

A Constructive Approach to "Universals"

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But it is beyond the power of human capacity to frame and retain distinct ideas of all the particular things we meet with: every bird and beast men saw; every tree and plant that affected the senses, could not find a place in the most capacious understanding.

John Locke¹

During the Middle Ages, much of the debate about universals concerned the question whether or not they could be considered to "exist". According to their point of view, the discussants could be separated at least roughly into four schools.

1. Platonic Realists, who characterized their position by the slogan *universalia ante res*; they believed that we have general concepts *before* we experience things.
2. Aristotelian Realists , whose slogan was *universalia in rebus sunt*, because they considered them inseparably inherent in things.
3. Nominalists , who maintained that words are the only universals, because they can be applied to a variety of things.
4. Conceptualists , for whom universals arose *post res*, i.e., after the experience of things because they were generated by abstractive thinking from particulars.

All four schools have their problems.

According to 1, all the universals that cover inventions and newfangled things, such as windmills, chastity belts, Highways, quarks, and credit cards, would have to have "existed" at the very beginning. Of course, if you believe with Plato that God supplies every newborn with the full complement of necessary ideas, there is no problem, because God, being omniscient, knows all human inventions before they are made. But for modern thinkers this is not a congenial model.

The Aristotelian notion (2) that the universals are already in the particular things does not answer the crucial question of how they manage to become *general*, given that we never meet them *except in particulars*.

Nominalism (3) still does not explain how it comes about that we find more or less large groups of particulars that can be subsumed under one universal word.

From my constructivist perspective, number 4, the conceptualist approach, is the most interesting; but in the form it was expounded by the empiricists, who partially relied on the nominalist's assumption, it is not quite satisfactory either. I shall therefore lay out a modified brief version of a historically much longer conceptual development that I consider more in keeping with recent ideas.

The abstractive thinking, that produces universal ideas, was well described, for instance, by Descartes:

If, as has often to be done, one thing be deduced from a number of things, we must remove from the ideas of things whatever does not require present attention, so that the remaining features may be the more readily retained in memory. (Descartes, 1629/1958, Rule XII, p.56)

The epigram I have placed at the beginning of this paper is Locke's compelling statement of the *need* for such abstractions. I would suggest that most, if not all, would agree with this statement irrespective of which of the four approaches to universals they subscribe to. Even Berkeley, who vigorously fought against the notion of "abstract general ideas" that were supposed to have *existence* in their own right, freely admitted the generalizing use of words (Berkeley, 1710, Introduction, §12).

In fact, the whole debate about universals is not about whether or not, say, the name "triangle" can be applied to an infinite variety of three-cornered shapes, but rather about whether or not the abstraction it designates actually represents an observer-independent

entity. Berkeley makes this quite explicit and it is therefore useful to quote him at some length:

It is, I know, a point much insisted on, that all knowledge and demonstration are about universal notions, to which I fully agree: but then it doth not appear to me that those notions are formed by abstraction in the manner premised - *universality*, so far as I can comprehend, not consisting in the absolute, positive nature or conception of anything, but in the relation it bears to the particulars signified or represented by it; by virtue whereof it is that things, names, or notions, being in their own nature *particular*, are rendered *universal*. Thus, when I demonstrate any proposition concerning triangles, it is to be supposed that I have in view the universal idea of a triangle; which ought not to be understood as if I could frame an idea of a triangle which was neither equilateral, nor scalenon, equicrural; but only that the particular triangle I consider, whether of this or that sort it matters not, doth equally stand for and represent all rectilinear triangles whatsoever, and is in that sense *universal*. (ibid., §15)

There follows more than a page in which Berkeley tries to substantiate (not very successfully, I think) that, having demonstrated that the sum of the angles in one type of triangle is equal to two right angles, he can extend this finding to all types of triangle, because the length of the sides and the size of the angles do not play any role in the proof. Apparently he himself was not satisfied with his argumentation, for in 1734 he added the following passage to his last edition of the *Principles*:

And here it must be acknowledged that a man may consider a figure merely triangular, without attending to the particular qualities of the angles, or relations of the sides. So far he may abstract: but this will never prove that he can frame an abstract, general, inconsistent idea of a triangle. (1734 addition to 1701, §16)

To assume such a partial abstraction seems indispensable because we all are able to *recognize* as triangles, figures whose sides and angles are not all the same. In this respect, then, Berkeley was a nominalist. A name, he says, though it is the name of a particular, can play the part of a sign, and thus become general (1701, Introduction, §12).

But this leaves open the question of how it comes about that different particulars can be designated by the same sign. For realists, Platonic or Aristotelian, this is no problem because they take it for granted that things-in-themselves manifest similarities that make it possible to sort them into "natural kinds". For nominalists and conceptualists, however, this can hardly be a forgone conclusion, because in their model there is no room for generality outside language.

I do not want to say that Berkeley did not manage to wriggle out of this dilemma; but it is by no means clear to me how he did it. In my view he created the problem himself, when he wrote, in the context of universals: "But my conceiving or imagining power does not extend beyond the possibility of real existence or perception" (1710, Principles, §5). For the reader, the statement is confusing because the "or" makes it ambiguous. One could interpret it as though existence and perception were different affairs; but in Berkeley's model it is exclusively *being perceived* that generates existence (*esse est percipi*). For Berkeley himself, the statement is a trap, because it links "conceiving" and "imagining". For me these are distinct capabilities which, although they sometimes manifest themselves simultaneously, do not coincide on the level of operations. We are able to conceive of many things whose composition is "abstract", because in principle they lie beyond perception. We have, for instance, a concept of negative numbers although we do not perceive them; we can apply the concept of 'lie' without specifying a truth that is being countermanded; and we can, indeed, form a concept of triangle without imagining specific side lengths and specific angles.

This last example can serve as a useful illustration. Let us suppose you are at the entrance to a field and you begin to walk in a straight line; at a certain point you make a turn to the right, walk another stretch straight,

make a second turn to the right, and return in a straight line to the entrance. You know that your walk has described a triangle, irrespective of the length of the straights and the size of the angles. You performed a program of construction that operationally determines and thus defines a triangle although instead of specific values for sides and angles it contains *variables*. The point is that, even in perception, we do not find ready-made triangles but have to build them up from smaller elements.

Berkeley was clearly very close to this insight, when he wrote that one "may consider a figure merely triangular, without attending to the particular qualities of the angles, or relations of the sides." But he was blocked by two conventional notions that prevented him from further elaborating on his statement. Although he had realized that items such as space, time, and number were "things of the mind", he apparently maintained the traditional belief that both concepts and mental images were static and unitary. This was the first blocking notion. The second originated in the indubitable experience that it is impossible to *imagine* a triangle without substituting specific values for the variables in the above definition. Indeed, the operational definition can serve for the *recognition* of triangles, because the missing values are supplied by the very act of perception. But it is impossible to visualize a triangle that should be equilateral, isosceles, and scalene at the same time.

I have elsewhere shown that the ability to recognize something is but a precursor of the ability to imagine that same thing (Glaserfeld, 1979; 1995). Daily experience provides innumerable examples of this. We all have many acquaintances of whom we are unable to produce a mental image, although we recognize them when we meet them in the street; similarly, for all of us there are words of our language (and many more of a second language) whose meaning we know when we hear or read them, but they are nevertheless unavailable to us when we are speaking or writing.

This difference between concept and mental image does, I believe, open a fertile new path in the debate on universals, and the constructivist approach provides a plausible explanation.³ If one relinquishes the usual

assumption that concepts must be conscious, static entities, it becomes possible to show their construction with the help of an empirical example. Lettvin, Maturana, Pitts, & McCulloch (1959) have demonstrated that the nervous system of a frog discovers a possible prey whenever four different fibers of the optical nerve conduct impulses in a certain sequence to the ganglion cells which, in a manner of speaking constitute the frog's center of command. The single impulses are reactions to stimuli which can be described respectively as: (1) local light-dark contrast, (2) convexity of a small dark object, (3) movement of a dark shape, and (4) sudden darkening of the local visual field. Given this arrangement, 1, 2, and 3, react to anything that behaves like a small insect on a dark background. Jointly they trigger the action with which the frog captures its prey (according to the species of frog, jumping and snapping or shooting out the tongue). Impulse 4 serves to impede the action whenever a sudden darkening signals the possibility of a looming danger to the frog. Thus one can say that the coordination of 1, 2, and 3, constitutes the matrix that enables the frog to recognize its food - but it also leads to the fact that the frog will react to a small moving shadow or a rolling black pellet as though it were a bug. We are therefore dealing with a construct of the frog's nervous system, and it does not give the frog a picture of reality but merely a sufficiently successful method for finding nourishment in its environment. Were the frog in a position consciously to reflect on its way of operating, one might add that, for it, the program of the three impulses constitutes the operational definition of an edible insect. However, in order to speak of a mental image, one would have to ascribe to the frog the additional ability to implement the program deliberately when the relevant nerve fibers do not supply the required impulses.

It is interesting to note that fulfillment of this last condition is also the criterion on the basis of which Piaget ascribed the achievement of "object permanence" to children who were about two years old. To recognize an object was not sufficient; the child also had to be able to imagine the object when it was not in the present field of experience. It is characteristic of innumerable developmental psychologists that they claimed to have demonstrated object permanence in much younger children,

cats, and other animals, although their tests in no way tested the ability to imagine an absent object.

Returning to the problem of universals, I would summarize the constructivist approach in the following manner:

Programs of construction in which characteristic elements are coordinated in such a way that they serve to cut pieces out of the flow of experience and to recognize them as belonging to a class, I would call "recognition matrices" or "recognition concepts". Consequently I would suggest to limit the term "universal" to those concepts that are accessible to a subject's conscious reflection and which the subject can also deliberately call up as mental images.

Of neither the recognition concepts nor of the universal ones could one say that they "exist", as long as one intends the term "to exist" as referring to some form of independent *being* in space and time. Both types of concept are repeatable programs and as such have no subsistence in the flow of mental operations and therefore no duration or substance. They do not belong to the furniture of an independent world.

To conclude, I want to add that, from my constructivist position, no ontological affirmations can be made and therefore there can be no claim that one describes a "reality". All that is ever intended is to suggest models of how one might think about certain things.

Notes

1. Locke, J. (1690) *An essay concerning human understanding*, Book III, ch.III,§2.
2. The difference I am making here corresponds in part, but only in part, to what Kant explains as the opposition of "pure" and "empirical" *Anschauungen*; cf. *Kritik der reinen Vernunft*, B742-744. (The term *Anschauung* is usually translated as "intuitions", but this does not render the German meaning that is closer to "view").
3. Cf. John Dewey's statement that an operation is grasped in thought as a relation which 'is independent of the instances in which it is overtly exemplified, although its meaning is found only in the *possibility* of these actualizations.'" (*The quest for certainty*, New York: Putnam, 1960; S.163.)

References

- Berkeley, G. (1710) *A treatise concerning the principles of human knowledge*. Dublin: Printed by Aaron Rhames, for Jeremy Pepyat, Bookseller.
- Descartes, R. Rules for the guidance of our native powers (composed before 1629, published in 1701), in N.Kemp Smith (Ed.& Trans.) *Descartes philosophical writings*. New York: The Modern Library, Random House, 1958.
- Glaserfeld, E.von (1979) Cybernetics, experience, and the concept of self. In M.N.Ozer (Ed.), *A cybernetic approach to the assessment of children: Toward a more humane use of human beings*,(67-113). Boulder, Colorado: Westview Press.
- Glaserfeld, E.von (1995) *Radical constructivism: A way of knowing and learning*. London: Falmer Press.
- Lettvin, J., Maturana, H.R., McCulloch, W.S., & Pitts, (1959) What the frog's eye tells the frog's brain, *Proceedings of the IRE*, 47 (11), 1940-1959.