulating a contextual definition, one needs to pick a context in which the term being defined commonly occurs; a comprehensive contextual definition covers all the contexts in which the term being defined occurs with the sense envisaged, but is often unachievable. The expression in the defining part of the definition should be neither too narrow (failing to cover some cases correctly labeled by the defined term in the specified context) nor too broad (including cases not correctly labeled by the defined term in the specified context). *Examples*: To say that an inherited trait is polygenic is to say that several genes must be present for the inherited trait to be present. (This definition is a comprehensive contextual definition of the term 'polygenic'. It claims that the expression "an inherited trait is polygenic" is equivalent in meaning to the expression "several genes must be present for the inherited trait to be present". Comprehensiveness is achievable because the adjective 'polygenic' is said only of inherited traits.) 'A person does something slowly' means the person takes more time to do it than most people take. (This definition is a non-comprehensive contextual definition of the term 'slowly'. It claims that the expression "a person does something slowly" is equivalent in meaning to the expression "the person takes more time to do it than most people take". Since one can speak of things other than a person's actions as happening slowly, such as a train going up a steep grade slowly or a predatory animal slowly stalking its prey, the definition is not comprehensive.)

Contradictory opposites (p. 97): Two terms are contradictory opposites if and only if they are opposites and everything in their common range is correctly labeled by one of the terms at any given time with respect to the same part of itself and in relation to the same thing. *Example*: The terms 'separate' and 'together' when said of spatially located objects are contradictory opposites, since both terms apply to all spatially located objects and every such object is at any given time either separate from or together with a specified part of a given other spatially located object. The terms 'white' and 'black' are not contradictory opposites, even though they have the same range of coloured objects, because

some coloured objects sometimes have parts that are neither white nor block. See *opposite* and *contrary opposites*.

Contrary opposites (pp. 97-98): Two terms are contrary opposites if and only if they are opposites but not everything in their common range is correctly labeled by one of the terms at any given time with respect to the same part of itself and in relation to the same thing. *Example*: The terms ‘white’ and ‘black’ are contrary opposites, because some coloured objects sometimes have parts that are neither white nor block. The terms ‘separate’ and ‘together’ when said of spatially located objects are not contrary opposites, since every spatially located object is at any given time either separate from or together with a specified part of a given other spatially located object. See *opposites* and *contradictory opposites*.

Counterexample (pp. 93-94): A counterexample to a definition is a real or imaginary case that is correctly labeled by the term being defined but not by the defining part of the definition, or vice versa. The first sort of counterexample shows that the definition is too narrow and needs to have its defining part broadened so that it covers the sort of case illustrated by the counterexample. The second sort of counterexample shows that the definition is too broad and needs to have its defining part narrowed so that it does not include the kind of case illustrated by the counterexample. A definition can have counterexamples of both sorts, in which case it is too narrow in one respect and too broad in another respect. *Examples*: A duplex is a counterexample of the first sort to the definition of a house as a single-family dwelling, since a duplex is a house but is not a single-family dwelling; the definition of a house as a single-family dwelling is thus too narrow and its defining part needs to be broadened, for example to ‘a dwelling for one, two or three households’. A person who is only mildly hungry is a counterexample of the second sort to the definition of ‘ravenous’ as meaning hungry, since a person who is only mildly hungry is hungry but not ravenous; the definition of ‘ravenous’ as meaning hungry is thus too broad and its defining part needs to

be narrowed, for example to ‘extremely hungry’. The definition of ‘gesticulate’ as meaning the same as ‘wave’ has counterexamples of both sorts. An exaggerated nodding of the head is a counterexample of the first sort, since it is a case of gesticulating but not a case of waving; this counterexample shows that the defining part of the definition needs to be broadened to include gestures other than waving. An ordinary wave is a counterexample of the second sort, since an ordinary wave is a wave but does not count as gesticulating; this counterexample shows that the defining part of the definition needs to be narrowed to exclude ordinary waves. One can remedy both inadequacies by defining ‘gesticulate’ as meaning: gesture in an exaggerated way. See *narrow definition*, *broad definition*.

Declaration (p. 26, n. 16): An illocutionary act of bringing something about merely by uttering a sentence. Some authors treat a stipulation of how a speaker is using a term as a declaration. The present essay, however, treats such a stipulation as a combination of a directive requesting the listener to interpret the term as having the stipulated meaning in the specified context and a commissive committing the speaker to use the term with that meaning in that context. *Example*: A guilty verdict pronounced by a judge is a declaration, because the mere act of pronouncing the verdict makes the accused guilty.

Decoding (p. 8): Understanding a term that someone else uses in communication. People often use dictionary definitions for help with doing so. See *encoding*.

Definiendum (p. 87): The traditional name for the term being defined in a definition. The name is Latin for ‘what is to be defined’. Since the term will be unfamiliar to many readers, this essay avoids using it and speaks instead of “the term being defined”. Some authors (e.g. Gupta 2019) use the term ‘*definiendum*’ to refer to the entire first part of a normal definition, including in the case of contextual definitions the surrounding context in which the term being defined occurs. *Example*:

Consider the following definition: "'To prove a proposition beyond a reasonable doubt' means to offer enough evidence in its support that it would not make good sense to deny that proposition". In this contextual definition, the term being defined is 'prove beyond a reasonable doubt', but on Gupta's conception of a *definiendum*, the *definiendum* is 'prove a proposition beyond a reasonable doubt'.

Definiens (p. 87): The traditional name for the defining part of a definition. The name is Latin for 'what defines'. Because the term will be unfamiliar to many readers, this essay avoids using it and speaks instead of "the defining part" of a definition. *Example*: Consider the following definition: "'Irascibly' means angrily." In this definition by synonym, the *definiens* is the word 'angrily'.

Definition (p. 3): To define a term is to indicate what it means or should be taken to mean or should mean. The product of this activity is a definition. The preceding definitions of the terms 'define' and 'definition' are quite broad. They do not require that the product of an activity of defining be accurate or wise or justified, only that the person engaging in the activity is trying to say what a term means or should be taken to mean or should mean. Nor do the definitions require that the product of an activity of defining must consist of words or other conventional symbols of a language; for example, to show what a word means by pointing at something while saying the word counts as an act of defining, and the combination of the spoken word and the gesture counts as a definition of the word. This book distinguishes three independently varying dimensions of definitions: the act of defining, the content of the resulting definition, and the form of the definition. *Examples*: To write a dictionary entry is to say what a word means in one or more of its existing uses; the entry is a (reportive) definition of the word. To say at the beginning of an article or book how one intends to use a given term is to say what the term should be taken to mean in the article or book; the statement is a (stipulative) definition of the term. To specify what counts as systemic racism in the context of efforts to reform

police forces is to say what it should mean in this context; the specification of what counts as systemic racism is a (positional) definition of the term 'systemic racism'. *Non-examples*: A general statement about the properties of a kind of thing is not a definition if it is not the result of an attempt to say what the term for this kind of thing means. For example, a statement in an encyclopedia that lions are most active at night and live in a variety of habitats is not a definition of the term 'lion'. See *act of defining*, *reportive definition*, *stipulative definition*, *positional definition*, *content of a definition* and *form of a definition*.

Definition by antonym (pp. 96-99): A normal definition of a term as the opposite of another term. It has the structure: '<Term being defined>' is the opposite of '<defining part>'. The defining part should be substitutable for the term being defined without making the surrounding sentence ungrammatical. It should be a genuine opposite of the term being defined, in the sense that the defined term and its alleged opposite cannot be true of the same thing at the same time in the same part of itself and in relation to the same other thing. The alleged opposite may be either a contradictory opposite or a contrary opposite. Definitions by antonym are useful in explaining the meaning of an unfamiliar term to someone who knows the meaning of its opposite. They are also useful in explaining in which sense one is using a polysemic term. They have the advantage of brevity. *Examples*: 'Uptight' is the opposite of relaxed. I mean 'light' as opposed to 'heavy', not 'light' as opposed to 'dark'. See *opposites*, *contradictory opposites* and *contrary opposites*.

Definition by extended synonym (pp. 99-102): A normal definition whose defining part is a long phrase alleged to be equivalent in meaning to the term being defined. In contrast to a definition by synonym, whose defining part is a single word or a short phrase, a definition by extended synonym can be more accurate. The defining part of a definition by extended synonym is typically the same part of speech as the term being defined and thus can be substituted for the term being defined without making

the surrounding sentence ungrammatical. But such substitutability is not required. The defining part of a definition by extended synonym can give an analysis of the thing meant by the term being defined or can describe the relation of such a thing to other things or can describe a rule that determines whether an object is correctly labeled by the term being defined. A special case of definition by extended synonym is definition by genus and differentia. *Examples*: The definition of 'even-tempered' as meaning not prone to anger is a definition by extended synonym that gives an analysis of the thing meant by the term. A definition of red as the colour of blood, cherries and claret is a definition by extended synonym that describes the relation of the colour red to other things. The legal definition of 'German citizen' used in the United States zone in Germany after the end of the Second World War is a definition by extended synonym that describes a rule that determines whether a person living in the zone is a German citizen. See *definition by synonym* and *definition by genus and differentia*.

Definition by genus and differentia (pp. 102-117): A kind of definition by extended synonym whose defining part names a general class (called the 'genus') and describes one or more distinguishing features (collectively called the 'differentia'). Someone who proposes a definition by genus and differentia claims that all the items correctly labeled by the defined term belong to the genus and have each of the features that make up the differentia. That is, they postulate that belonging to the genus and having each component of the differentia are separately necessary conditions of being correctly labeled by the term being defined. They claim also that belonging to the genus and having all the features that make up the differentia are collectively a sufficient condition for being correctly labeled by the term being defined. They do *not* claim that belonging to the genus or having just one of the features that make up the differentia is a sufficient condition for being correctly labeled by the term. In constructing a definition by genus and differentia, one should choose a genus that includes all the items correctly labeled by the term being defined and that will make it easy to construct an understandable description of the

differentia. A good way to do this is to find a genus that includes things that are similar to the items correctly labeled by the term being defined and that may even sometimes be confused with them. To construct the differentia, it helps to have in mind both a variety of items in the genus that are correctly labeled by the term (so as to make sure that the differentia is not too narrow) and a variety of items in the genus that are not correctly labeled by the term (so as to make sure that the differentia is not too broad). The selected differentia should consist of one or more features that belong to all the varied items in the genus that are correctly labeled by the term but to none of the varied items in the genus that are not correctly labeled by the term. *Examples*: In the definition of a square as a plane figure bounded by four straight lines of equal length and having an interior right angle, the genus is plane figure and the differentia is the combination of the two features of being bounded by four straight lines and having an interior right angle. This definition is correct, because for something to be a square (in the sense being defined) it is a necessary condition that that thing is a plane figure, a necessary condition that it is bounded by four straight lines of equal length, a necessary condition that it has an interior right angle, and a sufficient condition that it meets all three of those necessary conditions. However, neither component of the differentia is sufficient by itself to distinguish squares from other items in the genus; there are plane figures bounded by four straight lines of equal length that are not squares (namely, rhombuses without an interior right angle) and plane figures with an interior right angle that are not squares (namely, rectangles with adjacent sides of unequal length). It would be a mistake to select deciduous trees as the genus of oak trees, because there are oak trees that are not deciduous in the usual sense—namely, live oaks. It is better to select timekeeping devices rather than devices as the genus of clocks, since the class of devices is very broad whereas the class of timekeeping devices groups clocks with watches. The differentia can consist either of properties of the items correctly labeled by the term being defined or of their relation to something else (such as lying on the north side of the invariable plane of the Solar System, the differentia of the north pole of a rotating body in the

Solar System) or of operations (such as moving along the diagonal, the differentia of the bishop in the game of chess) or of their means of construction or production (such as resulting from the fusion of two gametes, the differentia of a zygote). See *genus* and *differentia*.

Definition by group membership (pp. 120-123): A normal definition of a term whose defining part names the kind or kinds of beings that belong to a group signified by the term being defined and describes what makes some of them members of such a group. This form of definition is like definition by genus and differentia, with the kind or kinds of beings belonging to the group like the genus and the description of what makes some of them members of such a group like the description of the differentia. Like the name of the genus, the name of the kind or kinds of beings that belong to these groups should include everything correctly labeled by the term being defined. Like the description of the differentia, the description of what makes beings of the given kind members of such a group should include all and only those beings of the specified kind that are its members. *Examples*: A pod is a group of marine animals such as whales, dolphins, seals, or pelicans that travel together over a period of time for social engagement and protection from predators. (In this definition, the kinds of beings that are claimed to belong to a pod are “marine animals such as whales, dolphins, seals, or pelicans” and the description of what makes them members of such a group is that they “travel together over a period of time for social engagement and protection from predators”.) A jury is a group of lay people who are selected to make a decision in a legal case on the basis of the evidence, testimony and argument presented to them. (In this definition, the kind of being claimed to belong to a jury is “lay people” and the description of what makes some of them members of such a group is that they “are selected to make a decision in a legal case on the basis of the evidence, testimony and argument presented to them”.) See *definition by genus and differentia*.

Definition by synonym (pp. 89-96): A normal definition of a term whose defining part is a word or short phrase alleged to have roughly the same meaning as the term being defined. A definition by synonym is a rough explanation of a sense of a term as used in an assumed context. The alleged synonym should be substitutable for the term being defined in the assumed context and thus should be the same part of speech as the term being defined. Substitution of the alleged synonym for the term being defined in the assumed context should *generally* not change the truth-value of the sentence in which the substitution is made, provided that the context is extensional. However, since true synonyms (i.e. terms with exactly the same meaning) are very rare in a natural language, almost all definitions by synonym have counterexamples—cases correctly labeled by the defined term but not by the alleged synonym, or vice versa. Hence refutation of a definition by synonym requires a whole family of counterexamples, not just a single counterexample. Definitions by synonym have the advantage of brevity but the disadvantage of not fully explaining the meaning of the term being defined. They are useful in giving a quick explanation of the meaning of an unfamiliar term to a person who knows the meaning of the alleged synonym. *Examples*: 'Illuminate' means light up. An algorithm is a recipe. See *extensional context*, *counterexample*, *narrow definition* and *broad definition*.

Definition by whole and part (pp. 117-120): A definition whose defining part names a whole to which things signified by the term being defined belong and describes one or more features that distinguish the part of the whole that the term signifies from other parts of the same whole. It can be used to define any term that names a part of some whole. Definitions by whole and part are similar in their logic to definitions by genus and differentia. However, the name of the whole must cover all and only the objects of which the things signified by the term being defined are parts—a more restrictive condition than that for choosing a genus, where it is enough to cover all the things signified by the term being defined. *Example*: A root is the non-leaf, non-nodes

bearing parts of a plant's body. (In this definition by whole and part, the whole is a plant's body and the phrase "non-leaf, non-nodes bearing" describes two features (not bearing leaves, not bearing nodes) that distinguish the root of a plant's body from the other parts of a plant's body.

Differentia (pp. 102, 112-117): A set of one or more features that collectively distinguish a species of a genus from coordinate species in the same genus. Every member of the species has all the features that make up the differentia. No member of a coordinate species in the genus has all those features, although some may have some of them. *Examples*: The differentia of a square, when it is conceived as a species of plane figure, consists of the two features of being bounded by four straight lines of equal length and having an interior right angle. Every plane figure that is a square has both these features; that is, every such figure is bounded by four straight lines and has an interior right angle. No plane figure that is not a square has both features. However, some plane figures that are not squares are bounded by four straight lines of equal length (namely, rhombuses without an interior right angle) and some plane figures that are not squares have an interior right angle (namely, rectangles with adjacent sides of unequal length). See *genus* and *definition by genus and differentia*.

Directive (p. 26, n. 16): An illocutionary act of trying to get the listener or reader to do something by uttering a sentence. Directives include asking a question, requesting a favour, giving an order, and the like. *Example*: Stipulating a meaning in a stipulative definition is a directive, because it is an attempt to get the listener or reader to interpret or use the term defined with the stipulated meaning in the specified context. Stipulative definitions are thus neither true nor false, though they may be wise or unwise. See *illocutionary act*.

Eliminability (p. 35-36): One of two criteria for the formal correctness of a stipulative definition that introduces a new term into a mathematical or logical theory as an abbreviation. Such

a definition makes the term eliminable if and only if it permits translation of any sentence using the new term into the language of the theory into which it was introduced. The other criterion for the formal correctness of such stipulations is that the definition be conservative. Mathematical logicians have worked out rules for constructing such abbreviating definitions that ensure that they are conservative and that the newly introduced term is eliminable. *Example*: In an axiomatization of arithmetic that has a plus sign '+' with its usual meaning, the minus sign '–' can be introduced as an abbreviation by means of the following definition: x – y = z if and only if x = y + z. Any sentence with a minus sign that can be formulated in the language of the expanded theory can be translated using the definition into a sentence without a minus sign. For example, the false sentence '5 – 2 = 7' can be translated using the definition into the false sentence '5 = 2 + 7'. In that sense, the definition makes the minus sign eliminable. See *conservative*.

Encoding (p. 8-9): Using a term in communication. Filmore (2003) argues that reportive definitions that are to serve this purpose must characterize the "frame" (i.e. the conceptual background) of the defined term as well as its meaning. Atkins and Rundell (2008, 409) add that successful encoding requires knowledge also of the term's precise semantic features, its collocational and selectional preferences, its sociolinguistic features, and its pragmatic and connotative features. This essay does not discuss these additional requirements of definitions that are intended to help people use defined terms in their own communication. It focuses only on the role of definitions in saying what a term with a given sense means or should be taken to mean or should mean. *Example*: To help people understand how to use the word 'carrion', its definition as meaning the rotting meat of a dead animal would need to be supplemented by an explanation of the behaviour of scavengers, so as to make clear that one cannot refer to raw meat left out of the refrigerator for days as 'carrion'. See *decoding*.

Epsilon operator (p. 2, n. 2): The Greek letter epsilon (written '∈') used in introducing a name into a formal language by means of a description of what would bear the name if such a thing existed. *Example*: 'Nessie = ∈*x*(*x* is the monster in Loch Ness)' means that Nessie is the Loch Ness monster (if such a monster exists).

Essence (pp. 166-170): The traditional philosophical conception of an essence is that of something in virtue of which a thing is the kind of thing that it is. Following Aristotle, philosophers thought that all the distinctive features of a kind of thing followed from the essence of that kind. Each (non-defective) member of a biological species like live oaks or gray wolves or the bacterium *Helicobacter pylori*, for example, would have a set of attributes that made it a member of that species and from which followed all the characteristics peculiar to members of that species. So-called "real definitions" were supposed to describe such essences. This essay rejects the notion of an essence as traditionally understand, as well as contemporary philosophical attempts to revive the notion, and instead regards all definitions as definitions of terms. However, it accommodates some of the concerns that motivate the concept of a real definition of an essence in its criteria for theoretical definitions. See *real definition*, *nominal definition* and *theoretical definition*.

Exemplary definition (p. 158): A definition of a term by giving an example that is correctly labeled by the term, typically by showing it rather than describing it. *Example*: A drawing of a triangle with its vertices labeled A, B and C, as a reference in a geometrical proof for the term 'triangle'. See *giving examples, non-examples and borderline cases*.

Explicative definition (pp. 34-35): A stipulative definition for use in research contexts that aims to make precise the meaning of a term in common use while respecting its central uses. Its adequacy is determined by its preservation of specified features of the term's existing use. Carnap (1956) proposed that explicative

definitions should have a defining part that is similar in meaning to the defined term and should be exact, fruitful and simple. Cordes and Siegwart (2018) have proposed a general structure for the activity of explicating that allows for criteria of explicative adequacy specific to each explicative definition. *Examples*: The definition of an ordered pair <x, y> in set theory as the set {{x}, {x, y}} permits the elimination of the concept of order from the concept of an ordered pair (or triple, quadruple, and so on), so that it can be treated using the concept of a set, where order does not matter. At the same time, it preserves the property that ordered pairs are equal if and only if their components are equal and occur in the same order.

Expressive (p. 26, n. 16): An illocutionary act that expresses the speaker's emotional attitude to something. Defining a term usually does not include such an expression of the speaker's emotional attitude. *Example*: It is an expressive to say how disgusting or surprising or sad something is. See *illocutionary act*.

Extension (pp. 3, n. 4; 179-180): The extension of a term is the set of things correctly labeled by the term. It is contrasted to a term's intension, which is the way in which the term picks out that set of things. *Example*: The extension of the term 'natural number' is the set {0, 1, 2, …}. See *intension*.

Extensional context (pp. 95; 100, n. 17): A context in which substitution for a term of a word or phrase with the same extension does not change the truth-value of the sentence in which the term occurs. A definition whose defining part has the same grammatical form as the term being defined is correct if its defining part can be substituted for the term being defined in extensional contexts without changing the truth-value of the surrounding sentence. In non-extensional (or "intensional") contexts, however, substitution of the defining part of a correct definition can change the truth-value of the surrounding sentence. *Example*: 'Illuminate' means light up. In the sentence, 'The fireworks illuminated the night sky,' the word 'illuminate' occurs in an extensional context, and

its replacement by the word ‘light up’ produces the sentence, “The fireworks lit up the night sky,” which has the same truth-value (true *or* false) as the original sentence. However, in the sentence, ‘Chris does not know that ‘illuminate’ means light up,’ the word ‘illuminate’ occurs in a non-extensional context, and its replacement by the word ‘light up’ produces the sentence, ‘Chris does not know that ‘light up’ means light up,’ which is probably false even though the original sentence might be true. *See* intensional context.

Extensional definition (pp. 143-144): A definition of a term that lists the individuals correctly labeled by the term or the species included in the genus signified by the term. *Examples*: The definition of natural numbers as the numbers 0, 1, 2 and so on is an extensional definition; it lists (or, more precisely, indicates how one would list) the individuals correctly labeled by the term ‘natural number’. The (inadequate) definition of corvids as crows or ravens or jackdaws or jays or magpies is an extensional definition; it lists some of the kinds of birds that are correctly called ‘corvids’.

Form of a definition (p. 6): The structure of a definition. This book distinguishes 14 forms of definition. *Example*: A definition by genus and differentia has the form: A <defined term> is a <genus> <differentia>. Such a definition claims that items correctly labeled by the defined term belong to a broad class, traditionally called their “genus”. It further claims that one or more features, collectively called the “differentia”, distinguish items in the genus correctly labeled by the defined term from items in the genus not correctly labeled by it. An example of a definition by genus and differentia is the following definition: A square is a plane figure bounded by four straight lines of equal length and with four right angles. In this definition, the word ‘square’ is the defined term, the phrase ‘plane figure’ names the genus, and the phrase ‘bounded by four straight lines of equal length and with four right angles’ describes the two features (being bounded by four straight lines of equal length, having four right angles)

that collectively make up the differentia that distinguishes squares from such other plane figures as triangles and rhombuses. See *normal form of a definition*; *definition by synonym*; *definition by antonym*; *definition by extended synonym*; *definition by genus and differentia*; *contextual definition*; *range definition*; *extensional definition*; *operational definition*; *giving examples, non-examples and borderline cases*; *ostensive definition*; *use in a sentence*; *inductive definition*; *recursive definition*; and *role-specifying definition*.

Fundamental inductive definition (p. 201, n. 2): An inductive definition that generates a domain anew and not as a sub-domain of a class of objects generated by a previous inductive definition. *Example*: In the construction of a formal language, an inductive definition of a well-formed formula is a fundamental inductive definition when it uses as a base clause a description of the simple well-formed formulas of the language and as an inductive clause a list of the ways of making well-formed formulas more complex with the use of operators, connectives, quantifiers and the like. *Non-example*: In the construction of an axiomatized formal theory, an inductive definition of an axiom by means of a base clause specifying initial axioms and an inductive clause permitting generation of new axioms by substitution is a non-fundamental inductive definition, since it generates the axioms as a sub-domain of the class of well-formed formulas of the language in which the theory is expressed—a domain generated by the previous inductive definition of a well-formed formula. See *inductive definition*.

Genus (pp. 102, 107-112): A general class that includes several kinds, each called a "species" of the genus. Ideally, the species that make up a genus are mutually exclusive and jointly exhaustive. *Examples*: Plane figures are a genus, since they are a broad class that includes circles, squares, rectangles and triangles; the species mentioned are neither mutually exclusive (since squares are rectangles) nor jointly exhaustive (since they do not include crescents, pentagons or irregular plane figures). Human virtues are a genus that includes patience, kindness, courage, helpfulness

and prudence, among other virtues. See *definition by genus and differentia* and *differentia*.

Giving examples, non-examples and borderline cases (pp. 154-159): Giving examples of cases correctly labeled by a term, of cases incorrectly labeled by the term, and of borderline cases is a way of communicating what the term means or should be taken to mean or should mean. Hence it is a form of definition, in the broad sense of the term 'definition' used in this essay. It is a useful supplement to an explicit definition. In explaining a term's meaning in this way, it is helpful to pick a variety of examples, to pick non-examples that might mistakenly be labeled by the term and to pick borderline cases that reveal the term's vagueness. If the examples are meant to help with encoding (i.e. labeling new cases by the term), the examples and non-examples should cover the range of cases to be encountered. *Example*: The U.S. Federal Bureau of Investigation's *Uniform Crime Reporting Handbook* (FBI 2004) supplements its definition by genus and differentia of the term 'criminal homicide—murder and non-negligent manslaughter' with 10 scenarios of deaths that should be reported under this classification and four scenarios of deaths that should not be reported under this classification. See *non-examples*.

Homograph (p. 12): A word with the same spelling as another word in the same language, but with a different pronunciation. *Example*: The English verb 'tear', meaning to rip, is a homograph of the English verb 'tear', meaning to produce tears. The first word when spoken rhymes with the word 'air', the second with the word 'ear'. See also *homonym* and *polysemy*.

Homonym (p. 12): A word that has the same spelling and pronunciation as another word in the same language, but an unrelated sense. The two words have unrelated senses as a result of having come into the language in two different ways. *Example*: The English word 'punch' in its use for a hard blow with the fist is a homonym of the word 'punch' in its use for a drink mixed with various ingredients. The first word came into English from

the Latin word ‘punctus’, which means pricked. The second word came into English from the Sanskrit word ‘paunch’, which means five—the drink originally having had five ingredients. See also *homograph* and *polysemy*.

Hyponymy (p. 103, n. 20): The relation between a term that signifies a species and a term that names a genus of that species. *Example*: The term ‘square’ is a hyponym of the term ‘plane figure’, since squares are a species of plane figure. See *definition by genus and differentia.*

Illocutionary act (p. 26, n. 16): An act that a speaker or writer performs in producing a sentence. Searle (1976, 354-361) distinguishes five broad kinds of illocutionary acts: representatives, directives, commissives, expressives and declarations. *Examples*: Reporting a meaning by a reportive definition is a representative act, since in doing so the author represents something as being the case—namely, that the defined term is used as reported. Reportive definitions are thus either true or false. Stipulating a meaning by a stipulative definition is a directive, because it directs the listener or reader to interpret the term defined as having the stipulated meaning in the specified context or to use it with the stipulated meaning in the specified context. If the stipulation is an indication of how the author will use the term in the specified context, then it is also a commissive, because it commits the author to using the term with the stipulated meaning in the specified context. Stipulative definitions are thus not true or false, although they can be wise or unwise. See *representatives*, *directives*, *commissives*, *expressives*, and *declarations*.

Impact equivocation (pp. 39-40, 47-51): Use of misleading terminology that has the impact of an equivocation (trading illegitimately on an ambiguous meaning), because listeners and readers will interpret the term as having its ordinary meaning rather than the technical meaning that it has been stipulated to have. Specialists introducing nomenclature should avoid using

pre-existing terms whose use would give rise to impact equivocation. *Examples*: In logic, the term ‘valid argument’ means an argument whose conclusion follows necessarily from its premisses, even if they are obviously false. In ordinary speech, however, people mean by a valid argument an argument with some merit that deserves to be taken seriously; logically valid arguments can however be totally worthless. In inferential statistics, the term ‘significant difference’ means a difference between two samples that is unlikely to have occurred if the samples were drawn from the same “population” (or “universe”). In ordinary speech, however, to say that something is significant is to say that it is important or that it is meaningful; statistically significant differences can be unimportant and meaningless for practical purposes. In measurement theory, the term ‘reliable test’ means a test that gives the same result in different circumstances, such as different administrations of the same test to the same person (test-retest “reliability”), scoring of the same test response by different markers (inter-rater “reliability”), or different components of the same test taken by the same person on a given occasion (inter-item “reliability”). In ordinary speech, however, to say that something is reliable means that it can be relied on; a bathroom scale that is inaccurate but gives the same result when a person steps on it twice within a short period is reliable in the technical sense but unreliable in the ordinary sense. Thus the terms ‘valid argument’, ‘significant difference’ and ‘reliable test’ can give rise to impact equivocation when used in their technical sense but understood in their ordinary sense.

Inductive clause (pp. 201-203): The clause in an inductive definition that describes one or more procedures for identifying objects correctly labeled by the term being defined on the basis of objects previously identified as correctly labeled by the term being defined. The inductive clause in an inductive definition is similar to the recursion clause in a recursive definition. *Example*: In an inductive definition of the term ‘ancestor’ as used in contexts where it is said of persons, the inductive clause is the clause that a parent of a person’s ancestor is an ancestor of that person.

When this clause is applied to the initial ancestors of a person as defined by the definition's base clause (the person's parents), it identifies the person's grandparents as ancestors of that person. When applied to the grandparents, it identifies the person's great-grandparents as ancestors of that person. And so on. See *inductive definition* and *recursion clause*.

Inductive definition (pp. 201-203): A definition of a term that refers to a set of objects that can be reached step by step ("inductively") from a set of one or more initial objects. A "base clause" describes the initial object or objects, an "inductive clause" describes one or more procedures for getting to later objects from earlier objects, and a "closure clause" states that nothing belongs to the set except the things reached by the previous clauses. The base clause should identify all and only the beginning members of the sequence of objects to which the term refers. The inductive clause should generate all and only the subsequent objects in the sequence. Inductive definitions can be formulated as normal definitions in which the defined term does occur in the defining part of the definition. *Example*: An inductive definition of the term 'ancestor' as said of people would consist of a base clause that each parent of a person is an ancestor of that person; an inductive clause that, if one person is an ancestor of another person, then each parent of the latter person is an ancestor of the former person; and a closure clause that nobody else is an ancestor of a given person. Rephrased as a normal definition, it would say a person's ancestors are the smallest set whose members include both the parents of that person and the parents of every member of the set. See *fundamental inductive definition*, *base clause*, *inductive clause*, *closure clause* and *recursive definition*.

Inference to the best explanation (pp. 16-23): An inference from data to the best explanation of some phenomenon or phenomena. Description of a sense of a term on the basis of usage data is a kind of inference to the best explanation. This essay proposes three criteria for good inference to the best explanation. (1) An acceptable explanatory hypothesis must explain the phenomena

that it is advanced to explain, in the sense that these phenomena are what one would expect, given background assumptions, if the hypothesis were true. (2) The hypothesis must be consistent with all the evidence and background knowledge that one has at one's disposal, in the sense that the combination of the evidence and the background knowledge with the hypothesis does not imply a contradiction. (3) Any competing alternative hypothesis must be inconsistent with facts, in the sense that its combination with some facts implies a contradiction. Applied to reportive definitions, the first two criteria incorporate the standard requirements of being neither too narrow nor too broad. The second criterion requires consistency with what we know about the kind of thing signified by the term in the defined sense. The criteria of being neither too narrow nor too broad need to be applied with caution, since apparent counterexamples may reflect a different sense of the term being defined. Distinct reportive definitions of the same term in the same sense are not necessarily competing alternative hypotheses, since they may differ only in the details they provide about the kind of thing signified by the term in that sense. They are rivals only if they have different implications for the extension of the term in the given sense or incorporate conflicting claims about the kind of thing signified by the term. *Example*: Four dictionary definitions of the word 'clock' in its use for grandfather clocks, digital alarm clocks, travel alarm clocks and the like differ in how well they satisfy the criteria for a good inference to the best explanation. When modified to remedy their deficiencies, they are distinct reportive definitions of the term 'clock' in the specified sense, but are not rivals. See the discussion on pages 17-22 for details. (See also Niiniluoto (2018).)

Intension (p. 3, n.4; 179-182): The intension of a term is the way in which it picks out its extension. It can be identified with the concept signified by a term. This essay distinguishes a definition of a term from a philosophical analysis of the concept signified by a term, and confines its attention to definitions of terms. *Example*: The intension of the term 'natural number' might be described as what we get when we count things of a given kind one by one.

If we count the sides of a banana one by one, calling the first side ‘one’, the next side ‘two’, and so on until we get to the last uncounted side, we will call that last side ‘five’ and conclude that the (natural) number of sides of a banana is five. An analysis of the concept of natural number is given by Peano’s axioms, listed on page 162. See *extension* and *intensional context*.

Intensional context (p. 90-91): A non-extensional context, i.e. a context in which replacement of a term by a word or phrase with the same extension does not necessarily produce a sentence with the same truth-value. One such context is a ‘that’ clause governed by a verb expressing an attitude to a proposition, such as ‘hopes’, ‘knows’, believes’, ‘doubts’, ‘wishes’, and ‘fears’. In intensional contexts, substitution of the defining part of a definition for the term being defined can change the truth-value of the surrounding sentence, even if the definition is correct. *Example*: In the sentence “Chris does not know that ‘illuminate’ means light up,” the term ‘illuminate’ occurs in an intensional (non-extensional) context. Substitution for the term ‘illuminate’ of the defining part of the definition of ‘illuminate’ as meaning light up produces the sentence “Chris does not know that ‘light up’ means light up,” which is likely to be false even if the original sentence is true.

Narrow definition (pp. 19-22, 93): One definition of a term is narrower than another definition of the same term if the defining part of the first definition covers fewer cases than the defining part of the second definition. Hence a definition of a term is narrow if its defining part covers fewer cases than the defining part of most other definitions of the same term. A definition of a term is too narrow if its defining part fails to cover cases that are definitely correctly labeled by the term. A definition can be too narrow and too broad at the same time, in different respects. *Examples*: A reportive definition of a pod as a group of whales that swim together is narrower than the definition of a pod as a group of marine animals such as whales, dolphins, seals, or pelicans that swim together, since the defining part of the first definition (“a group of whales that swim together”) fails to cover groups

of marine animals other than whales that swim together, which the defining part of the second definition ("a group of marine animals such as whales, dolphins, seals, or pelicans that swim together") does cover. The World Health Organization's widely accepted definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" is narrow in comparison to the more obvious rejected definition of health as the absence of disease or infirmity, since the defining part of the WHO definition ("a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity") fails to cover people without disease or infirmity who are overweight or anxious or lonely, whereas the defining part of the obvious definition ("the absence of disease or infirmity") covers such people. A definition of a house as a single-family dwelling is too narrow, since its defining part ("a single-family dwelling") fails to cover duplexes and triplexes, which are correctly called houses. The definition of 'gesticulate' as meaning wave is both too narrow and too broad—too narrow because its defining part ("wave") fails to cover exaggerated gestures other than waving, which are gesticulations; and too broad because its defining part covers ordinary waves, which are not correctly labeled as gesticulations. See *broad definition*, *counterexamples*.

Natural semantic metalanguage (NSM) (pp. 84-86): A language proposed by the linguist Anna Wierzbicka (1996) to explain the meaning of all words in all natural languages on the basis ultimately of a core consisting of indefinable "semantic primes" that are lexicalized in all human natural languages and some universal grammatical principles for combining them. When this essay was written, researchers using the NSM approach had identified 65 semantic primes (whose English "exponents" are listed in Table 1 on page 85), without claiming that the list is complete. *Example*: Wierzbicka (1997, 41) proposes the following contextual definition of the word 'friend' as used in 19th century Britain and America: "I think about this person like this: I want this person to know what I think. I want this person to know what I feel. I don't want many other people to know these things. I know

this person thinks the same about me." She takes this sequence of sentences to be equivalent in meaning to the expression 'this person is my friend' as it would have been used in 19th century Britain and America. In the quoted defining part of the definition, the words 'I', 'think', 'this', 'person', 'like', 'want', 'know', 'feel', 'not', 'many', 'other', 'thing' and 'same' are English exponents of semantic primes in NSM. The syntax and other words are in accordance with NSM's grammatical principles.

Nominal definition (p. 166): A report of how a term is used or a stipulation of how it is to be interpreted or used or an advocacy of how it is to be used. Nominal definitions are contrasted to so-called "real definitions", which specify a supposed "essence" of the kind of thing signified by a term. This essay argues that all definitions are nominal definitions, on the ground that kinds of things do not have essences. See *real definition* and *essence*.

Non-example (pp. 154-158): A non-example of a term is a case that is not correctly labeled by the term. Giving non-examples as part of a definition helps to show the limits of a term's correct application. *Example*: The U.S. Federal Bureau of Investigation gives as an example of a case that law enforcement agencies must *not* classify as "criminal homicide—murder and nonnegligent manslaughter" the following scenario: "A man was despondent over the breakup of his marriage. Police officers discovered his body in his home office with a bullet wound to his head and a revolver still in his hand. They also found a suicide note in the victim's handwriting on his desk." (FBI 2004), 17) See *giving examples, non-examples and borderline cases.*

Non-extensional context: See *intensional context*.

Normal (form of a) definition (pp. 87-88): A (form of) definition that begins with the term being defined, follows that term by some linking word or phrase like 'is' or 'means' or '=df' or 'if and only if' that indicates equivalence, and ends with a description of the meaning attributed to the term. The present essay distinguishes

seven normal forms of definition: definition by synonym, definition by antonym, definition by extended synonym, definition by genus and differentia, contextual definition, range definition and extensional definition. *Examples*: 'Recondite' means esoteric. A triangle is a plane figure bounded by three straight lines. Average density of x $=_{df}$ mass of x in grams / volume of x in cc. Something is beautiful to somebody if and only if it has been perceived by someone and that person is pleased by that perceptive experience. See *definition by synonym, definition by antonym, definition by extended synonym, definition by genus and differentia, contextual definition, range definition* and *extensional definition*.

Operational definition (pp. 145-154): A definition that describes how to determine the correct applicability or value of a term by the result of applying one or more operations. If the term signifies a property, the result determines whether the term correctly labels the case. If the term signifies a variable with a range of values, the result determines what value the variable has in the given case. An operational definition does not describe the meaning of a term but rather specifies one way of determining its correct applicability or value, and thus is strictly speaking not a kind of definition. Operational definitions have a reportive aspect, since they should conform to a common use of the term being "defined". They also have a stipulative aspect, since they make precise how to determine whether something is correctly labeled by a term or the value of the variable that a term signifies. Some people use the term 'operational definition' in a broad sense that includes specifying observational criteria for the correct application of a term; this broad sense can be defended on the ground that observing is a kind of operation. *Examples*: It is an operational definition of a ripe cantaloupe to define it as a cantaloupe (1) that has a fragrant, sweet, vaguely musky scent that's easily detectable through its thick rind when you sniff it, (2) inside which you can feel seeds flopping around when you shake it, and (3) whose stem area at the top is firm rather than hard as a rock and gives a little with pressure when you press down on it with your thumbs. The

operations described in this definition are sniffing the cantaloupe, shaking it and pressing down on its stem area with your thumbs. Results of a fragrant smell, felt shaking of seeds and felt firmness and giving with pressure indicate that the cantaloupe is correctly labeled by the term ‘ripe’; the opposite results indicate that the cantaloupe is not correctly labeled by this term. It is an operational definition of the mass of an object to define it as the total mass of the objects on one side of a balance scale that is balanced when the object is on the scale’s other side. The operation described in this definition is putting the object whose mass is to be determined on one side of a balance scale and then placing objects of known mass on the other side until the scale is balanced. The result of this operation is the value of the variable mass for the object being weighed.

Opposites (pp. 97-98): Two terms (in specified senses) are opposites if they have the same range (i.e. the same class of cases in which it makes sense to apply the term) but cannot be true of the same thing at the same time, in the same part of itself, and in relation to the same thing. Opposed terms generally signify qualities (like heavy and light) or relations (like near and far). They may be contradictory opposites or contrary opposites. One way to define a term is to specify its opposite. *Examples*: The term ‘white’ is the opposite of the term ‘black’, since the same coloured object cannot be both white and black at the same time and in the same part of itself. The term ‘separated’ is the opposite of the term ‘together’, since something that is spatially located cannot be both separated from something and together with that same thing at the same time and in the same part of itself. See *definition by antonym*, *contradictory opposites* and *contrary opposites*.

Ostensive definition (pp. 159-160): An explanation of the meaning of a term by pointing (literally or metaphorically) at one or more things correctly labeled by the term. Such definitions are useful in teaching small children what words mean. They need to fit the intended meaning and should be as unambiguous as possible. To avoid misunderstanding, it helps to point to several

objects that differ in all respects except the intended one or to point to several objects that are identical except in a single respect whose variation is marked by using different terms. Ostensively acquired understanding of a term's meaning is limited to the sphere in which it was acquired and may be falsely extended beyond that sphere. *Examples*: One can teach a child what 'yellow' means by showing the child pictures of yellow objects of several different kinds and saying 'yellow' when pointing to each one. One can teach a child the names of different colours by showing the child in turn a succession of crayons of different colours and naming the colour of each one as it is shown. See *semi-ostensive definition*.

Paradigm (pp. 137-138): A typical case of something correctly labeled by a vague term. Black (1954, p. 29) proposes that a fully specified range definition should describe (1) one or more such cases, along with (2) a set of criteria that he calls "constitutive factors", which are capable of variation and are present in at least one of the paradigms, and (3) rules for determining from variations in the constitutive factors the degree of distance of a case from the paradigms. *Example*: Black took as paradigms of scientific method the methods used in such recognized branches of science as astronomy, mathematics, geography, archeology and biology. See *range definition* and *constitutive factor*.

Persuasive definition (pp. 52-53, 55-58): A positional definition of a vague emotionally loaded term that advocates an ethical position by giving the term a precise application and typically attaching an adjective like 'true' or 'real' to the term. Some authors treat persuasive definitions as logical fallacies, while others treat them as needing support. *Examples*: True freedom is the capacity for acting according to one's true character. Selfishness is concern with one's own interests. See *positional definition*.

Polysemy (pp. 12-13): Having more than one related sense. *Example*: The English word 'dog' is used for the male of the species *Canis canis*, for a member of either sex of this species, for a member of the genus *Canis*, as a verb meaning to follow like a

dog, and in other related senses. See also *homonym*, *homograph* and *regular polysemy*.

Positional definition (pp. 4, 52-74): To advocate a meaning is to take a position on an issue by means of a definition. The product of such an action is a positional definition. Definitions can be simultaneously positional and either stipulative or reportive (or both). *Example*: In the context of a debate about whether to recognize same-sex unions in law as marriages, a definition of marriage as a union between a man and a woman is a positional definition, because it takes a position in opposition to legal recognition of same-sex unions as marriages. This definition may also be reportive, if its author claims that this is the traditional meaning of the word 'marriage'. *Non-example*: Dictionary definitions are not positional, because they report on how the defined words are used without thereby taking a position on any issues involved in the use of the word. This book's stipulative definition of the word 'term' (pp. 1-2) is not a positional definition, because it does not use the definition to take a position on any issue (other than how the word 'term' is to be interpreted in this book). See *reportive definition* and *stipulative definition*.

Programmatic definition (pp. 52-53, 58-59): A positional definition of a term linked to a social practice that alters or endorses the range of objects currently labeled by the term. *Examples*: Learning is the lifelong process of transforming information and experience into knowledge, skills, behaviors, and attitudes. Critical thinking is reasonable reflective thinking that is focused on deciding what to believe or do. See *positional definition*.

Prototype (pp. 15, 138-139): A clear case of a kind (especially a basic category) that has the features typically associated with that kind. In defining a term that refers to the kind, description of such typical features is an alternative to listing individually necessary and jointly sufficient conditions. A prototype approach accommodates the creativity and fuzziness of ordinary language

and allows for exceptions. *Example*: According to surveys by Eleanor Rosch, people regard robins and sparrows as prototypical birds, pheasants and ducks as much less typical birds, and ostriches hardly as birds at all. See *basic category* and *range definition*.

Proximate genus (p. 108, n. 23): The smallest general class, on some principle of division, to which the things correctly labeled by a term belong. Traditionally, definers were advised to pick the proximate genus in a definition by genus and differentia. This essay advises instead that definers pick a genus that makes the definition easiest to understand. *Example*: On one principle of division, the proximate genus of triangles is the class of rectilinear plane figures. Hence, according to the traditional advice, one should define a triangle as a rectilinear plane figure with three sides. Because the word ‘rectilinear’ is unfamiliar to many people, it would be more understandable (and therefore preferable) to define a triangle as a plane figure bounded by three straight lines. See *genus*.

Range definition (pp. 137-143): A normal definition whose defining part uses qualifying terms like ‘typically’ or ‘characteristically’ or ‘possibly’ or ‘roughly’ to indicate that the things correctly labeled by the term being defined are not a sharply bounded class but have boundaries that are fuzzy like the boundaries of a mountain range. With the qualifiers removed, a range definition can be a definition by synonym or by antonym, a definition by extended synonym or by genus and differentia, or a contextual definition. A range definition is too broad if it has even a single counterexample of something with the features mentioned in its defining part that is not correctly labeled by the term being defined. To show that a range definition is too narrow, one needs a whole family of counterexamples that are correctly labeled by the term being defined but lack the features claimed to be typical. *Examples*: The following definition is a range definition: The scientific method is a method of investigation characteristically involving a substantial number, but rarely all, of the following characteristics: observation,

generalization, experimentation, measurement, calculation, use of instruments, formulating and testing hypotheses that get support from their being able to explain the facts and their competitors' being inconsistent with the facts, and being more or less tentative when concluding. (This definition is a qualified definition by genus and differentia. The genus is method of investigation. The differentia is possession of the eight characteristics listed after the colon. The qualifying terms are 'characteristically', 'substantial', 'rarely all' and 'more or less tentative'. If there is a method of investigation with all eight characteristics that is not scientific, it would be a counter-example to the definition. If there is a method regularly used in a recognized science that has only one or two of the eight characteristics, it would be a counterexample to the definition.) The following definition is also a range definition: 'Stingy' is, roughly speaking, the opposite of 'generous'. (This definition is a qualified definition by antonym. Its qualifying term is 'roughly speaking'. If a number of people are generous and stingy in the same respect and in relation to the same other person, they would be a counterexample to the definition.) See *paradigm*, *constitutive factor*.

Real definition (pp. 166-171): A description of the essence of the kind of thing signified by a term. Traditionally, the essence of a kind of thing is a postulated set of characteristics that make it the kind of thing that it is, that are describable by naming a genus to which that kind of thing belongs and describing the features that as a group distinguish that kind from other kinds of things in the genus, and that are causally responsible for the thing having all the other characteristics that belong necessarily to everything of that kind and only to things of that kind. An individual thing such as an individual human being or tulip or electron is supposed to have an essence that makes it a member of the lowest species to which it belongs in a single objective hierarchy of species and genera. The progress of scientific inquiry has made it doubtful whether there are essences in the postulated sense of the word 'essence'. This essay argues that the insights in careful contemporary attempts to defend a concept of essence can be accommodated by the concept

of a theoretical definition as a kind of positional definition that advocates how a term should be used in scientific theorizing. *Examples*: Traditionally, the definition of a human being as an animal possessing reason was advanced as a real definition, whose components of being rational and being an animal are supposedly causally responsible for all the distinctive characteristics of being human, such as being able to learn to read and write and having a sense of humour. The definitions of hydrogen as an element whose nucleus has one proton and of water as a compound whose molecules each consist of two atoms of hydrogen and one atom of oxygen could be regarded as real definitions, whose components are supposedly causally responsible for all the distinctive properties respectively of hydrogen and of water. See *nominal definition* and *essence*.

Recursive definition (pp. 203-205): A definition of a function-name or predicate with respect to a domain generated by a fundamental inductive definition. A recursive definition has a step-by-step character that follows the step-by-step generation of their domain. A base clause describes the values of the function signified by the function-name for an initial input to the function or an initial object or objects correctly labeled by the predicate. A recursion clause, like the inductive clause of an inductive definition, describes one or more procedures for determining the value of the function for specified input on the basis of previously defined values of the function for specified inputs or for determining objects correctly labeled by the predicate on the basis of objects previously determined to be correctly labeled by it. Unlike inductive definitions, recursive definitions have no need for a closure clause, since the domain with respect to which they are defined has already been generated. *Examples*: A recursive definition of the function-name '+' with respect to the domain of natural numbers generated by three of Peano's axioms has as its base clause that, for any natural number x, $x + 0 = x$ and as its recursion clause that, for any natural numbers x and y, $x + y' = (x + y)'$, where 'x'' means the immediate successor of x. A recursive definition of the predicate 'numeral' with respect to the domain

of the expressions of Peano arithmetic has as its base clause that '0' (i.e. the numeral, not the number zero) is a numeral and as its recursion clause that, if '*n*' is a numeral, then '*n'*' is a numeral. See *inductive definition*, *fundamental inductive definition*, *base clause*, *recursion clause* and *closure clause*.

Register (p. 158, n. 10): The register of a word or phrase is, roughly speaking, its degree of formality or informality. Examples of the correct use of a term should have a consistent register, in the sense that each syntactically distinct word or phrase in the sentence should have the same degree of informality. *Example*: The sentence 'He opened his trap and launched into a grandiloquent soliloquy' has an inconsistent register, because the word 'trap' is a crude word for a person's mouth but the phrase 'grandiloquent soliloquy' is highly affected and formal.

Regular polysemy (pp. 12-13): A pattern of polysemy that is found in many words. One database has been claimed to have 100 classes of regular polysemy. *Example*: The same word is often used both for a species and for a broader genus to which it belongs. In English, the word 'cat' is used both for the domestic animal kept as a pet and for the family of animals that includes also tigers, lions and cheetahs; the word 'dog' is used both for the domestic animal kept as a pet and for the family of animals that includes also jackals, hyenas and wolves. This is a pattern of species-genus polysemy.

Reportive definition (pp. 3-4, 7-25): To report a meaning is to indicate, correctly or incorrectly, what a term means or what it refers to in a supposed pre-existing use. The product of such an action is a reportive definition. Definitions can be simultaneously reportive and stipulative or positional (or both). *Example*: A dictionary definition is a reportive definition. *Non-example*: The introduction of a completely new term to a language by means of a definition is not a reportive definition but rather a stipulative definition. See *stipulative definition* and *positional definition*.

Representative (p. 26, n. 16): An illocutionary act in which a speaker represents something as being the case. *Example*: Asserting something is a representative; it ordinarily represents the asserted proposition as true. Reporting a meaning in a reportive definition is a kind of assertion, and thus is a representative illocutionary act. Such a definition is true or false. See *illocutionary act*.

Role-specifying definition (pp. 206-207): A definition of a term that specifies its role in phrases or sentences. This form of definition is particularly useful for prepositions, conjunctions, articles and other words that perform a linking role but do not refer to anything. *Example*: The English word ‘the’ is used, especially before a noun, with a specifying or particularizing effect.

Semi-ostensive definition (p. 160): An explanation of the meaning of a term by referring to what is observed under specified conditions. They communicate the term’s meaning only if the effect is observed or known independently of the definition. *Example*: The definition of the Zeeman effect as what is observed to happen to a yellow line on a spectrogram when a solenoid magnet is switched on is semi-ostensive. It communicates what ‘the Zeeman effect’ refers to only if someone actually observes or learns independently what happens under the specified circumstances. (A single spectral line splits into two or more lines of different frequencies.)

Sense (of a term) (pp. 9-16): A type of meaning that a term has. Postulation of a sense is an act of abstraction or generalization from the many occurrences of the term in written texts and spoken discourse. In distinguishing senses of a word, makers of dictionaries typically go through something like the following five-step process: (1) Analyse instances of usage of the word. (2) Provisionally identify different senses. (3) Collect good corpus examples for each provisional sense, storing ambiguous examples for further analysis. (4) For each cluster of examples, identify the features typically associated with it that distinguish it from

the other clusters. (5) Refine the inventory of senses if necessary, for example by splitting or lumping, so that all uses of the word that occur frequently in text are accounted for. Indicators of a difference in sense include differences in the kinds of texts in which a word occurs, in the opposite word in different contexts, in the objects labelled by the word in different contexts, in its collocations, in syntactic and lexicogrammatical behaviour, in selectional restrictions and collocation, and in preferences for or against certain forms, structures or positions. *Example*: The English word ‘bank’ has at least two distinct senses, in one of which it stands for a type of financial institution and in the other of which it stands for the side of a waterway.

Stipulative definition (pp. 4-5, 26-52): To stipulate a meaning is to indicate how a term is to be interpreted or used in a specified context. The product of such an action is a stipulative definition. Definitions can be simultaneously stipulative and reportive or positional (or both). Stipulative definitions occur as explanations in a scholarly or scientific work of how an author is using a term in the work, in legal documents as indications of how terms in the document are to be interpreted, in instructions by data-collecting agencies to individuals or groups that send them the data, in introductions of nomenclature, in standardizations of nomenclature, in setting numerical thresholds for things correctly labeled by a term, in making terms precise as a basis for research and in introducing terms into axiomatized mathematical or scientific theories. This essay proposes 10 guidelines for constructing a stipulative definition, as follows. (1) Have a reason for stipulating. (2) Have a good reason for stipulating. (3) Be sure that you have the right to stipulate. (4) Abide by your commitments. (5) Be precise. (6) Be unambiguous. (7) Pick a meaning that serves your purpose. (8) Avoid misleading new nomenclature. (9) Introduce informative nomenclature. (10) Do not create a contradiction. These 10 guidelines can be turned into questions to be asked in evaluating stipulative definitions. *Examples*: The definition of the word ‘term’ on pages 2-3 indicates how the word ‘term’ is to be interpreted in this book, and so is a

stipulative definition (as well as being reportive). The definition of the term ‘criminal homicide—murder and non-negligent manslaughter’ as “the willful (nonnegligent) killing of one human being by another” in the *Uniform Crime Reporting Handbook* of the U.S. Federal Bureau of Investigation (FBI 2004, p. 15) indicates how the term ‘criminal homicide—murder and non-negligent manslaughter’ is to be used in reports to the FBI by law enforcement agencies in the United States, and so is a stipulative definition. *Non-example*: A dictionary definition is not a stipulative definition, because it merely reports how the defined word is used and does not indicate how the word is to be interpreted or used in a specified context. See *reportive definition* and *positional definition*.

Subordinate category (p. 138, n. 36): A category in a culture’s hierarchy of kinds of things that is narrower than the basic category in the hierarchy, in the sense that fewer things belong to it. *Example*: In North American culture, the category of kitchen chairs is a subordinate category, because it includes fewer things in the hierarchy of pieces of furniture than the basic category of chairs. See *basic category*, *superordinate category*.

Superordinate category (p. 138, n. 36): A category in a culture’s hierarchy of kinds of things that is broader than the basic category in the hierarchy, in the sense that more things belong to it. *Example*: In North American culture, the category of pieces of furniture is a superordinate category, because it includes more things in the hierarchy of pieces of furniture than the basic category of chairs. See *subordinate category*, *basic category*.

Term (pp. 2-3): A word or phrase of general application that is short of a full sentence. *Examples*: Individual words (like ‘‘hockey’ or ‘if’ or ‘pellucid’ or ‘grow’) are terms, and so are phrases (like ‘major bleeding’ or ‘in the vicinity’ or ‘very carefully’ or ‘well disposed’ or ‘proof beyond a reasonable doubt’ or ‘legal system’). *Non-examples*: Names of individuals (like ‘Napoleon Bonaparte’) are not terms. Nor are strings of linguistic

signs that do not form a syntactic unit (like ‘clock always’ or ‘guidelines are neither’). Nor are complete sentences or stretches of text or discourse that include several sentences. *Borderline cases*: Definite descriptions like ‘the tallest woman in the room’ are sometimes terms, but some scholars hold that they sometimes function like proper names and in these cases are not terms.

Theoretical definition (pp. 52-53, 61-72): A positional definition of a term for use in scientific theorizing. *Examples*: An atom is the smallest unit that an element can be divided into and still remains identifiable as that element. Life is self-replication with variations. A sphere is the figure comprehended when, the diameter of a semicircle remaining fixed, the semicircle is carried around and restored again to the same position from which it began to be moved. A planet is a celestial body that (a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and (c) has cleared the neighbourhood around its orbit.

Traditional rules for definition (pp. 171-179): Textbooks in the European logical tradition have for centuries included rules for definitions. These rules are motivated by the conception of a definition as the description of the essence of a kind of thing signified by a term by means of specifying the genus and differentia of that kind of thing. They typically include the following five rules:

1. A definition should state the essential attributes of the species.

2. A definition must not be circular.

3. A definition must be neither too broad nor too narrow.

4. Ambiguous, obscure, or figurative language must not be used in a definition.

5. A definition should not be negative when it can be affirmative.

The present essay rejects the assumption that kinds of things have essences, for reasons stated in section 6.2 (“Real versus nominal definitions”) on pages 166-169. Hence it rejects the notion that definitions are attempts to describe an essence. Instead, it regards all definitions as attempts to say what a term means or should be taken to mean or should mean. From this perspective, the present essay re-evaluates the traditional rules and proposes the following substitutes:

1. A theoretical definition should permit derivation of many characteristics of the things correctly labeled by the term defined. In a mathematical theory, the definition of a term introduced by definition should logically imply, in combination with the theory into which it is introduced, all the true sentences using that term that are expressible in the language of the theory.

2. The words one uses in the defining part of a definition should not presuppose understanding of the meaning of the term being defined.

3. A definition should be neither too broad nor too narrow with respect to its benchmark (which may be either actual use of the defined term with a given sense or an intention of how the defined term is to be taken or a position on an issue), but may allow for borderline cases if the term is vague.

4. The words used in the defining part of a definition should be unambiguous in context and should have a clear meaning that intended readers will understand, but may be figurative if there is no risk of their being misinterpreted.

5. A definition may be negative, as long as it clearly communicates the meaning of the term being defined.

Morscher (2017, 209-223) lists the following additional five "traditional rules":

6. A definition should specify the proximate genus and specific difference of the kind signified by the term.

7. A definition should specify a good sense.

8. A definition should if possible be evaluatively neutral.

9. A definition should contain no disjunction.

10. A definition should be consistent both in itself and as part of a chain of definitions.

Of these five rules, rules 6 and 9 are arbitrary and unjustifiable, but rules 7, 8 and 10 make sense.

Use in a sentence (pp. 160-163): Using a term in a sentence as a way of showing what the term means (in a specified sense) is a form of definition, in the broad sense of indicating what a term means. Dictionaries supplement explicit definitions with such example sentences, typically by taking a phrase in which the term commonly occurs and inventing a sentence containing the phrase. According to Atkins and Rundell (2008, 457-461), sentences constructed for this purpose should (1) be built from a common phrase using the defined term, (2) be self-contained, (3) have a consistent register, (4) allow a reader to infer what the term means, (5) not contain information that conflicts with the explicit definition that it illustrates, (6) add useful information not contained in other example sentences containing the defined term, and (7) avoid unnecessarily difficult word choice and grammatical structure. A special case of defining a term by using it in a sentence is the introduction of a new term in an axiomatized theory by means of a set of axioms containing the term, axioms from which ideally all and only the true sentences containing the term follow. *Examples*: To illustrate the meaning of the word 'objective', a dictionary adds to its explicit definition the sentence, "I can't

really be objective when I'm judging my daughter's work." (http://dictionary.cambridge.org/dictionary/english/objective; accessed 2020-01-20) To define the symbol '+', indicating the operation of addition, one can add to Peano's theory axiomatizing the natural numbers the two axioms: (1) n + 0 = n; (2) (n + m)′ = n + m′. From these axioms there follow all and only the true statements expressible in the language in which the symbol '+' occurs.

Zipf's law (p. 17, n. 12): The law proposed by George Kingsley Zipf (1935) that the frequency with which a word occurs in a collection of texts is inversely proportional to its ranking in a frequency table. This law provides a rough guide to determining how large a corpus one needs to have enough occurrences of a word to support a useful description of each of its senses. The lower the ranking, the larger is the required corpus. *Example*: In a corpus, the 10th most frequent word will occur about twice as often as the 20th most frequent word, about 10 times as often as the 100th most frequent word, and so on.

References

American Psychiatric Association. 2013. *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition. Arlington, Virginia: American Psychiatric Association.

Archimedes. (c. 225 BCE) 2004. *On Sphere and Cylinder*. In *The Works of Archimedes*, Vol. I, edited and translated by Reviel Netz. Cambridge: Cambridge University Press.

Archinal, Brent A., Michael F. A'Hearn, Edward G. Bowell, Albert R Conrad, Guy J. Consolmagno, et al. (2010). "Report of the IAU Working Group on Cartographic Coordinates and Rotational Elements: 2009." *Celestial Mechanics and Dynamical Astronomy* 109 (2): 101–135.

Aristotle. (4th century BCE) 1984. *The Complete Works of Aristotle*, ed. Jonathan Barnes. 2 vols. Princeton: Princeton University Press. Citations are to the work's title, book number, and chapter number, and to the page, column and line numbers of the Bekker edition.

Atkins, B. T. Sue, and Michael Rundell. 2008. *The Oxford Guide to Practical Lexicography*. Oxford: Oxford University Press.

Austin, John Langshaw. 1965. *How to Do Things with Words*, ed, J. O. Urmson. New York: Oxford University Press.

Avigad, Jeremy, and Richard Zach. 2020. "The Epsilon Calculus." In *The Stanford Encyclopedia of Philosophy*, fall 2020 ed., edited by Edward N. Zalta. https://plato.stanford.edu/entries/epsilon-calculus/.

Ayars, Alisabeth. 2017. "Note on Definition and Impossibility." *Analytic Philosophy* 58 (4): 413-417.

Babbie, Earl R. 1998. *The Practice of Social Research*, 8th ed. Belmont, CA: Wadsworth.

Bajzar, Laszlo, Reg Manuel, and Michael E Nesheim. 1995. "Purification and Characterization of TAFI, a Thrombin

Activatable Fibrinolysis Inhibitor." *Journal of Biological Chemistry* 270: 14477 -84.

Black, Max. 1954. "The Definition of Scientific Method." In *Problems of Analysis: Philosophical Essays*, by Max Black, 3-23. Ithaca, NY: Cornell University Press.

Borsboom, Denny, Gideon J. Mellenbergh, and Jaap van Heerden. 2004. "The Concept of Validity." *Psychological Review* 111 (4): 1061-1071.

Bridgman, Percy. 1927. *The Logic of Modern Physics*. New York: Macmillan.

Bruni, Riccardo. 2019. "Addressing Circular Definitions via Systems of Proofs." In *Mathesis Universalis, Computability and Proof*, edited by Stefania Centrone, Sara Negri, Deniz Sarikaya, and Peter M. Schuster, 75-100. Cham, Switzerland: Springer.

Card, David. 2011. "Origins of the Unemployment Rate: The Lasting Legacy of Measurement without Theory." *The American Economic Review: Papers and Proceedings* 101, no. 3: 552-557.

Carnap, Rudolf. 1956. *Meaning and Necessity: A Study in Semantics and Modal Logic*, enlarged ed. Chicago: University of Chicago Press.

Carter, Stacy M., Chris Degeling, Jenny Doust, and Alexandra Barratt. 2016. "A Definition and Ethical Evaluation of Overdiagnosis." *Journal of Medical Ethics* 42 (11): 705-714.

Cellucci, Carlo. 2018. "Definition in Mathematics." *European Journal for Philosophy of Science* 8 (3): 605-629. https://doi.org/10.1007/s13194-018-0203-y.

Chandrasekharan, Hariharan, and Navindu Gupta. 2006. *Fundamentals of Nuclear Science: Application in Agriculture*. New Delhi: Northern Book Centre.

Cleland, Carol. 2012. "Life without Definitions." *Synthese* 185 (1):125–144.

Cleland, Carol E. 2019. *The Quest for a Universal Theory of Life: Searching for Life as We Don't Know It*. Cambridge: Cambridge University Press.

Copi, Irving M., Carl Cohen, and Kenneth McMahon. 2011. *Introduction to Logic*, 14th ed. Upper Saddle River, NJ: Prentice-Hall.

Cordes, Moritz. 2020. "The Constituents of an Explication." *Synthese* 197: 983-1010.

Cordes, Moritz, and Geo Siegwart. 2018. "Explication." In *The Internet Encyclopedia of Philosophy*. https://www.iep.utm.edu/explicat/.

Cronbach, Lee J. 1971. "Test Validation." In *Educational Measurement*, 2nd ed., edited by Robert L. Thorndike, 443-507. Washington, DC: American Council on Education.

Cruse, D. A. 1986. *Lexical Semantics*. Cambridge: Cambridge University Press.

Cruse, D. Alan. 2000. *Meaning in Language: An Introduction to Semantics and Pragmatics*. Oxford: Oxford University Press.

Dalton, John. 1808. *A New System of Chemical Philosophy, Part I*. London: R. Bickerstaff.

Darwin, Charles. 1859. *On the Origin of Species by Means of Natural Selection, or The Preservation of Favoured Races in the Struggle for Life*. London: John Murray.

Davies, Stephen. 2012. "On Defining Music." *The Monist* 95: 535-555.

Dawkins, Richard. 1976. *The Selfish Gene*. Oxford: Oxford University Press.

Dawkins, Richard. 1981. "In Defence of Selfish Genes." *Philosophy* 56: 556-573.

Dewey, John. 1933. *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process*. Boston: D. C. Heath.

Donnellan, Keith S. 1966. "Reference and Definite Descriptions." *Philosophical Review* 77: 281–304.

Doroszewski, Witold. 1973. *Elements of Lexicology and Semantics*, translated by Iain Taylor. The Hague: Mouton.

Elgin, Samuel Z. "The Opacity of Definition." https://philarchive.org/rec/ELGDDA.

Ennis, Robert H. 1962. "A Concept of Critical Thinking: A Proposed Basis for Research on the Teaching and Evaluation of

Critical Thinking Ability." *Harvard Educational Review* 32 (1): 83-111.

Ennis, Robert H. 1964. "Operational Definitions." *American Educational Research Journal* 1: 183-201.

Ennis, Robert H. 1980. "Presidential Address." In *Philosophy of Education 1979. Proceedings of the Annual Meeting of the Philosophy of Education Society (35th)*, edited by Jerrold R. Coombs, 3-30. Normal, IL: Philosophy of Education Society.

Ennis, Robert H. 1987. "A Taxonomy of Critical Thinking Dispositions and Abilities." In *Teaching Thinking Skills: Theory and Practice*, edited by Joan Baron and Robert Sternberg, 9-26. New York: Freeman.

Ennis, Robert H. 1991. "Critical Thinking: A Streamlined Conception." *Teaching Philosophy* 14 (1): 5-25.

Ennis, Robert H. 1996. *Critical Thinking*. Upper Saddle River, NJ: Prentice-Hall.

Ennis, Robert H. 2015. "Critical Thinking: A Streamlined Conception." In *The Palgrave Handbook of Critical Thinking in Higher Education*, edited by Martin Davies and Ronald Barnett, 31-47. New York: Palgrave Macmillan.

Ennis, Robert H. 2016. "Definition: A Three-Dimensional Analysis with Bearing on Key Concepts." *OSSA Conference Archive*, May 18, 2016. https://scholar.uwindsor.ca/ossaarchive/OSSA11/papersandcommentaries/105/.

Ennis, Robert H. 2019. "Definition." In *Studies in Critical Thinking*, edited by J. Anthony Blair, 299-326. Windsor: ON: Windsor Studies in Argumentation. https://windsor.scholarsportal.info/omp/index.php/wsia/catalog/view/106/106/1101-2.

Euclid. 1956/c. 300 BCE. *Elements*, translated from the text of Heiberg by Sir Thomas Little Heath with introduction and commentary, 3 vols. New York: Dover. First published c. 300 BCE.

Facione, Peter A. 1990. *Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction*. Research findings and recommendations prepared

for the Committee on Pre-College Philosophy of the American Philosophical Association. ERIC Document ED315423.

FBI [Federal Bureau of Investigation]. 2004. *Uniform Crime Reporting Handbook*. U.S. Department of Justice. https://ucr.fbi.gov/additional-ucr-publications/ucr_handbook.pdf.

Ferreira, Francisco, Dean Mitchell Jolliffe, and Espen Beer Prydz. 2015 "The International Poverty Line Has Just Been Raised to $1.90 a Day, but Global Poverty Is Basically Unchanged. How Is That Even Possible?" Washington, DC: World Bank. http://blogs.worldbank.org/developmenttalk/international-poverty-line-has-just-been-raised-190-day-global-poverty-basically-unchanged-how-even.

Fillmore, Charles J. 2003. "Double-Decker Definitions: The Role of Frames in Meaning Explanations." *Sign Language Studies* 3: 263-295.

Fillmore, Charles J. 2006. "Frame Semantics." In *Cognitive Linguistics: Basic Readings*, edited by Dirk Geeraerts, 373-400. Berlin: DeGruyter Mouton.

Fine, Kit. 1995a. "The Logic of Essence." *Journal of Philosophical Logic* 24 (3): 241-273.

Fine, Kit. 1995b. "Senses of Essence." In *Modality, Morality, and Belief: Essays in Honor of Ruth Barcan Marcus*, edited by Walter Sinnott-Armstrong, 53-73. New York: Cambridge University Press.

Fine, Kit. 2001. "The Question of Realism." *Philosopher's Imprint* 1 (2): 1–30.

Fine, Kit. 2012. "Guide to Ground." In *Metaphysical Grounding*, edited by Fabrice Correia and Benjamin Schnieder, 37–80. Cambridge: Cambridge University Press.

Fisher, Ronald Aylmer. 1925. *Statistical Methods for Research Workers*. Edinburgh: Oliver and Boyd.

Foley JH, Kim PY, Hendriks D, Morser J, Gils A, and Mutch NJ, for the Subcommittee on Fibrinolysis. 2015. "Evaluation of and Recommendation for the Nomenclature of the *CPB2* Gene Product (Also Known as TAFI and proCPU): Communication

from the SSC of the ISTH." *Journal of Thrombosis and Haemostasis* 13: 2277-8.

Gerring, John, and Paul A. Barresi. 2003. "Putting Language to Work: A Min-Max Strategy of Concept Formation in the Social Sciences." *Journal of Theoretical Politics* 15 (2): 201-232.

Gigerenzer, Gerd. 2017. "A Theory Integration Program." *Decision* 4 (3): 133-145.

Goddard, Cliff, and Anna Wierzbicka. 2014. *Words and Meanings: Lexical Semantics across Domains, Languages, and Cultures*. Oxford: Oxford University Press.

Gorsky, D. P. 1981. *Definition (Logico-Methodological Problems)*. Translated by Sergei Syrovatkin. Moscow: Progress Publishers.

Gruber, Monika. 2016. *Alfred Tarski and "The Concept of Truth in Formalized Languages": A Running Commentary with Consideration of the Polish Original and the German Translation*. Cham, Switzerland: Springer.

Gupta, Anil. 2018. "In Praise of a Logic of Definitions that Tolerates ω-inconsistency." *Philosophical Issues* 28 (1): 176-195.

Gupta, Anil. 2019. "Definitions." In *The Stanford Encyclopedia of Philosophy*, winter 2019 ed., edited by Edward N. Zalta. https://plato.stanford.edu/archives/win2019/entries/definitions/.

Gupta, Anil, and Nuel Belnap. 1993. *The Revision Theory of Truth*. Cambridge, MA: MIT Press.

Hart, Herbert L. A. 1961. *The Concept of Law*. Oxford: Clarendon Press.

Hempel, Carl. 1952. *Fundamentals of Concept Formation in Empirical Science*. International Encyclopedia of Unified Science, vol. II, no. 7. Chicago: University of Chicago Press.

Hibberd, Fiona J. 2019. "What is Scientific Definition?" *Journal of Mind and Behavior* 40 (1): 29-52.

Hitchcock, David. 2017. *On Reasoning and Argument: Essays in Informal Logic and on Critical Thinking*. Dordrecht: Springer.

Hitchcock, David. 2018. "Critical Thinking." In *The Stanford Encyclopedia of Philosophy*, fall 2018 ed., edited by Edward N. Zalta. https://plato.stanford.edu/archives/fall2018/entries/critical-thinking/.

Hofmann, Bjørn. 2016. "Defining and Evaluating Overdiagnosis." *Journal of Medical Ethics* 42 (11): 715-716.

Huber, Machteld, André Knottnerus, Lawrence Green, Henriëtte van der Horst, Alejandro R Jadad, Daan Kromhout, Brian Leonard, et al. 2011. "Health: How Should We Define It?" *Briitsh Medical Journal* 343 (7817): 235-237.

Hurley, Patrick J. 2008. *A Concise Introduction to Logic*, 10th ed. Belmont, CA: Thomson Wadsworth.

IARC Working Group on the Evaluation of Cancer-Preventive Strategies. 2003. *Fruit and Vegetables*. IARC Handbooks of Cancer Prevention, vol. 8. Lyon, France: International Agency for Research on Cancer. https://publications.iarc.fr/Book-And-Report-Series/Iarc-Handbooks-Of-Cancer-Prevention/Fruit-And-Vegetables-2003.

International Astronomical Union. 2006. "Definition of a Planet in the Solar System." http://www.iau.org/static/resolutions/Resolution_GA26-5-6.pdf.

Irvine, Andrew David, and Harry Deutsch. 2016. "Russell's Paradox." In *The Stanford Encyclopedia of Philosophy*, winter 2016 ed., edited by Edward N. Zalta. https://plato.stanford.edu/archives/win2016/entries/russell-paradox/.

Jackson, Howard. 2002. *Lexicography: An Introduction*. London: Routledge.

Jenicek, Milos. 2014. *Writing, Reading and Understanding in Modern Health Sciences: Medical Articles and Other Forms of Communication*. Boca Raton, FL: CRC Press.

Kane, Michael T. 2006. "Validation." In *Educational Measurement*, 4th ed., edited by Robert L. Brennan, 17-64. Westport, CT: American Council on Education.

Kelley, Truman L. 1921. "The Reliability of Test Scores." *The Journal of Educational Research* 3, no. 5: 370-379.

Keselman, H. J., Carl J. Huberty, Lisa M. Lix, Stephen Olejnik, Robert A. Cribbie, Barbara Donahue, Rhonda K. Kowalchuk, et al. 1998. "Statistical Practices of Educational Researchers: An Analysis of their ANOVA, MANOVA, and ANCOVA Analyses." *Review of Educational Research* 68, no. 3: 350-386.

Kleene, Stephen Cole. 1974. *Introduction to Metamathematics*. Groningen: Wolters-Noordhof. First published 1952.

Knuutila, Tarja, and Andrea Loettgers. 2017. "What are Definitions of Life Good for? Transdisciplinary and Other Definitions in Astrobiology." *Biology and Philosophy* 32 (6): 1185-1203.

Krabbe, Erik C. W. 2007. "Predicaments of the Concluding Stage." *OSSA Conference Archive*, 90. https://scholar.uwindsor.ca/ossaarchive/OSSA7/papersandcommentaries/90.

Krabbe, Erik C. W. 2017. "The Formalization of *Critical Discussion*." *Argumentation* 31: 101-119.

Kripke, Saul. 1977. "Speaker's Reference and Semantic Reference." *Midwest Studies in Philosophy* 2 (1): 255-276.

Kripke, Saul A. 1980. *Naming and Necessity*. Cambridge: Harvard University Press. First published 1972.

Kuhn, Thomas S. 1970. *The Structure of Scientific Revolutions*, 2nd ed., enlarged. International Encyclopedia of Unified Science, vol. 2, no. 2. Chicago: University of Chicago Press.

Lamont, Corliss. 1967. *Freedom of Choice Affirmed*. New York: Horizon Press.

Landau, Sidney I. 2001. *Dictionaries: The Art and Craft of Lexicography*, 2nd ed. Cambridge: Cambridge University Press.

Lavoisier, Antoine-Laurent. 1790. *Elements of Chemistry, in a New Systematic Order: Containing all the Modern Discoveries*, trans. Robert Kerr. Edinburgh: William Creech. French-language original first published in 1789.

LeBlanc, Jill. 1998. *Thinking Clearly: A Guide to Critical Reasoning*. New York: W. W. Norton.

Liddell, Henry George, Robert Scott, and Sir Henry Stuart Jones. 1968. *A Greek-English Lexicon*. Oxford: Clarendon Press.

Linsky, Bernard. 2016. "Logical Constructions." In *The Stanford Encyclopedia of Philosophy*, winter 2016 ed., edited by Edward N. Zalta. https://plato.stanford.edu/archives/win2016/entries/logical-construction/.

Locke, John. 1689. *An Essay concerning Human Understanding*. London: Edward Macy. https://en.wikisource.org/wiki/An_Essay_Concerning_Human_Understanding.

Macagno, Fabrizio, and Douglas Walton. 2014. *Emotive Language in Argumentation*. New York: Cambridge University Press.

Macagno, Fabrizio, and Douglas Walton. 2019. "Emotive Meaning in Political Argumentation." *Informal Logic* 39 (3): 229-261.

Madge, Steve, and Hilary Burn. 1994. *Crows and Jays: A Guide to the Crows, Jays and Magpies of the World*. London: AandC Black.

Margot, Jean-Luc. 2015. "A Quantitative Criterion for Defining Planets." *The Astronomical Journal* 150 (6): 185-191.

Matarazzo, Joseph D., Timothy P. Carmody, and Leo D. Jacobs. 1980. "Test-Retest Reliability and Stability of the WAIS: A Literature Review with Implications for Clinical Practice." *Journal of Clinical Neuropsychology* 2: 89-105.

Mel'čuk, Igor. 1996. "Lexical Functions: A Tool for the Description of Lexical Relations in a Lexicon." In *Lexical Functions in Lexicography and Natural Language Processing*, edited by Leo Wanner, 37-102. Amsterdam: John Benjamins.

Metzger, Philip T. 2015. "NASA Scientist: 'Call Pluto a Planet'." Interview by Basak Sezen. *Deutsche Welle*, 2015-06-25. http://www.dw.com/en/nasa-scientist-call-pluto-a-planet/a-18538215.

Miles, Samantha. 2017. "Stakeholder Theory Classification: A Theoretical and Empirical Evaluation of Definitions." *Journal of Business Ethics* 142 (3): 437-459.

Modesto, Sean P., Jason S. Anderson, and François Lutzoni. 2004. "The Phylogenetic Definition of Reptilia." *Systematic Biology* 53 (5): 815-821. https://doi.org/10.1080/10635150490503026.

Morscher, Edgar. 2017. *Die wissenschaftliche Definition*. Wien: Lit.

Moudon, Anne Vernez, Chanam Lee, Allen D. Cheadle, Cheza Garvin, Donna Johnson, Thomas L. Schmid, Robert D. Weathers, and Lin Lin. 2006. "Operational Definitions of Walkable Neighborhood: Theoretical and Empirical Insights." *Journal of Physical Activity and Health* 3, no. s1: S99-S117.

Murray, James, et al. 1971. *Oxford English Dictionary*. 12 vols. in 2 vols. Oxford: Oxford University Press. First published in 1933.

Niiniluoto, Ilkka. 2018. *Truth-Seeking by Abduction*. Synthese Library 400. Cham, Switzerland: Springer.

Papineau, David. 1996. "Theory-Dependent Terms." *Philosophy of Science* 63 (1): 1-20.

Plato. (4th century BCE) 1997. *Complete Works*, edited, with introduction and notes, by John M. Cooper. Indianapolis: Hackett. Citations are to the title of the work and to the page, section and line numbers of the Stefanus edition.

Plucker, Jonathan A., and Amy L. Shelton. 2015. "General Intelligence (*g*): Overview of a Complex Construct and its Implications for Genetics Research." *Hastings Center Report* 45, no. S1: S21-S24.

Putnam, Hilary. 1975. "The Meaning of 'Meaning'." In *Language, Mind and Knowledge: Minnesota Studies in the Philosophy of Science* (Vol. VII), edited by Keith Gunderson (131–193). Minneapolis, MN: Minnesota University Press.

Rawls, John. 1971. *A Theory of Justice*. Cambridge, MA: Harvard University Press.

Ribes-Iñesta, Emilio. 2003. "What is Defined in Operational Definitions? The Case of Operant Psychology." *Behavior and Philosophy* 31: 111-126.

Rigotti, Eddo, and Sara Greco. 2019. *Inference in Argumentation: A Topics-Based Approach to Argument Schemes*. Argumentation Library 34. Cham, Switzerland: Springer.

Rivello, Edoardo. 2019. "Revision without Revision Sequences: Circular Definitions." *Journal of Philosophical Logic* 48 (1): 57-85.

Robinson, Richard. 1954. *Definition*. Oxford: Clarendon Press.

Rosch, Eleanor. 1978. "Principles of Categorization." In *Cognition and Categorization*, edited by Eleanor Rosch and Barbara B. Lloyd, 27–48. Hillsdale, NJ: Lawrence Erlbaum.

Rosen, Gideon. 2010. "Metaphysical Dependence: Grounding and Reduction." In *Modality: Metaphysics, Logic and Epistemology*,

edited by Bob Hale and Aviv Hoffman, 109–36. Oxford: Oxford University Press.

Rosen, Gideon. 2015. "Real Definition." *Analytic Philosophy* 56 (3): 189–209.

Rößler, Jürgen L. 1998. *Die operationale Definition*. Europaische Hochschulschrifte, Reihe 20, Philosophie, Vol. 571. Frankfurt am Main: Peter Lang.

Ruediger, Gustav F., and Robert Hulbert. 1914. "Is Dried Blood as Reliable as Fresh Serum in Making the Widal Test?" *American Journal of Public Health* 4, no. 2: 113-119.

Sackett, David L., William M. C. Rosenberg, J. A. Muir Gray, R. Brian Haynes, and W. Scott Richardson. 1996. "Evidence Based Medicine: What It Is and What It Isn't." *British Medical Journal* 312: 71-72.

Schane, Sanford. 2002 "Ambiguity and Misunderstanding in the Law." *T. Jefferson L. Rev.* 25: 167-190.

Scheffler, Israel. 1960. *The Language of Education*. Springfield, IL: Charles C. Thomas.

Schiappa, Edward. 2003. *Defining Reality: Definitions and the Politics of Meaning*. Carbondale, IL: Southern Illinois University Press.

Searle, John R. 1976. "A Classification of Illocutionary Acts." *Language in Society* 5: 1-23.

Spearman, Charles. 1904. "General Intelligence: Objectively Determined and Measured." *American Psychologist* 15: 201-93.

Stevens, S. S. 1935. "The Operational Definition of Psychological Concepts." *Psychological Review* 42: 517-527.

Stevenson, Charles L. 1944. *Ethics and Language*. New Haven, CT: Yale University Press.

Steward, Stephen. 2017. "Definition and Impossibility." *Analytic Philosophy* 58 (4): 409-412.

"Student". 1907. "On the Error of Counting with a Haemacytometer." *Biometrika* 5 (3), 351-360.

Suppes, Patrick. 1957. *Introduction to Logic*. Princeton: D. Van Nostrand.

Tarski, Alfred. 1983. "The Concept of Truth in Formalized Languages." In *Logic, semantics, metamathematics: Papers*

from 1923 to 1938, translated by Joseph Henry Woodger, 2nd edition introduced and edited by John Corcoran, 152-278. Indianapolis: Hackett. Polish original first published 1933.

Theodosius. (c. 2nd century BCE) 2012. *Sphaerica*. Nabu Press. Reprint of the 1852 edition. Citations are to the chapter and section numbers.

Thurstone, Louis Leon. 1932. *The Reliability and Validity of Tests*. Ann Arbor, MI: Edwards Brothers. https://babel.hathitrust.org/cgi/pt?id=wu.89097667356;view=1up;seq=5.

Todd, Knox H. 1996. "Clinical versus Statistical Significance in the Assessment of Pain Relief." *Annals of Emergency Medicine* 27, no. 4: 439-441.

Trifonov, Edward N. 2011. "Vocabulary of Definitions of Life Suggests a Definition." *Journal of Biomolecular Structure and Dynamics* 29 (2): 259-266.

Trochim, William, James Donnelly, and Kanika Arora. 2016. *Research Methods: The Essential Knowledge Base*. Clifton Park, NY: Delmar Cengage Learning.

van Tulder, Maurits, Antti Malmivaara, Jill Hayden, and Bart Koes. 2007. "Statistical Significance versus Clinical Importance: Trials on Exercise Therapy for Chronic Low Back Pain as Example." *Spine* 32, no. 16: 1785-1790.

Veatch, Robert M., and Lainie Friedman Ross. 2016. *Defining Death: The Case for Choice*. Washington, D.C.: Georgetown University Press.

Watson, H. W. 1904. "Determining Factors in the Selection of Brewery Yeasts." *Journal of the Institute of Brewing* 10 (6): 536-538.

Weinrich, Uriel. 1967. "Lexicographical Definition in Descriptive Semantics." In *Problems in Lexicography*, 2nd ed., edited by Fred W. Householder and Sol Saporta, 25-44. Bloomington, Indiana University Press. First published in 1962.

Wierzbicka, Anna. 1996. *Semantics: Primes and Universals*. Oxford: Oxford University Press.

Wierzbicka, Anna. 1997. *Understanding Cultures through their Key Words*. Oxford: Oxford University Press.

Zgusta, Ladislav. 1971. *Manual of Lexicography*. Janua Linguarum, Series Maior 39. Prague: Academia.

Zipf, George Kingsley. 1935. *The Psycho-Biology of Language: An Introduction to Dynamic Philology*. Cambridge, MA: Houghton Mifflin.

Index

Terms defined in examples

Note: Many of the cited definitions are bad definitions, used as examples of how one can go wrong in defining a term.