Definition by Genus and Difference

Definition by genus and difference relies directly on the intension of the terms defined, and it does so in the most helpful way. In view of their exceedingly common use, we look very closely at definitions of this type.*

Earlier we referred to the attributes that define a class. Normally these attributes are complex—that is, they can be analyzed into two or more other attributes. This complexity and analyzability can be understood in terms of classes. Any class of things having members may have its membership divided into subclasses. For example, the class of all triangles can be divided into three nonempty subclasses: equilateral triangles, isosceles triangles, and scalene triangles. The class whose membership is thus divided into subclasses is called the genus, and the various subclasses are its species. As used here, the terms “genus” and “species” are relative terms, like “parent” and “offspring.” The same persons may be parents in relation to their children, but also offspring in relation to their parents. Likewise, a class may be a genus in relation to its own subclasses, but also a species in relation to some larger class of which it is a subclass. Thus the class of all triangles is a genus relative to the species scalene triangle and a species relative to the genus polygon. The logician’s use of the words “genus” and “species” as relative terms is different from the biologist’s use of them as fixed or absolute terms, and the two uses should not be confused.

A class is a collection of entities having some common characteristic. Therefore all members of a given genus have some characteristic in common. All members of the genus polygon (for example) share the characteristic of being closed plane figures bounded by straight line segments. This genus may be divided into different species or subclasses, such that all the members of each subclass have some further attribute in common that is shared by no member of any other subclass. The genus polygon is divided into triangles, quadrilaterals, pentagons, hexagons, and so on. Each species of the genus polygon differs from all the rest. What differentiates members of the subclass hexagon from the members of all other subclasses is having precisely six sides. In general, all members of all species of a given genus share some attribute that makes them members of the genus, but the members of any one species share some further attribute that differentiates them from the members of every other species of that genus. The characteristic that serves to distinguish them is called the specific difference. Having six sides is the specific difference between the species hexagon and all other species of the genus polygon.

*Definitions by genus and difference are also called analytical definitions, or by their Latin name, definitions per genus et differentia.
Thus, we may say that the attribute of being a hexagon is analyzable into the attributes of (1) being a polygon and (2) having six sides. To someone who did not know the meaning of the word “hexagon” or of any synonym of it, but who did know the meanings of the words “polygon,” “sides,” and “six,” the meaning of the word “hexagon” can be readily explained by means of a definition by genus and difference: The word “hexagon” means “a polygon having six sides.”

Using the same technique, we can readily define “prime number”: A prime number is any natural number greater than one that can be divided exactly, without remainder, only by itself or by one.

Two steps are required to define a term by genus and difference. First, a genus must be named—the genus of which the species designated by the definiendum is the subclass. Second, the specific difference must be named—the attribute that distinguishes the members of that species from members of all other species in that genus. In the definition of prime number just given, the genus is the class of natural numbers greater than one: 2, 3, 4, . . . , and so on; the specific difference is the quality of being divisible without remainder only by itself or by one: 2, 3, 5, 7, 11, . . . , and so on. Definitions by genus and difference can be very precise.

Two limitations of definitions by genus and difference deserve notice, although such definitions remain, nevertheless, exceedingly useful. First, the method is applicable only to terms whose attributes are complex in the sense indicated above. If there are any attributes that are absolutely unanalyzable, then the words with those intensions cannot be defined by genus and difference. The sensed qualities of the specific shades of a color have been thought by some to be simple and unanalyzable in this sense. Whether there really are such unanalyzable attributes remains an open question, but if there are, they limit the applicability of definition by genus and difference. Second, the technique is not applicable when the attributes of the term are universal. Words such as “being,” “entity,” “existent,” and “object,” cannot be defined by the method of genus and difference because the class of all entities (for example) is not a species of some broader genus. A universal class (if there is one) constitutes the very highest class, or summum genus, as it is called. The same limitation applies to words referring to ultimate metaphysical categories, such as “substance” or “attribute.” Neither of these limitations, however, is a serious handicap in most contexts in which definitions are needed.

Constructing good definitions by genus and difference is by no means a simple task; it requires thoughtful selection of the most appropriate genus for the term in question, as well as identification of the most helpful specific difference for that term. In appraising proposed definitions by genus and difference, especially when they are intended as lexical, there are five good rules that have been traditionally laid down.
Rule 1: A definition should state the essential attributes of the species.

Earlier we distinguished the conventional intension of a term from the subjective intension and the objective intension. To define a term using, as its specific difference, some attribute that is not normally recognized as its attribute, even though it may be a part of that term’s objective intension, would be a violation of the spirit of this rule. The rule itself might best be expressed, using our terminology, by saying that a definition should state the conventional intension of the term being defined.

The conventional intension of a term is not always an intrinsic characteristic of the things denoted by that term. It may concern the origin of those things, or relations of the members of the class defined to other things, or the uses to which the members of that class are normally put. Thus the term “Stradivarius violin,” which denotes a number of violins, has as its conventional intension no actual physical characteristic but rather the attribute of being a violin made in the Cremona workshop of Antonio Stradivari. The essential attributes of “governors” or “senators” would not be any specific mental or physical features that differentiate them from other persons, but the special relations they have to other citizens. The use of shape, or material, as the specific difference of a class is usually an inferior way to construct a definition. It is not an essential attribute of a “shoe,” for example, that it is made of leather; what is critical in its definition is the use to which it is put, as an outer covering for the foot.

Rule 2: A definition must not be circular.

If the definiendum itself appears in the definiens, the definition can explain the meaning of the term being defined only to those who already understand it. So if a definition is circular it must fail in its purpose, which is to explain the meaning of the definiendum.

A book on gambling contains this blatant violation of the rule: “A compulsive gambler is a person who gambles compulsively.”\textsuperscript{16} And a sophisticated scientist, writing in a medical journal, lapses into definitional circularity in this passage: “This review defines stress as a specific morphological, biochemical, physiological, and/or behavioral change experienced by an organism in response to a stressful event or stressor.”\textsuperscript{17}

As applied to definitions by genus and difference, avoiding circularity rules out the use, in the definiens, of any synonym of the definiendum. For example, there is no point in defining “lexicon” as “a compilation of words like a dictionary.” If the synonym “dictionary” is assumed to be understood, one could as well give a straightforward synonymous definition of “lexicon” instead of resorting to the more powerful but more complicated technique of...
genus and difference. By the same token, antonyms of the definiendum are also ruled out.

**Rule 3:** A definition must be neither too broad nor too narrow.

This is an easy rule to understand, but it is often difficult to respect. We don’t want the definiens to denote more things than are denoted by the definiendum, or fewer things either, of course. But mistakes are often made. When Plato’s successors in the Academy at Athens settled on the definition of “man” as “featherless biped,” their critic, Diogenes, plucked a chicken and threw it over the wall into the Academy. There was a featherless biped—but no man! The definiens was too broad. Legend has it that to narrow the definition of “man,” the attribute “having broad nails” was added to the definiens.

Finding or constructing the definiens that has precisely the correct breadth is the task faced by the lexicographer, and it is often very challenging. But if Rule 1 has been fully observed, the essence of the *definiendum* stated in the definiens, this rule will have been obeyed, because the conventional intension of the term cannot be too broad or too narrow.

**Rule 4:** Ambiguous, obscure, or figurative language must not be used in a definition.

Ambiguous terms in the definiens obviously prevent the definition from performing its function of explaining the definiendum. Obscure terms also defeat that purpose, but obscurity is a relative matter. What is obscure to amateurs may be perfectly familiar to professionals. A “dynatron oscillator” does truly mean “a circuit that employs a negative-resistance volt-ampere curve to produce an alternating current.” Although it may be obscure to the ordinary person, the language of this definiens is wholly intelligible to the students of electrical engineering for whom the definition was written; its technical nature is unavoidable. Obscure language in nontechnical definitions may result in an effort to explain the unknown using what is even more unknown. Dr. Samuel Johnson, in his great *Dictionary of the English Language* (1755), defined “net” as meaning “anything reticulated or decussated at equal distances with interstices between the intersections”—a good example of obscurity in definition.

Another sort of obscurity arises when the language of the definiens is metaphorical. Figurative language may convey a “feel” for the term being defined, but it cannot give a clear explanation of the term. We do not learn the meaning of the word “bread” if we are told only that it is “the staff of life.” *The Devil’s Dictionary* (1911), by Ambrose Bierce, is a collection of witty definitions,
many of which have a cynical bite. Bierce defined “fib” as “a lie that has not cut its teeth,” and “oratory” as “a conspiracy between speech and action to cheat the understanding.” Entertaining and insightful such definitions may be, but serious explanations of the definiendums they are not.

**Rule 5:** A definition should not be negative when it can be affirmative.

What a term *does* mean, rather than what it does *not* mean, is what the definition seeks to provide. There are far too many things that the vast majority of terms do not mean; we are unlikely to cover them all in a definition. “A piece of furniture that is not a bed or a chair or a stool or a bench” does not define a couch; neither does it define a dresser. We need to identify the attributes that the definiendum has, rather than those it does not have.

Of course there are some terms that are essentially negative and therefore require negative definitions. The word “bald” means “the state of not having hair on one’s head,” and the word “orphan” means “a child who does not have parents.” Sometimes affirmative and negative definitions are about equally useful; we may define a “drunkard” as “one who drinks excessively,” but also as “one who is not temperate in drinking.” In those cases in which negatives are used appropriately in specifying the essential attributes, the genus must first be mentioned affirmatively. Then, sometimes, the species can be characterized accurately by rejecting all other species of that genus. Only rarely are the species few enough to make this possible. If, for example, we define “scalene” triangle as “a triangle that is neither equilateral nor isosceles,” we respect poorly the spirit of Rule 1—because it is the essential attribute that the class does possess, “having sides of unequal length,” that best defines it. In general, affirmative definitions are much preferred over negative ones.

In summary, intensional definitions, and among them definitions by genus and difference especially, can serve any of the purpose for which definitions are sought. They may help to eliminate ambiguity, to reduce vagueness, to give theoretical explanation, and even to influence attitudes. They are also commonly used to increase and enrich the vocabulary of those to whom they are provided. For most purposes, intensional definitions are much superior to extensional definitions, and of all definitions that rely on intensions, those constructed by genus and difference are usually the most effective and most helpful.

**EXERCISES**

A. Construct definitions for the following terms (in the box on the left side) by matching the *definiendum* with an appropriate genus and difference (from the box on the right side.)
B. Criticize the following in terms of the rules for definition by genus and difference. After identifying the difficulty (or difficulties), state the rule (or rules) that are being violated. If the definition is either too narrow or too broad, explain why.

1. A genius is one who, with an innate capacity, affects for good or evil the lives of others.

2. Knowledge is true opinion.
   —Plato, Theaetetus

3. Life is the art of drawing sufficient conclusions from insufficient premises.
   —Samuel Butler, Notebooks

4. “Base” means that which serves as a base.
   —Ch’eng Wei-Shih Lun, quoted in Fung Yu-Lan, A History of Chinese Philosophy, 1959

5. Alteration is combination of contradictorily opposed determinations in the existence of one and the same thing.
   —Immanuel Kant, Critique of Pure Reason, 1787
6. Honesty is the habitual absence of the intent to deceive.

7. Hypocrisy is the homage that vice pays to virtue.
   —François La Rochefoucauld, Reflections, 1665

8. The word body, in the most general acceptation, signifieth that which filleth, or occupieth some certain room, or imagined place; and dependeth not on the imagination, but is a real part of that we call the universe.
   —Thomas Hobbes, Leviathan

9. Torture is “any act by which severe pain or suffering, whether physical or mental, is intentionally inflicted on a person for such purposes as obtaining from him or a third person information or a confession.”
   —United Nations Convention Against Torture, 1984

10. “Cause” means something that produces an effect.

11. War . . . is an act of violence intended to compel our opponent to fulfill our will.
    —Carl Von Clausewitz, On War, 1911

12. A raincoat is an outer garment of plastic that repels water.

13. A hazard is anything that is dangerous.
    —Safety with Beef Cattle, U.S. Occupational Safety and Health Administration, 1976

14. To sneeze [is] to emit wind audibly by the nose.
    —Samuel Johnson, Dictionary, 1814

15. A bore is a person who talks when you want him to listen.
    —Ambrose Bierce, 1906

16. Art is a human activity having for its purpose the transmission to others of the highest and best feelings to which men have risen.
    —Leo Tolstoi, What Is Art?, 1897

17. Murder is when a person of sound memory and discretion unlawfully killeth any reasonable creature in being, and under the king’s peace, with malice aforethought, either express or implied.
    —Edward Coke, Institutes, 1684

18. A cloud is a large semi-transparent mass with a fleecy texture suspended in the atmosphere whose shape is subject to continual and kaleidoscopic change.
    —U. T. Place, “Is Consciousness a Brain Process?”
    The British Journal of Psychology, February 1956
19. Freedom of choice: the human capacity to choose freely between two or more genuine alternatives or possibilities, such choosing being always limited both by the past and by the circumstances of the immediate present.


20. Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.

—Constitution of the World Health Organization, 1946

21. By analysis, we mean analyzing the contradictions in things.

—Mao Zedong, *Quotations from Chairman Mao*, 1966

22. Noise is any unwanted signal.


23. To explain (explicate, *explicare*) is to strip reality of the appearances covering it like a veil, in order to see the bare reality itself.


24. The Master said, Yu, shall I teach you what knowledge is? When you know a thing, to recognize that you know it, and when you do not know a thing, to recognize that you do not know it. That is knowledge.

—Confucius, *The Analects*

25. I would define political correctness as a form of dogmatic relativism, intolerant of those, such as believers in “traditional values,” whose positions are thought to depend on belief in objective truth.


C. Discuss the following definitions.

1. Faith is the substance of things hoped for, the evidence of things not seen.

—Heb. 11:1

2. “Faith is when you believe something that you know ain’t true.”

—Definition attributed to a schoolboy by William James in “The Will to Believe,” 1897

3. Faith may be defined briefly as an illogical belief in the occurrence of the improbable.

—H. L. Mencken, *Prejudice*, 1922
4. Poetry is simply the most beautiful, impressive, and widely effective mode of saying things.

   —Matthew Arnold, 1865

5. Poetry is the record of the best and happiest moments of the happiest and best minds.

   —Percy Bysshe Shelley, *The Defence of Poetry*, 1821

6. Dog, n. A kind of additional or subsidiary Deity designed to catch the overflow and surplus of the world’s worship.

   —Ambrose Bierce, *The Devil’s Dictionary*, c. 1911

7. Conscience is an inner voice that warns us somebody is looking.

   —H. L. Mencken, 1949

8. A bond is a legal contract for the future delivery of money.

   —Alexandra Lebenthal, Lebenthal and Company, 2001

9. “The true,” to put it very briefly, is only the expedient in the way of our thinking, just as “the right” is only the expedient in the way of our behaving.

   —William James, “Pragmatism’s Conception of Truth,” 1907

10. To be conceited is to tend to boast of one’s own excellences, to pity or ridicule the deficiencies of others, to daydream about imaginary triumphs, to reminisce about actual triumphs, to weary quickly of conversations which reflect unfavorably upon oneself, to lavish one’s society upon distinguished persons and to economize in association with the undistinguished.

   —Gilbert Ryle, *The Concept of Mind*, 1949

11. Economics is the science which treats of the phenomena arising out of the economic activities of men in society.

   —J. M. Keynes, *Scope and Methods of Political Economy*, 1891

12. Justice is doing one’s own business, and not being a busybody.

   —Plato, *The Republic*

13. Legend has it that the distinguished economist, John Maynard Keynes, enjoyed referring to a university education as “the inculcation of the incomprehensible into the indifferent by the incompetent.”

14. By good, I understand that which we certainly know is useful to us.

   —Baruch Spinoza, *Ethics*, 1677
15. Political power, then, I take to be a right of making laws with penalties of death, and consequently all less penalties, for the regulating and preserving of property, and of employing the force of the community in the execution of such laws, and in defense of the commonwealth from foreign injury, and all this only for the public good.

—John Locke, *Essay Concerning Civil Government*, 1690

16. And what, then, is belief? It is the demi-cadence which closes a musical phrase in the symphony of our intellectual life.

—Charles Sanders Peirce, “How to Make Our Ideas Clear,” 1878

17. Political power, properly so called, is merely the organized power of one class for oppressing another.

—Karl Marx and Friedrich Engels, *The Communist Manifesto*, 1847

18. Grief for the calamity of another is *pity*; and ariseth from the imagination that the like calamity may befall himself.

—Thomas Hobbes, *Leviathan*, 1651

19. We see that all men mean by justice that kind of state of character which makes people disposed to do what is just and makes them act justly and wish for what is just.

—Aristotle, *Nichomachean Ethics*

20. Inquiry is the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole.


21. A fanatic is one who can’t change his mind and won’t change the subject.

—Winston Churchill

22. Regret is the pain people feel when they compare what is with what might have been.


23. Happiness is the satisfaction of all our desires, *extensively*, in respect of their manifoldness, *intensively*, in respect of their degree, and *potensively*, in respect of their duration.

—Immanuel Kant, *Critique of Pure Reason*, 1787
24. A tragedy is the imitation of an action that is serious and also, as having magnitude, complete in itself; in language with pleasurable accessories, each kind brought in separately in the parts of the work; in a dramatic, not in a narrative form; with incidents arousing pity and fear, wherewith to accomplish its catharsis of such emotions.

—Aristotle, Poetics

25. Propaganda is manipulation designed to lead you to a simplistic conclusion rather than a carefully considered one.


26. . . . the frequently celebrated female intuition . . . is after all only a faculty for observing tiny insignificant aspects of behavior and forming an empirical conclusion which cannot be syllogistically examined.

—Germaine Greer, The Female Eunuch, 1971

27. A fetish is a story masquerading as an object.


28. Religion is a complete system of human communication (or a “form of life”) showing in primarily “commissive,” “behabitive,” and “exercitive” modes how a community comports itself when it encounters an “untranscendable negation of . . . possibilities.”


29. Robert Frost, the distinguished New England poet, used to define a liberal as someone who refuses to take his own side in an argument.

—“Dreaming of JFK,” The Economist, 17 March 1984

30. The meaning of a word is what is explained by the explanation of the meaning.

—Ludwig Wittgenstein, Philosophical Investigations, 1953

SUMMARY

In this chapter we have been concerned with the uses of language, and with definitions.

In Section 3.1 we identified the three chief uses of language—the informative, the expressive, and the directive—and two less common uses—the ceremonial and the performative.

In Section 3.2 we discussed the emotive and the neutral meanings of words. Disputes, we explained, may arise from conflicting beliefs about facts,
or from conflicting attitudes about facts whose truth may (or may not) be agreed on, and we emphasized the importance of the neutral uses of language in logical discourse.

In Section 3.3 we explained that ambiguous terms are those that have more than one distinct meaning in a given context. We distinguished three different kinds of disputes: those that are genuine, whether the conflict be about beliefs or attitudes; those that are merely verbal, arising from the unrecognized use of ambiguous terms, and those that are genuine but appear on the surface to be verbal, in which a real difference remains even after apparent ambiguity has been eliminated.

In Section 3.4 we began the discussion of definitions, distinguishing the definiendum (the symbol that is to be defined) from the definiens (the symbol or group of symbols used to explain the meaning of the definiendum). We distinguished five different kinds of definition based on their functions: (1) stipulative definitions, with which a meaning is assigned to a term (and hence which cannot be true or false); (2) lexical definitions, which report the meaning that the term already has (and hence can be true or false); (3) precising definitions, which aim is to eliminate vagueness or ambiguity; (4) theoretical definitions, which aim is to encapsulate our understanding of some intellectual sphere; and (5) persuasive definitions, which aim to influence conduct.

In Section 3.5 we explained the structure of definitions, first distinguishing the extension of a general term, the objects denoted by it, from its intension, the attributes shared by all and only the members of the class designated by that term. We explained three varieties of extensional definition: definition by example, in which we list, or give examples of the objects denoted by the term; ostensive definitions, in which we point to, or indicate by gesture the extension of the term being defined; and semi-ostensive definitions, in which the pointing or gesture is accompanied by a descriptive phrase whose meaning is assumed known.

We also distinguished three varieties of intensional definition: synonymous definitions, in which we provide another word whose meaning is already understood that has the same meaning as the word being defined; operational definitions, which state that a term is applied correctly to a given case if and only if the performance of specified operations in that case yields a specified result; and definitions by genus and difference, of which a full account is given in the following Section.

In Section 3.6 we closely examined definitions by genus and difference, in which we first name the genus of which the species designated by the definiendum is a subclass, and then name the attribute (or specific difference) that distinguishes the members of that species from members of all other species of that genus. We formulated and explained five rules for the construction of good definitions by genus and difference: (1) A definition should
state essential attributes; (2) a definition must not be circular; (3) a definition must not be too broad or too narrow; (4) definitions should not rely on ambiguous, obscure, or figurative language; and (5) when possible, definitions should not be negative.

**End Notes**

1. John Burgon, “Petra” (1845), on the ruins of Petra, now in Jordan.


4. By provision of the Federal Communications Decency Act. The reason those seven words are held not fit to broadcast is the reason they are not listed here. But the letters with which they begin are: S, P, F, C, M, and T.

5. Defined stipulatively in 1991 by the *Conférence générale des poids et mesures* (General Committee on Weights and Measures), the international body that governs in the realm of scientific units. At the other extreme, a billionth of a trillionth has been stipulatively named a “zepto,” and a trillionth of a trillionth is called a “yocto.” Perhaps the most famous of all stipulations was the arbitrary naming of the number $10^{100}$ (represented by the digit 1 followed by 100 zeros) as a “googol”—a name suggested by the 9-year-old nephew of the mathematician, Edward Kasner, when he was asked for a word that might appropriately represent a very large number. The name of the now-famous Internet search firm, Google, is a deliberate misspelling of this term.

6. The term was introduced by Dr. John Archibald Wheeler at a 1967 meeting of the Institute for Space Studies in New York City.

7. In James Joyce’s novel *Finnegan’s Wake*, the word “quark” appears in the line, “Three quarks for Muster Mark,” but Dr. Gell-Mann reported that he had chosen this name for the particle before he had encountered it in that novel.


13. In a system other than our solar system, the new definition requires that the body be (1) in orbit around a star or stellar remnant; and (2) have a mass below the limiting mass for thermonuclear fusion of deuterium; and (3) be above the minimum mass/size requirement for planetary status in the solar system.


15. The term *operational definition* was first used by the Nobel Prize-winning physicist P. W. Bridgeman in his 1927 book, *The Logic of Modern Physics*.
