25. Roots of sociology as a science: some history of ideas*

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1. INTRODUCTION

The core features of a scientific approach to sociology as described in this Handbook (see the chapter by Raub, De Graaf & Gërxhani) are as follows: sociology and social science in general is an explanatory empirical science – at least it is the goal to establish such a science. The aim of science is the explanation of regularities that have been established by systematic observation. Theories specify causal relationships and in conjunction with boundary conditions imply testable hypotheses. There are obviously some contrasts between the natural and the social sciences. However, scientific sociology is based on the idea of the unity of science, the conviction that there are no fundamental differences with respect to the methodological rules and criteria of evaluating theories between the sciences, such as physics or biology, and the social sciences.

Rigorous sociology has a variety of roots. Science is a social activity that is embedded in institutions and in organizations (such as research universities). Establishing institutional contexts which foster a viable rigorous approach to sociology can hardly be overestimated. However, in this chapter I will primarily focus on cognitive aspects. In focusing on a variety of intellectual traditions from different historical periods which are presented in chronological order I do not want to argue that there has been a cumulative quasi-linear development. A further caveat is in order: The selection of contributions that are covered comprises a small and possibly biased sample from a much larger set of important other scientists and research traditions. The chapter accentuates social theory and does only in passing refer to developments in statistical and other methods which are central in rigorous quantitative research.

2. THE BRITISH TRADITION OF EMPIRICIST SOCIAL THINKING

It may seem uncommon to start with the discussion of ideas from a tradition that is usually considered as belonging to philosophy. In contrast to many surveys on the history of sociological thinking, but in accordance with some other work (e.g., Schneider 1967; Vanberg 1975; Levine 1995), the impact of thinkers from the British tradition should be

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recognized. In the seventeenth and eighteenth centuries, the division of labor between the various scientific disciplines was not yet well developed. What is now labeled sociology, economics or political science was in this time called philosophy or ‘moral philosophy’. The British philosophers Thomas Hobbes and David Hume may therefore, as Hardin (2007, pp. 3–4) succinctly put it, be characterized as ‘proto social scientists’ because they ‘solidly ground their theories and explanations in the real world. [. . .] They are driven by theory, or deduction from a few given objective principles, and are therefore early moderns in their approach to science’.

Thomas Hobbes (1588–1679) is well-known for his *Leviathan* (1651). In this work, Hobbes sketches the so-called problem of ‘social order’. Hobbes uses a *Gedankenexperiment* for an explication of the problem, namely the ‘state of nature’. In this hypothetical situation, which is approximated by real-world conditions in stateless ‘primitive’ societies, by international relations or by civil wars, goal-directed actors attempt to achieve ‘goods’. They want to secure their physical existence, collect material resources and also achieve social approval (status, reputation). In the state of nature, rules of cooperative conduct are mutually profitable but cannot be enforced because the individuals interact in a kind of social dilemma. Everyone knows that everyone would be better off if rules were universally accepted but every individual has an incentive to let others cooperate. The state of nature thus is akin to a Prisoner’s Dilemma or public goods production situation where individual rationality yields suboptimal collective results. Hobbes’s solution to this problem is the state (‘commonwealth’). Every individual joins a social contract with every other individual and transfers the right to control one’s actions to the state. The state in this way receives the power to monitor and sanction the ‘natural rules’ which require cooperation.

Hobbes’s thinking is modern not only because it has supplied one of the most basic problems of social theory to this day (the problem of cooperation). In addition, the following components of Hobbes’s ideas are constitutive to a modern social science:

1. Social science (in Hobbes’s times still a branch of ‘philosophy’) has the task to explain real world phenomena by principles which are based on causal relationships among objective factors. There is no need to postulate divine or metaphysical forces which act in the natural and the social world.
2. Hobbes’s approach is empirical. Being impressed by the success of Galileo Galilei’s mechanics, Hobbes assumes that the *empirical laws* of motion apply to both, activities of unconscious bodies and of human bodies: Hobbes’s ‘philosophy is an attempt to see how far the Galilean dynamics can be pushed as an explanatory principle’ (Copleston 1959, p. 23). Hobbes therefore can be considered as an early thinker who subscribes to the idea of the *methodological unity of science*. For him, there is no contrast between natural and social science. Hobbes pushes this idea as far (possibly too far) as arguing in favor of a materialistic and mechanical view of the social world.
3. Another important element of Hobbes’s thinking is due to his admiration of axiomatic and *deductive reasoning* in Euclid’s geometry. Hobbes attempts to develop his arguments ‘more geometrico’ (in a geometric manner) like geometers who deduce theorems from primitive assumptions (axioms).
4. Hobbes tacitly uses a heuristic postulate that has been made explicit much later, namely, the principle of *methodological individualism*. Social phenomena must be explained by
principles which apply to the behavior of individual agents. The distinction between individual action and social outcomes is fundamental in Hobbes’s thinking.

The Hobbesian idea of a social contract has been a target of empiricist attacks from authors of different theoretical camps. One of the most prominent critics is David Hume (1711–76) who argues that social order can be a result of ‘convention’. That is, self-interested individuals cooperate under the condition that their interaction partners will likewise cooperate. Conditional reciprocal cooperation can emerge in small groups and communities even in the absence of a coercive authority (cf. Hume 1739 [1978], pp. 490, 520–521 and passim; Hardin 2007, pp. 81–133). In a similar vein, the idea of a ‘spontaneous’ social order has been used by Adam Smith (1723–90) to characterize the workings of the ‘invisible hand’ of market institutions. Bilateral exchange relations among agents who are purely motivated by their narrow self-interests produce, under certain conditions, collective results which appear as being outcomes of intentional design.

There are at least two main ideas of the Scottish tradition that are constitutive to modern social theory.

1. Hume (like Hobbes and other British authors) conceptualizes micro-macro transitions from a methodological individualistic perspective. In contrast to the contractarian approach of Hobbes, Hume stresses the idea of *spontaneous gradual evolution of social institutions* such as informal norms (coined ‘artificial virtues’) and conventions.

2. To realize the aims of methodological individualism one needs to establish the empirical laws of human behavior. This is possible due to the ‘uniformity’ of human nature. There are law-like empirical regularities of human behavior which are at work in every culture and in every historic period (Hume 1777 [1975], p. 83).

Space limits prevent a more detailed discussion of Hume’s impact on modern social theory (see Hardin 2007). Hume’s epistemology is that of a radical empiricist. With an anti-metaphysical furor, Hume expresses his view about the criteria of cognitive validity in famous albeit drastic words:

> When we run over libraries [...] what havoc must we make? If we take in our hand any volume; of divinity or school metaphysics, for instance; let us ask, Does it contain any abstract reasoning concerning quantity or number? No. Does it contain any experimental reasoning concerning matter of fact and existence? No. Commit it then to the flames: for it can contain nothing but sophistry and illusion. (Hume 1777 [1975], p. 165)

Framed in more recent terminology, Hume’s epistemology is based on the thesis that the set of cognitively meaningful statements contains two disjoint subsets: analytic propositions, which can be proven to be true or false by deductive reasoning, and empirical (‘synthetic’) propositions, which can be tested by empirical observation and experiment.

3. **TWO CLASSICS OF RIGOROUS SOCIOLOGY: EMILE DURKHEIM AND MAX WEBER**

The beginning of sociology as an academic discipline in Europe (circa 1900) is linked to the names of Emile Durkheim and Max Weber. At the risk of over-simplifying, Durkheim
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(1858–1915) can be described as a sociologist who attempted to create a new science that aims to discover and test via empirical observation nomological, causal regularities about ‘social facts’ which resemble the laws of natural science. Max Weber (1864–1920) set up the vision of a theoretically sound discipline that explains social macro-phenomena (social facts in Durkheim’s sense) by using law-like assumptions about individual action. In contrast to Durkheim, Max Weber supported methodological individualism and the idea that sociology and economics are akin in that both disciplines use rationality assumptions to explain human action.

Durkheim’s (1895) *Règles de la méthode sociologique* is an attempt to demonstrate that sociology is a scientific discipline with a domain that is different from the domains of other subjects in the natural sciences and the humanities. The domain of sociology is ‘faits sociaux’ (social facts). Examples of social facts are conventions, informal and legal social norms, collective behavior, fads and fashions, and properties and products of populations of individuals (such as birth and death rates, suicide rates or crime rates). Social facts are the results of the behavior of individuals and their associations. They are different from physical objects, but they should nevertheless be treated like physical objects. Sociology’s task is the explanation of the emergence and effects of empirically observed social facts, it is not a science of conceptual abstractions (cf. Durkheim 1895, p. 20). How are social facts explained? Durkheim argues that social facts are emergent collective phenomena ’sui generis’. They are not reducible to their constituents (namely, individuals and their psychological traits) but must be causally explained by preceding social facts (Durkheim 1895, p. 109). Thus, Durkheim explicitly rejects methodological individualism. This holistic approach corresponds to influential intellectual currents in France, in particular Auguste Comte’s (1798–1857) ‘positivist’ kind of ‘sociology’. However, Durkheim in fact frequently deviates from his own methodology by introducing social psychological concepts and theories in his attempts to explain social facts (cf., e.g., Lindenberg 1975). A case in point is Durkheim’s *Suicide* (1897). Under the influence of forerunners in social statistics such as Adolphe Quetelet (1796–1874), albeit analytically less sophisticated than Quetelet (see on this point Goldthorpe 2021, pp. 36–37, who is critical of Durkheim), Durkheim argues that suicide rates are social facts which are correlated with other social facts. Protestant societies show larger suicide rates than catholic regions. In explaining this regularity, Durkheim points out a micro-explanation: suicide rates vary by the degree of social integration of the individual into the local group or community (‘egoistic suicide’). Protestant communities stress individual autonomy and free thinking. In contrast to catholic communities, they do not exert strong norms of everyday conduct and of liturgical procedures. Thus, the average Protestant is less integrated into her local group and therefore has a higher risk of committing suicide in situations of psychic stress. Some of Durkheim’s arguments about suicide are considered to this day as useful exemplars of deductive reasoning that is based on elementary empirical regularities (see, for example, Stinchcombe 1968, pp. 15–17; Van Tubergen 2020, pp. 53–58). Durkheim rightly argues that multiple other testable empirical predictions are implied by this account. For instance, suicide rates of single men will be higher than those of married men if age is held constant (Durkheim 1897, pp. 176–177). Durkheim’s (1897, Chapter V) concept of ‘anomic’ suicide is a further illustration of the fact that Durkheim explains links between social facts at time $t_1$ to social facts at $t_2$ by postulating (or, at least, adumbrating) a social mechanism at the micro-level. Durkheim’s account inspired more recent work that addresses deviant
behavior, in particular Merton’s theory of anomie and the theories of relative deprivation or frustration (Boudon 1977, Chapter V; Coleman 1990a, pp. 472–477).

Max Weber’s contributions to a rigorous sociology can hardly be overstated. Weber’s thinking has been influenced by different intellectual traditions with mutually inconsistent ideas. Weber started his career under the influence of the German ‘historical school’ of economics that favored an approach to social science which is incompatible with a rigorous perspective. The historical school assumed that social phenomena cannot be explained by law-like causal generalities but must be taken as unique singular events which must be described by using methods of historical research and by a hermeneutic understanding (Verstehen). In addition, some exponents of the historical school demanded that economics should aim not only at describing the historical evolution of events but also at providing value judgments about those interventions which foster the German national interests. Thus, there has been a tendency to merge normative and positive (descriptive) aspects. Weber also came under the influence of another influential tradition in German-speaking social science, namely, the Austrian School of economics. In contrast to the historical school, the Austrians (such as Carl Menger [1840–1921] and Joseph Schumpeter [1883–1950]) favored a social science that is akin the neoclassical thinking and has in fact been a component of the ‘marginalist’ revolution of the English-speaking academic world of their time. In the spirit of the British, and particularly the Scottish, tradition (David Hume, Adam Smith) the Austrians defended methodological individualism. They accepted neoclassical economics and did not demean efforts to look for generalized social regularities and to use mathematical models.

Max Weber was involved in one of the first Methodenstreite (debates on methodology) in German-speaking social science and defended the postulate of a value-free social science (Werturteilsfreiheit) against his (mostly right-wing) opponents from the historical school. It is not evident whether Weber has been directly or indirectly influenced by Hume’s law, which states that one cannot derive an ought from an is. However, Weber apparently accepted the following propositions:

1. Normative and descriptive expressions can in principle be strictly demarcated. There is no way to logically derive normative propositions (or imperatives) and value judgments from sentences which exclusively contain descriptive concepts.
2. Since science deals with discovering and testing descriptive propositions it is not possible to justify normative statements by scientific methods.
3. Norms, value judgments and ‘morality’ nevertheless can be and must be studied as objects of empirical research.
4. Science can legitimately point out the real-world consequences of social interventions. In particular, social science may elaborate on the unintended consequences. It may demonstrate whether and in what degree certain normatively defined goals can effectively be realized.

There has been and still is some debate about the validity of Weber’s postulate. Some aspects of this debate result from misunderstanding (see Albert 1968, Chapter III). The fundamental practical consequence of Weber’s postulate is that the validity of products of scientific research (namely empirical propositions and theories) must be evaluated by cognitive criteria (such as logical consistency, empirical content and empirical support) and not
by ideological or political purpose. The postulate is thus opposed to certain tendencies of intellectual discourse and political action in contemporary Western academia. In the light of Weber’s view, sociology must secure its immunity with respect to standards of ‘political correctness’. Ironically, it may be that the more sociology attempts to become ‘politically relevant’ the less it will contribute to effective solutions of societal problems (Turner 2019).

Weber deviates from the historical school in another important aspect. *Verstehen* is but a heuristic method of discovery of action motives which in turn result from the actors’ situational contexts. Sociology, according to Weber, is a science which aims, with the help of interpretative understanding, at explaining causally the course and the social effects of social action (Weber 1973, p. 542).

Weber endorses, as expressed in his short booklet *Soziologische Grundbegriffe* [1921] (Weber 1973, pp. 541–581), methodological individualism. In his *Grundbegriffe* Weber develops theoretical and conceptual tools for sociology, starting with the most elementary units (behavior, action, social action, social relation, etc.) and demonstrates how more complex phenomena such as authority relations, legitimate social institutions and so on, can be constructed analytically as combinations of basic social units. Weber scholars have argued that the main subject of Weber’s approach is social interaction (meaningful social action in social relations) and the micro-macro relationship (Schluchter 2015, p. 595). Regarding the explanation of action, Weber accentuated the central role of instrumental rationality (*Zweckrationalität*) which is conceptualized, albeit without formalization, like rational choice in neo-classical economics. This implies that agents optimize not merely by choosing among alternative ‘means’ for given ‘ends’ but also trade-off various ends (see Norkus 2001 on Weber’s relation to modern rational choice theory). Besides instrumental rationality, Weber (1973, pp. 565–567) introduces the concept of value rationality (*Wertrationalität*) that resembles Kant’s ideas on categorical commitment. It is characteristic of this kind of motive that the agent chooses among alternatives such that she commits to certain values (religious, political, moral, etc.) and is unwilling to trade-off alternatives which are attached to these values. There is still some controversy whether this concept is theoretically sound and empirically valid (see Boudon 2009; Esser & Kroneberg 2015).

Among the substantive sociological works, the comparative historical analyses of societal effects of religious ideas and institutions are exemplars for Weber’s interest in micro-macro-transitions. In his most famous and controversial studies on the Protestant Ethic (Weber 1978) Weber argues that there are paradoxical by-products of actions which aim to realize other goals (**Paradoxe der Folgen**). Protestant believers are acting rationally (possibly motivated in terms of ‘value rationality’; cf. Schluchter 1988, p. 75 and passim) according to the protestant maxim of probation before god (**Bewährung vor Gott**) and thereby unintendedly contribute to the flourishing of capitalist economic institutions. In the long run, Weber argues, the religion and protestant ideas have been crowded out by materialistic cultural values in European capitalist societies.

## 4. PHILOSOPHY OF SCIENCE AND THE LOGIC OF SCIENTIFIC EXPLANATION

Durkheim has developed his perspective of an empirical sociology under some influence of ‘positivist’ French philosophers such as Auguste Comte. Weber was socialized in a
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e neo-Kantian intellectual milieu and, possibly via the Austrian school, has been inspired by the British tradition. In a similar vein, more recent twentieth century sociology has adopted philosophic ideas which helped to shape the vision of a rigorous sociology. This refers especially to European contributions to a rigorous sociology.

In philosophy, classical Humean empiricism has been adopted and elaborated in various ways by philosophers of the Vienna circle (Moritz Schlick, Rudolf Carnap, Otto Neurath) and of the affiliated Berlin group (Carl Hempel, Hans Reichenbach) of logical empiricism. Most members of the Vienna circle have been trained mainly in mathematics or physics. An exception is the sociologist Otto Neurath (1882–1945) who was perhaps the most radical member of the circle, both politically and relating to his attitude towards metaphysics (for an excellent treatment of the history of the Vienna circle, see Sigmund 2018). Neurath pleas for a materialistic sociology that is completely free of metaphysical elements. Though he admits that Weber has released important contributions to a scientific sociology, he rejects Weber’s empathetic Verstehen and defends a behaviorist methodology that is based on the idea of unified physicalist science: ‘[. . .] understanding (Verstehen) and the like may help the research worker, but they enter the totality of scientific statements as little as does a good cup of coffee which also furthers the scholar in his work’ (Neurath 1973, p. 357).

Philosophers of the Vienna circle discuss various criteria of cognitive significance (Sinnkriterien) to demarcate scientific statements from metaphysics. The criteria which have been proposed became increasingly liberal but nevertheless did not result in a success story (Hempel 1965, Chapter 4). In David Hume’s spirit, the set of cognitively significant propositions is partitioned into the two disjoint subsets of analytic and synthetic propositions a posteriori (i.e., propositions which are empirically testable). Statements which are neither analytic nor synthetic were declared as being meaningless. Various criteria of empirical significance were discussed in this context, for instance, the criterion of verification (or verifiability): synthetic propositions are meaningful if they can be verified by observation sentences. Karl Popper (1902–1994) argues in Logik der Forschung (1935) and subsequent work that, first, criteria of significance are too restrictive because, due to the logical impossibility of induction (which was already demonstrated by Hume), verification is logically not feasible in the case of universal deterministic laws. Second, metaphysics (i.e. ‘meaningless’ statements) should not completely be dispensed with – even in empirical science. Popper’s criterion for the demarcation of science from non-science is that scientific theories are falsifiable. According to Popper (1963), the history of science demonstrates that the growth of scientific knowledge in many instances has benefited from metaphysical ideas. In the social sciences, the postulates of methodological individualism and Weber’s postulate of value freedom are not falsifiable empirically because they are normative. However, these postulates may prove fruitful because they protect science from extra-scientific ideological forces and help to direct research to the construction of deep explanatory theories with extensive empirical content. Lakatos (1970) proposed a methodology of scientific research programs which is Popperian but accentuates the idea that successful research programs necessarily contain metaphysical components which serve as heuristics and even protect testable components from severe empirical tests until the program achieves maturity.

Popper (1935) argues that science aims at explaining singular events or regularities by using empirical laws and propositions about antecedent conditions. Carl G. Hempel
(1905–1997) and Paul Oppenheim (see Hempel 1965) clarified the covering law model of
deductive nomological explanation and proposed criteria for adequate explanations.
Besides Popper and Hempel, Ernest Nagel (1901–1985) is among the most influential
philosophers of science of the logical empiricist camp in the English-speaking world.
Nagel worked at Columbia University and has had some interaction and collaboration
with members of the sociology department. The impact of these philosophers on the
social sciences has been considerable.

Based on his philosophy of critical rationalism, Popper (1957, 1966) argues that the
social sciences will not be suited to providing general laws of societal development (see
also Boudon 1984 for a related discussion of ‘laws’ of social change). ‘Historicist’
accounts of societal change, like those of ancient Greek authors or like theories of Comte,
Marx or Spencer, fail if one accepts the empirically very intuitive assumption that social
change depends on the state of scientific and technological knowledge. To argue that
future knowledge can be predicted ex ante is self-contradictory. Therefore, it is impossible
to defend a theory of societal evolution that aspires to supply unconditional predictions
of future states of society (such as the realization of a classless society). In accordance
with Popper’s methodological individualism, sociology should explain social facts, for
instance the functioning of social institutions, by studying the ‘logic of the situation’ of
the involved agents. Since human knowledge is fallible and unintended consequences of
intentional actions are the rule rather than the exception, ‘conspiracy’ theories of society
(such as the idea that dominant actors of a ruling class completely determine social out-
comes) are dubious.

Popper and the German sociologist Hans Albert (born 1921) were involved into
another Methodenstreit among German-speaking sociologists in the 1960s. In this so-
called Positivismusstreit, Popper, Albert and Ralf Dahrendorf (1929–2009) argued
against members of the Frankfurt school of ‘critical theory’ (Theodor W. Adorno, Jürgen
Habermas) who pleaded for a Neo-Hegelian dialectical consideration of the ‘totality’ of
social processes as the task of social theory. Several European sociologists (e.g., Raymond
Boudon, Hartmut Esser, John Goldthorpe, Siegwart Lindenberg, Karl-Dieter Opp,
Reinhard Wippler) have been inspired by Popper’s critical rationalism in their own meth-
odological and substantive sociological work.

In addition to Robert K. Merton’s (1968, Chapter III) devastating criticism of the
basic presuppositions of classical functionalism, Hempel’s (1965, Chapter 11) and
Nagel’s (1961, Chapters 12, 14) analyses of the logic of functional analysis reinforced
the view that the requirements for logically sound and empirically meaningful functional
explanations in the social sciences are extremely restrictive. Among prominent
American sociologists, it is George C. Homans (1910–1989) who supported the view
that sociology should abandon holistic and functionalist ideas which are based on
the futile hope that universal macro-laws exist and can be discovered eventu-
ally. Homans (1964, 1967, 1974) extensively used arguments from the philosophy of
science to promote methodological individualism (and what he called ‘reduction’) and
pleaded for a strategy of constructing explanatory theories that starts with elementary
propositions from behavioral psychology and, in his later work, from rational action
theory.
5. THE COLUMBIA SCHOOL OF SOCIOLOGY: LAZARSFELD AND MERTON

Ideas from both classic authors, Durkheim and Weber, have been adopted and elaborated in the context of modern (post-WWII) American sociology. In particular, the Columbia School of Sociology, with Robert K. Merton and Paul F. Lazarsfeld as its two towering figures, has been a hotbed of modern rigorous sociology. In addition to Lazarsfeld’s and Merton’s own contributions to social theorizing and to social science methodology, Columbia’s sociology department provided the institutional and intellectual context for promising graduate students who later became formative figures in the further development of rigorous sociology.

Paul Lazarsfeld (1901–1976) studied mathematics and physics in his native Vienna. He was active in socialist politics since his high school days and was interested to contribute to the solution of social problems via applying methods and ideas from empirical social science. He became involved in applied social psychological research and was principal investigator of a classic empirical study about the jobless people of Marienthal (Die Arbeitslosen von Marienthal, Lazarsfeld et al. 1933).

After his emigration to the USA, Lazarsfeld joined Columbia University where he established, and since 1944 directed, the Bureau of Applied Social Research. Substantively, the Bureau’s research activities dealt with radio and communication research, political research (voting behavior), and market and consumer research. Lazarsfeld contributed to research methodology by helping to establish an institutional and organizational infrastructure but also, not the least, by his research on applied statistical methodology. Lazarsfeld introduced probabilistic and statistical thinking into social research and in this respect deviated from the design used in his earlier research in Europe (Coleman 1990a, p. 619): Large nation-wide random samples displaced the usual localized geographically bounded community studies which had been characteristic for much previous research, for instance, by sociologists from the early Chicago school. Methods of inferential statistics were increasingly replacing or supplementing qualitative methods. An especially influential work is on the interpretation of statistical relations (Lazarsfeld 1955; Nagel 1961, pp. 509–520; Goldthorpe 2000, pp. 138–140). In this work, Lazarsfeld provides a typology of causal relations among three or more qualitative variables. It parallels in some respects others’ work in similar directions dealing with metric data (see, for example, path analysis, cf. Duncan 1966). Besides other innovative methodological work, Lazarsfeld closely cooperated with the theorist Robert K. Merton (1910–2003). Lazarsfeld and Merton were complementary in that both were interested in promoting high quality empirical sociology that is both theoretically sound and methodologically rigorous. Under their leadership, Columbia’s sociology department flourished to become a first rank graduate school with an impressive output of outstanding graduates. Among their joint work there is a study on homophily in social relations (Lazarsfeld & Merton 1954) which has inspired much of social network research until this day (McPherson et al. 2001). This work is characteristic of the Columbia approach to survey research: units of sociological analysis are not isolated individuals but individuals in a social context. As early as in the 1950s, members of the Columbia school designed surveys which attempted to match the multi-level structure of social organization (see, for example, Lipset et al. 1956).
Robert Merton’s impact on the growth of sociological knowledge can hardly be exaggerated. Merton is sometimes labeled as a representative of ‘structural functionalism’. However, as early as in 1949 Merton is a severe critic of those variants of holistic functionalist reasoning which subscribe to organism analogies, look for criteria of the survival of total societies, want to specify functional requisites and argue based on the assumptions of functional universalism (every social item has a positive function) or functional indispensability (there are no functional alternatives). Although Merton’s analysis and critique address elder functionalism, they also apply to more recent approaches – for instance Parsons’ various attempts to provide a ‘grand theory’ based on the idea of four functional requirements of any social system.

In fact, one can reconstruct the Mertonian variant of social structural analysis as an exemplar of structural individualist theory building (Stinchcombe 1975; Elster 1979, pp. 28–35) that is, by and large, consistent with methodological individualism. Merton’s theorizing is, so to speak, a combination of Durkheim (as in Suicide) with Weber: Merton’s (1968, Chapter VI) anomie theory of deviant behavior attempts to explain social facts (rates of deviant behavior) as the aggregate products of individual actions. The actions are chosen under the constraints of structurally determined alternatives. Under certain social conditions, individuals perceive a discrepancy between feasible means and aspirations (i.e., anomie) which in turn creates frustration, and so forth. Thus, the essence of Merton’s thinking is a chain of arguments which connect two social macro-phenomena (social structural conditions and rates of deviant behavior) by a micro-mechanism that is akin to social psychological theories of deprivation or dissonance.

Some other aspects of Merton’s sociology are relevant to this day: sociology deals with unanticipated consequences of intentional action (Merton 1936, 1968, Chapters III, XIII). Merton’s kind of functional analysis thus aims at the specification of both manifest and latent functions of institutional patterns. This means that the complete set of social consequences of intentional actions of a population of agents must be worked out. The latent functions comprise those results which are not anticipated.

Sociological theories are, according to Merton (1968, p. 39), ‘logically interconnected sets of propositions from which empirical uniformities can be derived’. They guide empirical enquiry and permit empirical tests. Theories in this sense typically are not ‘total’ or grand theories but they are represented by ‘middle range’ theories. These theories focus on delimited problems. Merton (1968, pp. 39–40) mentions as explananda of such theories the emergence of social norms, social mobility, role sets, reference groups and relative deprivation. With respect to the construction of middle range theories, the interplay between theory and empirical research is fundamental. Merton (1968, Chapter V), who was an expert in the history of science and a founding father of the sociology of science, mentions the ‘serendipity’ pattern which gives momentum to the discovery of novel theoretical insights. ‘Serendipity’ occurs if results which were unexpected in the light of background knowledge repeatedly and validly are observed. These ‘anomalies’ motivate the construction of new theories which explain these results. As a case in point, Merton points to empirical findings which gave rise to the formulation of relative deprivation theory (Merton 1968, p. 283).
6. THE COLUMBIA SCHOOL OF SOCIOLOGY: TWO PROMINENT ALUMNI (BLAU, COLEMAN)

The Columbia department of sociology in the 1950s had an enormous output of outstanding graduates who studied with Merton, Lazarsfeld, and others (e.g., Ernest Nagel who gave joint seminars with Lazarsfeld on mathematical sociology and other subjects). The list of prominent graduates is long, indeed a Who’s Who of modern sociology. It comprises, among others, Louis and Rose Coser, Alvin Gouldner, Elihu Katz, Seymour Lipset, Philip Selznick and Dennis Wrong. However, the most impressive figures are Peter M. Blau and James S. Coleman.

Peter Blau (1918–2002) was a native from Austria who primarily studied with Merton. At the beginning of his career his research focused on a field that was at some time very central on Merton’s research agenda, namely Max Weber’s theory of modern bureaucracy. Much research in the sociology of organizations after WWII started with Weber’s ideas on the effectiveness of ‘rational legal’ authority with a bureaucratic administration. As is commonly known, some aspects of Weber’s ideas on the efficiency of bureaucratic organization have come under attack for lack of empirical support. Merton (1968, Chapter VIII) pointed out some problems of bureaucracy in terms of unanticipated consequences of bureaucratic structures. For instance, according to Weber, bureaucracy accentuates formality of social relations and formalized rules of conduct. These features of bureaucracy, on the one hand, have (‘positive’) effects because they increase the accountability and effectiveness of administrative behavior. On the other hand, they can give rise to ritualized conduct of the involved bureaucrats with the effect of a displacement of goals. Ritualism can contribute to conflicts with clients and therefore reduces the effectiveness of the organization. Several dissertations which were inspired by Merton attempted to investigate empirically the conditions such that bureaucratic structures induce positive or negative effects with respect to performance. Blau (1963), in his doctoral work *The Dynamics of Bureaucracy*, reported results of two case studies. He pointed out that bureaucratic structures can have positive as well as negative effects (manifest and latent functions that can both enhance and reduce efficiency). This is due to the emergence of informal relations and norms – an aspect of organizational behavior that Weber did not analyze. Based on observational data and interviews, Blau demonstrates empirically the emergence of social exchange relations and of an informal status differentiation among members of a working group in one of the bureaucracies he studied. These informal networks contributed in fact to an improvement of individual workers’ performance. On the other side they led to an attenuation of the supervisor’s authority because information transfer by means of informal exchange was formally forbidden. The findings in Blau’s study initiated an attempt to look for an explanation of these patterns of ‘consultations among colleagues’. In terms of Merton’s sociological theory, this may be interpreted as an example of a serendipity pattern. Blau (1964) himself as well as Homans (1958, 1974) used Blau’s empirical findings as exemplars for a newly constructed ‘middle range’ theory, namely social exchange theory. In the major monograph *Exchange and Power in Social Life*, Blau (1964) gives a systematic exposition and numerous illustrations of a variant of social exchange that is rooted in applications of what is by now called rational choice theory. He also explicitly tries to use some theoretical tools and ideas from elementary microeconomics (Blau 1964, Chapter 7, cf. also Oberschall 1979).
approach is employed to describe and explain structures and norms on the level of small groups. On the other hand, Blau also tries to elucidate, albeit somewhat less convincingly, implications for social organization on a larger scale. Blau’s analyses are illuminating because some topics and research problems are alluded to and anticipated which are central to this day.

To illustrate, Blau (1964, Chapter 4) discusses the conditions for the start of exchange processes. Social exchange in the work group is costly to the advice-giver in terms of the opportunity costs of time and effort. Given that in many instances exchange is sequential (A gives advice to B today and expects to receive a similar service from B at some later point in time) and requires trust on the side of A, one comes to the question of whether certain social motivations or internalized norms are necessary as starting mechanisms for social exchange. Blau (1964, p. 92 and passim) argues (as adumbrated by Hume (1739 [1978], pp. 520–521) some centuries ago) that even purely self-interested individuals can have incentives to transfer costly resources if there is a mutual expectation of future interactions and opportunities to exchange consultations. Contemporary game theory has by and large supported such claims theoretically and empirically (Axelrod 1984; see Montgomery 1996 for an analysis of Blau’s exchange system in terms of game theory).

A shift in Blau’s research on organizations culminated in publications based on data collected from large samples of organizations. Whereas the early studies comprised group behavior in the context of bureaucracies and provided case studies of organizations, Blau in the 1970s was principal investigator in a project where the focus was on relations between situational or contextual variables of organizations (such as organizational size) and internal structural properties of the organizations (degree of horizontal and vertical differentiation, span of control etc.). This research design allowed the application of statistical regression techniques, which at this time began to diffuse through research communities in the social sciences. To illustrate, the data demonstrated that there is a concave relation between the size of an organization and various measures of organizational differentiation. That is, increasing size yields increasing differentiation with decelerating rates. In a theoretical paper, Blau (1970) attempts to construct a deductive theory which explains this and other empirical findings. Blau’s work is motivated by the structural approaches to sociology which Blau ascribes to Weber, Durkheim and Simmel. Methodologically, Blau refers to work in the philosophy of science (Hempel, Popper) where a deductive approach to theory construction is accentuated. However, Blau did not fully succeed in carrying out his ambitious deductive enterprise in that he did not formalize the basic propositions and therefore could not consistently prove that the theorems of his theory in fact are logical consequences of the assumptions. Several critics point out deficits in terms of the lack of plausible and sound theoretical mechanisms which explain the observed empirical correlations on the level of situational and structural variables (this critique is also mentioned in Hedström 2005).

In its approach to general social theory, Blau’s work on organizations served as an intermezzo to the construction of theoretical arguments that deal with other aspects of social inequality and of heterogeneity. Status attainment processes in modern society are the subject of ground-breaking research on social stratification and mobility in collaborative work with Otis D. Duncan (1921–2004) on *The American Occupational Structure* (Blau & Duncan 1967). In this work, large sets of cross-sectional survey data were
analyzed by using statistical tools from linear regression and path-analysis. Blau continued to focus on social structure in the late 1970s and the following decades.

As in his research on organizations, Blau (1977) now argues that a deducitive theory of social structure is desirable. The concept of structure Blau introduces is that of a population of individuals who are distributed in a possibly multidimensional social space. The axes of this space are vertical and horizontal parameters that measure inequality (income, wealth, education) or heterogeneity (religion, affiliation, sex, race, etc.). One central variable considered in Blau’s theory is the size of the subpopulation that shares a specific value of a parameter or a combination of parameters. Consider a society with two groups of different ethnic origin (blues and greens) such that the blues are but a small minority relative to the greens. Then it is obvious (in fact a tautology) that if there are any intergroup relations (friendships) and if matches are generated randomly, then the proportion of intergroup contacts is much larger for the blues than for the greens. Most blues have a green friend but only a small fraction of greens have an intergroup contact. Matters may change if there is a preference for in-group matches (homophily). Depending on contact opportunities, the resulting proportions of intergroup relations and therefore the degree of social integration with respect to these aspects of heterogeneity can be predicted from this approach. Another central concept of Blau’s theory is the degree of ‘intersection’ of parameters. Two or more parameters intersect if they do not correlate, e.g., if status and race are uncorrelated these parameters intersect perfectly (the converse is called ‘consolidation’). Blau’s theory of social structure has subsequently been elaborated further and tested empirically such that it becomes more obvious that it is based on specific micro-level assumptions (Blau & Schwartz 1984; Blau 1994). Some recent work in social network analysis has been inspired by and has elaborated further on ideas from Blau’s theory (see, for example, Centola 2015, 2018).

James S. Coleman (1926–1995) started his academic life studying chemical engineering. After a short period of work as an engineer in 1951 he began his graduate studies of sociology at Columbia University, which induced a turning point in his life (Coleman 1990b, p. 75). Yet, Coleman’s training in physics has proved essential for his sociological work in that differential equations and models from statistical mechanics inspired Coleman’s perspective on modeling micro-macro transitions in sociology. Methodologically, Coleman was influenced by Lazarsfeld, who procured Coleman jobs as a research assistant at the Bureau and who directed Coleman’s interest to mathematical sociology. Indeed, Coleman’s (1964a) first major book on sociological theory and the methodology of theory construction, *Introduction to Mathematical Sociology*, is dedicated to Lazarsfeld. As another influence, Coleman (1990b, p. 98) mentions lectures and seminars taught by Ernest Nagel – some of them jointly with Lazarsfeld.

Coleman’s scholarship is unique in the history of post-WWII sociology because he achieved a worldwide reputation as a leading figure in different research areas: Besides outstanding empirical and applied work Coleman pioneered mathematical sociology and rational choice theory. Mathematical models are useful tools to construct so-called ‘synthetic’ theories which ‘begin with postulates on the individual level and end with deductions on the group level’ (Coleman 1964a, p. 41). They are in other words indispensable tools to achieve micro-macro transitions. To illustrate, the *Introduction* presents models of social diffusion processes which are capable of describing the spread of, for example, innovative ideas or rumors through social networks of informal interpersonal relations.
or in centralized social structures. In the most elementary variant of those models a deterministic ordinary differential equation is employed to represent a dynamic process (in continuous time) such that an item (a novel idea or product) is adopted due to information received from a personal social relation. If the information diffuses through a social network of personal relations, solving the differential equation implies (given the specification of appropriate antecedent conditions) that the diffusion can be described by a logistic function: the process can be represented by an S-curve such that the function is convex (with rapid exponential growth at the beginning) until half of the population has adopted the item and then, after a turning point, becomes concave. Another mechanism is social contagion through a central source (media reports on TV, internet website sources, etc.). In this case, the diffusion can be represented by an exponential function (Coleman et al. 1957; Burt 1987). Consequently, differing assumptions on the micro-level (contagion through interpersonal contacts versus information transfer through a central source) yield different results on the macro-level. Since these elementary models are deterministic approximations for processes in completely connected social structures Coleman (1964a, Chapter 17) discusses some further processes and models that account for stochastic forces and represent various incomplete social structures (see also, for example, Barthomolew 1982 for further elaborations of such models). On the micro-level these models use behavioral postulates about the disposition of representative individuals to adopt an item which is not derived from sophisticated theories of action. Coleman (1990b) himself characterizes this kind of theorizing as Durkheimian.

Coleman also became prominent for introducing rational action postulates at the micro-level. Inspired by ideas of the Scottish tradition, Coleman (1964b) argues for a new perspective on Hobbes’s problem of social order. In his magnum opus *Foundations of Social Theory*, Coleman (1990a, Chapters 10, 11) gives a sketch of a theory that explains how social norms of cooperation emerge under conditions of a social dilemma – even among self-interested agents. It follows from this account that social order (i.e., norms of cooperation) can emerge and be sustained without assuming pre-existing internalized values in situations which resemble a Hobbesian state of nature (see, for example, Piskorski & Gorbatai 2017 for an empirical test). Coleman dedicated his second major book to his teacher Robert K. Merton. The approach in this work follows a strategy of theory construction that has been pioneered by Max Weber. Coleman endorses methodological individualism and a theory of action that is a refined version of Weber’s concept of instrumental rationality. In the opening chapter of the book, Coleman (1990a, Chapter 1) uses his famous diagram of micro-macro transitions (‘Coleman boat’) referring to Weber’s protestant ethics thesis (cf. Raub & Voss 2017 on this diagram and its history). In presenting his ‘foundations’ Coleman starts from elementary social relations and proceeds step by step to phenomena which are the results of more complex aggregations of actions. In this book, Coleman (1990a, Chapter 25) also gives a comprehensive exposition of a formalized ‘linear theory of action’ that aims at representing social systems which are comprised of agents who control and have an interest in certain resources (or events). If there is a complementarity of control over resources and interests among the actors, agents may rationally want to exchange their control over resources such that an optimal distribution of control is realized.

Coleman is the author and principal investigator of numerous quantitative empirical studies. Many of these enquiries are of an applied policy character. This holds especially
for the so-called Coleman report (Coleman et al. 1966) which has been one of the most extensive and ambitious surveys on the effects of school organization and other variables on student achievement. The report was the largest social science research project ever at that time (see Hunt 1985, pp. 51–97). It was sponsored by the US government and received – to the displeasure of the political establishment and education politicians – extremely intensive public interest and controversial reactions. Many findings were quite unexpected. The report documents that financial inputs into schools apparently do not account for the huge black–white achievement gap that was empirically observed. The most important factor explaining differences in achievement is educational background of the student’s family. Another apparent finding that attracted attention on the side of local political activists was that school segregation had adverse effects on minority students’ achievement. Activists concluded that a policy of desegregation could help to improve educational opportunity and that a program of ‘busing’ would be instrumental to an education reform. Compulsory busing programs aimed at achieving more integrated schools by bringing black children into schools which are predominantly white. Coleman himself had not been an enthusiast of busing but nevertheless consented to a policy of busing in the first place. Ironically, re-analyses of the data revealed that some findings on segregation were artifacts due to coding errors (Smith 1972). After the implementation of busing, an enquiry of the effects of busing (1968–1973) revealed severe unanticipated consequences. White parents in considerable proportion defected. The ‘white flight’ was accomplished by the moving of white middle class parents into other districts or by choosing to exit from the public school system: ‘current means by which schools are being desegregated are intensifying that problem, rather than reducing it’ (Coleman et al. 1975, pp. 79–80). After Coleman had made these empirical consequences public and argued against busing based on these findings, he became the target of vicious attacks from activists who accused him of being a racist. Some influential colleagues from the sociology profession took action to accuse Coleman of unethical behavior (‘racism’) and tried to expel him from the American Sociological Association – but were not successful (Becker 1996, p. 177). Democratic politician and social scientist Patrick Moynihan judged that Coleman was among the first public intellectuals to become attacked for being politically incorrect by people who ‘dissolve every statement of fact into a declaration of purpose’ (Moynihan 1996, p. 177). Coleman (1990a, Chapter 23) discusses some aspects of the relation between applied policy research and the demand of various interest groups who make use of the research to further their political activities.

7. SOME (VERY) SHORT REMARKS ON OTHER ROOTS

There are many other pioneers and institutions which would merit appreciation. Goldthorpe (2021) gives a book-length account of pioneers of quantitative empirical survey research that complements this chapter and addresses a distinct set of contributions. The impact of Otis D. Duncan’s research on the demographic or population approach has been enormous (Xie 2007). Duncan’s statistical approach is compatible but in some respects different from the roots which are referred to in this chapter.

In Europe, one should highlight the French sociologist Raymond Boudon (1934–2013). His theoretical work on mechanisms of social inequality and mobility
Handbook of sociological science (Boudon 1974) has become a classic. Most of Boudon’s work emphasizes the importance of ‘generating models’ which demonstrate how individual actions are aggregated to produce social outcomes. Such models are necessary tools if sociology aims to go beyond the mere description of statistical associations and attempts to supply explanatory theories and an ‘understanding’ of social phenomena at the macro-level (Boudon 1979).

In the Netherlands, a group of sociologists (Siegwart Lindenberg, Frans Stokman and Reinhard Wippler) founded the ICS (Interuniversity Center for Social Science Theory and Methodology) in the 1980s. The founding fathers were inspired by Popper’s and Albert’s critical rationalism and by the sociological thinking of Boudon and Coleman. In fact, Albert, Boudon and Coleman (‘ABC’) served as members of ICS’s first International Scientific Curatorium. ICS offers unique structured graduate training focusing on analytical theory construction and quantitative research methodology. The Center flourishes to this day and has promoted over 200 successful PhDs from different countries. Most of them have become and are still involved in research or have achieved positions of professors.

8. SUMMARY AND CONCLUSION

Rigorous sociology owes credit to ideas that originate from the British enlightenment. Thomas Hobbes and David Hume have been among the founding fathers of a social science that is empiricist. Sociology as an academic discipline in Europe emerged at the start of the twentieth century. The two most prominent sociologists of this period, Emile Durkheim and Max Weber, had diverging opinions in several respects. They, however, shared the conviction that sociology must be rigorous in its standards for the evaluation of theories and by employing systematic research methods. According to Durkheim and Weber, sociology’s task is the explanation of social facts or social regularities. Although Durkheim in some of his programmatic writings on methodology pleaded for a holistic approach to explain social facts, in his substantive work he often introduces ideas about social mechanisms that touch the micro-level of social behavior. Weber was much more explicit in this respect. Weber shared with the British tradition the focus on an individualist research strategy. He also accentuated purposive action and pointed out the importance of unanticipated social consequences of intentional actions. Weber also was prominent for his engaged advocacy of the postulate of a value-free social science. In Weber’s time, many fellow social scientists – mostly from a nationalist right-wing perspective – ridiculed this principle as naïve and impracticable. However, Weber made it clear that the postulate, though it is difficult to realize, is an indispensable ideal if scientists want to contribute credible explanations of real-world phenomena. Products of scientific research should only be evaluated by cognitive criteria and not by political, ideological or religious standards. The legacy of empiricist philosophy, of Durkheim and Weber, has been received and further elaborated by many other social theorists and sociologists. This chapter – for limitations of space – accentuates the contributions of members of two generations of the Columbia school of sociology. Robert Merton and Paul Lazarsfeld had tremendous impact on the progress of a rigorous sociology. This was due to their research, their institution-building activities and, not the least, by their
teaching and inspiring excellent younger researchers. Among them, Peter Blau and James Coleman stand out. Both did exemplary work that aimed at an integration of theory and empirical research. Although some of their research methods are by today’s standards somewhat outdated, substantive ideas from their work still determine or are relevant components of present-day research agendas. Both authors represent incarnations of an enlightened perspective to social science and social problems. As in Weber’s and Coleman’s (in the role as principal investigator of the Coleman report and his later education studies) times, there is currently pressure from right- and left-wing activists, ideological fundamentalists and populists outside but also within academia to sacrifice standards of rigorous research in the name of political and ideological values or emotions of romanticism. A recollection of the contributions referred to in this chapter can possibly reinforce the conviction that only standards of rational argumentation and of factual evidence will serve as guides to effective policies that help to realize humanistic ideals – whatever they are.

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