

Chapter 4

Catalysis, Functional Explanations and Functionalism in Psychology

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The term “catalysis” must be regarded as a foreign term in psychology. Just recently, it has been introduced as a term describing constraining factors in human behaviour (Beckstead et al. 2009). The motivation is primarily to emphasize the conditional aspects of a process in which there are some constraining factors that are hard to specify (Cabell 2011). In this sense, catalysis connotes descriptive adequacy in the sense that the term communicates some changes without specifying exactly what the cause would be. Yet, catalysis has a very specific meaning in chemistry, where the catalyst provides a mechanism to “increase in the rate of a chemical reaction induced by material unchanged chemically at the end of the reaction” (<http://www.merriam-webster.com/dictionary/catalysis?show=0&t=1343969737>). This definition tells us that the catalyst is a material or an environment that influences a chemical reaction of which the catalyst is not to be regarded as a part. Accordingly, the catalyst stands unchanged after the reaction, and the reaction could have happened anyway, but not with the same intensity. According to this definition, a catalyst cannot explain the reaction, and it is not to be regarded as a necessary part of the chemical reaction. The reaction is dependent on the two or more chemical substances that interact, whereas the catalyst represents a foreign entity that has impact, but is not included, and in this sense stands outside the chemical reaction.

To what extent a catalyst may have explanatory power in the process touches on some intriguing questions embedded in the theory of science. In this respect, there may be drawn a continuous line from a nontheoretical description placed at one end, with causality given by necessity placed at the other. In between, we have all nuances and combinations of descriptions and explanations in which the explanatory factors belong to at least three different categories: (1) completely independent, (2) dependent with sufficient reasons or (3) dependent given by necessity. Sometimes we explain the rainy weather with the fact that we forgot to carry an umbrella. Although everyone knows that there are no connections between those factors, we sometimes accept the lack of an umbrella as an explanation for rainy weather. Murphy’s Law,

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which says that anything that can go wrong, will go wrong, is another example of the first category. All statistics with significant results are accepted on the basis of being just a sufficient reason and count as examples of the second category. Although most of us do not see any bad consequences for our health by drinking a glass or two of wine per week, many would say rather the opposite that the average alcohol consumption in a population corresponding to two glasses of wine a week is statistically regarded as a heavy burden for the average state of health, and it counts as a sufficient reason for modesty among everyone. As an example of what we would attribute as a necessary dependent, a drunken driver that steers a car directly into the face of a cliff is, by necessity, regarded as the cause for the incident if no other obvious explanations are to be found.

The role of density functional theory (Kohn 1998) in physics and chemistry may pinpoint these examples. This theory “is principally a theory of an atomic or molecular ground state” (Parr and Yang 1995, p. 702), which aims at modelling the electronic structure and nuclear position in which many and different bodies and materials are involved. Yet, in chemistry, this theory is applied as an explanatory model for the role of the catalyst (Parr and Yang 1995; see also Davison and Sulston 2006). In one respect, the atomic and molecular ground state of the catalyst has an impact on the chemical reaction. Thus, the density functional theory may have a kind of explanatory power in the sense that the atomic and molecular ground state may predict the metal’s catalytic impact on a specified chemical reaction. Yet, on the other hand, we are still talking about a catalyst, which stands outside and is in itself left untouched by the chemical process. This implies that the catalyst has impact, and can partly be regarded as a cause for the *intensity* of the chemical reaction, but not for the chemical reaction itself, which occurs between the materials that actually do go through a chemical transformation and end up being something different from what they were before the reaction. As long as the catalyst does not go through the same kind of transformation and is not affected by the chemical reaction, it is relevant to talk about “function” instead of “cause” when it comes to the role of a catalyst, which the name—density *functional* theory—also explicitly indicates. In the beginning, therefore, functional explanation could loosely and broadly be sketched as a situation in which the effect alone is regarded as the cause. The metal applied as a catalyst is defined as a catalyst solely because of the effect it has, and the metal itself is not necessarily an object for further investigations.

Functions in Mathematics

Catalysis, therefore, is highly related to functional explanations, and in this respect, the problem and potentiality of the process of catalysis may be regarded as transferable to several fields in which functions have been focused on. Even in mathematics, functions play an important and almost inevitable role. Here, function is very much understood in terms of two or more variables associated with each other in a more or less strict sense. A directory may serve as an example: a given name (x) is assigned

to a certain number (y), which implies that a directory consists of the two sets A (names) and B (telephone numbers) related to each other in terms of an assignment (f). In this sense, a telephone number is given as a function of x , which is mathematically expressed by the symbols: $f(x)$. Thus, a function in mathematics does not imply any necessary relationship between the two sets. They are, strictly speaking, rather independently assigned to each other by rules that are conventionally given or defined more or less ad hoc. A function indicates a not very strict or rather unnecessary connection between some data and the outcome derived from them. This is also why probability is mathematically expressed by a function of the data (x): $P(x)$; the likely outcome from the given data is rather suggested than given by necessity.

Functions in Biology

In Darwinistic biology, on the other hand, function is rather conversely understood. The process of natural selection is regarded as decisive and given by necessity because it includes and presupposes cause and effect. Although Darwin refers to functionality in an organism, he does not present an extensive definition of functional explanations in biology (Darwin 1859). The core aspect of functional explanation in biology is primarily related to natural selection (Darwin 1859; Elster 1979). Consequently, the only source of innovations and changes is provided by randomly given mutations. This implies that genetic dispositions are regarded as the only cause for development and that causality goes just in one direction, i.e. from the parents to the offspring. Thus, the function does not count as the cause for a certain capacity in the organism, but rather as a mechanism for selection. The function of the achieved capacity is tested against the environment, which determines if the acquired capacity gives the organism “the best chance of surviving” (Darwin 1859, Chap. 4, p. 1). There are primarily two reasons for why a cat is good at seeing in the dark: a mutation caused this at a certain stage in its development and this capacity made it easier for the cat to catch food and therefore to survive. Neither of these factors can be regarded as functional explanations but rather as outcomes of causes and effects. One cause is the mutation and the other is the capacity to see in the dark. This capacity has a specified cause and is therefore given by necessity, and the function or the effect of the capacity is to be regarded as an inevitably determining factor for the organism’s ability to survive.

Functions in Psychology

The Darwinian perspective on development and causality was adopted by psychology quite early. As William James refers to Darwin in his famous paper on emotions from 1884: “The labours of Darwin and his successors are only just beginning to reveal the universal parasitism of each special creature upon other special things, and the

way in which each creature brings signature of its special relations stamped on its nervous system with it upon the scene” (James 1884, p. 190 f.). Ten years later, John Dewey aimed to combine the James–Lange theory of emotion with Darwin’s principles: “In the following pages I propose, assuming Darwin’s principles as to the explanation of emotional attitudes, and the James-Lange theory of the nature of emotion, to bring these two into some organic connection with each other” (Dewey 1894, p. 553). Functional explanations in psychology are therefore highly associated with William James and American psychology. Yet, there are a lot of questions to pose in this respect. As we have seen so far, if functional explanations shall be subsumed under one paramount definition, it must be very vague and broad because an abundance of varieties that may even contradict each other have to be included. The complicating factor is, of course, to what extent a function is to be regarded as a sufficient or necessary condition to be a reason, or if a function can be regarded as a reason at all. There is inevitably a teleological aspect of a function, and teleological explanations have been hard to justify during the last centuries. Another complicating factor is the philosophical background of William James, which is tightly connected to the American pragmatism. As Charles Sanders Peirce formulated the pragmatic thesis, scientific understanding is primarily related to the conceivable effects, which implies that the understanding of causality is dependent on our conception of the matter (Peirce 1878/1986). This philosophy is probably not so easy to combine with Darwinism as long as it includes strong causality as a prerequisite, and Peirce does not exactly embrace Darwin (Peirce 1878/1986).

Catalysis in psychology must also be assessed on this background. In a chemical reaction, catalysis has a function in the sense that it has demonstrable effect on the reaction, but it is not a part of the chemical reaction itself. In this respect, a catalyst has a function and is explained in terms of its function. Moreover, it must be regarded as a sufficient reason for moderating the reaction, but it is definitely not a necessary reason for the reaction. Thus, when the term “catalysis” is transformed into psychology, it has to be regarded in these perspectives. The connecting point is, first of all, the extensive use of functional explanations in both sciences. Yet, the crucial issue is that functional explanations in psychology may refer to very different forms of explanations. On the one hand it is referred to Darwinism in which function forms a certain type of necessary condition, yet in chemistry, on the other hand, function is rather applied as a sufficient condition for increasing the chemical reaction. However, it may be that when the term “function” is applied in psychology, it satisfies neither necessary nor sufficient conditions for an explanation. If this third alternative is correct, is it then possible to talk about an explanation at all?

This is exactly the question this chapter aims to pursue. First of all, we have to go deeper into the nature of functional explanations. Then, we have to investigate the relationship between necessary and sufficient conditions and reasons. However, “conditions” are used here in a logical sense and refer to the relationships between statements, whereas “reasons” are related to empirical matters. When we talk about a bachelor, an unmarried man counts as a necessary condition for the concept; however, to find a man that is actually unmarried is a necessary reason for having found a bachelor. This chapter primarily deals with explanations, which include empirical

matters, and hence, it will rather be referred to “reasons” than “conditions” because the latter requires obvious logical necessity. Therefore, the criteria for sufficient reason have to be specified, which is probably not only the most challenging but also a crucial issue in this investigation. On this background, we are hopefully able to present a nuanced but specified variety of functional explanations. On this background, there will be a need for a discussion about functionalism in psychology on the basis of a nuanced taxonomy of functional explanations. This discussion will hopefully sort out distinctions between the different appearances of functionalism in psychology. Admittedly, if we find appearances of functional aspects that may count as a sufficient reason in psychology, these examples would be sufficient to conclude that the term “catalysis” may be meaningful in psychology as well.

Functional Explanations

In a discussion about explanations, Aristotle’s four different causes: (1) matter, (2) form, (3) effect and (4) final are inevitable. Yet, these four types of causes discussed in his book *Physics* are not the only aspects he is introducing when it comes to explanations. To explain a phenomenon is regarded as one of the main duties of a philosopher, so in this sense, all his books aim at explaining the issues they are discussing. Nevertheless, the four causes he is mentioning in *Physics* demonstrate to a great extent his understanding of the variety of explanations that may exist and that the causes can not only be systematized in a rational way but also challenge our modern understanding. All those three aspects concerning variety, irrationality and modern perspectives on explanations are important to take into account in a discussion about explanations, and not least when we read Aristotle’s four types of explanations:

In one sense, then, (1) that out of which a thing comes to be and which persists, is called “cause”, e.g. the bronze of the statue, the silver of the bowl, and the genera of which the bronze and the silver are species.

In another sense (2) the form or the archetype, i.e. the statement of the essence, and its genera, are called “causes” (e.g. of the octave the relation of 2:1, and generally number), and the parts in the definition.

Again (3) the primary source of the change or coming to rest; e.g. the man who gave advice is a cause, the father is cause of the child, and generally what makes of what is made and what causes change of what is changed.

Again (4) in the sense of an end or “that for the sake of which” a thing is done, e.g. health is the cause of walking about (“Why is he walking about?” we say. “To be healthy”, and, having said that, we think we have assigned the cause). The same is true also of all the intermediate steps which are brought about through the action of something else as means towards the end, e.g. reduction of flesh, purging, drugs, or surgical instruments are means towards health. All these things are “for the sake of” the end, though they differ from one another in that some are activities, others instruments. (Aristotle 1990a, Book II, part 3)

This perhaps exhausts the number of ways in which the term “cause” is used.

There are no references to functional explanations in this summary. On the other hand, there are two forms of explanations that rather challenge the modern mind. This is the second and the fourth. We can accept number one because from a logical

point of view, we will admit that the material counts as a necessary condition for making something and that the quality of what we have made is highly dependent on the material it is made of. This is also true when it comes to the third explanation. According to the modern way of thinking, this is even the ideal type of cause, and probably the only acceptable as well. What we have problems with accepting are the form and finality as causes. The former is hard to accept because it mirrors a kind of platonic world in which the ideal type of everything already exists, and the latter because it presupposes a sort of purpose behind every event in the world.

Aristotle does not mention “functions” or “functional explanations” in the presentation above. However, in *Metaphysics*, he brings the term “function” in his explanation of the four causes. “The same thing may have all the kinds of causes, e.g. the moving cause of a house is the art or the builder, the final cause is the function it fulfils, the matter is earth and stones, and the form is the definition” (Aristotle 1990b, Book III, part 1). Aristotle associates finality or the teleological cause with function. Thus, the term “function” is in this example directly related to the builder of the house and his ideas about it because of the function it is supposed to have. There is a big overlap between the way Aristotle introduces the term “function” and the intentions the craftsman may have by building the house. This is probably also the reason why we very often find an unspecified use of functional explanations in psychology, in which intentional causes also may be included (de Jong 2003). This understanding of functional explanation rather contradicts the biological use of it, which assumes a blind and unintended mutational process as a prerequisite.

This confusion can also be regarded from the perspective that the conditions for Aristotle talking about causation and causality are very different from our comprehension today. This is what Heidegger is focusing on in his discussion about “The question concerning technology” (Heidegger 1977): “For centuries philosophy has taught there are four causes: (1) the *causa materialis*, the material, the matter out of which, a silver chalice is made; (2) the *causa formalis*, the form, the shape into which the material enters; (3) the *causa finalis*, the end, for example the sacrificial rite in relation to which the chalice required is determined as to its form and matter; (4) the *causa efficiens*, which brings about the effect that is the finished, actual chalice, in this instance, the silversmith” (Heidegger 1977, p. 6.). Heidegger is questioning our understanding of the term “cause”, which is not a Greek but a Latin word. According to Heidegger, the term used by Aristotle is “aition”, “that to which something else is indebted” (Heidegger 1977, p. 7). Here, Heidegger applies the German term “Schuld” and “verschulden”, which may be associated with “cause”, but rather means “to be responsible” for something or even “guilty”. Heidegger’s point is that our modern one-sided emphasize on *causa efficiens* as a mechanical and blind cause does not correspond to the Aristotelian understanding. If we take a new look at how Aristotle formulated this cause in his *Physics*, Heidegger is right. The one who has given an advice, or is the father of the child, is rather the one to be blamed (or maybe rather priced) than to be regarded as a unintended cause for the outcome.

Heidegger has a certain agenda for this discussion. Yet, the agenda is ambiguous. On the one hand, he is the one to praise modernity in terms of the age that has “introduced subjectivism and individualism” (Heidegger 1977, p. 128). Yet, according to

Heidegger, the original Greek term for subjectivity, “*hypokeimenon*”, has nothing to do with the self-centred I, but rather means: “Man becomes that being upon which all that is, is grounded as regards the manner of its Being and its truth. Man becomes the relational centre of that which is as such” (Heidegger 1977, p. 128). This is the basis for his philosophy and the ontology he develops in his main thesis *Being and Time* from 1927, and highlights first of all subjectivity and existence, and in this sense, it is an acceptance of subjectivity as a salient trait of modernity. Yet, on the other hand, modernity is also characterized by another aspect in the sense that “no age before this one has produced a comparable objectivism” (Heidegger 1977, p. 128). Although he admits that this tension between subjectivism and objectivism must be taken into account in a discussion about modernity, his investigation of the role of technology in modernity indicates something else. His discussion about the four causes of Aristotle reveals this. He wants to emphasize that *causa efficiens* is not to be understood as an objective or neutral cause, but rather as a subjective form of explanation. This is a distinction that can be illustrated by the phi phenomenon. If we have two lights placed at a certain distance from each other and they are alternately turned on and off in a certain tempo, the light is experienced as one source moving back and forth, whereas the two lights are in reality standing still. The cause is attributed to one or two sources of light. Heidegger would say that the two-light source attribution is also a subjective form of explanation.

This critique of modern science is important, but it also demonstrates a problem in Heidegger’s philosophy. Although he acknowledges that objectivism is a characteristic of modernity, he has problems with accepting it because according to him, subjectivity is to be regarded as the only basis for a modern ontology. The same can be traced in the writings of another critical scholar, namely the Wittgensteinian Stephen Toulmin, who emphasizes that modernity is characterized by a transition from particularity to universality (Toulmin 1992). Both critics are important, yet they do not take into account how to place the modern need for accuracy and strict reasoning, to which the praise of a more mechanistic understanding of *causa efficiens* in science is an example. It is exactly in this intersection between objectivism and subjectivism or rather between strict and loose reasoning functional explanations are of interest. They include both perspectives, almost at the same time. Thus, the challenge is first of all to sort out when functional explanations can be said to be what.

Defining “Functional Explanations”

There are several attempts at defining functional explanations. Fodor’s contributions in psychology in the late 1960s may be of interest in this context. He aims at meeting some analytical requests, but at the same time, opens up for alternatives to behaviourism and identity theories of mind. He ends up with a sort of functionalism along with Donald Davidson and Hillary Putnam. In his article about functional explanations (Fodor 1968), he presents the concept “phase one theory”, which refers to “the first phase of psychological explanation” (Fodor 1968, p. 233). These “theories characterize the internal states of organisms only in respect of the way they function in the production of behaviour” (Fodor 1968, p. 233). These types of explanations

“are not causal explanations” (Fodor 1968, p. 233) and “they give no information whatsoever about the mechanisms underlying these [internal] states” (Fodor 1968, p. 233). This type of explanation may be quite diverse and not very strict. In this sense, the explanations may correspond with an indefinite number of hypotheses. However, there is at least one criterion from which the explanation can be refuted, namely when the explanation contradicts known facts, specifically in neurology, he says. In this respect, “it is sufficient to disconfirm a functional account of the behaviour of an organism to show that its nervous system is incapable of assuming states manifesting the functional characteristics that account requires” (Fodor 1968, p. 235).

The latter quotation is interesting for several reasons. First of all, Fodor wants to bring in some constraining factors that can discern functional explanations from a type of “anything goes” theories. Yet, he admits that the demarcation criterion he presents is highly disputable, and therefore he acknowledges that the criterion is probably too strong, or maybe even wrong. A moderated version could therefore be that if the explanation contradicts common sense, either among ordinary people or scholars, the explanation has to be rejected. This implies anyway that there must exist some criteria based on which some explanations can be refuted, and as far as these criteria exist, each one of them will count as a sufficient reason for refuting the explanation. This is not the same as saying that the theory is falsifiable in a logical sense. The refutation can for example be based on a common sense decision made by a certain group of stakeholders. However, this decision could also be derived from obvious facts. Although both criteria may count as sufficient reasons for refuting the theory, they have different statuses from a logical point of view. In the first case, the refutation could, for example, be based on good conscience—what a group regards as reasonable or not. This type of refutation could be a consequence of some practical, religious or even juridical reasons. These can all be compelling, but not for logical reasons. Thus, from a logical point of view, a refutation on this background is not given by necessity. A refutation derived from obvious facts on the other hand is given by necessity for logical reasons (Hempel 1966):

H_0 : Catalysts do not have any effect on the disproportionation of hydrogen peroxide to water and oxygen;

As the evidence shows: Added manganese dioxide makes that hydrogen peroxide reacts rapidly;

H_0 is not true.

In other words, in the case of catalysis, the catalyst counts more as a sufficient reason given by necessity, compared with a refutation based on some sort of agreements. The aspect of necessity is, in other words, rather related to a question about degrees than a question about either–or. The reason is that the hypothesis (H_0) and the observed situation are two incomparable spheres given by thinking and sensation, respectively. This points at the problem with both falsification and verification, specifically that the general hypothesis and the particular observation will never coincide, and a hypothesis can neither be completely confirmed nor completely refuted. The traditional argument against falsification, which says that there is an infinite amount of hypotheses that can be related to and therefore explain an event can also be applied to confirmations. If one hypothesis is rejected or confirmed, there are

still an infinite number of hypotheses left because infinity minus one, or even minus thousands, still equals infinity. The hypothesis that is not falsified is not necessarily more correct than the other that is falsified. However, when it comes to statements belonging to each one of the two spheres, they are comparable individually. One fact may contradict the other, and because of the principle of contradiction, we have to choose one or the other. The same is true for theories as long as they contradict; then we have to make a choice. The same is also true when different theories are both confirmed. The rule is often that we choose the simplest one, which is solely a pragmatic criterion. Thus, this choice can be made on different bases, and the point here is that we experience an explanation as more or less likely owing to its level of necessity, but sometimes a low level of necessity is sufficient for accepting the explanation. This is what happens when we choose the simplest theory or when Murphy's Law is applied, for example.

Fodor's presentation of functional explanations demonstrates the same fact, specifically that explanations may be of a great variety and represent different degrees of likeliness. According to him, they are understood very widely, and he does not make any distinction between different types either. Thus, functional explanations are close to a category that may be labelled as "anything goes". There may exist some constraining factors that can narrow this down, and if so, these may serve as sufficient reasons for refutation. Yet, the reasons Fodor presents are not given by necessity, but rather given by common sense based on certain beliefs or values. In this respect, Fodor's presentation of functional explanations has not made us wiser when it comes to functional explanations given by necessity. This is probably why some rather refer to "functional analysis" than "functional explanations". According to Cummins, functional analysis is "the application of property analysis to dispositions/capacities" (Cummins 1983, p. 28), which in science implies the following: "to ascribe a function to something is to ascribe a capacity to it that is singled out by its role in an analysis of some capacity of a containing system" (Cummins 1983, p. 28). In other words, nothing is given by necessity in a functional analysis. The researcher has to define the role of a capacity owing to an unspecified context. In this respect, functional analysis is referring to a quite loose understanding of the effect as an explanation of the cause. Yet, this type of explanation is not only characterising Fodor's discussion of functional explanations but also seems to be a proper understanding of "functionalism" in general: an unspecified direction of causality in which both the effect may explain the cause and the cause may explain the effect.

A Strict Understanding of Functional Explanations

As a reaction to the "anything goes" discourses, especially in a Marxist-influenced rhetorical style in social sciences in the 1960s and 1970s, Jon Elster tried to sort out what is and what is not acceptable to present as scientific explanations in general (Elster 1994). Yet, this study on Marxism is highly related to some other publications of the same author. This includes also a study in Norwegian, in which he presents how the three sciences—physics, biology and social sciences—are characterized by

three different types of explanations (Elster 1979). In physics, causality in terms of a necessary relationship between cause and effect is regarded as an inevitable sort of explanation. Biology is characterized by functional explanations, whereas social sciences are characterized by intentional explanations based on the theory of rational choices. The point and conclusion of his study is that a functional explanation has to be defined in a strict sense, which reduces its area of application to biology, and the only acceptable forms of explanations in social sciences are different sorts of intentional explanations. His conclusion, in other words, is that functional explanations must be rejected in social sciences (Elster 1979). Yet, this presupposes an exact and clear distinction between intentional and functional explanations.

“Intentional explanation cites the intended consequences of behaviour in order to account for it. Functional explanation cites the actual consequences” (Elster 1994, p. 27). This quotation may serve as a definition of the overall difference between the two types of explanations. Yet, a full understanding of functional explanation requires an elaboration. Elster suggests five aspects that characterize a functional explanation (Elster 1979). (1) We are first of all focusing on the effect of “something”, and not about the cause. This “something” could be a substance, an organism, a capacity, a certain pattern of behaviour or an institution. (2) The effect or consequences of “something” are beneficial for the same “something”. (3) The effect or consequences are accidental in the sense that those who are responsible for this “something” do not consciously intend to end up with them. (4) Those that are responsible for the effect and consequences of “something” have not acknowledged or realized the beneficial consequences. (5) The effect and consequences maintain this “something” by means of a causal feedback through those who are responsible for this “something”, but still do not realize the beneficial consequences of it.

Thus, the most outstanding characteristic of a functional explanation is the fact that it is blind. There are no connections between the intentions the agents may have and the outcome. It is solely the unacknowledged beneficial consequences that provide the existence, and not any sort of intentions. For example, it is not sufficient to say that an institution was established on the basis of a certain purpose, whereas it functioned in an almost opposite way. Foucault’s analysis of reforms of punishments may count as an example (Foucault 1977). Although the presented argument for making reforms was based on the purpose of increasing the prisoners’ dignity, the result was rather that the punishment became more effective; hence, it was not the dignity aspect that sustained the new forms of punishment, but rather their efficiency. To compare this with the 5-point scheme presented above, the explanation Foucault presents for the reforms in punishment would be as follows: (1) The unintended effect of the reforms in punishment is stronger discipline. (2) Stronger discipline is beneficial for the government. (3) The argument presented for the reforms is to make punishment more human. (4) The government will not admit that the reforms make the punishment more efficient. (5) The efficiency of punishment is the actual reason for continuing to make reforms. Yet, in such cases, there are still agents that actually do have these intentions. They want to fortify the punishment rather than make it human. In those cases, there are some agents that are very well aware of the consequences. On this background, Elster states that in social sciences criteria 4

and 5, namely unacknowledged consequences combined with feedback effects from the consequences, are never satisfied at the same time. This is a strong statement, but it sounds reasonable in terms of the fact that the criterion for an explanation is that *explanans* (the explanation) must be able to explain *explanandum* (the event that shall be explained) with necessity. This criterion combined with the fact that human beings are characterized by having intentions and the capacity of analyzing a situation, makes it hard to say that unacknowledged effects alone are able to explain institutions made of human beings.

On this background, there are three different explanations that can be combined with a sort of necessity. First, we have mechanical or efficient causality, which primarily dominates physics and natural sciences, but is also applied in social sciences and humanities. Second, we have functional explanations that primarily can be justified in biology in terms of natural selection. Yet, we have seen that functional explanation can be applied in chemistry when it comes to the role of catalysis. Still, the catalyst represents a blind effect, which has a certain feedback on the chemical reaction. However, both in biology and chemistry, the functional aspects represent a sort of constraining environment that forces the causal process in a certain direction. Third, we have intentional explanations, which are given by necessity in social sciences and humanities. Although causal explanations are valid in those sciences, functional explanations seem to be hard to accept without ending up with intentional or mechanical factors. Anyway, there are some constraining factors that determine the situation in social sciences and humanities as well, but these rather determine the individual choices, which bring in the intentional aspects again.

Nevertheless, there are no reasons to reject functional explanations. Although there are some overlaps with mechanical and intentional explanations, one or the other type of functional explanation is hard to get rid of and therefore seems to stand on its own feet. So far this investigation tells us that the definition we started with, namely that functional explanation is characterized by regarding the effect as the cause, seems to be valid still. Yet, the effect has to be understood in a way that includes finality. This is the way Aristotle understood functionality and he connected it with teleological explanations. To regard the effect as the cause is to put the cart before the horse, and to regard finality as a cause is to assume an unidentified purpose. Neither sounds very rational nor scientific, but in that sense, they are in the same category as Murphy's Law, which make connections that are impossible to trace. Yet, this is exactly the meaning of "function" in functional mathematics. The tag number, the car and the owner have nothing in common, except sharing a common destiny of being brought together, but in this respect, they are inseparable. On the other hand, a functional explanation can refer to a very strict understanding of the development of the species, and help us to trace the origin of each one of them. The same is the case for the catalyst in chemistry. In other words, the term "functional explanation" can refer to a great variety of forms of explanations, but they still have in common the emphasis on effect. So far it is hard to put them into more specified categories, but this stands left to investigate and hopefully achieve something by pursuing necessary and sufficient reasons as constraining factors.

Necessary and Sufficient Reasons

When the philosopher and physicist Stephen Toulmin should enquire explanations in science, he ended up talking about understanding instead (Toulmin 1963). “Explanation” represents something decisive, whereas “understanding” rather may refer to a kind of familiarity with something, without specifying how rich and deep the understanding actually is. Thus, there is a continuous scale of gradual transference from obvious acceptable explanations to obvious tentative and hardly acceptable forms of understanding. It is in this respect that we are talking about explanations given by necessity or sufficiency, or neither of them. Although it is hard to find the criteria on which different sorts of explanations are based, especially because “necessity” is a logical term and “explanation” an empirical, we have an intuitive understanding of what is given by necessity, although it is mixed up with some degree of uncertainty.

It is basically the same with necessary and sufficient reasons. On the one hand, both types of conditions may be understood strict and logical. Thus, the sufficient condition can also be defined in terms of:

If A, then B.

That A is a sufficient condition for B implies that if A occurs, B will also occur, but if B occurs, A will not necessarily occur (Næss 1971). A necessary condition may similarly be defined in terms of:

If B, then A.

That A is a necessary condition for B implies that if B occurs, A will also occur (Næss 1971).

However, we have in addition an everyday use of both types of reasons, which is very different. In regard to sufficient reasons for accepting something, we will admit many types of persuasive arguments. They do not even have to be logical, but rather emotional. One example would be “because you deserve it”, you just have to buy it. Especially when the persuasive effect is dependent on emotions, there will be no strict distinctions between what is given by necessity and what is not. As long as one is obsessed by a certain thought, this thought is from a subjective point of view as if it is given by necessity. This is the car buyer syndrome: one starts with thinking about a reasonable car, but after having visited the car dealer the third time, one is obsessed with a certain standard, which is normally high above the starting point, and the final decision of buying exactly this car is almost given by necessity.

Schopenhauer

In this respect, every decision is based on a certain reason, which is regarded by someone to be sufficient to say that it is both reasonable and meaningful. This is very much the foundation for the philosopher Arthur Schopenhauer to build a complete philosophy on the principle of sufficient reason. In his terms, this principle is formulated quite simply as “Nothing is without a reason for its being” (Schopenhauer 1903, p. 5). Although Schopenhauer has been accused for not being a very

reliable philosopher, his method for investigating this principle is highly relevant in this context. As the foundation of his method, he applied what he calls “the law of homogeneity and the law of specification” (Schopenhauer 1903, p. 1). These two laws, or rather strategies we may say, imply that it is important to highlight and specify distinctions between phenomena. However, this does not stand in opposition to the fact that the phenomena are to be regarded as related to each other in a certain way, like in nature, where exemplars are collected “into species, species into genera, and so on” (Schopenhauer 1903, p. 1). These two laws, which more or less guide the intellectual activity, make the discussion sensitive to distinctions and connections at the same time. Yet, the principle of sufficient reason is a principle that emphasizes the latter, namely connections, but opens up for the former, namely distinctions.

The four reasons Schopenhauer ended up with, specifically “becoming”, “knowing”, “being” and “willing”, could have been relevant in this context, but not at this stage of the discussion. The same is true when it comes to both Leibniz’s and Wolff’s use of the principle of sufficient reason. When it comes to these three philosophers, they are applying the principle as a basis for their ontology, although Wolff admits that there is a psychological need for bringing in a sufficient reason to explain a certain act or behaviour (Wolff 2005, § 70 ff.). In other words, the principle of sufficient reason is regarded as an overall principle that provides (1) logical inferences, (2) explanations in natural sciences, (3) explanations in humanities and (4) a general understanding of something. Accordingly, keeping in mind Schopenhauer’s method by regarding this in terms of the laws of homogeneity and specificity, we may find out if there are any distinctions and concurrences here.

On this background, we may conclude that there are at least three different types of reasons. The first one is (1) *necessary reasons*, out of which the most obvious appearances are connected to causality in physics, specifically theoretical physics. Gravity is theoretically regarded as a necessary condition for the fact that the apple will fall to the ground if the stem detaches from the branch. The second and third would be the two different types of sufficient reasons. One is (2) *sufficient reason given by necessity*. This is best exemplified by the catalyst’s role in a chemical reaction. The catalyst is neither a necessary nor a sufficient condition for having a chemical reaction, but it is sufficient for enforcing and intensifying the reaction. The catalyst is a sufficient reason by necessity because it *always* enforces and intensifies the chemical reaction by its presence, but as there may be other metals or aspects (like temperature, certain wave frequencies in the air or in the water etc.) that can provide the same catalytic effect, it is not a necessary condition. The last type of reason is just (3) *sufficient reason*, which is an open principle, whose purpose is to provide an understanding of a situation or an event based on the statement that “Nothing is without a reason for its being”. All these three types of reasons share some similarities in the sense that they define the conditions for our understanding and consequently belong to a common category. In this respect, the law of homogeneity covers them. Yet, on the other hand, they are in principle quite different and operate on different levels of precisions, which make them also to be covered by the law of specificity (Table 4.1).

Table 4.1 Characteristics of reasons

Types of condition for reason	Characteristics
Necessary	If A is a necessary reason for B, then if B occurs, A will always occur
Sufficient by necessity	If A is a sufficient reason by necessity for B, then if A occurs B will always occur
Sufficient without necessity	If A is a sufficient reason without necessity for B, then if B occurs, there must exist at least one A that may count as a reason for B

Table 4.2 Characteristics of explanation

No.	Type of explanation	Characteristics
1	Causal (mechanical)	A specified event that determines a specified outcome
2	Functional	A specified effect that determines a specified but general specie, property or capacity by means of specified genetic and environmental causes
3	Intentional	A specified purpose that determines a specified outcome
4	Catalysis	An unspecified effect on a process that includes causal explanations
5	Functionalism	An unspecified direction of cause and effect
6	Understanding	An unspecified connection between some specified events

Relationship Between Explanations and Necessary and Sufficient Reasons

When Toulmin talked about understanding instead of explanations (Toulmin 1963), the conclusion must primarily be understood in terms of “the law of homogeneity”. In the effort of achieving a paramount and adequate understanding of explanations, the common ground for all sorts of explanations must be the need of obtaining a sort of connection between phenomena, and this sort of making meaning by placing something in a context in a looser or stricter way is probably what characterizes our use of the term “understanding”. Thus, understanding does not contradict “the law of specificity”, which helps us make some distinctions between different sorts of explanations. In this respect, it is not necessary to bring in all the different types of explanations, but just summarize some of those that seem to be valid in the modern science of today and relevant for this discussion. Accordingly, there seem to be six main categories of explanations that are at stake here: (1) causal explanations, (2) functional explanations, (3) intentional explanations, (4) catalysis, (5) functionalism and (6) understanding. Hence, we do not have to include all the three other types of explanations Aristotle referred to, the four types from Schopenhauer (1903) or other types of explanations, but they are not excluded either (Table 4.2).

We see now that the six types of explanations represent six different levels of specificity and that they can be divided into two subgroups. The first three are more specific than the last three. The first three refer to a specific connection between cause and effect. The three latter forms are rather unspecific when it comes to the

relationship between cause and effect. This is a crucial distinction because a common sense understanding of a scientific explanation is that the connection between cause and effect is to be specified. However, what this investigation has demonstrated so far is that catalysis is a type of explanation in natural science that operates with an unspecific connection between cause and effect. Yet, this is not sensational in natural science. As long as theoretical complementarity is applied, like when light is understood both as a sort of wave and a sort of particle at the same time, the understanding of light as such is still an open question. However, this is no problem in practice. We can still find out the distances to stars by treating the light as waves, and we can analyse the light's energy by treating it as if it consists of particles. In this respect, there are unspecified connections between cause and effect, but we accept this as the understanding of light anyway. This is why all the six types have to be included as scientific explanations.

If we now compare the six different types of explanations with the three different types of reasons, we may hopefully end up with an increased specification of the explanations. This will tell us the explanations' level of precision as well. Although a (1) causal explanation is not as applicable as we would like it to be, there is no doubt that it represents the strictest type of understanding with a high level of precision in those cases where it occurs. This type of explanation satisfies both necessary reasons and sufficient reasons given by necessity. Gravity is both a necessary and a sufficient reason for the fact that the apple will fall to the ground if the stem is detached from the branch: without gravity, the apple will not fall.

When it comes to (2) functional explanations it is not that easy to put it into a proper category. Yet we have already made a distinction between functional explanations and functionalism. This implies that functional explanations have to be reserved to how it is applied in biology in terms of natural selection. Because of the presentation given in this chapter, causality forms the basis also in functional explanations in the sense that mutations represent the cause for why a certain organism has obtained beneficial properties. These properties may also not be beneficial for the organism, and if so, the organism will become extinct. In this sense, a functional explanation presupposes blindness in the sense that it is not the end that explains the survival of a species, but a random occurrence of a mutation combined with a randomly given environment. This blindness presupposes, of course, an abundance of individuals, which is certainly the situation for some species, but not necessarily for all. For this reason, Fodor and Piattelli-Palmarini (2011) accuse Darwinism for committing an intentional fallacy by stating, "evolution is a process *in which creatures are selected for their adaptive traits*" (p. xvii) on the basis that "evolution is a process in which *creatures with adaptive traits are selected*" (Fodor and Piattelli-Palmarini 2011, p. xvii). In other words, the fact that some species by necessity have developed beneficial characteristics by means of random mutations and natural selection does not imply that all species by necessity have developed beneficial characteristics solely by random mutations and natural selection. There may be several other explanations, and the condition, specifically the necessary abundance of individuals, may not have existed. In this sense, the causality in functional explanations is not to be regarded as a necessary condition given by necessity in all cases but still appears as a sufficient reason given by necessity in those situations in which it is reasonable to be applied.

It is quite common in psychology to include (3) intentional explanation as a part of (2) functional explanations. However, with the specification of functional explanations presented here, this integration will be impossible. They rather contradict each other in several ways, and especially in regard to the role of intentions. Functional explanations are characterized by blindness, which is completely excluding any type of intended plans, whereas intentions form the core characteristics of intentional explanations. The intentions or purposes even have to be explicit. Immanuel Kant has already characterized “unconscious intentions” as a contradiction in terms, which is also emphasized by Elster (1979). This signalizes that intentional explanations are to be regarded as given by a sort of necessity, or at least that necessity is a sort of ideal and realistic achievement. The reason is that social phenomena are hard to explain unless one is able to trace a certain intention or purpose behind their occurrences. As long as purposes are traceable in records, social phenomena are easy to explain. Yet, the problem is that the great amount of intentions and purposes have very often never been articulated or recorded. They have rather remained within the inventor’s minds. Especially if there is a group standing behind a social phenomenon or an institution, which very often is the case as well, it is certainly difficult to trace the type of intention that forms a sort of necessary condition for its existence. Especially in history, the phenomenon to be explained may have changed and therefore may have appeared as something else because new decision makers with new intentions would have come in and made the changes. Although we may refer to the same institution, building or social phenomenon, it could have been one thing originally and something else later on. This has caused Elster to distinguish between different sorts of intentional explanations by introducing the terms “subintentional causality” and “supraintentional causality”. The former includes individuals’ wishful thinking, reduction of cognitive dissonance, biases and unrelated motivation and the latter refers to an aggregated cluster of notions and motivations, which make the intentions rather diffuse (Elster 1994). In this respect, intentional explanations are touching the whole spectrum of conditional factors in psychology. Intentional explanations do include aspects of necessity in the sense that an act presupposes a purpose, and this purpose is a necessary reason for the act. Yet, when the act is performed as a result of an order, it is not this person’s intentions that are followed, but another’s, who may even be unidentified. The fact that the order is given is sufficient, but not a necessary reason for the act that is performed. Thus, intentional explanations may gradually move over to serve as sufficient reasons, and even to the looser versions, especially if the forcing condition for an act is an unidentifiable person or even undetectable circumstances. There is at least one more or less certain intention behind a social phenomenon or an institution, and this is sufficient to achieve an explanation. Sometimes this can be so strong and well articulated in the records that we may talk about causality in terms of being a necessary reason. This was the situation when parliamentarism was introduced in Norway in 1884 for example. This historical change required that someone agitate for parliamentarism, and the politician Johan Sverdrup did so. He was also nicknamed “The father of Parliamentarism in Norway”, which tells us that he was the reason for this political change. Yet, he was not a sufficient reason by necessity because this change of

political system had to be approved by King Oscar II, and he was rather reluctant to this reform. In this sense, the king could have been a sufficient reason by necessity, but Johan Sverdrup's resistance caused him to not be one. Several individuals and the whole Norwegian population contributed to force the king to approve, and in this sense, almost each individual within the Norwegian borderlines contributed to this, but we do not have any records telling us what each one of them actually contributed. The whole Norwegian population therefore represented a sort of reason for why the king was forced, but it is more diffuse. Therefore, the pressure from the whole Norwegian population was sufficient to make a change, but it is hard to specify exactly how there should be a connection between each individual's opinion and the king's decision. In other words, by being nicknamed "The father of Parliamentarism in Norway", Johan Sverdrup was regarded as a sufficient reason without being the only reason for the political change. In this sense, he was an important factor, and probably the most important factor along with a lot of other unspecified factors, like the people's will for example. Because of all the other factors, but Sverdrup as the most specific, Sverdrup could be regarded as a sufficient reason, but not in a strict sense and therefore without logical necessity.

Some similar aspects are also recognizable when we talk about (4) catalysis. According to the density functional theory, the catalyst's impact on the chemical reaction may be explainable. What is recognizable is the fact that the catalyst is a third and not so definable part in the chemical process. In this sense, the catalyst counts as a sufficient reason for making the reaction stronger and more efficient. The certain metal applied is not necessary but rather sufficient because there may be other metals or even other factors that will trigger the same type of reaction. The same could be said about the process of decision-making in the earlier example from Norwegian history, namely that a certain individual takes the decision, but there would be a lot of other factors that have influenced upon it. In this respect, the individual would be the direct cause to the decision made, but very often it would have been triggered by a lot of different factors, like colleagues, as well as quite peripheral factors like a certain mood or whatever. Yet, these factors would represent a great variety and are quite unpredictable in the sense that it would be impossible to decide which of those two factors that actually set off the certain decision on exactly that day. Hence, the psychological situation is analogous to the chemical situation in some respects, but not in all. The difference is of course that it is hard to decide which factor that appeared as the compelling force triggered the very decision. The reason is that the factors involved are human beings, and each one of them has a free will that can go in different directions. The same is true for the decision-maker as well, of course. One may narrow down the environment, but the unpredictability will still be there because the individuals have free wills, which make the situation very different from a chemical process.

On this background, catalysis may refer to two separable situations. One is in chemistry, in which a specified metal or circumstance has a demonstrable impact on a certain chemical reaction. In this situation, the catalyst counts as a sufficient reason for making the chemical reaction stronger and more efficient. It is also predictable in the sense that by bringing in this metal or factor, the chemical reaction will always be

intensified. The other situation may also appear in chemistry in the sense that there may be different catalysts and factors that can trigger a specified chemical reaction, which does not appear without the catalysts. In this situation, we do not know exactly the causal sequences in the sense that the catalysts seem to represent a type of cause, although they are untouched at the end of the chemical process. In this sense, the catalyst can rather be regarded as a constraining factor in which the causal sequences are highly unclear, but still count as an explanation for the efficiency of the process. This is a situation that can be comparable with a psychological situation, like in decision-making as mentioned. However, these two situations are still discernible in the sense that the first situation indicates that the catalyst is a sufficient reason given by necessity, whereas the other is a sufficient reason not given by necessity.

What is called (5) functionalism is of a very different type of explanation. We actually do not know very much about the causal sequences, and if we are able to trace some, there must certainly be many others as well. Thus, the only thing we can deal with is the effect and not the cause itself. As may be obvious, these represent a group of explanations that are neither logically nor intellectually fully satisfying. We nonetheless accept them as a type of sufficient reason, but not in a logical way. In this context, the term “sufficient reason given by necessity” is reserved for a situation in which the reason is given as if it is by logical necessity: A by necessity always implies B, but B does not by necessity always imply A. So when the reason is not given by necessity, we are not dealing with reasons as result of logical inferences, but rather with reasons as a psychological need, so to speak. This is the need for making meaning out of an situation and this is what Ernst Cassirer calls “mythical thinking”, which “has a free selection of causes at its disposal” (Cassirer 1955, p. 46). Yet, according to Cassirer, this does not contradict the “empirical thinking”, which makes “an unequivocal relation between *specific* ‘causes’ and *specific* ‘effects’” (Cassirer 1955, p. 46) in the sense that empirical thinking also is a sort of mythical thinking: “Thus taken abstractly, both the mythical and the scientific explanations of the world are dominated by the same kinds of relation: unity and multiplicity, coexistence, contiguity and succession” (Cassirer 1955, p. 60). However, thinking in causes and effects is different from a pure mythical thinking, and they represent different aspects in our understanding of the world. It is also a requirement to make distinctions between different forms of understanding the world, to exactly obtain different sorts of meaning. On this basis, it is meaningful to make a clear distinction between (2) functional explanations and (5) functionalism. Yet, owing to the two laws of specificity and homogeneity, they neither exclude each other nor appear as identical. They have different forms in the sense that the mechanical cause and effect is more closely related to the logical notion of necessity, whereas the latter has a free selection of causes at its disposal and is detached from any logical criteria of necessity.

On this background, it is interesting to quickly again bring in the retrospective look at some aspects of the appearance of functionalism and functional explanations in the history of psychology. So far, functional explanations are narrowed down and are to be defined in terms of natural selection as it is presented in Darwinism. Thus, the conclusion in this chapter is to make a distinction between functionalism and Darwinism. If we go back to the one that is regarded as the founder of functionalism in psychology, namely James Rowland Angell, we will see that he did not make any distinctions between functionalism and Darwinism: “functional psychology [...]

has been increasingly in evidence since Spencer wrote his *Psychology* and Darwin his *Origin of Species*" (Angell 1907, p. 62). By referring to the *Origin of Species*, he is referring to the mechanism of natural selection and specifically functional explanations. Yet, this is not specified, like it is not in James' 1884 article on emotions either. On the one hand, James also talks about Darwin as the one who has presented a universal understanding of development (James 1884, p. 190 f.), but on the other hand, he is also referring to Darwin's work on emotions (James 1884, p. 190; Darwin 2009). Those two works of Darwin must be said to be different in the sense that the latter does not discuss natural selection, but rather focus on bodily forms of expressions as a basis for explaining emotions. This is the aspect John Dewey was pursuing when he aimed at bringing "Darwin's principles as to the explanation of emotional attitudes, and the James-Lange theory of the nature of emotion [...] into some organic connection with each other" 10 years later (Dewey 1894, p. 553). This connection is more or less fulfilled in Dewey's discharge theory of emotions, which tells us something about the relationship between functionalism and functional explanations. "My proposition at this point is that the phenomena referred to the principle of direct nervous discharge (the response to an idiopathic stimulus) are cases of the failure of habitual teleological machinery, through some disturbance in one or more of the adjusted members of the habit" (Dewey 1894, p. 560). In other words, the inhibition in achieving intended goal is producing emotions, which are expressed in a bodily reaction. This includes, by necessity, some teleological aspects. Yet, the teleology in this situation is to be defined in terms of certain intentions. In other words, functionalism in this situation does not include efficient causes, like we found in functional explanations, but rather intentional causes.

In this retrospective perspective also behaviourism is interesting in the sense that especially B.F. Skinner referred quite frequently to Darwin (Skinner 1976). Fodor and Piattelli-Palmarini (2011) make a great point out of the coincidences between Darwinism and the theory of operant conditioning: "In fact the two theories are virtually identical: they propose essentially the same mechanisms to compute essentially similar functions under essentially identical constraints" (p. 3). They continue: "both are about how traits in a population change over time in response to environmental variables" (p. 5). They both also deny mental causes, and in this respect "Darwin was right [...] but] Skinner was wrong" (p. 13). It is in this respect Fodor and Piattelli-Palmarini can state that Skinner commits an intensional (with an "s") fallacy. Skinner presupposes a separation of behaviour and intentions and regards them as independent entities, whereas they are in fact two sides of the same coin and cannot be separated at all. When it comes to behaviour, it is completely dependent on intentions, and in this respect, it is explained by mental causes. Fodor and Piattelli-Palmarini endeavour to persuade the reader that Darwin also committed the same fallacy. Yet, the argument is not as strong and persuasive, although their arguments make sense because the theory of natural selection presupposes an abundance of individuals to create favourable mutations, and it is not very likely that they can be traced back to the development of higher primates. This does not logically exclude the possibility of natural selection as an explanation for the existence of these species though.

Conclusions

The aim of this chapter was to investigate to what extent catalysis can serve as an explanatory term in psychology. The conclusion is that catalysis in chemistry has to be regarded as something different from catalysis in psychology. Yet, the term can also be used in psychology, but if so, it refers to something else than what is referred to in chemistry. The difference is based on a nuanced understanding of sufficient reasons, which is used in two different meanings in the literature. On the one hand there is a logical understanding of sufficient reason, which implies that by sufficiency a specified reason is given by necessity. On this background, one may say that catalysis in chemistry forms a sufficient condition for enhancing the chemical reaction, whereas catalysis in psychology rather counts as a sufficient reason without any compelling factors given by necessity. In this respect, there are no clear differences between the use of catalysis and functionalism in psychology.

Several philosophers have applied sufficient reason in a not so strict meaning to have a criterion for meaningful explanations. One of them is Schopenhauer. His law of specificity was applied to make distinctions between the explanations and the criteria applied to specify them. The distinction between sufficient reason and sufficient condition is one of them. Similarly, the law of homogeneity was also applied, not only for saying that there is a connection between sufficient reason and sufficient condition but also to make a connection between the different explanations. Thus, there is a continuous line between the explanations and their reasons, which also results in overlaps between them. Therefore, catalysis in psychology must be understood in this perspective, which makes that it may appear as a metaphor as well as that it adequately explains influences circumstances and situations may have on individuals or a group of people.

This is a sort of connection, which was also traced between functionalism and functional explanations. Functionalism was brought in because the process of catalysis is normally explained in terms of the functions of the catalyst. Yet, it was demonstrated that functionalism could be distinguished from functional explanations in biology and intentional explanations in social sciences and humanities. The latter two forms of explanations are more strict and specified in the sense that it is possible to trace and pursue the parts in a series of causes. This is not the case in functionalism, which is rather a way to make meaning out of something that is not characterized by an explicit and traceable causal sequence, and therefore is very close to a general understanding. Hence, when catalysis is applied in psychology, it is primarily used in the latter meaning, which is a situation where there are some constraining factors, but where the causal sequence is impossible to specify. On this background, we have dealt with six different forms of explanations and evaluated them in terms of “sufficient reason”, “sufficient reason given by necessity” and “necessary reason”. This can be illustrated in a table in which the X will show which forms of explanations are satisfying which criteria (Table 4.3).

The brackets signify that the explanation just partly satisfies the criterion of being a necessary reason. This emphasizes the problems with putting these terms into such strict categories as the table represent. Because the terms are rather empirical

Table 4.3 Criteria different forms of explanations

	Sufficient reason	Sufficient reason by necessity	Necessary reason
Efficient cause		X	X
Functional explanations		X	(X)
Intentional cause	X	X	(X)
Catalysis	X	X	
Functionalism	X		
Understanding	(X)		

than theoretical, there are no strict boundaries between the categories. They are to be regarded as stations on a continuous line, which is continuous because of the law of homogeneity, but the stages are also possible to discern because of the law of specificity. In this sense, the table does not take into account the law of homogeneity, but rather emphasizes the law of specificity. On this background, there are some similarities between the different sorts of explanations, and also between catalysis applied in chemistry and psychology; however, these similarities do not exclude or contradict emphasising the distinctions as well. In other words, there is no problem to apply all the six types of explanations, but one has to be aware of the fact that they are different and represent different levels of precision.

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