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On the use of abstractions in sociology: The classics and beyond

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Abstract

This article is exploratory in nature and attempts to address the following two questions: What is the role of abstractions in sociology? and How can you learn to become better at using them? Noting that there exists next to no literature in sociology on the topic of abstraction, a presentation is first made of two statements on this subject by Durkheim and Weber. Their content can be summarized as follows: abstractions are produced through *isolation* and *generalization*. Durkheim and Weber, like other sociologists, do not, however, address the issue of the general nature of abstraction, and for this, some ideas by Charles S. Peirce and Alfred North Whitehead are brought in. They suggest that an abstraction is characterized by the fact that its nature is derived from the reality of another phenomenon. The consequences of this view for sociology are discussed. The article ends with an attempt to show what a practical definition of abstraction would look like, in which the focus is on how to construct and use an abstraction, rather than on just define it in a formal manner.

Keywords

Abstraction, generalization, induction, isolation, theorizing, theory

> Dear Bob:
> I like people who study the particular in order that they may comprehend the general and who speculate in general so that they may understand the concrete incident.
>
> (Everett C. Hughes, letter to Robert K. Merton on the possible hiring of Candidate X, 19 February 1953)

> Dear Everett:
> Candidate X would be an excellent possibility. She has an exceptionally thorough grasp of social theory in the best sense of the word, and is thoroughly committed to the belief that social theory has to be developed through the careful study of particulars.
>
> (Robert K. Merton, letter in response to Everett C. Hughes, 24 February 1953)[1]

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Abstractions play an important role in all types of scientific analyses, including sociology (e.g. Bueno, 2014; Cohen, 1989; Collins, 1998: 787–800; Hoffmann, 2009; Langer, 1951; Saitta and Zucker, 2013; Whitehead, 1926). They are part of concepts, explanations, theories, and much more.[2] But what exactly is an abstraction and what is it used for? And can you improve the analysis through a better use of abstractions? If so, how is this done? These are the types of questions that will be explored in this article.

As with many words, the term abstraction is defined in a number of different ways, and there exists no single, generally accepted definition (e.g. Oxford English Dictionary [OED], 2011). At this stage of the article, all that can be done is therefore to present a provisional definition. Once the main argument of the article has been presented, a different one will be suggested.

Qualities that are often associated with the term abstraction in everyday language include an absence of details and concreteness, in combination with a focus on what is general. A provisional definition, conceived along these lines, might read as follows: *an abstraction is a representation of what is general about a phenomenon, without any details or references to what is concrete*.

The abstract/concrete distinction

It is also common to view abstraction as part of a continuum that starts with what is concrete and particular, and ends with something that is general and contains no details. As an example of this, one can mention the so-called ladder of abstraction, which was popularized in the United States by Hayakawa (1939: 123–128, 1990: 84–86). To illustrate what "the process of abstraction" looks like, Hayakawa used a ladder as his metaphor. A specific cow ("Bessie"), to use his example, can be successively abstracted into "steps" up on the ladder, such as cow in general, livestock, farm asset, and wealth (see Figure 1).

Some years later, political scientist Giovanni Sartori borrowed the idea of a ladder of abstraction and used it in an influential article on concepts (Sartori, 1970). He emphasized the importance of clearly distinguishing between different levels in the analysis. First, you need to work with low-level categories (for a first conceptualization), then with medium-level categories (for middle-range theory), and last with high-level categories (for global theory). As an example, Sartori used the French and British civil services, with the next level of abstraction being civil service, followed by administration, and by staff (see Figure 1).

Since the days of Sartori, political scientists have further worked with his ideas on abstraction and turned them into a very useful tool (e.g. Collier and Levitsky, 1997; Goertz, 2006). It has, for example, been pointed out that a concept can be made more narrow and less abstract by adding an adjective. It can also be made more general and more abstract by removing an adjective. A concept such as revolution can, for example, be made less general and less abstract by adding such adjectives as, say, religious or social.

Sociologists have had considerably less to say about the topic of abstraction than political scientists. When the topic has been discussed at all, it has mainly been in

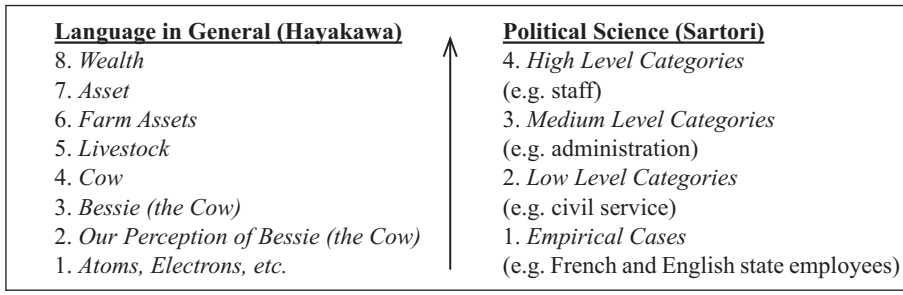

Figure 1. The ladder of abstraction.
Source: Hayakawa (1990: 85); Sartori (1970: 1044).
While Hayakawa presented his ladder of abstraction in a book on language, Sartori was concerned with the use of concepts among political scientists. At Level 4 of Sartori's ladder of abstraction, you have high-level categories ("global theory"); at Level 3, medium-level categories ("middle range theory"), and at Level 2, country by country analysis ("narrow-gauge theory").

connection with other issues, most famously as part of the critique of Talcott Parsons' work in the 1950s. In a series of studies that culminated with the publication of *The Social System* (1951), Parsons strongly emphasized the abstract element of sociological theory (e.g. Parsons, 1949, 1951; Parsons and Shils, 1951).[3] In discussing what makes a theory analytical, Parsons made a sharp distinction between what constitutes a theory, on one hand, and the object it refers to, on the other. He also argued that something becomes a fact first when it has been incorporated into an abstract conceptual scheme (e.g. Parsons, 1949: 41).[4] Concepts and categories, he emphasized, are helpful analytical tools, but it is important to realize that they do not exist in reality. Parsons approvingly referred to Whitehead's argument that analytical terms have no counterpart in reality. To believe that this is the case is an example of the so-called "fallacy of misplaced concreteness" (e.g. Parsons, 1949: 29; see Whitehead, 1925: 75).

A common critique that was directed at Parsons' conception of theory was that it was *much too abstract*. According to Robert K. Merton, for example, sociological theory should focus on the middle range and stay at that level (Merton, 1949, 1968). Attempts to formulate a general theory, at the highest and most abstract level of sociology, were in his view premature and should not be undertaken.

Also C. Wright Mills criticized Parsons for being much too abstract, but his critique differed from that of Merton. According to Mills, Parsons was basically playing around with words and had in this way reduced sociology to "the associating and disassociating of concepts" (Mills, 1959: 26). Parsons had cut off the analysis from empirical reality, and the result was a type of sociological theory that was as empty and abstract as it was pretentious. "Grand Theory" as Mills called it (Mills, 1959: 25–49).

In criticizing Parsons' work, Merton and Mills also took the opportunity to discuss and comment on another error, which involved the use of abstraction and was common in US sociology at the time. This was to proceed in the very opposite way from Parsons, namely, to make no abstractions at all. To Merton, this represented a failure to generalize and contribute to sociological theory, while Mills blamed this way of proceeding on the kind of methods and data that were used at the time.

According to Merton, a study that simply reports empirical data cannot contribute to the development of sociology, as any good study should. The main reason for this is that such a study only speaks to the particular situation it happens to analyze. By proceeding in this way, you cannot contribute to theory, according to Merton, and the main reason for this is that a theory consists of two or more propositions or general statements that have been linked together (Merton, 1968: 39 ff., 59).[5] Merton also pointed out that by not abstracting from the results, that is, by not generalizing, studies that only present empirical results also lose the capacity to suggest new research.

According to Mills, the problem with studies that were narrowly empirical at the time was not so much that they failed to produce generalizations and theory, as Merton had argued, but that they suffered from what he called "abstracted empiricism" (Mills, 1959: 50–75). Sociologists like Paul Lazarsfeld and other quantitative sociologists insisted, in Mills' view, so strongly on only using certain methods to gather data that they ended up producing studies that were incomplete and superficial. A good sociological study, Mills said, should always be linked up to the social structure of society in a direct way. This must be done even if you cannot use high-quality data for all parts of the analysis. The major problem with "abstracted empiricism" was that only empirical data of a specific type were collected and regarded as relevant, namely, survey data. What could not be studied with this method, Mills charged, was simply excluded from the analysis.

To sum up, the type of abstraction that was at the center of the debate in the 1950s was very much conceptualized in terms of what is general and cut off from concrete, empirical reality. If abstractions are used in this manner, it was concluded, the result will be a disembedded and artificial type of analysis along the lines of Parsons. It is similarly dangerous to not make any abstractions at all; also this will result in a deficient type of analysis.[6]

Abstraction as isolation and generalization

Even if the notion of abstraction was central to the critique and discussion of Parsons' work in the 1950s, it was not discussed as a topic in its own right. This is also true for sociology as a whole, yesterday as well as today. It is possible to locate a few brief statements on the general role of abstractions in sociology, but that is all. Still, some of these brief statements have been produced by powerful thinkers such as Durkheim and Weber, and they are therefore of special interest.

To start with Durkheim, that Durkheim was very interested in topics in which the element of abstraction play an important role, is clear, for example, from *Elementary Forms* and the essay on primitive classification, co-authored with Mauss (Durkheim, 1995 [1912]; Durkheim and Mauss, 1963 [1903]). Durkheim, however, only singles out the topic of abstraction itself for discussion in one of his less known articles, namely, "Studies in Social Science" from 1886 (Durkheim, 1970 [1886]). As part of his critique of how economists use abstractions, Durkheim (1970 [1886]) here says,

> Abstractions represent a legitimate procedure in science. This is true. But to abstract means to cut out a piece from reality that one isolates (*isoler*); it does not mean that you can then take these pieces [like the economists do] and create a rational actor out of them.
>
> (p. 212)

Durkheim, in other words, was critical of the way that the economists handled abstractions in their analyses. They did not use its main feature, *isolation*, in a correct way.

This brief passage in Durkheim's article did not attract any attention until 2005 when a conference on the role of abstractions in sociology was held in France. Two of the papers that were presented paid special attention to Durkheim's statement from 1886; one of these was written by Raymond Boudon and the other by a young French sociologist, Pierre Demeulenaere (Boudon, 2006; Demeulenaere, 2006; see also Demeulenaere, 2007).

Both of these authors chose to focus on what Durkheim said about the economists' use of a rational actor (*être de raison*); they also used his statement to criticize rational choice sociology. More generally, there exist "good abstractions" and "bad abstractions," according to Boudon, with the former being the same as "realistic abstractions" and the latter as "unrealistic abstractions" (Boudon, 2006). Boudon's general point was similar to that of Mills, namely, that sociological abstractions must be firmly anchored in empirical facts. Only if this is the case, is an abstraction "good." According to Boudon, this was something that first-rate sociologists like Marx, Tocqueville, and Weber had all been very well aware of.

Weber is for many reasons of special interest in a discussion of the use of abstractions in sociological analysis. His notion of ideal type is, for example, deeply influenced by the abstract notion of *homo economicus* (e.g. Morgan, 2006). Many of his comments on what constitutes interpretive sociology in Chapter 1 in *Economy and Society* also contain important statements about the role of abstraction in theory construction. One example of this is what Weber says about establishing the element of meaning in an empirical analysis. You can create an abstraction in different ways: by taking the average, by focusing on certain central elements, and so on.

The only place, however, where Weber directly addresses the topic of abstraction itself is in his essay on Eduard Meyer (Weber, 2012 [1906]: 139–184). His main concern in this study was with the way that causality should be constructed and used in social science, that is, in the kind of an analysis where the element of meaning must be taken into account. The key problem, in brief, was that causality cannot be handled in the same way in social science as in natural science.

According to Weber, in a social science analysis, you first have to single out the causes from a number of factors. These also have to include the role of meaning that the actors invest their actions with. All of this should be done by means of abstraction, which Weber defines as "isolation and generalization (*Isolierung und Generalisierung*)" (Weber, 2012 [1906]: 175–176, 183). After you have isolated or separated out the factors that are involved, you proceed to the next stage. At this point, you remove the factor that you think is behind the change that is to be explained. If the change then disappears, you have located the cause.[7] The way that Weber proceeds in establishing causality is today seen as an example of so-called counterfactual reasoning.

Weber states several times that an abstraction basically consists of two elements: "*isolation and generalization*" (Weber, 2012 [1906]: 175–176, 183; emphasis added). Isolation, to recall, was also mentioned by Durkheim as central to abstraction; but he did not spell out what it is that you do when you isolate something. This, however, is something that Weber does. Isolation, he says, means to "'*break down*' what is given into its

'*components*'" (Weber, 2012 [1906]: 175). In other words, you first try to discern or roughly make out the elements that constitute a phenomenon, and when this has been done, you sharpen up the analysis so that these elements can be clearly distinguished from one another.

As earlier mentioned, this way of proceeding was part of an attempt from Weber's side to show what an explanation (*explanans*) in social science should look like (Weber, 2012 [1906]: 175–176, 183; see also, for example, Ernst, 2015; Parsons, 1949: 610–611). Weber's way of formulating himself, however, indicates that he probably also intended what he said to be applicable to the phenomenon to be explained (*explanandum*). When this is done, the analyst has first to decide what topic to study and single this out, since reality is infinite (e.g. Weber, 2012 [1906]: 114, 117–118). Once a topic has been chosen, the sociologist has to use isolation as part of the attempt to "transform the given 'reality' in order to make it into a 'fact,' a theoretical construct" (Weber, 2012 [1906]: 175). Weber also emphasizes that the element of isolation can be carried out in different ways, depending on what the analyst is interested in studying; "to quote Goethe: there is 'theory' in 'facts'" (Weber, 2012 [1906]: 175).

Weber has less to say about generalization, the second element in an abstraction, than about isolation. The two are clearly related, and some social scientists even equate the two.[8] In the case of Weber, however, isolation roughly means separating out the phenomenon to be studied, while generalization represents the next step. Once the selection has been made, you need to generalize from it, and in this way make the subject under study broader, less detailed, and in this way also more amenable to a theoretical analysis. It should be noted that generalization and abstraction are in this way clearly related and linked to one another. This means that what you get when you generalize depends on what you first isolated. Abstractions, in brief, must be constructed in a careful way.

Levels of abstraction

As earlier mentioned, it is sometimes argued that an abstraction can be seen as part of a continuum, with no details at one end of the spectrum and plenty of details at the other. The reader may recall Hayakawa's ladder of abstraction and also how Sartori used the same idea but applied it to political science (Figures 1–2).

Most abstractions, however, have structures that are complex and do not easily fit into a continuum.[9] It is true that successive abstractions from the same phenomenon are typically separated from one another through levels or other dividers, a bit like a ladder has steps. But in contrast to the steps of a ladder, the distances between the levels are not of the same length; they also have different internal structures. There finally seems to be quite a bit of variability when it comes to the ways in which levels are used in the various sciences (for philosophy and natural science, see, for example, Floridi, 2008; Marr, 1982).[10]

This is also true for sociology (see, for example, Edel, 1959; Lauderdale et al., 1990; Little, 2007; Murmann, 2014). Take, for example, the way that Arthur Stinchcombe (1968) uses levels and abstractions in his well-known book *Constructing Social Theories*. To Stinchcombe, a theory is roughly the same as an explanation, and he argues that it is

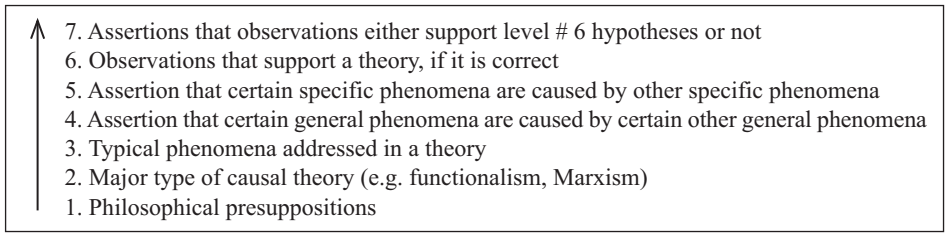

Figure 2. The different levels of sociological theory (Arthur Stinchcombe).
Source: Stinchcombe (1968: 48–53).
According to Stinchcombe, the analyst needs to be aware of what level of generality she is operating on, when trying to map out the causality of some phenomenon.

useful to distinguish between seven different "levels of generality" or abstraction when something is explained in a sociological analysis.

A sociological theory, according to Stinchcombe, is typically based on certain basic assumptions, and this constitutes the most basic and general level (Level 1; Stinchcombe, 1968: 47–56). At the opposite end of the spectrum, there are rules or instructions for how to decide if an analysis of a concrete case should be accepted or rejected (Level 7). In between these two levels, there are several others, each of which represents a different type of causality (Levels 2–6). The first of these is of a broad and general nature, such as the notion of an economic base in Marx's work. Then come others of a more narrow character, stating, for example, that a certain type of political movement is likely to be supported by certain strata (see Figure 2).

Stinchcombe's analysis can be described as an attempt to delineate or separate out different types of causality with the help of abstractions, which are separated from each other by the devise of levels. One thing that this way of proceeding accomplishes is to keep things apart; it also opens up the space for the analyst to work with causal forces of different generality.

But there also exist several other ways of using abstractions in combination with levels in theoretical sociology. Levels can be used not only to separate aspects of some phenomena from one another but also to tie them together so they form a whole. The micro–macro debate that took place in the 1980s is an example of this (e.g. Alexander et al., 1987). The issue here was the following: how are we to understand and analyze the way that individual behavior and general social phenomena are related to one another, while realizing that they also need to be analytically kept apart?

Another example that illustrates how useful the notion of levels can be, when used in combination with the idea of abstraction, can be found in the work of Robert K. Merton. In his lectures on sociological theory after World War II, Merton taught his students how to check if a sociological analysis is complete or not. One way to do this, he said, is by making sure that not only one but *all* levels of social reality have been taken into account. In this case, in other words, the notion of levels is used, not as a tool to improve the analysis but as a way to establish that all of the relevant aspects of a topic have been properly covered – from the most concrete to the most general or abstract.

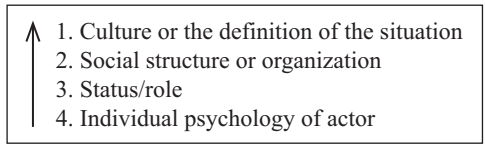

Figure 3. Robert K. Merton's levels analysis.
Source: Robert K. Merton, Material on levels analysis in the Robert K. Merton Papers in the Rare Books & Manuscript Library, Columbia University.
Levels analysis can be used to check if a sociological analysis is complete or not. Merton experimented with different versions of what was on Level 1, Level 2, and so on, and the ones that can be found in the figure above were among the ones that are used most often.

Merton told the students that social reality can be conceptualized as having four levels and that all of these have to be included in the analysis. The first of these is also the most concrete one: the level of the physical individual or more precisely his or her individual personality. Then, moving up one step, there is the level of status or position, which limits the actions of the individual. This is followed by the level of the social structure or organization, in which the status or the position is embedded. The last and most general level is that of culture or, alternatively, the definition of the situation (see Figure 3).

A full sociological analysis, to repeat, must according to Merton cover all four levels. Most sociological analyses, however, tend to only cover the status-role level (Level 2), something that Merton called "the core and bane of sociology" (Merton, 1950). But again, this is not enough. A full sociological analysis also needs to include the level of the concrete individual and her psychology (Level 1), the social structure or organization (Level 3), and culture or how people view the situation they are in (Level 4).

The examples that have just been presented of how Stinchcombe and Merton used the notion of levels in their analyses show that there is more to the idea of abstraction than isolation and generalization. What is involved is not only an extra element, namely levels, but more complexity. How to conceptualize this complexity, and also how to integrate the various parts of abstractions that so far have been discussed, will be addressed in the next section.

Trying to put the pieces together

In the attempt that will now be undertaken to produce a full and integrated picture of what constitutes an abstraction, use will be made of its three basic elements that so far have been discussed: *isolation, generalization*, and *levels*. The distinction between abstraction and concreteness will also be referred to. The role of abstractions in establishing the sociological object of study (*explanandum*) will first be discussed; this will then be followed by a discussion of their role in the explanation (*explanans*). The important issue of how to use abstractions in a practical way in a sociological analysis will also be addressed.

The element of isolation finds its first use when you move from the first general impression, the "blooming, buzzing confusion," to the object of interest in the study

(James, 1890: 488). A generalization is also involved at this stage of the research if a decision has been made to situate the analysis at a certain level. Isolation is used once again when the facts are separated out together with the general pattern of social behavior that is to be studied. Quantification, commensuration, and coarse-graining are often part of these processes, all of which involve abstraction in the sense that concrete individual items have to be streamlined before they can be compared or counted.[11]

In carrying out the initial process of isolation, it is imperative to break with the lay definition of the phenomenon under study. This means that the phenomenon has to be singled out and abstracted from a *scientific* point of view. In the case of this article, this means that this has to be done from the viewpoint of sociology. This is especially important to emphasize since sociologists sometimes use the same terms in their analyses as people do in their everyday language, such as role, status, and so on.

It is also important to try to challenge the existing way that scientific concepts are understood or scientific facts/variables constructed. This is one way to advance science. In *How We Think*, John Dewey (1933) presents a similar argument in which abstraction plays a key role:

> Abstracting gets the mind emancipated from conspicuous familiar traits that hold it fixed by their very familiarity. Thereby it acquires the ability to dig underneath the already known to some unfamiliar property or relation that makes it intellectually much more significant because it makes possible a more analytic and more extensive inference.
>
> (p. 201)

Abstractions are also used in many other ways when you dig down beneath the surface of things, in the way that Dewey suggests. New categories, for example, may have to be introduced, and for this abstraction is needed. The same goes for boundaries as well as typologies. Networks can be described as highly abstract representations of social action, not least in their visual form. It should finally be mentioned that attempts to get rid off old and worn-out abstractions, and replace these with fresh and innovative ones, typically entail the difficult task of thinking in new ways. From this perspective, existing sociological abstractions can at some point turn into epistemological obstacles (Bachelard, 2002: Chapter 1).

If we now move from the role of abstractions in creating the object of research to the explanation, there is a second set of phenomena that have to be selected, isolated, and turned into facts. Abstractions are consequently part of an explanation in this way. But there is also the explanation itself, which is largely abstract in nature. One way of looking at an explanation is, for example, to imagine two identical substances, and then see what happens when something is added to one of these (e.g. Woodward, 2005). The effect that is set off in this way can be portrayed as a black box but should preferably be modeled in the form of a general process. For this to happen, a new set of abstractions are needed, say in the form of a social mechanism.

Both when the focus is on the phenomenon to be explained and on its explanation, it is often necessary to use levels in the analysis. As already has been noted, this can be done in different ways. In *The Sociological Imagination*, C. Wright Mills says that the

hallmark of Grand Theory is that the analyst remains at a very high level of abstraction and fails to connect with the level of empirical facts. He then adds that

> Every self-conscious thinker must at all times be aware of – and hence be able to control – the levels of abstraction on which he is working. The capacity to shuttle between levels of abstraction, with ease and with clarity, is a signal mark of the imaginative and systematic thinker.
>
> (Mills, 1959: 34)

Mills' implicit warning that the analyst needs to know what she is doing when working on several levels of abstraction in the analysis is worth spelling out. A common error, such as the ecological fallacy, illustrates what can happen when data on one level are used to draw inferences on another level (Lieberson, 1985: 107). One can also speak more generally of "the fallacy of the wrong level" (Galtung, 1975: 45). This fallacy

> … consists not in making *inferences* from one level of analysis to another, but in making direct *translation of properties or relations* from one level of analysis to another, i.e., making too simple inferences. The fallacy can be committed working downwards, by projecting from groups or categories to individuals, or upward, by projecting from individuals to higher units.
>
> (Galtung, 1967: 45)

By way of summing up what has been said so far in this article, it can be said that abstractions play an important role at many points in a sociological analysis. They do so, it should be emphasized, in a very practical manner. They help the analyst to get a handle on the research object, to prepare the ground for a quantitative or a qualitative analysis, to control that the analysis is anchored in reality, and more. The main function of abstractions, it can be argued, is precisely this: to make it possible to carry out an analysis in a number of practical ways.

But that is not all; sociologists can do more with abstractions than has been discussed so far. There is in particular one more way in which abstractions can be used by sociologists in a way that is of much help, namely, in being innovative. This can be called the heuristic use of abstractions, and it will be discussed in the next section.

The heuristic use of abstracting

The purpose of the heuristic use of abstractions is to help the sociologist to come up with new ideas and in this way improve their research. This can be done in several different ways. One is simply to try to make an abstraction from the actual data in a study and in this way generalize and see something new. Howard Becker tells in his book *Tricks of the Trade* how one of his colleagues, Bernie Beck, used to encourage his students to proceed in this way (Becker, 1998: 125–128). After having patiently listened to his students' account of their dissertation research, he would ask them, "Tell me what you've found out, but without using any of the identifying characteristics of the actual case" (Becker, 1998: 126).

There also exist many other ways than "Bernie Beck's Trick" in which one can use abstractions for heuristic purposes. One can, for example, experiment with various ways of isolating and conceptualizing a phenomenon. Similarly, new levels can be added and existing ones removed, again to spark new ideas. It is also possible to use the ladder of abstraction in a heuristic way, for example, by running up and down the steps, and see what happens when this is done.

A few concrete examples may be helpful to illustrate what has just been said. To begin with levels, these can, for example, be added to as well as subtracted, and in this way help the researcher to see things in a new way. Take, for example, *The Protestant Ethic* by Weber which contains a very complex analysis, carried out on a number of different levels. From top to bottom, the study looks at capitalism (traditional and modern), its constitutive elements (spirit and institutions), different economic organizations (firms and putting-out systems), people working in these organizations (owners and workers), and their attitudes to work (traditional and methodical). Weber similarly introduces a number of different levels in his analysis of Protestantism (doctrine, theology, sermons, people's beliefs).

Weber himself, it can be noted, added an additional level to his analysis in *The Protestant Ethic* after its publication. This was done in "The Protestant Sects and the Spirit of Capitalism," and the new level was that of the sect (Weber, 1946 [1906], 2012 [1906]: 302–322). Weber's argument in this article was that the impact of religious ideas on individuals increases when these are members of a sect, since this means that they live closely together and are in a position to police one another's behavior.

Another example that involves a heuristic use of levels can be found in Schumpeter's recasting of Marx's thesis about base and superstructure (Schumpeter, 1994 [1942]: 12–13). Schumpeter was very impressed by Marx's argument that economic forces influence ideas and culture but also felt that it was too dogmatic. He therefore corrected Marx's analysis by arguing that causality not only goes from the base to the superstructure but also the other way around.

It is also possible to use the element of isolation in an abstraction for heuristic purposes. This can be done, for example, by isolating and separating out different parts of social reality, when studying a particular phenomenon, and see what happens when you do this. The general principle involved can be illustrated with the help of an example from Karl Popper's well-known analysis of induction (or see, for example, Abbott, 1997). The example is the following: assume that you have a number of circles, triangles, quadrants, and rectangles; some of which are colored black and some of which are of a smaller size than the others. You are then asked to make an induction. When you do this, you quickly realize that this can be done in a number of ways, not just one. You may select all the circles, all the figures that are black, all the ones of the same size, and so on (see Figure 4).

Since Popper's example is about geometric figures, it may be more appropriate from the perspective of this article to take an example from the social world. Assume that you want to study drug addiction in a small town. How would you select and delimit the phenomenon of "drug addiction"? One way would be to explore the idea that peer groups are the key, and in this case you may want to select the kind of facts that are needed for a network study. But you could also decide to study this phenomenon in terms of demand

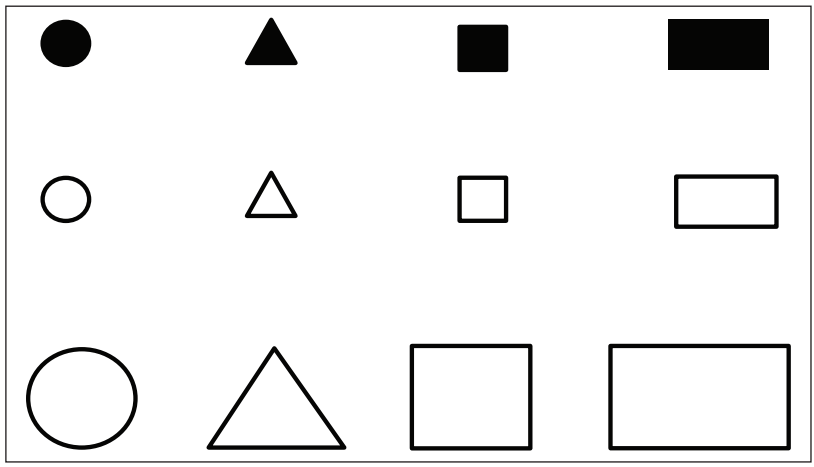

Figure 4. Karl Popper on the many ways of making an induction from the same material.
Source: Popper (1992: 421).
Popper argues that inductions can be made in different ways from the same data. In this figure, you may, for example, select all the circles, all the triangles, all the figures that are black, and so on.

and supply. In this case, you would not only want data about the drug users and their needs but also about the pushers, the medical doctors, the police, and so on.

A third possibility would be to focus on folk theories about drug addiction among the people in the town. What causes drug addiction in their view – is it bad blood, having the wrong friends, being at the wrong place at the wrong time, or what? Here you may want to study the views of those who are close to someone who is a drug addict as well as the views of those who are not. Many other factors may be interesting to look at when it comes to folk theories, such as level of education, geographic area, age groups, and so on.

Also the ladder of abstraction can be used for heuristic purposes. If we start with the idea of running up the ladder of abstraction, by making successively general abstractions, this is something that can be done in different ways. And to engage in this type of exercise may lead to the development of new ideas.

A sociological example that illustrates this way of proceeding may look as follows. Take the situation of people traveling in a subway, sitting in their own thoughts and ignoring what happens around them. This represents the most basic level of observation (Levels 1A, 1B). From here you can make abstractions or inductions in several different directions. One would be to study the way that people are resting their minds, while being in a public place (Level 2A), something that represents a form of relaxation (Level 3A). But you can also choose to focus on something else, say the way that people are ignoring their fellow travelers (Level 2B), which is part of a more general phenomenon known in sociology as civil inattention (Level 3B). More precisely, civil inattention is a form of social interaction that can be found in public places, where people deliberately ignore one another, by not staring at each other, by not talking to each other, and the like (e.g. Goffman, 1971: 209n.19, 331–332).

These two ways of running up the ladder of abstraction can be visualized in the form of a V, in which the point where the two lines come together is represented by the people sitting in their own thoughts in a subway. Our ladder, to continue with this metaphor, has two legs. Let us now, however, switch things around and see what happens when you run *down* the steps of the ladder, first on one side and then on the other.

If we continue with the example of civil inattention, we can imagine that this might work out differently depending, say, on what kind of people are involved. Adults and children, for example, are likely to handle the demand of civil inattention differently. You can also run down the other side of the ladder. Let us this time use the distinction between public and private. Do people ignore each other in a different, but still civil manner, depending on whether the interaction takes place in public or in private? And what happens when the two get mixed up, say when a married couple quarrels in public? Again, and as in the examples with levels and isolation, new ideas may be generated by playing around with abstractions in a heuristic way.

Defining abstraction

A provisional definition of abstraction was provided at the beginning of this article, and the time has now come to attempt a fuller definition, and one that is also of interest to sociology. But before doing this, something must be said about one aspect of abstraction that so far has *not* been discussed, and this is its general nature. What exactly is an abstraction? Sociologists have not addressed this issue at all. The brief statements by Durkheim and Weber have more to do with components of abstraction and how you produce an abstraction than with its basic nature.

Philosophers, however, have long discussed this topic, and according to some of them, what characterizes an abstraction is a very special fact. This is that an abstraction is something whose reality or substance is derived from another, more basic reality or substance.[12] Alfred North Whitehead (1926) sums up the argument in the following way:

> … to be an abstraction does not mean that an entity is nothing. It merely means that its existence is only one factor of a more concrete element of nature.
>
> (p. 171)

Charles S. Peirce has expressed the same basic idea, but in a somewhat different way. "An abstraction," he says, "is a substance whose being consists in something being true of a different substance" (Peirce, 1997: 138). Or in another place, "an abstraction is a substance whose being consists in the truth of some proposition concerning a more primary substance" (Peirce, 1997: 141).

The main idea of Peirce and Whitehead, in brief, is that an abstraction does not have the same kind of "ordinary" reality as the phenomenon from which it is abstracted.[13] Its reality is derived, and it is different. According to this view, what constitutes the nature of an abstraction is related to a philosophical position that was most succinctly expressed during the battle between the nominalists and the realists during the Middle Ages. An abstraction, according to this view, is not the same as nothing (nominalism), nor does it

have the reality of ordinary objects (realism); it is situated somewhere in between. Peirce referred to this position as scholastic realism (e.g. Peirce, 1934: 310–315, 2019c; see, for example, Lane, 2018: Chapters 5–6; Moore, 1952).

Does a statement of the ontological character of an abstraction, along the lines of Peirce and Whitehead, have any implications of interest for sociology? Or should it rather be ignored and viewed as something that basically belongs to the philosophy of science? It can be argued that the latter would be a mistake and that the argument about the derived nature of an abstraction has important consequences also for sociology.

The reason for taking this position is as follows. In a sociological analysis, you start out by observing some empirical situation, which first has to be selected and then turned into a distinctive phenomenon. This means that the analysis from very early on has to be carried out on an abstract or analytical level. The abstract phenomena that are being analyzed and explained are consequently of a secondary nature, while the empirical situation constitutes the ultimate foundation for the analysis. If the (abstract) object of study lacks this foundation, the analysis is not properly anchored in concrete, empirical reality.

This argument, which draws on the ideas of Peirce and Whitehead, shows a distinct affinity with Weber's position about agency in sociology. According to this view, a state or some other collective does not "act"; to say that a state "acts" is just a manner of speaking. Only biological individuals act. Or to cite Weber directly, "for sociological purposes there is no such thing as a collective personality which 'acts' … only individuals" (Weber, 1978: 14). What this means is that "sociology … can only be pursued by taking as one's point of departure the actions of one or more (few or many) *individuals*" (Weber, 2012: 410; emphasis in original).

It can similarly be argued that roles, organizations, and so on are abstractions; they are analytical abstractions used by sociologists to explain social behavior and their nature is derived. That is, their nature is secondary in comparison to the primary and concrete acts of the individuals, who through their actions produce these roles, organizations, and so on. Note, however, that this argument is only valid from the perspective of the sociological analyst. As Weber points out, the individuals themselves may well believe that some collective entity like the state does indeed exist as well as act, and they may also orient their actions to this view. But while this is something that must be taken into account by the sociologist, when a phenomenon is analyzed, it does not change the argument about the secondary or derived nature of sociological abstractions.

The idea that sociological abstractions must always be anchored in individual actions can be quite useful to the sociologist. It can, for example, be used as a test, to see if the abstractions in the analysis are properly anchored in concrete acts by individuals. This works both for studies by oneself and by others. If the abstraction has not been derived from the phenomenon, it is not correct. Paraphrasing Merton, one can call this procedure "establishing the abstraction" (Merton, 1987).[14]

In the provisional definition, which was provided at the very beginning of the article, an abstraction was referred to as a "representation," and a brief comment why this term was used is in place. Given that many representations stand for objects, an abstraction can be said to constitute a special type of representation, namely, one that is based on less features than the representation it is abstracted from. In brief, it replaces one kind of structure with one that is both more simple and more general. Since "icon" is the general

term for a representation that expresses the structure of a phenomenon, and since sociologists look at structures, one can say that a sociological abstraction is a special type of an icon (e.g. Atkin, 2013; Peirce, 2019b). More precisely, it is an abstraction that is based on another icon, namely, that of a social phenomenon as constructed by the sociologist (e.g. Gentner and Hoyos, 2017).

After this discussion of the derivative or secondary nature of abstractions, it is now time to return to the task of trying to provide a useful definition of an abstraction. Adding together all of the elements that have been discussed so far in this article, you may get something like the following: *An abstraction is a representation of a phenomenon that is the result of a selection from another representation, which refers to a more concrete reality.*[15] For a version that applies to the kind of abstractions sociologists use, you only need to introduce some minor changes, namely, to add the term social. You then get, *A sociological abstraction is a representation of a social phenomenon that is the result of a selection from another representation, which refers to a more concrete reality*.

This is a fuller definition than the provisional one, which was presented earlier, but it is not easy to penetrate and not very intuitive. You do not get an immediate sense of what an abstraction is. One can also ask how valuable this type of definition is in the first place. What practical use could a sociologist possibly have of such a definition, beyond the fact that it is always helpful to have definitions of the terms you use? Contrast, for example, this type of definition to the definition of a special concept, such as status or charisma. Such a definition can be very helpful when you carry out your research: it both tells the sociologist what a certain phenomenon is and how to locate it in empirical reality.

Would it be possible to also produce a definition of an abstraction of this type, that is, one that would help the sociologist to advance the analysis *in a practical way*? This would mean to leave behind the usual type of definition and try to come up with something of a different nature; a different way of looking at a definition.

Let us begin by taking a look at something that Herbert Simon says in *The Sciences of the Artificial.* He here suggests that you can distinguish between what he calls a "state description" and a "process description" of a phenomenon (Simon, 1996: 210–211). Using a circle as his example, Simon provides the following state description: "A circle is the locus of all points equidistant from a given point." The process description, in contrast, reads as follows: "To construct a circle, rotate a compass with one arm fixed until the other arm has returned to its starting point."

Simon, in other words, had found a way to describe a circle not only in a formal way but also in a practical way. He did this by moving from a description of a type that is known in philosophy as "knowledge *that*" to one of "knowledge *how*" (Ryle, 1945, 1949: Chapter 2; emphasis added). This distinction is also central to cognitive psychology, where the terms "declarative knowledge" and "procedural knowledge" are used (e.g. Bullemer et al., 1989).[16]

Can a similar move be made with a definition? If so, it would mean a definition with a focus on process, in this case on "abstracting" rather than on "abstraction." Such a definition would have to describe, in a simple and concrete way, how an abstraction is constructed by the analyst. Central features of an abstraction, such as isolation, generalization, and the use of levels would have to be translated into a set of practical instructions. The same goes for the idea of a transition from a primary to a secondary reality.

Long before Simon, Peirce had argued along similar lines, saying that from a pragmatic perspective, the usual type of definition may be of less use in science than one that is practical in nature (Peirce, 1932: 330). By practical, in this context, Peirce means that the definition does not describe a phenomenon, but instead tells you what to do, in order to produce this phenomenon. By way of illustration, Peirce uses the example of two different ways in which the element of lithium are defined in a chemistry textbook. One of these is to simply state its atomic weight, and this is the most common definition. The other type describes how lithium looks in its natural state, when it is exposed to heat, when it is submerged in acid, and so on. Peirce comments on the second way of proceeding as follows: "The peculiarity of this definition … is that it tells you what the word lithium denotes by prescribing what you are to *do* in order to gain a perceptual acquaintance with the object of the word" (Peirce, 1932: 330; emphasis in original).

It was earlier said that in order to produce a different and practical definition of abstraction, it should ideally include references to its central features, such as isolation, generalization, and levels. The definition that now follows attempts to do this, but it should be pointed out that the term *induction* will be used instead of generalization. The reason for this is that this term is more easily translated into a set of practical instructions.[17] When you make an induction, you (1) focus on certain phenomena, (2) pick something out that these all have in common, and (3) exclude the rest. (4) If you then focus on (2), you have an induction.

As Popper makes clear, when you make an induction, you are always making a choice; you are only choosing one of many possible inductions (see Figure 4). Since some inductions may be much more useful than others in a particular analysis, this means that skill and creativity come into play when an induction is made. To make an induction should therefore not be viewed as a mechanical or semi-mechanical act. What is also involved is that elusive phenomenon known as an abduction or a mental leap of the mind (e.g. Fann, 1970; Peirce, 2019a).

Once you have carried out an induction, you have an abstraction. If you then proceed to make another induction, based on the result of the first induction, you will get a second level abstraction. This latter abstraction is related to the same concrete reality as the first abstraction but is separated from it by one level.

To sum up what has just been said, our two definitions of abstraction may be formulated as follows:

> Formal definition: *An abstraction is a representation of a phenomenon that is the result of a selection from another representation, which refers to a more concrete reality.*
>
> Practical definition: *You produce an abstraction by making an induction that you select for analytical purposes from a concrete phenomenon, which has first been isolated from its surroundings*.

The major reason for having a practical or actionable definition is that it would work a bit like an instructions manual, and less like a formal statement which is often difficult to translate into practice. For an example of what such a "manual" might look like, applied to the construction of the research object in a sociological analysis (*explanandum*), see

1. Isolate or separate out the general social phenomenon that is the object of the study. Explore different ways of doing this.

2. Do the same with the pattern of social behavior that answers to this phenomenon. Again, explore different ways of doing this.

3. Generalize, that is, make an induction into a sociological configuration that can be used for one more induction or to be fitted into an existing sociological category or concept. Explore the different types of inductions that can be made.

4. If the final product is an existing sociological concept or category, does it need to be amended? If it is new, does it fit into some existing theory or does a new theory have to be developed?

Figure 5. How to use abstractions to construct the object of study (*explanandum*) in a sociological analysis.
Inductions should be made in order to produce a sociological analysis, that is, not any kind of inductions will do. Abduction is also central to successful inductions-abstractions, which means that inductions should be carried out in an imaginative way, drawing on a mixture of hard work and inspiration.

Figure 5. The figure also makes clear that the most important types of abstractions that are made in sociology have to be in conformity with the basic ideas of what constitutes a sociological analysis.

Discussion

> *Paragraph 63. The Analytic Method*.
> The first problems to suggest themselves to the inquirer into nature are far too complex and difficult for any early solution … What ought to be done, therefore, and what in fact is done, is at first to substitute for those problems others much simpler, much more abstract, of which there is a good prospect of finding probable solutions. Then, the reasonably certain solutions of these last problems will throw a light more or less clear upon more concrete problems which are in certain respects more interesting.
> (Charles S. Peirce)[18]

While an attempt has been made in this article to open up the topic of abstraction for discussion and to cover its most important aspects, it is basically exploratory in nature. The topic of abstraction is very complex and several questions of interest have not been addressed. One of these is if the use of abstraction in sociology is somehow different from its use in other sciences. To a large extent, this is probably not the case. Concepts, categories, theories of causation, and more, all contain important elements of abstraction, and there is no reason to believe that sociological concepts and so on differ in essential respects from their counterparts in the other sciences.

There does, however, exist one exception. Abstractions are used not only by sociologists but also by their objects of study. This fact enters into the sociological analysis in many ways. People, for example, use concepts, categories, explanations, and so on in their social actions.

But there is more, and this is something that especially Arthur Stinchcombe has analyzed in *When Formality Works: Authority and Abstraction in Law and Organizations.* Stinchcombe's main focus is on the phenomenon of formality, which he views as a special type of what can be called materialized abstractions. Formality, he says, is "an abstraction [that] can be taken as a fact" (Stinchcombe, 2001: 2). The basic idea is that people create as well as use many different kinds of abstractions in their everyday lives, such as legal statutes, blueprints, and formal organizations (similarly, see, for example, Douglas and Turowetz, 2019; Zijderveld, 1970).

Stinchcombe also raises another interesting issue in *When Formality Works.* This is the following: when does an abstraction of this type work and when does it not? Stinchcombe provides the following answer. An abstraction works well in the form of say an organization when it helps to realize its purpose. If this is not the case, things will go wrong. In other words, you get a bureaucracy only when an organization has stopped fulfilling its goal. The idea of bureaucracy, Stinchcombe argues, is consequently *not* inherent in the idea of a formal organization.

This is a provocative and interesting idea. It is also true that the kind of abstractions that are used in a sociological analysis can go wrong. One way to find out if some abstraction has been used in the right way or not is to confront it with empirical evidence. The earlier discussion of Parsons' work provides an example of how abstractions can be misused. The main critique directed at his work, to recall, was that sociological abstractions should always be anchored in the empirical material from which they are derived. To this Stinchcombe adds that they should be *properly* anchored, meaning by this that they should fulfill the goal of the analysis.

Can abstractions also be misused for political and similar non-scientific purposes? This is definitely the case, both in everyday life and in the sciences. You can run up and down the ladder of abstraction in different ways depending on, say, your political views (e.g. Toscano, 2008). Prejudices and racist ideologies are as much abstractions as human rights and democratic constitutions.[19] But again, from Stinchcombe's viewpoint, you may want to explore if an abstraction, as used in a specific situation, fulfills its goal or not.

Another question about abstractions that needs some discussion is its relationship to human nature and biology. The fact that abstractions are an integral part of so many mental phenomena raises the question if not human beings are endowed with a general capacity to produce and use abstractions. The enormous speed and subtlety with which these abstractions are produced and used by people in their everyday lives are indications that the capacity to make abstractions is part of human nature. If this, however, is the case or not, is not known today. It is perhaps also a question for another science than sociology to decide, such as cognitive science or neurophysiology.

However this issue is resolved, it seems clear that *the power of abstraction* is something that both can and should be used in sociology. An abstraction is a mental tool that allows you to cut through a complex reality, a bit like Occam's famous razor. Its use in the sciences also belongs to an old tradition, according to which you should always try to *simplify* in an analysis. "*We need a method*," Descartes (1985 [1628]) famously says, and the deliberate use of abstractions, it is suggested in this article, should be part of such a method (p. 15).

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Notes

1. Merton (1990: 54–55). The gender of the candidate (who was Peter Blau) has been changed in the quote.
2. For helpful advice, I especially thank Michela Betta. I am also very grateful to Wissenschaftskolleg zu Berlin where this article was written.
3. At one point in a chapter by Parsons (co-authored with Edward Shils), a reference is made to "the process called *abstraction*, which is nothing more than the creation of objects from the field of experience by grouping situations according to selected criteria" (Parsons and Shils, 1951: 161; emphasis in original).
4. "Adapting Professor Henderson's definition, in this study a fact is understood to be an 'empirically verifiable statement about phenomena in terms of a conceptual scheme'" (Henderson, 1932; Parsons, 1949: 41).
5. "The term sociological theory refers to logically interconnected sets of propositions from which empirical uniformities can be derived" (Merton, 1968: 30).
6. In connection with the discussion of the abstract/concrete distinction, a few words should also be said about the method of successive approximation which is part of a similar discourse. This approach is famously discussed in *Grundrisse*, in a section called "The Method of Political Economy" (Marx, 2015: 33–41; see, for example, McQuarie, 1978). Some sociologists have also expressed ideas that are close to this approach (e.g. Homans and Curtis, 1934: 37–40; Merton, 1951: xix–xx). According to this method, you must not begin the analysis by first studying some phenomenon as it appears in empirical reality, and then abstract from it. Instead you should first try to locate the central core of the theoretical problem that needs to be solved. This is done by focusing on those aspects of reality that are related to the problem, and then abstracting from these. Once this has been done, you have produced a general theory that can be used to analyze the phenomenon in question. You now approach the original phenomenon again; but this time you will be able to make scientific sense of it since you are now armed with a theory. New factors can then be gradually introduced into the analysis, and in this way a solid analysis can be produced of the original phenomenon.
7. What differentiates this type of analysis from one in natural science is, to repeat, that the element of meaning needs to be taken into account. When explaining human behavior, you sometimes also need to look at what Weber calls the objective possibility of something happening. By objective possibility is meant what *would* have happened if a certain action was undertaken, in situations where we roughly know the result of such acts (since similar events have taken place before with this result). One of Weber's examples is the Battle of Marathon, and he notes that if the Persians had won, the course of the West would have been different. The reason for this is that we know how the Persians treated territories they had conquered, namely, in an authoritarian manner that would have blocked the emergence of what we today see as the West.
8. There are also those who keep them apart. Political scientists working in the tradition of Sartori refer, for example, to "the ladder of generality" and not to "the ladder of abstraction" (e.g.

Goertz, 2006: 69 ff.). The reason for this is that "the term *abstract* is often understood in contrast to *concrete*, which can be confusing" (Collier and Mahon, 1993: 846, 853 n. 5).

9. To illustrate this complexity, one can, for example, mention how certain words, according to Chomsky, are "both concrete and abstract" (Chomsky, 2000: 126). To illustrate the point, he uses the examples of a house and a city that are first destroyed and then rebuilt. If a house is destroyed and then rebuilt, you have a new house. If a city, say London, is destroyed and rebuilt, you still have London.
10. Marr famously suggests that it is helpful to carry out an analysis on three levels: those of computational theory (Level 1), representation and algorithm (Level 2), and hardware implementation (Level 3). For the topic of abstraction, this would mean something like the following. You first need to conceptualize what an abstraction is and does, then model its mechanisms, and finally trace out what happens in the brain when abstractions are made. According to Marr, whose main expertise was vision, work on all three levels is to be recommended. This article can be described as an attempt to work on Level 1, that is, on how to conceptualize an abstraction.
11. Comparisons can be described as attempts to analyze the similarities or differences between two phenomena. Abstractions primarily play a role in establishing these similarities and differences. In quantification, the general emphasis is different: to make sure that all of the observations are identical in some regard, namely, the part that is to be quantified. This is typically a process that transforms the observations in a profound manner, and it should therefore always be described and discussed in the study. The latter point has especially been argued by Stanley Lieberson ("A Social Theory of Data" – Lieberson, 1985: 229–231).
12. This is, for example, also the view of Aristotle (e.g. Bäck, 2014). More generally, the concept of abstraction seems to have been worked out in philosophy mainly in terms of nominalism versus realism. It would also appear that nominalism is predominant in modern philosophy (e.g. see also Rodriguez-Pereyra, 2016; Rosen, 2018). Quine and Nelson Goodman, for example, are nominalists of sorts, that is, with some reservations.
13. It is not necessary for the argument in this article to discuss the issue of what constitutes reality or a substance. But see, for example, Karl Popper's argument about the three worlds (World 1 [physical objects], World 2 [mental or psychological states], and World 3 [culture or products of the human mind]; Popper, 1978). According to Popper's scheme, abstractions originate in World 2, mainly fall in World 3, and can be used in various ways for producing items in World 1. A scientific abstraction would mainly fall in World 3 or more precisely in scientific culture.
14. Merton speaks of "establishing the phenomenon," that is, making sure that the phenomenon that is being analyzed actually exists. An abstraction, to return to the argument in the main text, can be unsound in two ways. First, if it does not answer to the pattern of social behavior of the phenomenon itself. And second, if it is not based on a representative sample.
15. See note 13.
16. It is clear that what cognitive psychologists say about declarative and procedural knowledge is of much interest for theorizing in sociology. The same is true for work on three related topics, namely, declarative memory–procedural memory, declarative learning–procedural learning, and the two kinds of consciousness that answer to the declarative–procedural distinction (e.g. Danziger, 2008; Knowlton et al., 2017; Wheeler et al., 1998). For an insightful article on procedural learning, from Ryle onwards, see Star (2000).
17. For the philosophical-technical meanings of the two terms induction and generalization, see, for example, Hawthorne (2018) and Leslie and Lerner (2016).
18. Peirce (1931: 63).
19. It is, however, less clear that broad statements about abstractions of the type that can be found in *Dialectic of Enlightenment* are correct. According to Adorno and Horkheimer, abstractions are "the instrument of the Enlightenment" and lead to a "leveling rule" (Horkheimer and Adorno, 2002: 9).

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