

Scientific System (*Wissenschaftssystem*)

Science is a functionally differentiated subsystem of modern society [*→Differentiation of Society*], which uses the communication medium *→truth* for its own reproduction. The function of the scientific system is to construct and obtain new knowledge. Scientific truth is not understood as the equivalent of the real world, but rather as a *→symbolically generalized medium*. To produce operations, truth refers to the coding of the difference between true and untrue: both values mark a communication as scientific, which becomes observable through these values. As such, scientifically untrue knowledge must also be treated as scientific.

The structures of the scientific system consist of *→expectations* of a cognitive type, which are changed in the case of disappointment. This means that scientific knowledge changes when research produces new, hitherto unknown results: new theories and concepts are formulated, following which scientific structures engender different expectations than they did before. Compared with how deviation is handled in other subsystems of society, science handles it the other way around: each scientific communication produces something new, and this new thing can be adopted as a condition for further communication, or abandoned if it is later shown to be untrue or has no connectivity for research. At any rate, it only makes sense to conduct research when we have something new to say.

The values of the code true/untrue [*→Truth*] indicate scientific communication by differentiating it from other communication that takes place in society. The code, however, provides no instructions for the topics or structures that scientific communication facilitates and steers. This is done by the scientific system's *→programs*. Theories and methods function as correctness conditions in the allocation of code values. As conditions, theories and methods limit and determine what is accepted in scientific operations. Both make observable whatever research refers to (e.g., organisms, psychic or social sys-

tems, machines, nature). In this way, science can condition its observations in a specific form, namely through limitationality: the determination of an element in a relationship contributes to the determination of the other elements in the relationship. When a hypothesis proves to be untrue, certain other hypotheses become more probable and attract research resources: in this way, new research opportunities are constantly being formed. Limitationality, in this sense, should be grasped not as the limitation of observable objects, but rather as the condition for scientific communication. When everything could be completely arbitrarily different, it would be impossible to produce new knowledge that could be used as if it were true. The negations that are constantly produced in the scientific system must be informative—in a theoretically and methodologically conditioned way—for instance, for what can still be done, for which hypothesis can be held as reliable. The choice of one distinction limits, for instance, what can be indicated by its exclusion of other possibilities; at the same time, this choice is contingent because it excludes something. Only in this way can science refer to objects and use certain distinctions in its observations, and it is only in this way that it is possible to train scientific knowledge.

Since reality is constructed on the basis of theoretically guided distinctions, the system favors making distinctions that take its contingency into account, i.e., it can exert a certain control over itself. This is possible when the distinction can indicate itself through a *→re-entry*. One example is the guiding distinction of systems theory between system and environment: a system can only observe itself when it can distinguish itself from its own environment—i.e., when it refers to the distinction system/environment. The observer making this distinction (in our case, systems theory in the scientific system) can observe the distinction in question without having to leave it, and it therefore has the chance to justify this distinction without having to reach for theory-external reasoning. The justification of the chosen distinction lies, in other words, in the ability to compare this distinction with other possible, alternative distinctions within the initial schema. The necessity of using distinctions that can be reapplied is primarily emphasized in the epistemological reflection of science. The description of scientific knowledge as an operation of a self-referential system is today accepted by theories of knowledge known under the heading of “*→constructivism*”. The question that scientific reflection asks itself no longer concerns the correspondence between knowing system and known world, but rather the structures of a social system that itself constructs the reality that it observes, and can make this question the starting

point of its own reflection. Constructivism phrases the problem in terms of how a theory of knowledge can be constructed that takes into account the fact that the observers in the world it wants to describe empirically exist. The epistemology to which constructivism refers is one that includes the designer of the knowledge: it is an epistemology that also describes itself and therefore requires self-observing distinctions. The same goes for the case of a theory of society, which can only be autological because it is found among its own objects and must therefore include itself in its objects.

For sociology, these arguments are particularly important because the theories offered by this discipline often base their validity on assumptions that are more moral or ideological than scientific. Indeed, there is often the implicit assumption that the critic of the criticized society does not belong to it. The system-theoretical approach takes the opposite course: however well or badly we can speak of this society, the sociologist's task is primarily to retain the fact that everything she writes and says about society is also true of the sociologist herself. [G.C.]

Die Wissenschaft der Gesellschaft (1990); The Differentiation of Advances in Knowledge (1984).

