The systems model and political science

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§ 0.

In a provocative review and partly brilliant analysis of the Easton critique H. Bang raises the basic question of the applicability of a systems model to the understanding of political data (Bang 1981). Bang shows convincingly that there are different approaches to the *ontological* as well as the *epistemological* implications of the relevance of the systems modeling of political data outlined by David Easton in his classical text *A Systems Analysis of Political Life* (1965). Bang's framework – complicated and not always quite exact – may be reduced to a simple 2 x 2 Table (p. 5).

To both the Understanding Tradition and the Critical Tradition the existential recognition that the social reality includes subjective phenomena like pieces of cognition, volition and valuation has profound consequences, but the Critical Tradition distinguishes itself by its insistance upon the fundamentally subjective mode of social science organisation, the emphasis on the interest orientation of knowledge and the denial of the possibility of a value-neutral Erkenntnis. Bang fails to make the crucial distinction between two types of Explanatory Traditions: while both firmly believe in the possibility of making distinctions between descriptive and prescriptive language one Tradition (I) differs from the other (II) by the denial of the existence of so-called inner behavior. The adherence to a subjective ontology is by no means tied to a subjective epistemology which the methodology of Max Weber so clearly shows – in the most excellent interpretation of H. H. Bruun, *Science, Values and Politics in Max Weber's Methodology* (1972). In the orthodox Marxist Tradition the subjective dimension of reality is regarded as an epiphenomenon and all knowledge including science is socially determined. The distinction between the Explanatory Tradition (II) that transcends behaviorism and the Understanding Tradition concerns, of course, the cognitive status of a faculty called Empathy. True, there is a variety of Marxist positions along the two dimensions in the 2 x 2 Table. Moreover, Bang's argument includes a *model type distinction;* he states: "This intransigant discussion concerning the subject matter of the social sciences – which takes place externally as well as internally between the two traditions at the matascientific level – at last winds up with the different products

Table 1. Meta-scientific traditions

Ontology / Epistemology	Objective	Subjective
Objective	The Explanatory Tradition I	Tradition II the Understanding Tradition
Subjective	the Marxist Tradition	the Critical Tradition

at the scientific level, comprising any general understanding which can respond to challenge and questions. Depending on which world-view function they perform and which meta-subject they explore, these products appear in three different explanatory models. Those derived from theory construction/behavior appear as causalistic models, those derived from theory construction/social facts appear as quasi-teleological models, and finally those derived from organization of enlightenment/social definitions appear as teleological models." (Bang 1981:4).

I will argue that Bang's way of making the model distinction between causal models and teleological ones is inadequate and that an understanding of the scope of a systems model for the interpretation of political data depends upon how that model distinction is conceived. I believe that the Bang argument can be developed still further once it has been clarified how the systems model relates to the distinction between causal and teleological models – a task to which I now turn, a task that requires an examination of a few basic problems in systems analysis. Bang makes a number of assertions about these fundamental problems in systems analysis; his manner of treating them asks for an elaborate comment. Bang states: "The incorporation of the teleological model within the materialistic framework of systems analysis springs in this way from a methodological holism which, according to Easton, stands between pure individualistic reductionism and philosophical holism – i e a holism which asserts both the need to take account of the special properties found when individuals interact as an organized group and the need to reduce behavior to observable individual interactions." (Bang 1981:11–12). The clarity in the debate may be enhanced if these topics lumped together by Bang are treated on their own terms: *systems analysis, holism* and the *nature of a teleological model.* These notes contain an outline for such a disquisition.

§ 1.

For the purpose of stating what is characteristic of a systems model it is expedient to make a distinction between specific systems theories like the Eastonian one and the General Systems Theory. Specific systems theories deal with limited phenomena like the political system, the social system or the personality as as system, whereas the General Systems Theory – GST – contains a theory or an outline of a theory for all systems. Since GST is incoplete in several ways and its cognitive status is unclear it should be analyzed separately, because criticism against GST is not necessarily relevant to specific systems theories.

§ 2.

There is a set of works or concepts that usually occur in specific systems theories. The vocabulary of systems theories has a certain degree of coherence and there is a set of minimum words common to the theories, models and approaches labeled "systems analysis".

§ 3.

The word "system" is sometimes given a narrow definition, sometimes a wide definition. The Hall-Fagen standard definition of "system" is vague but not ambiguous:

DF1. A system is a set of objects (elements) with relations between the objects and between their properties (Hall & Fagen 1956:18).

From the Hall-Fagen definition follows that it is difficult to point out something in the social world that is not a system. Most social phenomena may be regarded as composed of parts, and some relation between these, e g time and space relations, can always be identified. The wide range of the word "system" according to DF1 is due to the fact that no restrictions have been placed on the three key words in the definition. A narrow definition of "system" introduces qualifications on object, relation or property.

§ 4.

Some theorists have stated criteria which would sort out trivial from non-trivial systems, thus introducing narrow definitions of "system". Examples of such criteria are: (a) constancy in time: only such relations between the parts as persist over time would be accepted as constitutive of a system (Parsons 1965:36). (b) causal relations: only such relations as can be called "causal" can be accepted (Parsons 1966).

Two objections may be made against such criteria. It is difficult to create unambiguous criteria of the kind suggested: how long should a relation persist in order to bind together a non-trivial system? The use of the criterion causal relation would result in an exclusion of social systems usually considered non-trivial, e g systems where only relations of space are valid between the parts. As Easton empasized in *Framework for Political Ana-*

lysis (1965) the classification of systems into interesting and uninteresting ones depends on the problem and cannot be made a priori; if the problem is to study the social system that is composed of the interaction of two or several actors, then certain relations are obviously interesting like power, prestige, approval, etc whereas a time property may be uninteresting. The definition of "system" is necessarily vague in order not to exclude a priori applications that could prove interesting.

§ 5.

Certain kinds of systems and certain properties of these systems are of focal interest within social science systems theories; other kinds of systems and properties are not considered relevant. Systems theory deals with *empirical* systems which are described by means of *theoretical* systems. Sometimes the latter are also called "models". An example of an empirical system is the political system and examples of theoretical systems are Easton's and Almond's theories of the political system.

§ 6.

A distinction may be introduced between abstract systems and concrete system. This distinction divides the set of empirical systems into two subsets. An example of a concrete system is a person whereas the aspects of that person that enter into an interaction system constituting a part of a social system belong to an abstract system (Levy 1952: 35–36). Whereas a concrete system exists apart from other such systems, abstract systems are units that come about as a result of various degrees of abstraction from the concrete; such entities are not capable of a separate existence apart from these concrete phenomena. Systems theories deal with abstract systems, called "analytical systems". A social system is an abstract aspect of concrete systems, viz persons, and a political system is an aspect of social systems.

§ 7.

Static systems are often distinguished from dynamic systems:

DF2. A static system is a system whose relations are only relations of space.

DF3. A dynamic system is a system into which relations of time enter.

From these definitions it follows that static systems are unchanged over time. An example of a dynamic system is the Swedish political system. The systems dealt with in systems theories are usually dynamic systems.

§ 8.

The concept of environment is crucial in the Eastonian systems model.

DF4. An environment is the set of objects that has an input-relation or an output-relation or both to a system.

The application of the concept of environment depends on the choice of system. If e_i is an environment, it is an environment for a system a_1, a_2 or a_3. A set of objects can constitute a system as well as an environment but not so that $e_i = a_i$. What belongs to a system and what belongs to its environment is settled by the problem. In some cases it may be instrumental to divide the set of objects into two classes: a system and an environment. If one wants to describe the structure of a political system at a certain time, it may not be necessary to introduce the concept of environment, whereas this may be required in a change analysis, which is of course the case in the Eastonian systems analysis. It is possible to divide the empirical, abstract and dynamic systems into closed and open systems.

DF5. A closed system is a system that has no environment.

§ 9.

A social system can be part of another more comprehensive social system just as a (para) political system can be part of a more comprehensive political system. On the basis of the distinction between system-subsystem a distinction between two different levels of analysis can be introduced: macrosopic-microscopic. Macro analysis focusses on properties of wholeness, whereas micro analysis aims at an analysis of the properties of subsystems. The property of wholeness describes the extent of dependence between the component parts of a system: a system is characterized by wholeness to the extent to which a change in any part brings about a change in every other part (Hall & Fagen 1956: 21). Some systems are highly sensitive to change in their constituent parts like Third World political systems; polyarchies on the contrary may withstand major changes in some

parts without suffering alterations in other parts. A modern society can be classified as more dependent in the system sense than an agrarian society.

§ 10.

Progressive segregation occurs in a system to the extent that the degree of differentiation is increasing (Hall & Fagen 1956:22). Progressive segregation in a system takes place when the system passes through a transition from a living state to a dead one. Take e g the division of a political system: the different roles that were earlier connected in a hierarchical network are separated from each other to be integrated into two new hierarchical networks (Germany in 1945). Another example of this property is growth. "Growth" refers to the state of differentiation of a system into subsystems which are more or less functionally specific. A favorite social science example is the division of labor. When classifying societies some measure of segregation like the degree of differentiation of roles often forms a basis of division for distinguishing between primitive and modern societies.

§ 11.

Progressive systematization takes place in a system in so far as there is an increase in the amount of wholeness (Hall & Fagen 1956:22). Progressive systematization occurs when systems are integrated into new systems and when new relations between the different parts of a system are created. A typical example is the *integration* in a society of different collectivities. A political system may undergo progressive segregation at the same time as it passes through a progressive systematization. The transition from a primitive polity to a modern one means that out of a number of more or less autonomous collectivities with a low degreee of division of labor a differentiation of roles takes place. Every collectivity is not responsible for all the functions, but a division is brought about. With regard to the performance of functions progressive segregation occurres. At the same time a progressive systematization takes place as the functionally specific subsystems become dependent on each other with respect to the conditions for the carrying out of functions. Progressive segregation and systematization may constitute action parameters in the political system, which is of course the case in the Eastonian systems model.

§ 12.

Centralization is a systems property. A system is centralized in proportion to one part being a dominant part, i e a small change in that part brings about a change in all the other parts, and this part is independent of changes in the other parts (Hall & Fagen 1956:22). The property of centralization may occur in connection with the progressive segregation and the progressive systematization of a political system; the property may function as a causal factor between progressive segregation and progressive systematization, e g national roles in a society.

§ 13.

The systems concept of compatibility or harmony stands for a relation between a system and its environment or between a system and another system or between subsystems within a system. It is a property for varying degrees of coexistence and well integrated behavior, summarizing causal relations between different structures and between different functions. The Parsonian concepts of universal imperatives and structural imperatives may be regarded as an application of this concept (Parsons 1966:26–36, 177–180). A fundamental idea of Parsons is that a society is a more or less centralized system that can persist over time only if it is compatible with the environment and if the structure of the dominant subsystem is compatible with the structure of the other subsystems. With the help of the concept of compatibility concepts like conflict and reciprocity can be introduced into a systems analysis.

§ 14.

A subset of systems has the capacity of responding to stimuli from the environment with stimuli directly to the environment. Systems can be classified according to the degree of responsiveness.

DF6. A feedback system is a system with the property of introducing outcomes of one or several output-states as input-states.

Whereas responsiveness only implies the capacity for direct external response, feedback means the capacity for indirect external response, i e the capacity for external response to stimuli from the environment through a process in which outcomes of an external response are mirrored back to the system. Two different kinds of feedback responses can be distinguished.

DF7. A negative feedback system is a feedback system in which the effects of external stimuli are counteracted by system responses.
DF8. A positive feedback system is a feedback system in which the effects of external stimuli are strengthened by system responses.

§ 15.

In the Eastonian analysis political systems are regarded as included in the set of stable systems.
DF9. A stable system is a system in which a state is maintained over time.
The state that the variables of a stable system maintain or tend to maintain is called "equilibrium" or "homeostas". Two kinds of equilibria are possible, static equilibrium and dynamic equilibrium. The word "homeostas" is sometimes reserved for dynamic equilibria. Adaptive stable systems are dynamic equilibrium systems; they are described by means of negative feedback; closed stable systems are characterized by stationary equilibrium. Open non-adaptive systems and positive feedback systems cannot be stable systems. It is important to distinguish between the state of the system that is maintained over time and the values of the variables that maintain the state. The variables of a system with dynamic equilibrium can vary in value compared with each other and yet the values of the variables produce a condition, which brings about the equilibrium state of the system. Much of the difficulties with the Eastonian systems model stems from the fact that it is not clear how political systems are to be interpreted as stable system, what persistence is and what factors effect system persistence.

§ 16.

Political systems seem to belong to a special subset of systems, so-called ergodic systems.
DF10. An ergodic system is a system whose state of equilibrium is not dependent on the initial state of the system; a change in the initial state does not necessarily bring about a change in the equilibrium.
Ergodic systems are the adaptive stable systems which have the property of *equifinality*. Systems with equifinality can attain dynamic equilibria from a number of different initial conditions, and systems can be classified according to the degree of causal dependence on the initial state.

§ 17.

The scientific value of the taxonomy of the systems concepts and systems types introduced can be appraised only instrumentally depending on if its employment results in theoretically interesting propositions and fruitful classification of empirical systems. This question should be sharply separated from the evaluation of General Systems Theory. The foremost advocate of a general sytems theory is Bertalanffy in his *General Systems Theory* (1968). In Bertalanffy's articles there are many different ideas; a criticism leveled against some of these is not necessarily relevant with respect to other ideas. Some can be adopted without contradiction; others must be rejected.

§ 18.

It is necessary to sort out the various components entering into what Bertalanffy calls the "General Systems Theory":

(a) Specific systems theories of certain properties of the organism (Bertalanffy: 155–185, 120–138).

From a methodological point of view these theories are non-controversial: specific systems theories should be judged according to prevalent criteria: on the one hand the fact that they are empirically scientific theories, on the other the evidence elicited through tests.

(b) A specific systems theory about the difference between two different kinds of systems, closed and open systems (pp. 139–155).

The following applies to closed systems: the first law of thermodynamics, according to which the total amount of energy in a system S is constant or dU=dQ–dW (U=energy, Q=heat and W=work); the second law of termodynamics, according to which the amount of free energy in S can only decrease or ds>0 för every change in the state of S (s=entropy). The state of equilibrium in a closed system is a static equilibrium, and has properties like: does not perform work, probable, chaotic state; one – one determinism according to classical mechanics. The following applies to open systems: the first but not the second law of termodynamics: of open systems it is true that the amount of free energy can increase or ds=des+dis (es=external entropy and is=internal entropy). As the externally introduced entropy may be negative, the total amount of entropy may diminish. This applies to dynamic systems of equilibrium, which are characterized by: improbable, organized and capable of performing work; many – one determinism: equifinality,

overshoot and false start. What Bertalanffy calls "closed" and "open" systems have been defined above as a closed, stable system and an open, stable and ergodic system respectively. According to K Boulding all kinds of social systems belong to the set of open systems (Boulding 1956).

(c) General Systems Theory (GST).

§ 19.

Bertalanffy points out that GST is not a complete theory (Bertalanffy:55). The object of the theory is as follows: "Its subject matter is formulation of principles that are valid for 'systems' in general, whatever the nature of their component elements and the relations or 'forces' between them." (p. 37). There would be some significant differences between specific systems theories and a complete general systems theory. The basic problem in GST is how to go about finding the underlying structure of all systems? The fundamental idea in Bertalanffy is that the invariances that characterize systems are to be found in isomorphisms between different laws; such laws are called "homologies": "The isomorphism found in different realms is based on the existence of general system principles, of a more or less well-developed 'general system theory'." (p. 84). The first task for the development of a general systems theory is the collection and classification of isomorphisms between laws. Two laws are isomorphic if notwithstanding the fact that what they state something about are different objects and different relations, an arrangement of the objects of the two systems can be made which preserves these relations (Kaplan 1964:185). Laws may have the same structure, e g an exponential function. On the basis of the existence of isomorphisms between laws Bertalanffy puts forward two theses which can be regarded as fundamental to GST.

(a) The ontological thesis reads: "(The homology of system characteristics). . . is a formal correspondence founded in reality in as much as it can be considered as constituted of 'systems' of whatever kind." (Bertalanffy:85). An isomorphism confirms the ontological thesis only if the fact that the same mathematical relation applies in both laws also means that there is a common pattern underlying the laws and that this pattern is characteristic of nature. That need not be the case. The ontological thesis is erroneous. It is not possible to deduce empirical properties from merely mathematical properties.

(b) The epistemological thesis states that the existence of isomorphisms shows ". . . the fact that certain laws of nature can be arrived at not only on the basis of experience, but also in a purely formal way." (Bertalanffy:62–63). This is incorrect. It is possible to state that two laws are isomorphic. That is an *ex post* statement. But *ex ante* this is impossible. How is it possible to know between what *laws* there is an isomorphism, i e what ontological structure similar formulas have in common?

§ 20.

The task for GST is to elaborate a system of isomorphisms. The theory would in effect consist of propositions about mathematical structures and GST would become a purely mathematical discipline investigating all possible kinds of functional relations. It would then not be an empirical theory, since as a mathematical theory it would not fulfil the condition of falsifiability (Popper). Nor does it possess any explanatory or predictive power – it cannot be tested empirically. C. Hempel states: "Thus, e g, in the study of structural similarities between the laws governing different classes of phenomena, system theory could not predict 'new' isomorphisms: it would have to wait for empirical research to establish general laws for a new field, and it could then examine those laws for structural similarities with previously accepted ones." (Hempel 1951:315). A general empirical systems theory, i e a theory of all kinds of systems, constructed on the basis of the two theses specified, the ontological and the epistemological one, is a logical impossibility.

§ 21.

The ideal for GST is an axiomatic theory, formalized in mathematical terminology. Bertalanffy gives an account of an attempt at a theory with such a structure. A number of the systems concepts introduced above in a non-formal style are described mathematically with the aid of differential equations (Bertalanffy:60–80). However, a mathematical description of empirical concepts does not result in an empirical theory of systems, as axioms or propositions are lacking. The translation into mathematical language may increase the exactness of the concepts, but it does not result in knowledge about reality.

§ 22.

Bang fails to recognize the importance of disting-

uishing clearly between specific systems theories and a general systems theory, GST. Whereas the former are empirically scientific theories and can be studied from several points of view like cognitive structure and confirmatory evidence, GST is not an empirical theory. GST can be a tool when constructing theories; it has the same status as paradigms and taxonomies, namely that of an approach. I now turn to two salient problems in systems analysis, reductionism versus holism and the nature of teleological explanation – two subjects which Bang treats in an unsatisfactory manner.

§ 23.

Systems theories and GST in particular developed from philosophical notions like vitalism, the teleological idea of the universe, and ideas of emergence. All of them are opposed to empiricism, atomism and the mechanistic idea of the universe. It is often maintained as Bang does that the latter ideas are characterized by reductionism and the former by holism. It is possible to define and analyse the two doctrines starting from the following proposition:

(HS) "The Whole is more than the Sum of its Parts"

Holism maintains that the proposition (HS) is true, whereas reductionism rejects (HS). However, the contrast between holism and reductionism is not necessarily contradictory. It may be contrary, i e a third possibility exists. Such a possibility has been put forward by E. Nagel in his analysis of the holistic thesis and the reductionistic thesis (Nagel 1966, Nagel 1969).

§ 24.

(HS) is either trivially true or trivially false depending on how the key words are defined. The following example can be used: Let K' = the ordered set (1, 3, 5, . . ., 2, 4, 6 . .), K_1' = the ordered set (1, 3, 5 . .), K_2' = the ordered set (2, 4, 6. . .), K ≐ the set of natural numbers and K is not an ordered set, K_1 = the set of all odd natural numbers and the set is not ordered, K_2 = the set of all even natural numbers and the set is not ordered. (HS) can be reformulated into:

(P1) The set K' is a whole that is the sum of the parts K_1 and K_2;

(P2) The set K' is a whole is the sum of the parts K_1' and K_2'.

The first proposition is logically false whereas the second one is logically true. Provided that there is a whole consisting of ordered parts, i e parts and relations, and "sum" means addition of the parts regardless of the relations, then (HS) is trivially true. But if "sum" means addition of ordered parts, (HS) is trivially false. A way of saving the holistic thesis is to maintain that a part A of a whole is something else than A, when it is not part of a whole. The whole determines the properties of A. However, such a proposition is self-contradictory, as A is first identified with A and then A is said to be distinct from A (Nagel 1966).

§ 25.

Whether a whole like a political system can be reduced to the sum of its parts or not is an empirical question and cannot be decided a priori. Only in relation to a theory of the whole concerned can the problem of reduction be decided and this is an empirical question. And it is an empirical question whether there is a theory that fulfils the conditions of reduction or not: (a) The words for the whole and the words for the ordered parts must be extentionally equivalent; (b) The laws for the whole must be deduced from the laws for the ordered parts (Nagel 1969). The controversy can thus be solved by making a distinction between a whole that is the sum of its parts and a whole that is not the sum of its parts. The distinction is relative to a theory and thus connected with the development of knowledge.

§ 26.

The word "function" occurs in systems theories. It is often used in different senses in one and the same theory and it often has different meanings in various theories (Nagel 1961: 522–526). Causal explanations are characterized by the fact that their propositions often contain words like "cause", "effect", "necessary condition" and "sufficient condition". In functional explanations propositions are used in which words like "in order to" and "purpose" occur. An example of a functional proposition is a political science proposition like: Political parties have interest aggregation as a function (Almond & Powell 1966).

§ 27.

Firstly, it is important to distinguish between two kinds of functional explanations on the basis of two different kinds of objects for such explanations and two different terminologies that distinguish between these two kinds of explanations.

On the one hand, the word is used about functional explanations in the *means-end-terminology* of *an action* performed by a human actor. On the other hand, the word is used of biological systems, personality systems, social systems and cultural systems. The object of such an explanation is some kind of *system,* and the key terminology is not the means-end-terminology, but *structural-functional terminology.* The term "functional explanation" is often used as a synonym for "teleological explanation". "Teleological model" may refer to an explanation of an action performed by an actor in terms of means and end. Or "teleological model" may refer to an explanation of a system in terms of structure and function. Bang does not observe that the distinction between the two types of teleological models is of vital importance, as the explanation of an actor's means-end-oriented action is different from the structural-functional explanation of a system.

§ 28.

Secondly, it is sometimes maintained, as Bang does, that functional explanations constitute a special kind of explanation. A functional explanation is said to imply an explanation of systems in terms of inverse causality: a unit in a system is explained by reference to its effects. Suppose that y is an effect of x; the question "why does x occur" is answered in a functional explanation with: "x occurs because y". Functinal explanation has been accused of implying vitalism or indeterminism. It is believed that a functional explanation of a social system implies that the system is conceived to be analogous with the conscious behavior of a human actor and to the system are ascribed properties like purpose, consciousness and action. These correlates of functional explanation are not necessarily part of that type of explanation. Vitalism, indeterminism or inverse causality can be distinguished from functional explanations without the specific properties of the latter disappearing. The distinction between functional and causal explanations involves two separate problems: (a) The semantic problem: a distinction between causal models and functional models; (b) The ontological problem: a distinction between functional systems and non-functional systems.

§ 29.

The semantic problem concerns the relation between causal and teleological models. There are two possibilities: (a) Propositions in causal models do not state the same as propositions in functional models. They are true in relation to different conditions and are neither equivalent nor intertranslatable; (b) Propositions in causal models and propositions in functional models can be equivalent and consequently intertranslatable.

Strong arguments have been put forward in favor of thesis (b) (Wimsatt 1972). The difference between a causal model and a functional model need not be a difference between an approach that operates with concepts for causal relations and one that operates with other concepts. The distinction could be of a terminological nature.

§ 30.

A functional model is often said, as Bang does, to be adequate for certain kinds of systems, so-called "functional systems", whereas causal models are considered to be applicable to non-functional systems. What is meant by a "functinal system" as opposed to a "non-functional" system?

§ 31.

Newton's analysis of the solar system can be taken as an example of a non-functional system. Let S be the solar system and X_1, X_2, ... X_n the properties of S that are relevant in the analysis, the state variables, and SD be as set of values of the different state variables at a time t, a so-called state description. Newton's theory then shows that if the value of each state variable at the time t_o is independent of the value of the other state variables at t_o, SDt_1 can be determined with the aid of a function from SDt_0.

§ 32.

Let S' be a functional system, e g an organism, G the state in S' and A, B, C and D the state variables of the system, where A & B & C are endogenous and D is exogenous, namely the environment. Let K_A, K_B, K_C and K_D be a set of possible values for the state variables A, B etc, and let SD be a combination of values from all these sets (A_x, B_y, C_z, D_w). Let K_s be the set of all possible SD's. Some of these SD's are G-states, i e such states in (A_x, B_y, C_z, D_w) as cause G. Let K_y be the set of such SD's and K_y consist of four subsets K_{AY}, K_{BY}, K_{CY} and K_{DY}. The greater K_y is, the higher is the degree of plasticity or stability. Such a system is deterministic if the

values of the state variables at t_0, i e SD_0, are independent of each other, and if the values of the state variables at t_1, i e SD_1, are a function of SD_0. And such a system is a *functional system* if and only if (i) there are relations between the state variables in SD_0 and SD_1, i e a series of functions $f_1, f_2, \ldots f_n$, of such a nature that a change in the value of one variable at t_0 is counteracted by a change in the value of another variable at t_1, so that (ii) there is a series of functions g_1, $g_2, \ldots g_n$, of such a nature that SD_0 and SD_1 cause G. A functional system, i e a system in which the state variables and the state G fulfil the conditions (i)–(ii) above, is a self-regulating system.

§ 33.

It is an empirical question if and to what extent a system is a self-regulating system. Whether a political system is a self-regulating system or not depends on the variations in the values of the state variables, i e K_{AY}, K_{BY}, K_{CY} and K_{DY} and whether the relations (i)–(ii) above are fulfilled. Empirically it may be that political systems are more or less self-regulating, or that some political systems have this property but not all political systems. A theory is about a functional system if and only if in these theories are specified:

(a) S. (b) G in S, i e the state in S the necessary and/or sufficient conditions of which are sought. (c) The state variables in S.

(d) The values of the various state variables: empirically possible values, the G-values. (e) The set of possible SD's. (f) The set of SD that brings about G, K_G. (g) The set of functions $f_1, f_2, \ldots f_n$ and $g_1, g_2, \ldots g_n$.

In some theories of the social and the political systems these systems are assumed to be functional systems. Such an assumption is adequate, if and only if the theory contains a description of entities a–g above. If the theory cannot specify these entities the theory as a theory of a functional system is inadequate; these systems may be functional systems, as only knowledge of relevant facts is missing. In other theories of social and political systems these are not assumed to be functional systems, which does not prevent them from being such systems, but the theory does not state this. In such theories certain states in a system are also studied, but it is not assumed that these states are self-regulating states, i e it is not assumed that these states are maintained over time according to conditions (i)–(ii) above (§ 32). The distinctions in § 28 may be described in a 2 x 2 Table.

§ 34.

In his *Sociologists, Economists and Democracy* (1970) B. Barry states: "The discussion in this book is deliberately limited in scope so as to permit the examination of some ideas in depth. It is focused on two kinds of theory, which differ in a

Table 2. Functional model and functional system

Semantics / Ontology	Causal models	Functional models
Non-functional systems	Newton's analysis of the solar system	Levy's analysis of society. Almond's analysis of the political system.
Functional systems	Somerhoff's and Bertalanffy's analyses of the organism	Parsons' analysis of the social system. Easton's analysis of the political system

number of ways. One type is axiomatic, economic, mechanical, mathematical; the other is discursive, sociological, organismic, literary. They differ in the questions they ask and the answers they give. They rest on different ideas about the most fruitful ways of abstracting from the overwhelming particularities of 'reality', and on different assumptions about the nature of the scientific enterprise itself." (Barry 1970:3–4). By "the sociological approach" Barry refers to systems theory. There is no a priori reason why systems theory should have a different internal structure from other kinds of theory. In some cases a systems approach has been tied to the kind of properties Barry associates with the sociological approach. However, such an association is accidental and is due to the way in which some scholars have employed the systems approach. Systems theory may use an axiomatic and mathematical style of presentation, it is not by necessity organismic or discursive, and in general it does not imply a philosophy of science peculiar to itself. In his article in *Statsvetenskaplig Tidskrift* H. Bang has shown how the debate concerning *the* major systems theoretical work in political science – the Eastonian systems model – may be organized in terms of three perspectives on the systems model. The Bang analysis is illuminating until he begins to treat the basic methodological problems in systems analysis. I argue that Bang's treatment of these problems requires clarification. Moreover, I argue that the Eastonian systems model is a specific systems theory that makes a few basic assumptions about the nature of the political system, the political system being regarded as a functional system. According to my view Easton has not: (a) stated clearly how the political system is to be modeled as a functional system, according to the criteria in § 33; (b) presented confirmatory evidence för the hypothesis that the political system is a functional system.

Of course, if these two tasks, (a) & (b), could be accomplished it would mean a Kuhnian revolution in political science. Bang's ideas are interesting not only in a Scandinavian context, because it seems as if the use of the systems model in political science is by no means exhausted as long as problems (a) & (b) remain to be solved. Let us look somewhat more closely at the implications of the criteria of a functional system set forth in § 33.

§ 35.

Two different kinds of social science systems theories will be analyzed below; both are examples of functional analysis, which provides an opportunity to state more exactly what a functional approach implies. One of the theories deals with a non-functional system; the other contains an analysis of a system as a functional system. Methodological differences between the theories will be highlighted and an attempt is made to decide whether the theory which looks upon the social system as a functional system fulfils the conditions of adequacy specified above for such a theory (§ 33).

§ 36.

The Almond and Powell functional analysis treats the political system as a non-functional system; their analysis is an example of structural-functional theory. The structure of the analysis is as follows: (a) Definition of the system S to be studied. (b) Definition of the environment of S. (c) Establishment of the functional conditions (what is done) for the persistence of S (the functional requisites). (d) Establishment of the structural conditions *(how what must be done is done)* for the persistence of S (the structural requisites). (e) Classification of the subsystems which are conditions for the occurrence of the conditions in (c) and (d). The classification will show the similarities and differences between the various subsystems that fulfil one or several functions. The Almond-Powell theory consists of two different components, a classification of poltical systems and a theory of the transformation or development of political systems.

§ 37.

The taxonomy into which political systems are classified is deduced by means of the structural functional method. (a) S = the political system. (b) Environment. No exact definition of the values for this parameter is given. The political system is an open adaptive system (i e has input and output), but the relation between the system and its environment is not stated explicitly (Almond & Powell: 19–21). (c) Functions (pp. 27–30): (I) The capacity function: (i) regulative function, (ii) extractive function, (iii) distributive function, (iv) responsive function. These functions exhaust what must be done by the system relative to the environment. As the concepts demand and support specify relations between the system and its environment, there are corresponding kinds of

demands (i–iv) and corresponding kinds of support (i–iv). Similarly, outputs (actions and decisions) can be divided into (i–iv). (II) The conversion function: (i) interest articulation, (ii) interest aggregation, (iii) rule formulation, (iv) rule application, (v) rule adjustment, (vi) communication. (III) The adaptation function & system maintenance function: (i) socialization function, (ii) recruitment function. (d) Every function is fulfilled through one or more structures. The different structures can be classified in terms of analytical properties: the degree of differentiation, the degree of specificity, the value of the dicotomous properties of structures (Parsons' pattern variables) (Parsons 1966, Levy, pp. 222–240). (e) Enumeration of the various subsystems that are conditions for the categories in (c); derivation of the structure of S by identification of properties of the subsystems. The theory determines the structure of S by means of two properties: the degree of role differentiation and the degreee of autonomy of subsystems in S. (f) Political culture: every political system has a political culture. This variable may be introduced in a structural-functional analysis as an abstract aspect of structures. The theory classifies political cultures by the degree of secularization.

§ 38.

A taxonomy of political systems is introduced on the basis of three analytical properties: *degree of role differentiation, degree of autonomy of subsystems* and *degree of secularization,* which variables have three possible values: high – medium – low. Thus there are 3^3 types of systems, i e 27 possible types. The theory states that two properties, degree of role differentiation and degree of secularization covary, which implies that the taxonomy contains 3^2 possible types. Political systems are classified into this taxonomy (Almond & Powell, p. 308).

§ 39.

It should be emphasized that the classification divides political systems on the basis of structural properties. Political systems could also be compared functionally, i e with respect to the degree of performance of the three functions (I–III). If the theory contained only a structural classification, the word "theory" would hardly be inadequate. A structural-functional analysis is suitable not only for classification purposes, but it can also be used for the generation of hypotheses. The theory contains some fundamental propositions that are to be regarded as theoretical generalizations (pp. 322–325): (L1) The higher the degree of structural differentiation and secularization, the higher the degree of capacity. (L2) The higher the degree of structural differentiation and secularization, the higher the degree of responsive capacity if and only if the autonomy is high. (L3) A political system persists, only if there are structures for state building, nation building, participation and distribution. (L4) A high capacity occurs, only if there is an interest group system or party system or a functional equivalent. Of these lawlike propositions (L1) – (L4), (L1) is the central one. (L4) can be considered a special case of (L1). (L2) can be looked upon as a qualification of (L1) and can enter into (L1) through a minor emendation. (L1) has great empirical content or great deductive power, i e by the addition of other hypotheses a number of propositions can be deduced. These propositions (L1) – (L4) constitute only a fragment of a theory. The theory contains a variety of generalizations about political systems. However, these are not integrated with the propositions (L1) – (L4).

§ 40.

Parsons' functional analysis treats the social system as a Functional System; in Parsons' writings there are a variety of functional theories about different aspects of the social reality. Parsons has at least three different theories about the social system: (1) System 37: the means-end-terminology is used to analyze the basic units from which a system is constructed (Parsons 1968). (2) System 51: structural-functional terminology (TGTA & TSS). (3) System 56: structural-functional terminology with emphasis on function (Parsons 1965, Parsons & Smelser 1956). The main features of the theory from 1951 will be outlined below. Since the system 51 is a functional theory of the system conceived as a functional system, the purpose of the analysis is to try to establish whether the theory fulfills the conditions of adequacy for a theory of a functional system as introduced above.

§ 41.

The structure of the system 51 is as follows: (1) S = a society. (2) Type of analysis = functional analysis of the society as a functional system. (3) G in S = sufficient complementarity of roles and complexes of role in order that collective and individual goals may be realized. The description

of G in S is vague. In a society G can occur to a varying extent. The state G is threatened by conflict in the society, but G can occur even if there are conflicts within subsystems in S; G can be a state in transformation. (4) State variables in S = (A) role-content; (B) allocation; (c) integration; (D) environment; (E) mechanisms in S relative to its environment.

§ 42.

Role content (*TGTA*, pp. 208–221, *TSS*, pp. 113–150). (a) Possible values of the variable A (K_A): The possible values K_A are established by an analysis of the analytical properties of two kinds or roles, instrumental and expressive. The possible values K_A are the types of roles which are combinations of three dichotomous properties of roles: (i) discipline – affectivity, (ii) specific – diffuse, (iii) universalism – particularism. The number of combinations is 2^3 and the different types of roles are shown in Diagram 3 (*TGTA*, figure 14).

The different categories (1) – (8) are ideal types. In reality most roles do not contain only three of the six possible values; only marginally is a role merely either universalistic or particularistic. Still less can sets of roles, i e societies, be classified in one category only. Different subsystems in a society can be characterized with the aid of (1) – (8) depending on the dominant type of role. A society can be described in an analogous way depending on the subsystem that dominates. Central here is the concept of *the dominant type of role*. (b) G-values of the variable A (K_{AG}): The G-values of the variable A are certain combinations of instrumental and expressive roles: those role combinations in which there occurs discipline on the one hand and affectivity on the other, and where the former dominates: (5) or (6) + (1) or (2), i e four G-values; (4) + (1) or (2), i e two G-values. Combinations with (7) are marginal.

§ 43.

Allocation (*TGTA*, pp. 197–202). (a) Possible values of the variable B (K_B): The possible values K_B are a combination of the values of three variables: (i) what is allocated: role, actor, utility, reward; (ii) how is what allocated: ascriptively – achievement oriented; (iii) mechanism of allocation: tradition of competition. In an allocation there occurs at least one of the values of the variable (i), exactly one value of the variable (ii) and at least one of (iii). Particularly important is the allocaton of certain general utilities, money and power. (b) G-values of the variable B (K_{BG}): Certain values of K_B are not G-values. This is true of ascriptive allocation through competition, of achievement oriented allocation through tradition, and generally of every allocation value that is not compatible with other allocation values, e g allocation of money by ascription if it is combined with allocation of power on the basis of achievement.

§ 44.

Integration (*TGTA*, pp. 202–204). (a) Possible values of the variable C (K_C): The possible values K_C are a combination of two variables, collective value orientation and sanction role. The values of the first variable are self-orientation versus collective orientation. The number of sanction roles, i e roles oriented towards the maintenance of collective role expectations, can vary in number and differentiation. The occurrence of collective orientation in connection with sanction roles is called institution and institutionalization makes up K_C. (b) G-values of the variable C (K_{CG}): It holds good

Diagram 3. Possible types of roles in the system S1

	Particularism		Universalism	
	Specific	Diffuse	Specific	Diffuse
Discipline	(3)	(4)	(5)	(6)
Affectivity	(1)	(2)	(8)	(7)

that the extreme values, no institutionalization (total self-orientation) and total collective orientation are not G-values.

§ 45.

Environment (TGTA, pp. 226–227, *TPS*, pp. 26–36, 326–330, 384–390). (a) Possible values of the variable D (K_D): The possible values of this variable are a combination of the values of two variables: (i) endogeneous: personality systems, cultural systyems, subsystems; (ii) exogenous: physical environment, other social systems. (b) G-values of the variable D (K_{DG}): Certain values in K_D are not G-values: (i) endogenous: instability of personality systems and subsystems, conflict between subsystems and inconsistency of cultural systems; (ii) exogenous: those values of the physical variable that render social coexistence impossible, conflict between S and other social systems.

§ 46.

Mechanisms in S in relation to its environment (*TGTA*, pp. 223–230, *TSS*, pp. 201–243). (a) Possible values of the variable E (K_E): The possible values K_E are a combination of the values of two variables, socialization and social control: (i) socialization: learning mechanisms, consensus mechanisms. (ii) social control mechanisms: manipulation of rewards and deprivations, isolation, reintegration. (b) The G-values of the variable E (K_{EG}): The G-values are specified by a number of propositions about the conditions for deviant behavior. The existence of a lack of socialization or a lack of social control respectively and of low-degree of socialization and social control are not G-values.

§ 47.

State descriptions: Possible state descriptions (K_s) (*TGTA*, pp. 221–223, *TSS*, chapters 3 & 4). The possible number of state descriptions is at the same time the number of possible social structures. These are defined by means of the combinations of the values of the five pattern-variables: (i) discipline – affectivity, (ii) specificity – diffuseness, (iii) universalism – particularism, (iv) ascriptive – achievement orientation, (v) self-orientation – collective orientation. Theoretically, there are 2^5 social structures. If a society does not have one social structure, but a structure for each subsystem, the analysis of the possible structures of a socity becomes more complex, but not different in principle.

§ 48.

G state descriptions (K_G) (*TGTA*, pp. 221–223, *TSS*, chapter 5). The system 51 contains a number of propositions about the state descriptions (SD) in which G occurs. The basis is a fundamental *axiom:* every subsystem in a society has a structure and the structures of a society cannot vary at random in relation to each other. As K_G is the union of the subsets K_{AG}, K_{BG}, K_{CG}, K_{DG}, K_{EG}, the G-values of the state variables specified above must be fulfilled. Every SD, i e SD_0, SD_1, ... SD_n, must consist of these G-values and be ordered with regard to the G-values. A number of propositions try to solve the problem of specifying K_G: "One of the formemost of these is the problem of the discovery and explanation of certain empirical clusters among the formally possible clusters." (*TGTA*, p. 222). The system 51 states some propositions about clusters fo structures in a society, i e combinations of structures for each subsystem in a society, which are a SD_G or part of a SD_G (*TSS*, pp. 151–200): (L1) In every society the following entities exist: family, instrumental roles; expressive roles; the territory, violence and power; integration of values (*TSS*, pp. 153–167). (L2) In a society the dominant structure is compatible with the other structures if G occurs (*TSS*, pp. 167–180). (L3) If in an society a dominant structure is universalistic, it is also achievement- and discipline-oriented. (L4) If in an society a dominant structure is affective, it is also particularistic and ascriptive (L5) If in a society a dominant structure is universalistic and achievement-oriented, there is no other dominant structure that is particularistic and ascriptive. These lawlike statements (L1) – (L5) do not exhaust the part of the theory relevant for the specification of K_G, but they state certain essential relations in the system 51.

§ 49.

The set of functions: $f_1, f_2, \ldots f_2$ and $g_1, g_2, \ldots g_2$. The system 51 does not specify any of these functions, though it speaks of self-regulating functions in connection with certain subsystems (*TSS*, chapters 7 & 8). The theory assumes that the society is a functional system, but the two sets of functions that must be specified in order that the term "functional system" may be applied are not specified.

§ 50.

The system 51 does not satisfy the conditions of adequacy for a theory about a functional system that were laid down above (§ 33). The specification of K_G is incomplete, and the sets $f_1, f_2, \ldots f_2$ and $g_1, g_2, \ldots g_n$ are missing. The system does not show that a society is a functional system. However, the theory contains several necessary components of such a theory: "Our own analysis is thus very far from a classification of actual structural types of social systems. But it does present, we feel, a systematic approach to the problem, which is capable of further development into the very heart of substantive theory. It delineates all the principal components – the elements of orientation and the functional problems which it will be necessary to incorporate into such a classification – and works out some of their relations to each other." (*TGTA*, p. 223).

§ 51.

There is a variety of political theory types like systems theory, the sociological approach, rational choice theory, the actor approach, public choice, formal poltical theory, the structural-functionalist approach, collective behavior, game theory and so on. Whereas systems theory used to be fashionable during the sixties rational and collective choice approaches have become *en vogue* during the seventies. These ways of modelling political data do not offer contradictory alternatives for theoretical interpretation. In fact, they may very well complement each other. It is not a daring assumption to predict that we will see a *revival* of the systems model in political science during the eighties. Probably that revival of the relevance of the systems model will mean a renaissance of the Eastonian *systems analysis:* even if Bang is only partly right when reinterpreting Easton's system analysis, then maybe Danish political scientists like G. Sjöblom, L. Lundquist and E. Rasmussen are not that old-fashioned, after all.

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