

## Chapter 3. The Mystery of Signs

### [Signs of Representation; seventh to eighth paragraphs]

The idea of a sign is important because it succinctly captures the idea of representations. Specifically, the relationship between a signifier and what it represents produces meaning for us—in the case of the walking stick, a part of Dr. Mortimer’s professional history. The signified is often mistakenly ( ) to be some physical object in the world, but that is not what Saussure meant by it. For example, the word “tree” does not signify an actual tree ( ) the concept of a tree that we have in our minds.

This aspect makes it quite tricky to write about signs because, on the one hand, text and diagrams that are used to write about signs are signs themselves and, ( ), abstract concepts or ideas in the mind can never be shown directly but have to ( ) represented by signs as well. In the literature about semiotics, the theory of signs and their meaning, the idea of a sign is often ( ) by a diagram containing the word “tree” as an example of a signifier and a drawing of a tree as the thing signified by “tree”. However, the drawing is itself a sign for the concept of a tree, and therefore the diagram can be ( ), since “tree” is not a signifier of the drawing but of what the drawing signifies, which is the concept of a tree.

### [Making Sense of Signifiers; last two paragraphs]

The correctness of representation is ( ) for computation because if a computation receives an incorrect representation as input, it will produce incorrect results. This fact is sometimes referred to as “garbage in, garbage out”. Unsurprisingly, computations based on incorrect input that lead to incorrect results can have devastating ( ). If the pebbles represented a path farther into the forest, no correct path-finding algorithm could help find Hansel and Gretel their way home, and they would die in the forest.

A stark reminder of the importance of carefully choosing representations is the loss of the Mars Climate Orbiter, an unmanned spacecraft that was launched in 1998 by NASA to ( ) the climate and atmosphere of Mars. During a maneuver to correct its trajectory, the spacecraft came too close to the surface and disintegrated. The reason for the failed maneuver was the use of two different representations of numbers by the control software and the spacecraft. The software computed thrusts in English units ( ) the thrust controller expected numbers in metric units. This failure of representation came with a heavy price tag of \$655 million. I discuss methods to avoid these kind of mistakes in chapter 14.

### [Three Ways to Signify; first, second and fourth paragraphs]

Given the importance of accurate representation, how is the relationship between a sign and what it signifies established? This can happen in several different ways, and signs can be classified accordingly. The logician, scientist, and philosopher Charles Sanders Peirce identified three different kinds of signs.

First, an icon represents an object based on its similarity or likeness to the object. An example is a drawing of a person that represents the person by highlighting specific features. An obvious example of an iconic representation in *The Hound of the Baskerville* is the portrait of Sir Hugo Baskerville, which represents him through likeness. The portrait also looks ( ) the murderer and is thus another example of a signifier that can stand for different signified. The fact that the portrait is effectively two signs help Sherlock Holmes solve the case. Further examples are the abbreviations CCH and MRCS when they are used to represent the phrases and its abbreviation have in common. ( ), Sherlock Holmes ( ) a map of the Devonshire moor to understand the location where the murder has happened. A map is iconic, since the ( ) it contains (paths, river, forest, etc.) resemble, mostly in shape and position, the objects they represent.

(...)

Third, a symbol represents an object by convention only; no likeness or lawlike connection is involved in the representation. Since the link between the signifier and the signified is completely ( ), the creator and the user of the sign must agree on the definition and interpretation of the sign for it to work. Most modern languages are symbolic. The fact that the word “tree” stands for a tree cannot be ( ) but is a fact that has to be learned. Similarly, that “11” is a symbolic for eleven as well as three and that the pebbles are symbols for locations are ( ). Of the signs we have mentioned from *The Hound of the Baskervilles*, the abbreviations MRCS and CCH are symbols if used to represent the surgeon society membership and the hospital, respectively, because they bear no resemblance nor do they result from any lawlike relationship. Also, the symbol 2704 represents a cab that Holmes and Watson follow to identify a person suspected to be threatening the Baskerville heir Sir Henry.

### Key sentences

- A sign consists of two parts, the signifier and the signified. The signifier is what is perceived or presented, whereas the signified is the concept or idea that the signifier stands for.
- Given its algorithmic nature, it is not surprising that this method has been automated.
- The correctness of representation is crucial for computation because if a computation receives an incorrect representation as input, it will produce incorrect results.