then a second choice is made from the remaining alternatives (with choice probabilities that obey LCA) and ranked second, and so on until all the alternatives have been rank-ordered. In backward-ranking a least-preferred alternative is selected first and ranked worst, then a second-worst choice is made from the remaining alternatives, etc., again with the choice probabilities obeying LCA. Intuitively this model seems quite plausible, but surprisingly it proves to be mathematically incompatible with the equally plausible idea that when a person ranks the same alternatives from best to worst, and also from worst to best, rankings expressing the same preference ordering should occur with the same probability (Luce 1959). From a Thurstone model perspective, this unexpected incompatibility stems from the asymmetry of the double exponential probability density function. Other (though not all) independent Thurstone models based on asymmetric densities share the same property (Yellott 1997).

See also: Bayesian Theory: History of Applications; Bounded and Costly Rationality; Decision and Choice: Economic Psychology; Decision and Choice: Paradoxes of Choice; Decision and Choice: Random Utility Models of Choice and Response Time; Heuristics for Decision and Choice; Sequential Decision Making

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J. I. Yellott, Jr.

Luhmann, Niklas (1927–98)

Niklas Luhmann was born on December 8, 1927, in Lüneburg as the son of a brewer. His mother came from a family related to the Swiss hotel industry. At the end of World War II Luhmann was conscripted to the air defense for a short time. After the war he studied law at Freiburg (1946–9), became an assistant to a local lawyer, and from 1952 to 1962 worked as a public servant in the regional administration of Niedersachsen. In these years Luhmann was an official who after his office hours read lyrics and theory, especially Edmund Husserl and Talcott Parsons. There are two early publications of his in the journal *Verwaltungsarchiv* from 1958 and 1960, but a break in his career came with Luhmann gaining a leave in 1960/61 to study at Harvard with Talcott Parsons. After Harvard Luhmann changed, now as a researcher, to the *Verwaltungshochschule Speyer*, an institution for the continuing education of administrators. Luhmann's early writings were noted by the then very influential German sociologist Helmuth Schelsky at Münster who persuaded Luhmann, who had no academic degrees, to acquire a doctoral degree and a *Habilitation* at Münster in 1966. He became head of a new division Sociological Theory and Sociology of Law at the *Sozialforschungsstelle Dortmund*, affiliated with Münster, from 1966 to 1968. In 1968 he became the first professor of the newly established University of Bielefeld. He stayed there until his retirement in 1993 and continued this relationship until his death on November 6, 1998, in Oerlinghausen.

1. Theory of Social Systems

From its beginnings in the early 1960s Luhmann called his contribution to sociological theory systems theory (Luhmann 1970). Another early self-designation was functional-structural theory, an obvious opposition to Talcott Parsons's structural-functionalism by which Luhmann intended to say that in his writings the concept of function takes a more strategic role than in Parsons. Social reality is thought to consist in problem solutions; the identification of the problem a specific

structure solves is what functionalism is about; and having identified the function of a specific structure one may look for functional equivalents, that is, alternative institutional solutions for the same problem. Methodologically this points to the essentially comparative character of Luhmann's theory; he was always looking at reality as problem solving and compared the solutions identified to institutional alternatives.

What is systems theory? First of all this self-designation establishes system/environment as the guiding distinction for processes of theory building. One possibility is to conceive systems theory as a theory of open systems which implies a focus on exchange processes connecting a system and its environments. In Luhmann's case we have to do with a cybernetic systems theory in which a system is described by the selectivity of its relations to its environments. For this Luhmann invented the formula which made him famous: reduction of complexity. Environments are seen as overly complex and systems constitute themselves by a selective reconstruction of this complexity.

Luhmann primarily was interested in social systems and therefore had to establish their specificity. He did this by a theory of meaning (Habermas and Luhmann 1971, pp. 25–100). Whereas all types of systems produce a surplus of possibilities and then generate selection mechanisms reducing this surplus, social systems are constituted by a specific mode of dealing with reductions. In social systems the possibilities not chosen are not eliminated. They are instead maintained as possibilities to which one can recur at a later point in time.

There exists one other system type which operates on the basis of meaning: psychic systems. As it already was the case in Parsons, social and psychic systems are conceived as two different types, separate from one another but coupled via media such as meaning and language. Luhmann's thesis that human beings (as psychic systems) belong to the environment of social systems was always one of the most controversial aspects of his work. But how does a strict separation of social and psychic systems come about if both operate in the medium of meaning? Luhmann proposes to distinguish the elementary constituents from which both types of systems are built. In the case of psychic systems Luhmann favors a theory related to Husserl (Luhmann 1995a, Chaps. 1–4). Thoughts are elementary constituents in psychic systems which are described as systems of consciousness. Occasionally he experiments with more inclusive concepts of consciousness—including feelings, perceptions, acts of will—and points to intentional acts as a more general element of consciousness.

Which is the constituent element of social systems? In a first approximation one would think of social actions as elements (as unit acts in a Parsonian sense). One finds this understanding in the early Luhmann. He even then complicated the understanding of action by introducing a distinction between action and experience for which there were no antecedents in the sociological tradition. Social systems are conceived as processing selections which are either attributed to one of the systems involved which means they are social actions or to objective circumstances of the world which implies that one only experiences these selective events and can influence them in the present situation. This distinction of action and experience depends on attributions, that is, it is a processual result of social systems themselves.

This already points to the fact that social actions can't function as the constituent elements of social systems. Luhmann opted for communications instead, thereby becoming the first major social theorist to base the understanding of society on communications theory (Luhmann 1984, Chap. 4). This implies a switch in sociological theorizing from focussing on the exchange of resources to accentuating information transfer in social processes. Luhmann's communications theory, closely related to Bühler (Bühler 1934), does not conceive of communication as a single selective event. Instead any communicative event is based on interrelating three selections. (a) An informative event which—in the Batesonian understanding (Bateson 1973)—is a 'difference which makes a difference' to an observing system, but which is not a complete communication in itself. (b) An utterance which means that there exists a system conveying the information in question. (c) An understanding which implies that a second system is involved which projects the difference of information and utterance on the first system and understands thereby. A communication is a unity consisting from these three components. The acceptance or rejection of a communication can be identified as the fourth component of a communicative event, but it already belongs to the next communication, thereby securing the sequential unity of a communication system.

But how are communications elements of social systems? Do they possess the internal stability one should demand of an element? Luhmann theorizes this in terms of the temporality of the elements of social systems. In an essay from 1979 (Luhmann 1981a, pp. 101–25) he proposed that the elements of social systems—be it actions or communications—are events. They are of vanishing duration. Just having begun they are already gone, and new events must arise for the system not coming to an end. The reproduction of events is the most important structural imperative of social systems, and reproduction does not mean invariant reproduction which is inexistent in social systems. Reproduction means that new events connect to previous events and are limited by this. Such reproductive events Luhmann calls operations, and this substitution of the concept of operation for the concept of element is accompanied by further fundamental changes in systems theory.

First among them is a slide toward concepts of self-reference. This is already to be seen in Luhmann's early self-presentation as a proponent of cybernetic systems theory which means that selectivity in the relations of the system to its environment is always related to the self-identity of the system. Self-reference is articulated more strongly in the theory of autopoiesis which Luhmann adapted in the eighties from the Chilean neurobiologists Maturana and Varela (Maturana and Varela 1980, Luhmann 1984). Autopoiesis means that anything which functions as unity in a system—element, operation, structure, boundary—results from the production processes of the system itself. There are no imports to the system, no inputs and outputs. The system is closed operationally and structurally, but it is informationally open which means that from observed differences it projects to its environment the system derives internal differences which influence system processes. Systems which are closed structurally toward one another can be structurally coupled, that is, there exist two sets of structures in two systems which evolve under the pressure of irritations resulting from operations of the other system.

A last conceptual change regards the concept of operation. The theory of meaning and information theory point to the understanding that operations always are controlled by differences. Operations choose a specific option and they exclude another alternative option, that is, one can infer an underlying distinction. In social and psychic systems the other side of the distinction, the possibility not chosen, is often included representationally. If this is the case Luhmann calls the operation an observation (cf. Luhmann 1990b, Chap. 2). Agreeing with numerous social theorists from Garfinkel to Giddens who call this reflexivity, Luhmann postulates that observations and self-observations are basic to modern social systems. Second order observation (von Foerster 1984) is the type of observation characteristic of function systems in modern society. In function systems most observations are reflexively oriented to observations by other observers and only indirectly refer to reality.

Luhmann complements this by a calculus of observations invented by the British logician Spencer Brown (Spencer Brown 1972). Regarding the logical structure of observations Spencer Brown postulates a unity of distinction and indication. In distinguishing the two sides of an observation one always has to indicate one of these two sides and one has to do this in the same moment one uses the distinction. This demonstrates that one can not at the same time observe the observation one just makes use of. One can only do it later by applying another distinction to it. Therefore, insight (by using a distinction) and blindness (by being unable to observe the distinction one uses) always go hand in hand in social systems. Reentries are one strategy of dealing with this. A distinction can enter into the domain which is distinguished by it. A system can observe itself via the distinction of system and environment by which it was demarcated in the first place. Luhmann tried to conceive a theory of reentries as the modern version of a theory of rationality (Luhmann 1984, Chap. XI, 1997, Chap. 1, XI).

2. *Theory of Society*

For Luhmann modern social theory always consisted from two main undertakings. First, the theory of social systems; second, among social systems he identified one which encompasses all other social systems: society. His two main theoretical treatises were, therefore, devoted to the theory of social systems and to the theory of society (Luhmann 1984, 1997).

Luhmann postulates three levels of the formation of social systems: Interaction, Organization, and Society. Interaction is an analogue to what Goffman called encounter or interaction order (Luhmann 1975b, pp. 9–38, Goffman 1965). Interaction systems presuppose the copresence of the participants and their reciprocal perception. If these conditions are fulfilled, a social system will arise because then it is impossible not to communicate as Watzlawick demonstrated (Watzlawick 1967). Interaction systems are limited in their capacity: they can process only one topic at a time. When the participants leave the interaction system comes to an end.

Organizations constitute an intermediary level of system formation being based on membership (Luhmann 1964). Organizational members are bound by rules. Organizations as autopoietic systems consist from decisions which are binding for organizational members as long as they do not conflict with the organizational rules. Society is the encompassing social system including interactions and organizations. Luhmann defines society via communicative attainability and from this he concludes that in the present world there is only one societal system. Therefore, one should speak of World Society (Luhmann 1975, pp. 71–91) which is a stronger claim than what is postulated in globalization theories.

The theory of society is developed in Luhmann's writings in four parallel complexes. The most recent of them arose with the intensified interest in self-reference. Even society as the encompassing macro order is a self-referential system and cultivates this in self-observations and self-descriptions. Luhmann pursued these questions mainly in studies on the historical semantics of modern society (Luhmann 1980, 1981b, 1982, 1989, 1995b, 1997, Chap. 5).

The other three complexes are related to Luhmann's theory of meaning. Luhmann distinguishes a social, a temporal, and a material dimension of meaning and these three terms are connected to his theory of communications media, his theory of evolution, and

his differentiation theory as the core elements of his theory of society. These theories give an answer to the question how social, temporal, and material differences are dealt with in society.

Regarding the social dimension of meaning Luhmann's theory asks: how is it possible to mediate differences of conception and interest among participants in social processes? Language is one medium of communication effective in doing this, and since classical antiquity this function was supported by the art of rhetoric which always concentrated on persuasive effects. In modern society this function was taken over by symbolically generalized communication media such as power, money, love, and truth (Luhmann 1975b, 1988, 1982, 1990b, Chap. 4). This theory is related closely to the theory of generalized exchange media which Parsons invented (Parsons 1969). But whereas in Parsons media are specializing on mediating exchange processes between functional sectors such as the economy and the polity, in Luhmann they operate entirely internal to the function systems. All function systems, such as the economy and polity and science, are in Luhmann conceptualized as communication systems, and communication media are specialized in securing acceptability for communications internal to these systems. Luhmann postulated that in a highly differentiated society the acceptance of communicative suggestions becomes improbable and communication media realize symbolically effective ways of organizing persuasion. Money is one example of this. Why should I accept that someone becomes an owner of goods which I would like to have myself (Luhmann 1988, Chaps. 6–7)? Luhmann explains this by the symbolical effects of money. Money symbolizes the liberty to acquire something if I need to, and therefore makes it acceptable to me that some other one now buys desirable goods. He has to spend money and therefore the liberty of acquiring goods circulates in the economy in a direction opposite to the circulation of goods. Luhmann isolates comparable motivational structures for other communication media, and he formulates a complex technical apparatus for explicating internal structures of communication media and for comparing them. Binary codes (truth/falsity, legal/illegal), inflationary and deflationary phenomena (analogous to money), interrelations with bodily infrastructures of communication (sexuality, perception).

The second complex in Luhmann's theory of society regards structural changes in time. Already in his writings from the 1970s Luhmann did neither opt for modernization or development but instead for a neodarwinist theory of sociocultural evolution, closely related to the writings of Campbell (Luhmann 1990b, Chap. 8, 1993, Chap. 6, 1995c, Chap. 6, 1997, Chap. 3, Campbell 1988). There are two main motives in Luhmann's evolutionary theorizing. First, he was fascinated by the possibility of structure formation in social systems brought about by chance events. For him this was the conceptual core of evolutionary theory. Second, for Luhmann evolutionary theory was a theory of the interplay of evolutionary mechanisms such as variation, selection, and selective retention. Chance, therefore, meant the interruption of interdependencies between evolutionary mechanisms.

In conceptualizing the evolution of society Luhmann identified the variation mechanism in the possibility of saying no. Selection is effected by the binary codes of communication media distinguishing among new meaning components generated by negations. The patterns of meaning arising this way have to be stabilized by building social systems around them. Differentiated and more clearly articulated patterns of meaning enhance the probability of new negations arising, thereby demonstrating the circular interrelatedness of evolutionary processes (Weick 1979). This three-term structure of evolutionary theory mirrors the three-term-structure of Luhmann's theory of society: there is one mechanism which makes plausible how to operate on the base of chance events (temporality); a second mechanism enhances the probability of acceptance for new meaning components (social dimension); and a third which via differentiation orders the material complexity of the world (material dimension).

The third complex is differentiation theory, near to the core of the sociological tradition. The change Luhmann proposes is to interpret differentiation theory as a theory of system formation. Differentiation means that inside of systems new system/environment differences arise (Luhmann 1997, Chap. 4). There is no AGIL logic behind differentiation. New systems are inductive solutions for local or global problems. But Luhmann postulates that there is a limited repertoire of forms of system differentiation. First of all there exists segmentary differentiation. Segments such as kinship units in tribal societies are characterized by equality of status and similarity of internal structure. A second differentiation form Luhmann introduces is center/periphery. Center/periphery distinctions such as town/country always mean institutionalized and systematic differences in the control of resources and information. The third differentiation form is hierarchical differentiation or stratification. Hierarchical differentiation divides society into social systems (estates, castes, strata) which are distinguished by inequality of status. For the persons belonging to these systems they define a total context of life. Modern society, finally, is characterized by functional differentiation. By this is postulated that today it is dominated by macrosystems such as law, science, mass media, the polity, and the economy which are worldwide macrosystems and which are related toward one another by extreme material diversity. No stratification or status order among these macrosystems can be observed. Functional differentiation is the central empirical hypothesis of Luhmann's theory of society. It may be predicted that the future influence of systems

theory on sociology will to a considerable amount depend on the success of functional differentiation as a diagnosis.

3. *Profile of Theory Building—Relevance for Contemporary Social Sciences*

One of the most conspicuous features of the writings of Niklas Luhmann is a strong belief in the validity and cognitive strength of theoretical thinking. Theory for him primarily meant conceptual work, and in this he had close affinities to the cognitive style of Roman law and of philosophy. Luhmann never would have considered himself a philosopher but for him the philosophical tradition was a treasure trove of conceptual resources which sociology only could neglect at considerable cost. One example is his transformation of the blunt Parsonian concept of contingency which simply meant dependence into the scholastic concept which was defined by the double negation of chance and necessity. This way he created a more flexible conceptual instrument.

Interdisciplinarity was in Luhmann's case a logical corollary of his stance toward the philosophical tradition. In the development of Luhmann's theories he imported concepts continuously from disciplines as heterogeneous as social psychology, cybernetics, linguistics, biology, and logic. And the conceptual structures and theories which he imported were then sociologized completely. A remarkable case in point is autopoiesis, a biological concept well adapted to circular production processes of biological macromolecules in the living cell, which Luhmann transferred to the communication-based function systems of modern society. This is a controversial operation but on one point there can't be any dispute: there are not even traces of materialism or biologism in the sociological theory resulting from the transfer. Marxism was an important context in the development of Luhmann's theories. When Luhmann's scientific work became visible in the late 1960s the intellectual scenery in Germany was dominated by the student movement and its intellectual accompaniments. Luhmann became famous in 1971 when he published a book with Habermas, the main representative of the Frankfurt school (Habermas and Luhmann 1971). In the following years the career of systems theory in Germany was coupled with the demise of Marxism. After the mundane and middle-range sociology of the 1950s and1960s, the intellectual opposition of the late 1960s had re-established the expectation that sociology should deliver complex theories of society. When Marxism and political economy failed, systems theory was the only alternative remaining. Luhmann had no sympathy for the intellectual and political claims of Marxism but systems theory was adapted perfectly to an expectation structure looking for macrotheories of society and their universalizing claims. The structural functionalism of Talcott Parsons is the theory Luhmann started from. From the beginning this was an unusual intellectual relation. On the one hand Luhmann reconstructed point to point, often taking up minor theoretical distinctions hidden in the appendices of the essays on generalized media of exchange. On the other hand, the theory Luhmann built via this reconstructive effort is very different from the Parsonian undertaking: an open, inductive list of function systems supplanting the deductive logic of AGIL; World Society supersedes the solidarity-based national communities Parsons postulates; neo-Darwinist evolutionary theory pushes away the Parsonian thinking in developmental trends; a loose, heterarchical arrangement of different theories is substituted for the hierarchical structure of the Parsonian paradigm. When today systems theory is one of the few elaborated and universalistic paradigms of sociological thinking which will probably have an influence far into the twenty-first century, this is due to the theory-building and theory-reconstructing venture undertaken singlehandedly in the writings and teachings of Luhmann.

See also: Communication and Social Psychology; Husserl, Edmund (1859–1938); Meaning and Rule-following: Philosophical Aspects; Parsons, Talcott (1902–79); System: Social; Theory: Sociological

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R. Stichweh

Luria, Aleksander Romanovich (1902–77)

Aleksander Luria was born in Kazan, an old Russian University town east of Moscow on July 16, 1902. He entered Kazan University in 1918 at the unusually early age of 16 owing to the social disorganization (and associated opportunities) associated with the Russian revolution. He obtained his bachelor's degree in 1921 at the age of 19. In 1923 he moved to Moscow where he remained for the ensuing 54 years (with the exception of a period between 1942 and 1945 when he directed a clinic for rehabilitation of soldiers who had suffered brain injuries). During this long career he taught and conducted research at a variety of important institutions including the Institute of Psychology, the Department of Psychology at Moscow State University, the Institute of Defectology, and the Bourdenko Institute of Neurosurgery. He died in Moscow on August 14, 1977.

While an undergraduate student, he established the Kazan Psychoanalytic Association and planned on a career in psychology. His earliest research sought to establish objective methods for assessing Freudian ideas about abnormalities of thought and emotion, as well as the effects of fatigue on mental processes. His dream was to create a unified psychology that would encompass both the intimate personal thoughts and emotions of individuals, as well as the biological and social conditions that supported such processes (Luria 1979). As he summarized his notions about psychoanalysis:

> Here, I thought, was a scientific approach that combined a strongly deterministic explanation of concrete, individual behavior with an explanation of the origins of complex human needs in terms of natural science. Perhaps psychoanalysis could serve as the basis for a scientific *reale Psichologie*, one that could overcome the nomothetic-idiographic distinction (Luria 1979).

In emulation of the psychoanalytical writers, he conducted clinical research on free associations, but he mistrusted the results of such efforts, feeling that any conclusions he tried to reach about the flow of his subjects' thoughts were insufficiently grounded. As he wrote in his autobiography, 'While I was able to fill notebooks with (a patient's) free associations, I was in no position to carry out my plan to use such data to capture the concrete reality of the flow of ideas' (Luria 1979).

In response to this dissatisfaction he created a methodology designed to embody a psychodynamic theory of mind in an objective set of laboratory procedures. The centerpiece of this methodology was an experimental technique that he called the combined motor method, which, he hoped, would provide a way of rendering Freud's clinical methods accessible to experimental treatment.

The fullest existing description of this work is contained in a monograph published in English under the title *The Nature of Human Conflicts: Or Emotion, Conflict and Will* (Luria 1932). Luria explicitly rejected mechanical determinism in psychological analysis, declaring that 'The structure of the organism presupposes not an accidental mosaic, but a complex organization of separate systems…(that) unite as very definite parts into an integrated functional structure' (Luria 1932).

This approach required Luria to solve the following problem. Since this structure is the consequence of a long complicated development, both ontogenetically and cultural-historically, and because the parts are integrated into a whole functional system, how can it be possible to isolate elements in this system for purposes of psychological analysis? Phrased differently, since no two people are constructed alike, how could one possibly obtain valid evidence about the thought processes of another person?

The answer that Luria provided was that other people's thoughts can only be revealed indirectly in so far as they can be reflected in a publicly displayable, voluntary behavior. He phrased his strategy as follows:

> We should on the one hand, produce the central process of the disorganization of behavior; on the other hand, we should try to reflect this process in some [other] system accessible and suitable for examination. The motor function is such a systematic, objectively reflected structure of the neurodynamic processes concealed from immediate examination. And there lies before us the use of the motor function as a system of reflected structure of hidden psychological processes. Thus we proceed along the path we call the combined motor method (Luria 1932).

The first phase in his technique was to induce a well-coordinated, publicly available behavior as the medium of coordination necessary for the psychological analysis to be accurate. He used various devices for this purpose. Often the subject was requested to hold the left hand steady in a device that could record its movements, while simultaneously being asked to press a button or squeeze a bulb in response to verbal stimuli

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