Definition

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1 Introduction

Definitions usually take the following form:

$$\text{A } \underbrace{\text{human being}}_{\text{defined term}} \text{ is a } \underbrace{\text{featherless biped}}_{\text{defining formula}}.$$

The *defined term* is also known as the *term being defined*, *term to be defined* and *definiendum*. The *defining formula* is also known as the *definiens*. (Note that the plural of 'definiendum' is 'definienda' and the plural of 'definiens' is 'definientia'.)

2 Real and Abbreviatory Definitions

2.1 Introduction

There are two ways in which you can read a definition. You can read it from left to right and you can read it from right to left. To read a definition from left to right is to treat it as a *real* or *essentialist* definition, whereas to read it from right to left is to treat it as an *abbreviatory*, *nominalist* or *verbal* definition. Abbreviatory definitions are good and helpful and commonplace in science for they replace a (usually) long expression with a shorter one as the following examples show:

local Mach number The ratio of the velocity of the airflow over a part of a body in flight to the local speed of sound.

velocity ratio The ratio of the distance moved through by the point of application of the effort to the corresponding distance for the load in a machine.

(These definitions are taken from the Larousse *Dictionary of Science and Technology* (1995 edition).) Real or essentialist definitions, however, are bad, but before I explain why, I first need some more terminology.

B is a *necessary condition* for something to be an A iff, for all x, if $A(x)$, then $B(x)$. B is a *sufficient condition* for something to be an A iff, for all x, if $B(x)$, then $A(x)$. For example, being featherless is a necessary but not sufficient condition for something to be human and being human is a sufficient but not necessary condition for something to be a biped.

	1	2	3	4	5
A	×			×	
B	×	×	×		×
C		×		×	×
D		×	×		
E	×		×	×	
F		×	×	×	×
G	×		×		×

Table 1: Family resemblance.

An often stated requirement for something to be a good definition is that the defining formula must provide necessary and sufficient conditions for the term being defined. In other words, the definition must be neither *too wide* nor *too narrow*. The following illustrate the two ways in which definitions can go wrong:

- A bachelor is an unmarried adult male psychiatrist.

- A bachelor is an unmarried adult.

2.2 Family-resemblance Terms

One problem with real definitions is that there exist terms for which it is impossible to find a defining formula that provides necessary and sufficient conditions for them. Such terms are known as *family-resemblance* terms (see Table 1). Wittgenstein says the following about such terms (*The Blue and Brown Books* (1960), p. 25):

> We are unable to circumscribe the concepts we use; not because we don't know their real definition, but because there is no real "definition" to them. To suppose that there *must* be would be like supposing that whenever children play with a ball they play a game according to strict rules.

2.3 The Infinite Regress of Definitions

Another problem with essentialist definitions is that the terms that occur in the defining formula themselves are in need of definition. Many people fail to recognise this obvious point. Consider the following passage from Crossman's book, *Plato To-Day* (1937), p. 71f:

> Most of the futile arguments on which we all waste time are largely due to the fact that we each have out own vague meanings for the words we use and assume that our opponents are using them in the same senses. If we defined our terms to start with, we could have far more profitable discussions. . . . If politicians were compelled by law to define any term they wished to use, they would lose most of their popular appeal, their speeches would

be shorter, and many of their disagreements would be found to be purely verbal.

Using the notation

$$\frac{A \quad B \quad C}{T}$$

to mean that T is defined to be ABC, it is easy to see why Crossman's suggestion is unrealistic:

$$\begin{array}{cc} \frac{\ddots \quad \vdots \quad \cdot\cdot}{T_4} \quad \frac{\ddots \quad \vdots \quad \cdot\cdot}{T_5} \quad \frac{\ddots \quad \vdots \quad \cdot\cdot}{T_6} \quad \frac{\ddots \quad \vdots \quad \cdot\cdot}{T_7} \\ \frac{\qquad\qquad}{T_2} \qquad \frac{\qquad\qquad}{T_3} \\ \frac{\qquad\qquad\qquad\qquad}{T_1} \end{array}$$

Definitions cannot go on forever. This point is made by Popper in the left-hand side of Table 2. (This table occurs in several of Popper's writings, namely *Unended Quest*, [4, p. 21], *Objective Knowledge*, [3, p. 124], *Conjectures and Refutations*, [2, p. 19]. I will return to the right-hand side of this table in a later lecture.)

A concrete example might make this point even clearer. Consider the sentence 'The cat sat on the mat'; replace the noun 'cat' by its defining formula 'carnivore of genus Felis'. Next, replace the noun 'carnivore' by its defining formula. In the following displayed sentences the noun that is being defined is underlined and its defining formula is indicated by an overbrace. After a few replacements, we find a word used in the defining formula that occurred in the original sentence, namely 'cat'.

The <u>cat</u> sat on the mat.

The $\overbrace{\underline{\text{carnivore}} \text{ of genus Felis}}$ sat on the mat.

The $\overbrace{\underline{\text{carnivorous}} \text{ animal}}$ of genus Felis sat on the mat.

The $\overbrace{\text{flesh-eating}}$ <u>animal</u> of genus Felis sat on the mat.

The flesh-eating $\overbrace{\text{organised being having life, sensation and voluntary motion}}$ of <u>genus</u> Felis sat on the mat.

The flesh-eating organised being having life, sensation and voluntary motion of $\overbrace{\text{taxonomic group of lower rank than a family}}$ <u>Felis</u> sat on the mat.

The flesh-eating organised being having life, sensation and voluntary motion of taxonomic group of lower rank than a family $\overbrace{\text{the cat genus}}$ sat on the mat.

	IDEAS	
	that is	
DESIGNATIONS		STATEMENTS
or		*or*
TERMS		PROPOSITIONS
or		*or*
CONCEPTS		THEORIES
	may be formulated in	
WORDS		ASSERTIONS
	which may be	
MEANINGFUL		TRUE
	and their	
MEANING		TRUTH
	may be reduced, by way of	
DEFINITIONS		DERIVATIONS
	to that of	
UNDEFINED		PRIMITIVE
CONCEPTS		PROPOSITIONS
	the attempt to establish	
	(rather than reduce)	
	by these means their	
MEANING		TRUTH
	leads to an infinite regress	

Table 2: Popper's table of ideas.

2.4 Continuous Re-definition

Another problem with essentialist definitions is that many of them change over time and yet, if they were correct, you would expect them to remain true forever. Take the term *life* as an example. The meaning of this is discussed in Artificial Life because some of those working in this field want to know if something artificial could ever truly be considered to be alive. Some have claimed that Aristotle accepted the following definition [1, p. 18]:

> Something is alive if it possesses a soul.

After Darwinism became generally accepted, however, the definition changed. The evolutionary biologist John Maynard Smith writes (quoted in [1, p. 7]):

> Life should be defined by the possession of those properties which are needed to ensure evolution by natural selection ... . That is, entities with the properties of multiplication, variation, and heredity are alive, and entities lacking one or more of those properties are not.

After the discovery of DNA, another definition was proposed by Ernst Mayr (quoted in [1, p. 7]):

> The possession of a genetic program provides for an absolute difference between organisms and inanimate matter ... .

Thus, far from being independent of the changes in biological thinking, the various definitions of *life* that have been proposed piggy-back on theoretical developments.

Trying to provide necessary and sufficient conditions for something to be alive is exceptionally difficult in any case. This emerges from a more recent definition (taken from the *Star Trek: The Next Generation* episode "The Quality of Life"):

> [To be considered alive entities must have the ability] to consume food, derive energy from it, grow, adapt themselves to their surroundings and reproduce.

This occurs in the context of a discussion about whether or not the android Data is alive. He points out that a candle flame satisfies this definition.

3 Essentialism

Real definitions are closely related to an ancient philosophical theory called *essentialism*. There are several varieties of essentialism. The oldest is metaphysical essentialism (see Table 3). This holds that essences are genuine objects, but they exist outside space and time. Furthermore, essences are what the defined terms of real definitions stand for or refer to (just as proper names, like 'Tony Blair', stand for or refer to actual people). Real definitions are what people are after when they ask what-is? questions such as the following:

	metaphysical or ontological	methodological
essentialism	essences exist; they're immaterial, eternal, etc.	we make contact with essences using 'intuition'
anti-essentialism	essences do not exist	ignore what-is? questions; ask why?, how?, what-for?, etc.

Table 3: Varieties of essentialism and anti-essentialism.

- What is consciousness?

- What is the mind?

- What is the self?

- What is life?

- What is an explanation?

One of the problems with what-is? questions is that they are lazy questions to ask. People often ask them when they really do not know what they want to know about something. Consider the question 'What is consciousness?' Many have tried to answer this question. Here is one example (from Alfred North Whitehead's *Modes of Thought* (1938), p. 147):

> Consciousness is an ever-shifting process of abstracting shifting quality from a massive process of essential existence. It emphasizes. And yet, if we forget the background, the result is triviality.

I doubt that many of you will now feel that you understand what consciousness is. My suggestion is that you avoid asking, 'What is consciousness?' Rather, think carefully about what in particular you want to know about consciousness. For example, the following is one way of asking a better question (taken from Popper's contribution to *The Self and its Brain* (1977), §36, p. 125):

> Much of our purposeful behaviour (and presumably of the purposeful behaviour of animals) happens without the intervention of consciousness. What, then, are the biological achievements that are helped by consciousness?

There are, of course, many other questions that could be asked about consciousness. The following is a summary of why asking what-is? questions is to be avoided:

- At least some terms are family resemblance terms.

- Answers give the impression of finality or permanence.

- They lead to essentialism.

- They have a tendency to degenerate into merely verbal questions.

- They are rarely, if ever, fruitful.

- They save us the trouble of thinking out and saying what we want to know about X.

4 Avoiding Essentialist Language

Few people nowadays are thoroughgoing metaphysical essentialists, but the use of essentialist language is very widespread. Such language is harmful because it obscures the fact that all knowledge is conjectural and it obscures the fact that all theories are criticisable. The following example of essentialist language is taken from Conrad Russell's book *Academic Freedom* (1993), p. 29 (my emphasis):

> Research, *in its very nature*, is a form of gambling, for the researcher does not know what he is going to find out.

This would be better phrased as:

> There are several theories about the activity of research. Mine is that research is a form of gambling.

The following example of essentialist language is from *Plans and the Structure of Behavior* (1960), p. 16, by Miller, Galanter and Pribram (my emphasis):

> A Plan *is*, for [a human being], *essentially the same as* a program for a computer.

This would be better phrased as:

> Our conjecture is that a plan for a human being is the same as a program for a computer.

An even better paraphrase is the following:

> Our conjecture is that a plan for a human being is like a program for a computer.

5 The Etymological Fallacy

Etymology is the study of the origins of words. A fairly common fallacy is to think that the oldest meaning of a word is somehow the correct one. The fallacy is exposed by Martin Gray in *A Dictionary of Literary Terms* (1992), p. 110, as follows:

[The etymological fallacy is the] pedantic insistence that the oldest meaning of a word is its proper meaning, rather than a present-day use. An ordinary example is offered by the word 'aggravate' which means 'make heavier' but, to some people's disapproval, is commonly used to mean 'irritate'.

In general, however, words have to be used without any sense of their old and now esoteric meanings. 'Admiral', for example, comes from the Arabic *emir al* meaning 'chief of —', the final word in the Arabic expression (for a fleet of ships) having been lost; the 'd' was then added through false association with 'admire'. To insist on using a word with such a muddled provenance in any etymologically 'accurate' way would clearly be fruitless.

References

[1] Steven Levy. *Artificial Life: The Quest for a New Creation.* Penguin Books, London, paper edition, 1993.

[2] Karl Raimund Popper. *Conjectures and Refutations: The Growth of Scientific Knowledge.* Routledge and Kegan Paul, London, fifth edition, 1974. Originally published in 1963.

[3] Karl Raimund Popper. *Objective Knowledge: An Evolutionary Approach.* Oxford University Press, London, 1975. Originally published in 1972.

[4] Karl Raimund Popper. *Unended Quest: An Intellectual Autobiography.* Routledge, London, 1992. Originally published in this form in 1976.

[5] Karl Raimund Popper and John C. Eccles. *The Self and its Brain: An Argument for Interactionism.* Routledge, London and New York, 1977.

[6] Conrad Russell. *Academic Freedom.* Routledge, London and New York, 1993.

[7] Ludwig Wittgenstein. *The Blue and Brown Books.* Basil Blackwell, Oxford, 1958.