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A BASIC MODEL FOR SOCIAL INSTITUTIONS

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A precise model of social institutions is described comprising four dimensions: first, a macro-level of groups, types of actions, and related notions, second, a micro-level of underlying individuals and actions, together with suitable relations of intention, causal belief and power. Power is characterized in a new way emending proposals discussed recently. Third, the model contains intellectual representations of items on the macro- and micro-level. Fourth, it contains a dimension including the origin and development of what we call "social practices" (smallest units of socially relevant behaviour) which gives the model some historical depth. By putting all these items together, a powerful model with a wide range of applications is created. The claim associated with this model is that it applies to all social institutions which are similar to systems listed up in the introduction. The way of applying the model is discussed in detail on the basis of an abstract example.

KEY WORDS: Social institution, social organization, model, axiomatic model, social power, social practice.

This paper presents a theory of social institutions in precise terms. The theory is intended to apply to social systems of various size and from various historical periods of occurrence, like the grocer's shop next door, all grocery shops in a certain area, factories of different size (family enterprise, middle-sized factory, international company), political institutions of various degrees of comprehensiveness (like the mayor of a little town, the British Queen, the US president or the German Bundesrat), as well as structures comprising almost all the population of a certain area, like the feudal 13th or 16th century France. These and similar systems provide the data to be systematized, data to which the theory has to fit. We concentrate here on presenting the theoretical picture, the theory's models; questions of empirical application can be considered only briefly in the final section. Our models should be regarded as "core" models of a *basic theory-element* which by means of adding various *special laws* holding only under special circumstances may grow into a full-fledged *theory-net*. While the basic model is spelled out in detail, specializations or special laws are not elaborated here; we can only indicate some possibilities. The essential insight associated with this picture of a theory-net as consisting of various specializations

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of one common basic theory-element is that the basic theory-element usually is empirically trivial or nearly trivial while the whole net gets highly non-trivial by means of the different special laws which hold only under very limited conditions and in very limited domains. This net picture has proved correct for the most honoured theories in physics like mechanics, or thermodynamics.¹

A theory of social institutions necessarily has to be rather comprehensive. There is only a narrow path between its becoming unapprehendable because of too many features being included which are thought relevant, and between becoming simple but trivial because too many relevant features are left out. We believe that we are on that path, and though we may be nearer to the trivial side, our account provides many opportunities for refinement or specialization which will be indicated in some places.

In a first step we restrict ourselves here to social institutions of *first order*, and to a *static* model. By a first order institution we mean an institution all of whose actors are individuals. In contrast, a higher order institution has among its actors at least one corporate actor. The study of higher order institutions involves a marked increase in complexity with respect to the present approach and cannot be addressed here. We think, however, that our model will be useful for subsequent construction of higher order models. Our model is static in the sense of not making fully explicit the process of the origin and development of an institution. It is clear that ultimately a satisfactory concept has to comprise these dynamical aspects as well. The model is not entirely static, however, it contains some important dynamic ingredients: local features of the origin and development of "parts" of an institution (called *social practices* in Sec. 3). Explicit reference to time can easily be introduced though we did not for reasons of simplicity, and because mere inclusion of time does not by itself reveal new insights. The items mentioned, origin and development of a whole institution, did play an important role in the construction of our theory, but cannot fully be worked out here.

Also there is no space for detailed comparison of our model with others. The reader will recognize features similar from the functionalist approach² in the form of hierarchies of power (Sec. 1), and from constructivism³ in the notion and role of superstructures in our model (Sec. 2). The social practices in Sec. 3 are modelled along the lines of the picture of evolutionary theory⁴, and our account of power in Sec. 4 was inspired by recent work of Wartenberg⁵. What is new is the way of putting these items together in a precise way, including a precise account of power, in particular. What will be missed is explicit reference to the game theoretic

¹The basic theory-elements of the two theories mentioned can be shown to be empirically trivial, see Balzer, Moulines and Sneed (1987), Chap. IV. Our methodological approach is that of a recent school known sometimes under the label of "structuralism". According to this approach, a simple theory essentially is given by a class of models and a class of so called intended applications or intended systems (i.e. sets of data obtained from real systems by various systematic means). The empirical claim formulated with a theory is that the intended systems fit into suitable models and in this sense are explained by the theory (see Sec. V). More comprehensive theories are conceived as *nets* of simple theories, interrelated by various links. See Balzer, Moulines and Sneed (1987) for further details.

²See Parsons (1951).

³For instance Berger and Luckmann (1966).

⁴See Maynard Smith (1982).

⁵Wartenberg (1988).

approach⁶. We understand our model as *complementary* to the latter. Our model is not committed to assumptions of rationality and "independence" typical for the game theoretic account, and in this sense may be said to start from a more basic level. We do not want to deny that strategic thinking and behaviour is relevant and often important in institutions. Our individual POWER relation may be, and often should be, analyzed in game theoretic terms (this is why we used the term "complementary" above).⁷ Basically, our model focusses on arbitrary relations of power while game theory focuses on more rational kinds of strategic behaviour.⁸

The following four basic features of a social institution are taken into account by our model. First, the model contains a *macro structure* splitting up an institution into groups with characteristic behaviour and different status. Second, it makes explicit the "underlying" micro level of individual behaviour, including intentions and relations of power. Third, it deals with the way in which separate kinds of actions typical for certain groups originate and develop. Fourth, it contains components reflecting the "images", "models" and "representations" which are built up in individuals and stabilize, and provide sense to, their actions.

1. MACRO- AND MICRO STRUCTURE

The macro structure, or *core*, of an institution consists of *groups* which are characterized in terms of their behaviour and their "status". Behaviour is modelled in terms of action types, action types being understood as classes of actions (tokens) which are similar in certain respects. The relations of similarity by which action tokens are grouped together to form a type will not be made explicit here. In a macro structure we take the notion of action type as primitive. Each group is *characterized* by means of a collection of action types typically performed in that group. We use a function χ , called the *characteristic function*, which assigns such a collection of action types to each group. If γ is a group and $\{\tau_1, \dots, \tau_n\}$ is a set of action types then $\chi(\gamma) = \{\tau_1, \dots, \tau_n\}$ means that each action type τ_i typically is performed by members of γ , and that all action types τ_1, \dots, τ_n taken together are sufficient to distinguish members of γ from members of other groups. Members of other groups typically do not perform actions of *all* the types τ_1, \dots, τ_n . We cannot exclude, of course, that members of different groups perform certain single actions of the same type. But members of different groups do not perform the same "combinations" or sets of actions if such sets or combinations are taken to be sufficiently large and comprehensive: members of different groups "behave differently". We do not require that the set of action types characteristic for a group determines that group

⁶Recent topics are supergames and evolutionary game theory. See Taylor (1976), Axelrod (1984) and Schotter (1981).

⁷In such cases, our definition of power in D9 A17 becomes similar to that used by Thibaut and Kelley (1959), in particular their notion of fate control. In general, however, we make no assumptions about rationality and strategic thinking so that, in general, the game theoretic account of power and our account are difficult to compare.

⁸Another formal approach to institutions is via production rules, as found in the work of Fararo, Skvoretz and Axtén, see e.g. Fararo and Skvoretz (1984). In comparison to our model they provide a much more fine grained account of how actions in an institutionalized pattern follow, and are determined by, one another. We think that at the present stage this is more of a disadvantage, for many institutions allow for widely different kinds of sequences of actions. A further, different, approach worth mentioning is March and Simon (1958). Compare Scott (1981) for further overview and references.

uniquely, i.e. that χ be one-one, though in most applications this will be the case. Status of the groups is treated in a weak, merely comparative form. A binary status relation \triangleleft among groups indicates when one group, γ , has higher status than another, γ' : $\gamma' \triangleleft \gamma$. "Status" at this stage is a very vague notion, a "theoretical term" of our theory. We speak of "status" because of certain similarities to this term's meaning in network analysis (which cannot be worked out here, however.) The status relation is required to be transitive and antireflexive (A3 below), and such that there exists a group with highest "status" within the institution modelled (A4).

A core C of a social institution therefore is a structure

$$C = \langle \Gamma, \Theta, \chi, \triangleleft \rangle$$

where Γ is a set of "groups" and Θ is a set of "action types", χ is a "characteristic function" which maps each group into a set of action types (those "characteristic" for members of the group), and \triangleleft is a binary "status relation" among the groups. Moreover, the following axioms are required to hold:

- A1 The sets of groups and action types are non-empty and disjoint. The set of groups is finite.
- A2 Each action type in Θ belongs to some set $\chi(\gamma)$ characteristic for some group of Γ .
- A3 The status relation is transitive and anti-reflexive.
- A4 There exists one group with highest status.

In the following the status relation will get closely linked to the notion of power so that a group's higher status basically is derived from its members having more opportunities to exert power over members of a group with lower status. However, this link to power does not serve as a definition of status: the status relation in the final model still has its status as an undefined primitive.

Axioms A3 and A4 have empirical character. We can imagine possible counterexamples which however, if our models are correct, do not occur in real-life institutions. Think of an anarchist society like, say, the Nuer.⁹ Whatever grouping we may imagine in such a society, we do not find a natural relation on the groups which satisfies the above axioms. This does not show that the axioms are "wrong". The point is that anarchic societies are not among the intended systems for a theory of institutions: they are "uninstitutionalized". It has to be stressed that the claim associated with A3 and A4 is hold up only for institutions of the kind mentioned in the introduction. We have nothing to say about other kinds of social structures with stratifications that might be described with a binary relation among groups. Note that \triangleleft needs not be connected. There may be groups the status of which is not comparable.

Groups, action types and χ may be traced to the micro-level of individuals and their actions (action tokens). Such connection provides meaning and partial operational access to the macro-concepts occurring in a core. We consider individuals, action-tokens (i.e. concrete, single actions in their historical uniqueness) and three relations among individuals and actions: relations of PERFORMANCE, INTENDING and exerting POWER. Variables i, j will range over individuals, and a, b, c over

⁹See Flap (1985) for a sociological study of this example.

action-tokens in the following. While PERFORM has its standard syntax:

i PERFORMS *a*

we use INTEND with three arguments, due to the special context in which it is applied when we come to define power relations (in D9, A17 below):¹⁰

i INTENDS that *j* should do *b*, or simply: INTENDS(*i*, *j*, *b*).

The relation of power we use with four arguments:¹¹

i by doing *a* exerts POWER over *j* so that *j* does *b*,

for which we write: POWER(*i*, *a*, *j*, *b*). This format allows for an easy definition of *exercising power*. We say that *i* *exercises power over j* iff there exist *a*, *b* such that POWER(*i*, *a*, *j*, *b*). In the following, with respect to a given relation POWER(*i*, *a*, *j*, *b*), *i* will be called the *superordinate agent* and *j* the *subordinate agent*.

We define a *micro base* MB for an institution to consist of individuals and actions (= action tokens), together with the relations mentioned:

$MB = \langle J, A, \text{PERFORM}, \text{INTEND}, \text{POWER} \rangle$

where *J* is a set of "individuals", *A* is a set of "actions" (tokens), PERFORM, INTEND, and POWER are relations of the above format, and the following axioms are satisfied:

A5 *J* and *A* are non-empty and disjoint. The set *J* of individuals is finite.

A6 Any two individuals *i*, *j* $\in J$ are involved in some POWER relation by means of suitable actions (i.e. there exist *a*, *b* $\in A$ such that POWER(*i*, *a*, *j*, *b*) or POWER(*j*, *a*, *i*, *b*)).

There are no axioms about PERFORM and INTEND at this stage. In Sec. 4, these two relations will be needed in order to characterize the POWER relation, but the axioms to be formulated there involve other notions in an unseparable way. So we abstain from formulating axioms here which would become redundant later on. A6 requires that all individuals are involved in the POWER relation. POWER therefore creates a *connected* network of ties between the individuals, a tie existing between two individuals whenever one of them exerts power over the other (with respect to suitable actions *a*, *b*). In applications the sets *J* and *A* must not be treated as merely observational. Though there is no doubt that individuals and actions in most cases can be determined by observation, not all observed items will be relevant for the system under investigation, and the actions observed may vary with the observer. Some choice and interpretation always will be involved. If we apply the theory to a grocer's shop, and observe a mother with child, shopping and wiping the child's nose at the same time we may well forget about the child and wiping its nose because these do not contribute to modelling the situation as an institution of the type "grocer's shop". Such problems of delimiting "the" correct sets of objects in a system with respect to a given theory occur in every field (including the natural sci-

¹⁰The ordinary syntax of INTEND is "*i* INTENDS to do *b*". Our usage may easily be subsumed under this by taking *b* as an action which contributes to *j*'s doing *a* (from *i*'s point of view).

¹¹This is exactly the format used in Dahl (1957).

ences), and the ultimate criterion for a correct choice always is whether the process of application succeeds (compare Sec. 5).

A6 reminds of network analysis, and is put forward in that spirit. We believe that the possibilities of network analysis¹² are still far from being exhausted. One domain of application of network analysis that has been neglected up to now is that of networks of *theoretical*, abstract relations, like our relation of POWER. The mere fact that power relations are not observable in the same way as are numbers of telephone calls, say, does not indicate that they are not operationally accessible. The least we can say is that they are open to direct verbal investigation. Moreover, in everyday life we have fine senses for determining power relations which might give further hints at operationalization. Finally, a theoretical term of this kind needs not be fully operationalized, it may as well be determined by means of our theory. We note that our INTEND relation referring to two individuals also yields ties which may be considered as creating a network. On our account, however, only those ties of INTEND are important which have some connection with the POWER relation. A full characterization of POWER will be given only in Sec. 4.

Individuals and actions being available, groups of course can be treated as sets of individuals, and action types as sets of actions, respectively. Group membership and an action's being of a certain type then reduce to set theoretic membership. In this way we may base any "macro" core on some suitable micro base. Of course, such "foundation" requires further connections between the central notions on both levels. We have to state how the characteristic function and the status relation are related to the underlying individual notions PERFORM, INTEND and POWER. No definition of the former in terms of the latter is to be expected. Concerning the characteristic function we first state the obvious condition that every action type characteristic for a group also is PERFORMED by some member of that group. Second, and more importantly, we require that PERFORMANCE takes place in the frame given by the characteristic function (A8 below). Any individual i will perform only those actions b which are characteristic for one of the groups of which i is a member. Since the group is characterized by a set of action types $\chi(\gamma) = \{\tau_1, \dots, \tau_n\}$ this can be expressed by saying that the action b belongs to one of the types $\tau_1, \dots, \tau_n : b \in \tau_i$, for some $i \leq n$. This axiom is a cluster law binding together three important concepts: groups (and group membership), PERFORMANCE and characteristic actions. Note that groups are not necessarily disjointed. If an individual belongs to different groups then its performed actions have to be characteristic for at least one of those groups. Clearly, this requirement becomes stronger with decreasing number of groups to which an individual belongs. The most frequent case in applications is that of an individual's belonging to just one group. It has to be emphasized that the groups considered here are only those occurring in *one* institution.

The connection between the status relation and the micro concepts informally may be stated as follows. A group γ has higher status than group γ' only if all members of γ can exercise power over members of γ' , if a "big part" of the lower group is thus affected, and if the converse of this relation does not hold, i.e. not all members of γ' can exercise power over members of γ , and a "big part" of γ is thus

¹²See Burt (1980) for a survey.

left unbothered. This formulation may be emended as follows. First, we may replace the modal aspect expressed in "can exercise" by the actual mode. This yields an overidealized form, however. Typically, not all members of one group actually exercise power over members of the other—even if such events are allowed to be spread over some reasonably long interval. Usually, however, a "big part" of the higher group actually exercises power. So a more realistic version is obtained by requiring "big parts" (and complementary "small parts") in all places of the statement. We do not formalize the notion of "big parts", this might be done in different ways, for instance by referring to the actual numbers of members of the groups, and appropriate proportions. Also, we might use different proportions on both sides in order to obtain finer differentiation. Two groups γ_1 and γ_2 , for instance, may both have higher status than group γ with equal proportions in γ_1 and in γ_2 of members exercising power over members of γ . If more members of γ in this situation are affected by members of γ_1 than are affected by members of γ_2 we may say that γ_1 can be ranked "above" γ_2 relative to γ .

We define a *micro-based core* for a social institution to be the result of founding a "macro" core on some appropriate micro base. Thus a micro-based core MBC for an institution is a structure $MBC = \langle C, MB \rangle$ where $C = \langle \Gamma, \Theta, \chi, \triangleleft \rangle$ is a core for a social institution, $MB = \langle J, A, \text{PERFORM}, \text{INTEND}, \text{POWER} \rangle$ is a micro base, and the following axioms are satisfied:

- A7 Each group in Γ is a non-empty set of individuals (elements of J), and each individual in J belongs to some group in Γ . Each action type in Θ is a non-empty set of actions (elements of A), and each action in A belongs to some action type in Θ . Furthermore, for each action type characteristic for a group there exists an individual in that group PERFORMING an action of that type.
- A8 For any action b PERFORMED by some individual i there is some group of which i is a member such that action b belongs to one of the action types characteristic for that group.
- A9 For any two groups $\gamma, \gamma' : \gamma$ has higher status than γ' only if i) each member of a big part of group γ exercises power over some member of γ' , and a big part of γ' is thus affected, ii) there are members of γ' which do not exercise power over members of γ , and only members of a small part of γ are such that a member of γ' exercises power over them.

Note that A9 expresses only a necessary condition for the status relation. This leaves us with the possibility of further constraining it in other ways. One possibility—open for future investigation—would be to use the mental superstructures to be introduced below for further characterization: a group can have higher status than another one, for instance, if it ranks higher in most individuals' images of social structure and social ranks. The "surplus" requirements in A7 exclude individuals and actions which do not occur in any group and action type of the structure, respectively. Such individuals and actions do not contribute to the theoretical picture, they are redundant with respect to the institution under investigation, and thus are omitted. In an application it is always possible to choose individuals and actions in a minimal way to make these surplus requirements come out true.

Because of the central role of axiom A8 and its counterpart A13 to be introduced below let us use some different terminology for the sets of actions characteristic for a group. We say that an action type is *admitted* for a group (and for each member of that group) iff it occurs in the set of action types characteristic for that group, i.e. in the set of action types assigned to that group by the characteristic function. In the same way, each action occurring in an action type admitted for a group or a member of a group also is called admitted for that group or its member. Axiom A8 then may be restated as requiring that actions are performed only if they are admitted for one of the groups to which their actor belongs. Thus the characteristic function, and with it the institution, provides a setting, or a space of possible actions, for each individual. It may be objected that A8 can be immediately refuted by real-life counterexamples. In applying our theory to a firm we may be confronted, say, with an accountant performing a bank robbery which is not an action admitted for him in the firm under investigation. However, this and similar examples cannot be used as counterexamples to A8 for the action referred to does not belong to any action type relevant for the firm, and thus should not be included in the analysis. If an action is included in a model then there has to be a corresponding action type, too (by A7). Yet the action type has to occur in a set of action types characteristic for a group (by A2), so an appropriate group also has to be included in the model. Thus the choice of observed actions as appropriate to occur in the model depends on the whole process of application. Eliminating further possible ambiguities, the previous definitions may be formally stated as follows.¹³

- D1 *C* is a *core* for a social institution iff there exist Γ, Θ, χ and \triangleleft such that $C = \langle \Gamma, \Theta, \chi, \triangleleft \rangle$ and
 A0-1 Γ, Θ, χ and \triangleleft are sets, $\chi: \Gamma \rightarrow \text{PO}(\Theta)$ and $\triangleleft \subseteq \Gamma \times \Gamma$,
 A1 Γ and Θ are non-empty and disjoint, and Γ is finite,
 A2 $\cup\{\chi(\gamma)/\gamma \in \Gamma\} = \Theta$,
 A3 \triangleleft is transitive and anti-reflexive,
 A4 there exists $\gamma^* \in \Gamma$ such that for all $\gamma \in \Gamma$: if $\gamma \neq \gamma^*$ then $\gamma \triangleleft \gamma^*$.
- D2 *MBC* is a *micro-based core* for a social institution iff there exist $\Gamma, \Theta, \chi, \triangleleft, J, A$, *PERFORM*, *INTEND*, *POWER* such that
 $\text{MBC} = \langle \Gamma, \Theta, \chi, \triangleleft, J, A, \text{PERFORM}, \text{INTEND}, \text{POWER} \rangle$,
 $\langle \Gamma, \Theta, \chi, \triangleleft \rangle$ is a core for a social institution, and
 A0-2 J, A are sets, $\text{PERFORM} \subseteq J \times A$, $\text{INTEND} \subseteq J \times J \times A$, and $\text{POWER} \subseteq J \times A \times J \times A$,
 A5 J and A are non-empty and disjoint, and J is finite,
 A6 for all $i \in J$ there exist $j \in J$ and $a, b \in A$ such that $\text{POWER}(i, a, j, b)$ or $\text{POWER}(j, a, i, b)$,
 A7 $\Gamma \subseteq \text{PO}(J)$, $\Theta \subseteq \text{PO}(A)$, $\cup \Gamma = J$, and $\cup \Theta = A$, and for all $\gamma \in \Gamma$ and $\tau \in \Theta$ such that $\tau \in \chi(\gamma)$ there exist $i \in \gamma$ and $a \in \tau$ such that $(i \text{ PERFORMS } a)$,
 A8 for all $i \in J, a \in A$: if $(i \text{ PERFORMS } a)$ then there exist $\gamma \in \Gamma$ and $\tau \in \chi(\gamma)$ such that $i \in \gamma$ and $a \in \tau$,
 A9 for all $\gamma, \gamma' \in \Gamma$, if $\gamma' \triangleleft \gamma$ then

¹³We write $f: x \rightarrow y$ to express that f is a function from x to y . By $\text{PO}(x)$ we denote the power set of x and by $z \times y$ the cartesian product of sets z and y . $\cup x$ denotes the union of x (for a collection x of sets): $\cup x = \{u/\forall z \in x (u \in z)\}$.

9.1) for a big part γ^* of γ all $i \in \gamma^*$ exercise power over some $i' \in \gamma'$, and a big part of γ' is thus affected;

9.2) at most for a small part γ^0 of γ' , all $i' \in \gamma^0$ exercise power over some $i \in \gamma$, and a big part of γ is not affected by this.

D3 Let $MBC = (\Gamma, \Theta, \chi, \triangleleft, J, A, \text{PERFORM}, \text{INTEND}, \text{POWER})$ be a micro-based core for a social institution.

a) For each $\gamma \in \Gamma$, each $\tau \in \chi(\gamma)$ is called a type of actions *admitted for* (members of) γ , and each $a \in \cup \chi(\gamma)$ is called an action *admitted for* (members of) γ .

b) $\text{ADMIT}(\Gamma, \Theta) = \{(\gamma, \tau) / \gamma \in \Gamma, \tau \in \Theta \text{ and } \tau \in \chi(\gamma)\}$ is called the set of *admitted combinations* (in MBC).

2. SUPERSTRUCTURES

Part of the macro core of an institution: groups, action types, and the characteristic function, after a while get represented in the mental frames built up in the individuals, they get internalized and often even explicitly represented by terms in the language spoken by these individuals. All structures thus built up, whether conceptual or not, we subsume under the label of *superstructures*. There is a simple condition for their development: the institution has to last for more than one (human) generation. This usually being the case, parents from each group will pass on their implicit knowledge about rules of behaviour, that is, about the core of the institution, to their offspring.¹⁴ But even those individuals which are involved in the emergence of an institution (which therefore is not present in their process of socialization) internalize the essential distinctions (groups) and terms of behaviour (action types and χ)—though they may have no verbal expressions for them yet.

Once fully built up, a superstructure covers various items: language, beliefs, dispositions, and representations of the components occurring in a core: groups and action types (often expressible in the language) and the characteristic function and status relation (which sometimes may be so expressible but often are not). We restrict ourselves here to those items really necessary in the static part of the theory: language, causal beliefs, and representations for Γ , Θ and χ . Other items that might become important in specializations will be suppressed here. With respect to language substantial restriction is necessary in order to make applicable the technical means available today. We represent language by a *space of propositions*. Intuitively, a proposition is a class of sentences (of possibly different languages) which have the same meaning. Some philosophical objections notwithstanding¹⁵ propositions are very practical when applied with some awareness of the difficulties. Using the most economical approach we start with a binary relation \preceq among propositions which may be interpreted as "implication in meaning". The proposition (represented by the sentence) "I am walking" in this sense implies "I am moving" which is not a logical implication of course. Implication in both directions yields equality of meaning, so in a sense \preceq is already contained in the notion of a proposition. By a space of propositions we mean a set \mathcal{P} together with a relation \preceq on \mathcal{P} such that (\mathcal{P}, \preceq)

¹⁴This point is clearly elaborated in Berger and Luckmann (1966).

¹⁵See, for instance, Schiffer (1987), Chap. 3.

is a distributive, complementary lattice¹⁶ with 0 and 1. In applications we may simply work with sentences as representatives of propositions, and take the lattice operations \neg, \wedge, \vee to correspond to the ordinary logical connectives. Five additional items will be needed as occurring in any superstructure. First, we need a component representing a person's causal beliefs. For each individual, we use a binary relation B among propositions; reference to the individual will be made explicit below. $B(p, p')$ expresses that propositions p and p' represent events e, e' such that the individual under consideration believes e is a partial cause of e' . $B(p, p')$ may be read metaphorically as "the individual believes that p partially causes p' ". Alternatively, we might work with a causal relation B^* directly established among events which would lead to a more natural reading of $B^*(e, e')$: "the individual believes that event e partially causes e' ". We opt for causality being represented at the level of propositions because social theory puts more weight on causal belief than on "real" causes and effects, and because of strategic reasons not to be defended here. *Partial* causes are events which, together with other events (i.e. other partial causes) yield a "full" cause. The problems of causality cannot be discussed here.¹⁷ The relation of causal belief will play an essential role in our characterization of POWER in Sec. 4.

Second, we need representations of groups, action types, and the characteristic function, which are denoted by G (groups), T (action types), and CHI, respectively. It would be most natural to assume G and T to consist of sets of terms in the language used by the individual, and CHI to be given by a set of propositions defining which action types are characteristic for what groups. Such treatment is, in fact, possible, but the technical complication implied is not balanced by direct benefit in this paper. So for the moment we prefer a coarser approach, treating G and T just as unstructured sets, and CHI as a function, mapping each element of G in a set of elements of T . In addition, we use a binary relation ϵ among members of \mathcal{P} and T . The interpretation is this. Elements of G are internalized representations of the different groups in the individual's superstructure, and elements of T are internalized representations of the different action types. CHI is some internalization of the characteristic function in the individual to which the superstructure is assigned. CHI may be regarded as that individual's disposition to associate admitted types of action with the different groups, and ϵ as it's disposition to subsume some (representation of an) action under some (representation of an) action type. " $\text{CHI}(g) = \{t_1, \dots, t_n\}$ " may be read as "the individual internally associates representations t_1, \dots, t_n of action types with the representation g of a group", and " $p \in t$ " as "the individual subsumes proposition p , which represents some action, under it's representation t of an action type". If all representations are verbal, we may think of p as a sentence (describing some action), of t_1, \dots, t_n as expressions for action types, and of g as a term denoting some group. In general, however, we must not assume that all those representations "are" verbal, or can be verbalized. To the present account verbaliza-

¹⁶I.e. \preceq is transitive, reflexive, and anti-symmetric ($x \preceq y$ and $y \preceq x$ implies $x = y$), for any two $a, b \in \mathcal{P}$, their infimum $a \wedge b$ and supremum $a \vee b$ with respect to \preceq exist, and these infima and suprema satisfy the usual laws of distribution. Furthermore, there exists the infimum (resp. supremum) of all $a \in \mathcal{P}$, denoted by 0 (resp. 1), and for each $a \in \mathcal{P}$ there is exactly one b in \mathcal{P} (denoted by $\neg a$) such that $a \wedge b = 0$ and $a \vee b = 1$. See Graetzer (1971) for basic notions.

¹⁷A comprehensive, non-technical account of causality is found in Mackie (1974), for a technical, probabilistic approach see Suppes (1970).

tion is inessential, in particular in connection with CHI. All we need is that CHI be internalized so that it may guide the individual's behaviour. CHI also may be regarded as a rudimentary (representative of α) norm. In a more elaborate version of our models norms would have a natural place in the superstructures, together with some constraint requiring identical norms in members of the same group. This is another point where the present model may serve as a basis for further specialization.

We do not state special axioms for the relation of causal belief. Some general axioms might be found by studying philosophical literature¹⁷ while more interesting axioms will not hold in general but will be restricted to particular forms of social systems. Not only will particular causal beliefs in a society being thoroughly oriented towards magic like the Azande¹⁸, for example, be different from ours in the age of science, but the structure of the whole belief system is likely to be different. Therefore it seems better to leave axioms for causal belief to be studied in specializations of the present theory.

We define a *superstructure* to be a structure x the form

$$x = \langle \mathcal{P}, \preceq, B, G, T, \text{CHI}, \epsilon \rangle$$

such that $\langle \mathcal{P}, \preceq \rangle$ is a space of propositions, B is a binary relation among elements of \mathcal{P} denoting an individual¹⁹ i 's relation of causal belief, G and T are sets of internal representations of groups and action types in i , respectively, $\text{CHI} : G \rightarrow \text{PO}(T)$ is a function mapping representations of groups on sets of representations of action types which denotes the characteristic function as internalized by i , and ϵ is a relation of subsumption between elements of \mathcal{P} and T . The only axiom required to hold is that $\langle \mathcal{P}, \preceq \rangle$ be a distributive, complementary lattice with 0 and 1.

In principle each individual i may have its own superstructure. We use a function x to assign that superstructure to each individual i in an institution. Thus $x(i)$ denotes the superstructure assigned to individual i , or simply: i 's superstructure. In order to keep things legible we refer to the components of $x(i)$ by an upper index " i ". So²⁰ \mathcal{P}^i, \preceq^i etc. will denote $\Pi_1(x(i))$, $\Pi_2(x(i))$ etc. In addition to this assignment, in Sec. 4 we will need a more fine-grained *representation function*, rep_i , which (depending on each individual i) maps actions into propositions, groups into representatives in G^i , and the characteristic function χ into a function CHI^i . Formally, rep_i may be defined on the union of the sets A of actions, Γ of groups, and the singleton $\{\chi\}$ (see A0-5 below), and be required to map each kind of argument into an appropriate value, i.e. each action into some proposition representing this action, each group into some member of G^i representing this group, and the function χ into the function CHI^i occurring in i 's superstructure. We agree that $\text{rep}_i(b)$ denotes the proposition (sentence) describing action b and $\text{rep}_i(\gamma)$ the representation of group γ in the language. In Sec. 4 representations as given by the functions rep_i will be used to formulate the central axiom for POWER relations.

Starting from a micro-based core we add one superstructure for each individual in the core, and we use functions x and rep to assign the whole superstructure and

¹⁷See Evans-Pritchard (1937), for example.

¹⁹Individual i is not made explicit in this definition, but will be made explicit below.

²⁰ $\Pi_i(u)$ denotes the i th component of tuple $u = \langle u_1, \dots, u_n \rangle$ ($i \leq n$). Thus $\Pi_1(\langle \mathcal{P}, \preceq, B, G, T, C, \epsilon \rangle) = \mathcal{P}$, and $\Pi_3(\langle \mathcal{P}, \preceq, B, G, T, C, \epsilon \rangle) = B$.

their components to the different individuals, respectively. The resulting structure we call a social schema.

A social schema SS therefore is a structure

$SS = \langle \Gamma, \Theta, \chi, \triangleleft, J, A, \text{PERFORM}, \text{INTEND}, \text{POWER}, M, x, \text{rep} \rangle$
 such that $\langle \Gamma, \Theta, \chi, \triangleleft, J, A, \text{PERFORM}, \text{INTEND}, \text{POWER} \rangle$ is a micro-based core for a social institution, M is a set, x is a function mapping J into M and rep is a function which, for each $i \in J$ maps actions, groups, and χ into respective elements from some superstructure. Moreover:

A10 Each element in M is a superstructure,

A11 x is onto,

A12 For all groups $\gamma \in \Gamma$ and for any two individuals i, j , if i, j both are members of γ then i and j have the same superstructure ($x(i) = x(j)$) and the same rep-function ($\text{rep}_i = \text{rep}_j$),

A13 For each individual $i \in J$ and each action $a \in A$, i PERFORMS a only if i 's representation $\text{rep}_i(a)$ can be subsumed under one of i 's representations of the action types in $\text{CHI}^i(\text{rep}_i(\gamma))$ characteristic for one of the groups γ to which i belongs.

Function x being onto as required in A11 restricts the set M of superstructures to those really needed. We call $x(i)$ individual i 's superstructure. Two individuals i, j in general may have different superstructures: $x(i) \neq x(j)$. By A12 this possibility is ruled out for individuals belonging to the same group. In other words, superstructures within one group are homogenous, and so are the ways different members represent actions and groups in the language. In its present form this axiom is perhaps too strong and idealized. It implies, for instance, that in an institution in which all groups are overlapping all individuals have identical superstructures. This problem of the formalism points to a real problem, however. There is some balance between the degree in which groups overlap on the one hand, and the degree to which the groups' languages are similar or equal on the other hand. There are two ways to weaken this axiom. First, we simply may blur it, and require that in each group the superstructures and the rep-functions are only approximatively equal. The precise way of blurring here is not obvious and will depend on the concrete case. Another, theoretically more interesting way consists in assigning superstructures not to individuals but to pairs of individuals and groups. This allows to speak of the superstructure of an individual as far as it is member of some group, and therefore of one individual "having" several superstructures, each one being used in situations governed by a corresponding group. We do not pursue this possibility here but note that the final definitions in Sec. 4 can be easily adjusted to such a treatment.

A13 mirrors A8 on the level of superstructures. Roughly, it says that each individual's PERFORMANCE has to be compatible with the characterization of groups in the institution, but now with the characterization as internalized by that same individual. This axiom is important for the stability of institutions. One major reason for stability is that the individuals have internalized the institution's characteristic function, and because they behave in the frame given by that function in their individual internal representations (A13). Using the notion of admissible actions

we may restate A13 as saying that each individual PERFORMS only those actions which are admissible according to the individual's superstructure. Thus the superstructures restrict and guide the possibilities of individual behaviour—in line with constructivism. Admittedly, little is known by now about the nature of these internal representations of characteristic functions, and our CHI-functions are just a dummy to be filled by future research. However, even in this crude form the role of the CHI-functions in our theory as expressed in A13 is crucial. Here are the formal definitions of superstructures and social schemata.

- D4 x is a *superstructure* iff there exist $\mathcal{P}, \preceq, B, G, T, \text{CHI}, \epsilon$ such that $x = \langle \mathcal{P}, \preceq, B, G, T, \text{CHI}, \epsilon \rangle$ and
- 1) $\langle \mathcal{P}, \preceq \rangle$ is a distributive, complementary lattice with 0 and 1,
 - 2) $B \subseteq \mathcal{P} \times \mathcal{P}$,
 - 3) G and T are disjoint sets, G is finite,
 - 4) $\text{CHI} : G \rightarrow \text{PO}(T)$,
 - 5) $\epsilon \subseteq \mathcal{P} \times T$.
- D5 S is a *social schema* iff there exist $\Gamma, \Theta, \chi, \triangleleft, J, \mathcal{A}, \text{PERFORM}, \text{INTEND}, \text{POWER}$, and M, x, rep such that
- $S = \langle \Gamma, \Theta, \chi, \triangleleft, J, \mathcal{A}, \text{PERFORM}, \text{INTEND}, \text{POWER}, M, x, \text{rep} \rangle$,
 $\langle \Gamma, \Theta, \chi, \triangleleft, J, \mathcal{A}, \text{PERFORM}, \text{INTEND}, \text{POWER} \rangle$ is a micro-based core for a social institution, and
- A0-5 M is a set, $x : J \rightarrow M$, and $\text{rep} : J \rightarrow \text{PO}((\mathcal{A} \cup T \cup \{\chi\}) \times (\cup \{\mathcal{P}^i / x(i) \in M\} \cup \{G^i / x(i) \in M\} \cup \{\text{CHI}^i / x(i) \in M\}))$ is such that for all $i \in J$:
 $\text{rep}_i := \text{rep}(i)$ is a function, $\text{rep}_i : (\mathcal{A} \cup T \cup \{\chi\}) \rightarrow (\cup \mathcal{P}^i \cup \cup G^i \cup \{\text{CHI}^i / x(i) \in M\})$ such that $\text{rep}_i(u)$ is in \mathcal{P}^i (resp. in G^i) if u is in \mathcal{A} (resp. in Γ), and $\text{rep}_i(\chi) = \text{CHI}^i$,
- A10 Each element in M is a superstructure,
- A11 x is onto,
- A12 for all $\gamma \in \Gamma$ and all $i, j : \text{if } i \in \gamma \text{ and } j \in \gamma \text{ then } x(i) = x(j) \text{ and } \text{rep}_i = \text{rep}_j$,
- A13 for all $i \in J$ and all $a \in \mathcal{A} : \text{if } (i \text{ PERFORMS } a) \text{ then there exist } \gamma \in \Gamma \text{ and } u \in \text{CHI}^i(\text{rep}_i(\gamma)) \text{ such that } i \in \gamma \text{ and } \text{rep}_i(a) \epsilon u$.

3. SOCIAL PRACTISES

Roughly, a new socially relevant type of actions originates and develops much like a new species. A new kind of action is performed with or without reasons, and if the surrounding is favourable, if other people around find it interesting, or important or exotic or chique, they will imitate it thus starting an avalanche of imitations. The original action (or actions) plus these imitations then form a new action type in our technical sense. A similar structure we find in the origin and development of groups of actors which perform a new type of action. At the beginning there are one or more "founders", people performing the new kind of action for the first time. Other people imitate the actions and in this sense become "disciples" of the original persons. Again, under favourable conditions the process is iterated and all persons obtained in the end make up a group with respect to a particular action type. Both

these processes constitute genidentical entities, for they both spread from a respective source by means of a relation of imitation, and it is just this which provides their unity. In the case of groups it is obvious that different persons in a group may be quite different, they have nothing in common except their imitating the "inventors" of a new action type. But also for actions it will be hard to hold up a thesis of their having common features besides their being copies of the original actions. It seems hard to identify, say, different forms of greeting one another only on the basis of the observed events in space-time. The important clue for identification is that they can be traced back to other, previous events which are imitated ("learned").

We define the auxiliary notion of a genidentical structure to consist of an abstract set D of "carriers", a subset SOURCE of D of "originals" or "founders", and a relation COPY among carriers. (δ COPIES δ') may be circumscribed as " δ is an imitation of δ' " in case of actions, and as " δ is a disciple of δ' " in case of individuals (children count as disciples).

D6 GS is a *genidentical structure* iff there exist D , SOURCE and COPY such that $GS = \langle D, \text{SOURCE}, \text{COPY} \rangle$ and

- 1) D is a non-empty set,
- 2) $\text{SOURCE} \subseteq D$ is not empty,
- 3) $\text{COPY} \subseteq D \times D$ is reflexive and anti-symmetric,
- 4) each $\delta \in D$ can be traced back through a chain of COPIES to some element of SOURCE,
- 5) SOURCE contains much less elements than D

D6-4 may be formalized as requiring for each $\delta \in D$ the existence of some $\delta_1 \in \text{SOURCE}$ and of $\delta_2, \dots, \delta_n$ such that $\delta_n = \delta$ and each δ_{i+1} COPIES δ_i ($i < n$). D6-5 has to be made precise in the respective context. Different ratios and speeds of propagation are studied in the evolutionary branches of game theory.²¹ If time is made explicit the number $|D_t|$ of carriers at a given instant t may be studied as a function of time (often an exponential one).

By combining the two genidentical structures associated with an action type and the group of agents performing actions of that type we obtain the fundamental concept of a social practise. It is fundamental because it is concerned with the smallest unit of socially relevant behaviour, a type of actions, and the way it originates and spreads. More complex social structures, so we claim, can be analyzed as systems of social practises (with further properties, of course). Social institutions provide one example for this claim (see D9 below).

A social practise consists of a set τ of actions of the same type and a set γ of actors such that each actor at least once PERFORMS some action of that type. Both these sets have developed out of corresponding SOURCES, the set of actions out of a set $\text{SOURCE}(\tau)$ containing historically original actions, and the set of actors out of a set $\text{SOURCE}(\gamma)$ consisting of the actors originally performing the actions in $\text{SOURCE}(\tau)$. $\text{SOURCE}(\gamma)$ may be called the set of founders or creators of the practise. It usually is very small, often a singleton. The actors may be abstract, corporate actors. This is why we avoid the term "individuals" here. The set of actions as well as that of actors consist of all COPIES which have been successively ob-

²¹ Compare Maynard-Smith (1982).

tained from originals and founders. We need two different COPY-relations, one for each set. (δ COPY(γ) δ') applies whenever a new actor δ definitely takes over the new behaviour and in this sense becomes a new member of γ , and (δ COPY(τ) δ') applies whenever action δ is a copy, an imitation of action δ' . Two axioms may be formulated connecting the two basic sets γ and τ . First, they are restricted to contain only elements which are involved in some PERFORMANCE relation (D7-4 below). Actions not PERFORMED by any member of the group can be excluded, even if they are similar to those occurring in τ . In the same way we exclude individuals which do not PERFORM any of the actions in γ . Such individuals are not socially relevant in constituting a social practise—though they may be quite relevant in other respects (for instance in providing the physical means of life for the whole group). A second axiom (D7-5) connects the original actions with the founders of the group. Each original action, i.e. each element of SOURCE(τ), has to be PERFORMED by some “founder”, i.e. some member of SOURCE(γ), and conversely, each founder has to PERFORM at least one original action of the type under consideration. We note that the long historical development of social practises results in the individual superstructures’ being firmly and deeply implanted, which in turn gives heavy weight to the “frame of admissibility”.

D7 P is a social practise iff there exist $\gamma, \tau, \text{PERFORM}, \text{SOURCE}(\gamma), \text{COPY}(\gamma), \text{SOURCE}(\tau), \text{COPY}(\tau)$ such that

SP = $\{\gamma, \tau, \text{PERFORM}, \text{SOURCE}(\gamma), \text{COPY}(\gamma), \text{SOURCE}(\tau), \text{COPY}(\tau)\}$ and

1) γ and τ are non-empty sets, and disjoint,

2) $\text{PERFORM} \subseteq \gamma \times \tau$,

3) $\{\gamma, \text{SOURCE}(\gamma), \text{COPY}(\gamma)\}$ and $\{\tau, \text{SOURCE}(\tau), \text{COPY}(\tau)\}$ are genidentical structures,

4) for all $a \in \tau$ there is some $i \in \gamma$ such that (i PERFORMS a), and for all $i \in \gamma$ there is some $a \in \tau$ such that (i PERFORMS a),

5) for all $a \in \text{SOURCE}(\tau)$ there is some $i \in \text{SOURCE}(\gamma)$ such that (i PERFORMS a), and for all $i \in \text{SOURCE}(\gamma)$ there is some $a \in \text{SOURCE}(\tau)$ such that (i PERFORMS a).

Further axioms concerning the COPY relations may be formulated, but are not needed here. The concept of a social practise has numerous applications, like “conferring a doctor’s degree”, “taking the holy communion” (Roman Catholic, say), “burning a witch”, “sieging a town”, “performing a campaign (in war)”, “electing a leader” (say, the US president).

It is clear that the components of a social practise may be difficult if not impossible to determine. The SOURCES often are lost in history, and the COPY relations also may be difficult to trace historically. This may create the impression that the notion is empty and irrelevant to social institutions. To this possible objection there are two replies. First, as already mentioned, there are no natural standards of similarity for actors and actions. As long as actors and actions are not formally defined in an institution, the basic approach towards their similarity, and thus towards the notions of groups and of action types themselves, is via genidentical structures. Second, and more importantly, genidentical structures form a conceptual basis on

which various different forms of growth and of growth conditions may be formulated and studied. By giving further, special inner structure to the actors and action types, by introducing the notion of special external conditions together with special laws governing the COPY relations we may obtain quite substantial structures. However, just as in the theory of evolution, such specialization is possible only at the cost of considerably narrowing down the range of applications. As stressed in the introduction, our aim here is only to present the general model.

In order to incorporate social practises into social institutions, two adjustments have to be made. First, actors have to be interpreted as individuals for we deal here with first-order institutions only. Second, we must not always identify a "group" of a social practise with a group in an institution. There are important social practises the actors of which are distributed over different groups of an institution. Think of the holy communion, say, in feudal France. Moreover, a social practise may be much older than an institution of which it becomes an ingredient. In this case the "group" of the social practise will contain many more individuals than each corresponding group of the institution into which the practise has found entrance.

4. SOCIAL INSTITUTIONS

We now have prepared the ground for introducing a comprehensive definition of social institutions. We start from a social schema, which is enriched in two steps. In the first step, we assume that each admitted pair $\langle \gamma, \tau \rangle$ consisting of a group γ and an action type τ in the schema's core is "given" by, or embedded or anchored in, a social practise. Recall that a core was defined to consist essentially of a set of groups each of which is characterized in terms of the action types performed by its members. An admitted pair consists of one such group and one of the action types characteristic for that group. Our assumption of embedding thus amounts to regarding each such action type as having originated from some historically first events of actions of that type performed by individuals perhaps long ago through sequences of imitations in which the number of individuals acting also increases. Usually, the group and action type making up one admitted pair in an institution will not correspond to a full social practise. In a typical case, a group in an institution originally is formed by individuals which already are used to one or several social practises existing before the institution is formed, but there will be other individuals used to these social practises which do not become members of the group in question. Often, one social practise in this way contributes to admitted pairs in different groups of one or several institutions. For this reason we must not identify an admitted pair $\langle \gamma, \tau \rangle$ with the full "base sets" of a corresponding social practise. We say that an admitted pair $\langle \gamma, \tau \rangle$ is *anchored* in a social practise if γ and τ are subsets of the corresponding sets of actors and actions in that practise. This relation is best seen from the point of view of a given social practise $P = \langle \gamma^*, \tau^*, \text{PERFORM}^*, \text{SOURCE}(\gamma^*), \text{COPY}(\gamma^*), \text{SOURCE}(\tau^*), \text{COPY}(\tau^*) \rangle$. In the formation of a new institution it may happen that some of the individuals involved are practitioners of the social practice, i.e. members of γ^* . Moreover, it may happen that the action type of the social practise is relevant for the institution. In that case it is likely that the set of members of γ^* which occur in the system will

form one of the evolving institution's groups, and the set of actions in τ^* performed by those members will form one of the institution's action types. If this is so, we say that the admitted pair $\langle \gamma, \tau \rangle$ of the institution is anchored in the social practise P , provided two further technical conditions are satisfied. First, we require that no other action type from the institution is contained in the set τ^* of the practise's actions, i.e. that the actions occurring in the social practise determine a unique action type in the institution. Second, we require that both PERFORM relations, that occurring in the social practise, and that occurring in the institution, are identical for admitted pairs, i.e. for pairs in $\gamma \times \tau$.

D8 If $\langle \Gamma, \Theta, \chi, \leftarrow, J, A, \text{PERFORM}, \text{INTEND}, \text{POWER}, M, x, \text{rep} \rangle$ is a social schema, $P = \langle \gamma^*, \tau^*, \text{PERFORM}^*, \text{SOURCE}(\gamma^*), \text{COPY}(\gamma^*), \text{SOURCE}(\tau^*), \text{COPY}(\tau^*) \rangle$ is a social practise, and $\gamma \in \Gamma$, $\tau \in \Theta$ are such that $\tau \in \chi(\gamma)$ then $\langle \gamma, \tau \rangle$ is anchored in P iff

- 1) $\tau \subseteq \tau^*$ and for all $\tau_1 \in \Theta$: if $\tau_1 \neq \tau$ then $\tau_1 \cap \tau^* = \emptyset$,
- 2) $\gamma \subseteq \gamma^*$,
- 3) PERFORM and PERFORM* are identical when restricted to $\gamma \times \tau$.

Note that the analogon to D8-1 fails to hold for groups. Individuals from different groups may well engage in a common social practise. In fact, if there are no common practises at all, an institution will not last for long.

For a social institution we require that *all* the institution's admitted pairs be anchored in the sense of D8 in suitable social practises. We use a function y to assign these social practises to the admitted pairs, so $y(\langle \gamma, \tau \rangle)$ denotes the social practise in which the admitted pair $\langle \gamma, \tau \rangle$ is anchored.

The second feature by which social schemata are enriched in order to obtain institutions consists in a detailed characterization of the POWER relation. Consider two individuals i, j and two actions a, b . Then our characterization of POWER is expressed in the following axiom:

(AP) i by doing a exerts POWER over j to do b if and only if the four following requirements are satisfied:

- a) actions a and b are actually PERFORMED by i and j ,
- b) i INTENDS that j should do b and j does not INTEND to do b ,
- c) the individuals believe that action a partially causes b ,
- d) i and j are members of groups γ, γ' such that actions a and b are admitted for i and j as members of groups γ and γ' , and such that the admissibility of a and b for these groups is represented in i 's and j 's superstructure, respectively.

Our characterization has the *form* of an explicit definition but is not intended to serve as a mere definition. Rather, we regard it as an ordinary axiom of the theory which happens to have the form of a biconditional. Such axioms frequently occur in respected empirical theories; think of Newton's second law. Not regarding (AP) as a definition implies two things. First, the axiom is open to variation in the "defining" conditions. We may add further requirements to a)-d) in order to obtain more special characterizations which do not hold in all cases of exertion of power but only in certain subsets of cases. This shows that (AP) may serve as a core for

a little self-contained theory of power in small groups which can be specialized in several ways to deal with different important forms of power like force, coercion, and manipulation.²² Second, the notion of POWER is not fully reduced to the other concepts occurring in conditions a)–d). Rather, it is taken as an ordinary primitive referring to some feature of reality, and accessible by means independent of the above axiom. As the concepts occurring in b) and c) are of the same difficult category as POWER itself with respect to operationalization nothing would be gained by insisting that the axiom *defines* POWER. On the contrary, there are direct—though not very reliable—means to determine POWER, for instance by appropriate scales.

Our characterization of POWER intuitively may be split up into two parts, one part (conditions a–c) concerning the micro level of actions, performance, intentions, and causal beliefs, the other part (condition d) exploiting the frame given by a social schema (characteristic function, superstructures). The first part of b) is necessary in order to exclude actions with unintended causal consequences (like a car accident) from the range of exertions of POWER, the second part of b) captures the insight that POWER exists only where there is some form of resistance.²³ The third “micro” condition c) deals with the causal connections between the two agents’ actions. Here the easy account would be to refer to an “objective” causal relation and to hold that *j*’s action *b* is causally determined, at least partially, by *i*’s action *a*. However, causal beliefs may differ between individuals from different social groups (think of magic beliefs, or belief in witches). We do not want to decide here whose causal relation is “the correct” one. In social reality there are frequent cases in which power is exerted on the basis of beliefs on the side of the subordinate agent which the superordinate agent regards as wrong or superstitious. This is part of the reason why we chose causal beliefs rather than an “objective” causal relation to figure in superstructures. Now we are in the position to use causal beliefs efficiently. In c) we require the individuals to believe that *j*’s action *b* is partially caused by *i*’s action *a*. It is not necessary that both individuals have such belief. Varying with the particular form of power it may suffice that either the superordinate agent or the subordinate agent has it²⁴. Of course, very often, both of them will have it. An important example of a form of power in which the causal connection may be hidden to one of the agents, is manipulation.

The second part of conditions for the POWER relation in (AP) refers to the frame given by the institution, or rather the social schema, in which the events take place. As stressed twice already, the characteristic function occurring in the core as well as its representations *CHI* in the superstructures provide a frame of admitted actions. All actions PERFORMED by an individual in a social schema have to be admitted, on the object level (A8) as well as on the level of superstructures (A13). Condition d) in (AP) is intended to make this explicit for the actions involved in a POWER relation. Thus (AP) has to be seen as a characterization of the notion

²²Compare Wartenberg (1988) for a recent account of these forms of power. Though the syntax of our POWER relation is the same as that of Dahl (1957) our characterization of the notion in D9 is not intended as a reconstruction of any existing account. It was developed independently, in an attempt to preserve the insights of other definitions, of course.

²³Weber (1980), p. 28.

²⁴This comes out once special forms of power, as described in Wartenberg (1988), are analyzed in the conceptual frame set up here.

of "power in a social institution", rather than of power in general. However, since $\text{POWER}(i, a, j, b)$, by a), implies that $(i \text{ PERFORMS } a)$ and $(j \text{ PERFORMS } b)$, A8 and A13 automatically imply that actions a and b are admitted on both levels in any exertion of POWER. So admissability needs not be explicitly stated as a condition for POWER. In other words: in a social schema $\langle AP \rangle$ above is equivalent to a characterization in which d) is omitted. Using A8 and A13 we prove without difficulty:

LEMMA. *If $S = \langle \Gamma, \dots, \text{rep} \rangle$ is a social schema then, in S , $\langle AP \rangle$ is equivalent to: for all i, j, a, b : $\text{POWER}(i, a, j, b)$ iff conditions a), b) and c) of $\langle AP \rangle$ above are satisfied.*

So in the following final definition of a social institution d) can be omitted.

SI is a social institution iff there exist $\Gamma, \Theta, \chi, \triangleleft, J, A, \text{PERFORM}, \text{INTEND}, \text{POWER}, M, x, \text{rep}, \text{SP}, y$ such that $\langle \Gamma, \Theta, \chi, \triangleleft, J, A, \text{PERFORM}, \text{INTEND}, \text{POWER}, M, x, \text{rep} \rangle$ is a social schema, y is a function assigning a social practise $y(\langle \gamma, \tau \rangle)$ to each admitted pair $\langle \gamma, \tau \rangle$ in the core $\langle \Gamma, \Theta, \chi, \triangleleft \rangle$, and

A14 SP is a set of social practises,

A15 y is onto

A16 each pair $\langle \gamma, \tau \rangle$ admitted in the core $\langle \Gamma, \Theta, \chi, \triangleleft \rangle$ is anchored in the corresponding social practise $y(\langle \gamma, \tau \rangle)$,

A17 For all $i, j \in J$ and all $a, b \in A$: i by doing a exerts POWER over j to do b iff

a) $(i \text{ PERFORMS } a)$ and $(j \text{ PERFORMS } b)$,

b) i INTENDS that j should do b and j does not INTEND to do b ,

c) at least one of the individuals i, j believes that a causes b .

A15 in analogy to A11 guarantees that all social practises occurring in SP are really needed. With respect to A17 we have several further remarks. First, our non-standard syntax for INTEND pays off here.

A17-b may be written formally as follows: $\text{INTENDS}(i, j, b)$ and not $\text{INTENDS}(j, j, b)$. In the first conjunct i and j are different, i has intentions about another person to do something. In the second conjunct both arguments for individuals are filled in by (the name of) the same individual. Here, $\text{INTENDS}(j, j, b)$ of course means that j "intends" to do b in the ordinary sense. Second, in A17-c the relation of causal belief operates on the level of propositions, as stated in Sec. 2. Therefore the actions a, b to be related as cause and effect first have to be represented in the form of propositions. If k denotes any of the individuals i, j holding a causal belief then we have to look into k 's superstructure $x(k) = \langle \mathcal{P}^k, \preceq^k, B^k, \dots \rangle$ in order to get k 's relation B^k of causal belief which relates k 's representations of actions a and b , $\text{rep}_k(a)$ and $\text{rep}_k(b)$: $B^k(\text{rep}_k(a), \text{rep}_k(b))$. This way of stating a causal connection in the superstructures (as opposed to the level of material reality) does not perfectly agree with causal talk in ordinary language which always proceeds in the realistic mode. But as stated above it is causal belief rather than real causes and effects that matter in social theory, and a causal relation among the propositions which are at an individual's disposal is well suited to express such beliefs.

It has to be stressed that condition A17 above covers only the mode of actually exerting power, not that of *having* power. The latter may be introduced by means of counterfactuals. Individual i has power by doing a to induce j to do b iff: if i

would PERFORM *a* then *i* by doing *a* would exert POWER over *j* to do *b*. There are standard ways to analyze such counterfactuals in possible world semantics²⁵. In the present case such analysis would require to introduce sets of social institutions "similar" to a given one.

If in condition A17 we look at part c) being satisfied for individual *i* and at the first half of part b), we see that POWER(*i*, *a*, *j*, *b*) implies that *i* INTENDS to achieve a goal (namely that *j* should do *b*), and *i* believes that his doing *a* causally contributes to reaching this goal. This is just the standard definition of goal directed action. So in most cases *i*'s exerting power in the sense of A17 is a goal-directed action. We may use this observation to locate the specific features in which exerting power goes beyond mere goal directed action. First, the goal has a special format: it consists in another individual's action. Second, some resistance is present on the side of the subordinate agent *j*: in *j*'s not INTENDING to do *b*. This resistance to be overcome is an essential feature of power as already mentioned. Dropping it would bring axiom A17 very near to special forms of mere goal directed action. Finally, it has to be noted that our formulation of A17-b is very weak, and might be replaced by the stronger version saying that *j* INTENDS not to do *b*. If *b* just not INTENDS to do *b* she may have no intention at all concerning *b*, in particular no intention *not* to do *b*. Our weak version stretches the extension of POWER to those cases where there is no real resistance to be overcome, just undecidedness. Accordingly, the notion of a social institution becomes much broader, including POWER relations of a type of "mere stimulation". This allows to cover the examples of a more economic nature mentioned in the introduction. Also, our weak version of A17-b allows to subsume those cases²⁶ under the theory in which the superordinate agent keeps silent about certain possibilities the subordinate agent might pursue if he were aware of them ("non-issue" policy).

There is a more difficult form of power which escapes our formalism. We think of cases in which the subordinate agent has internalized his subordinate role, and identifies his intentions with those of the superordinate agent in a way pointed out already by Hegel. In such a case we would have "INTENDS(*j*, *j*, *b*)" which contradicts our requirement

$$\text{"not INTENDS}(j, j, b) \quad (*)$$

in A17-b. We cannot simply drop (*), however, we have to replace it by some weaker condition, for dropping (*) altogether would reduce POWER in A17 to mere goal directed causal influence. A natural solution here is to refer to *j*'s intentions by means of a counterfactual. We suggest to replace (*) by

$$\begin{array}{l} \text{if } j \text{ were raised under approximately the same conditions} \\ \text{as } i \text{ then } j \text{ would not INTEND to do } b \end{array} \quad (**)$$

in order to deal with the cases in question. Of course, the "conditions in which an individual is raised" escape our conceptual frame but they might be systematized in an extension of it.

²⁵For instance, Lewis (1973).

²⁶Lukes (1974).

In order to make precise all the details of the model, let us state the definition in a completely formal way. The *theory* of social institutions introduced in this way consists of the class of all possible social institutions (as defined in D9) plus the set of all real systems to which it is intended to apply. This set of *intended systems* was roughly described in the introduction. The claim associated with the present theory is that each intended system is a social institution in a sense still to be specified.

D9 SI is a *social institution* iff there exist $\Gamma, \Theta, \chi, \leftarrow, J, A, \text{PERFORM}, \text{INTEND}, \text{POWER}, M, x, \text{rep}, \text{SP}, y$ such that

SI = $\langle \Gamma, \Theta, \chi, \leftarrow, J, A, \text{PERFORM}, \text{INTEND}, \text{POWER}, M, x, \text{rep}, \text{SP}, y \rangle$, and

A0-9 $\langle \Gamma, \Theta, \chi, \leftarrow, J, A, \text{PERFORM}, \text{INTEND}, \text{POWER}, M, x, \text{rep} \rangle$ is a social schema, A14 SP is a set of social practises,

A15 $y : \text{ADMIT}(\Gamma, \Theta) \rightarrow \text{SP}$ is onto, (compare D3-b)

A16 for all $\langle \gamma, \tau \rangle \in \text{ADMIT}(\Gamma, \Theta) : \langle \gamma, \tau \rangle$ is anchored in $y(\langle \gamma, \tau \rangle)$,

A17 for all $i, j \in J$ and all $a, b \in A$:

[POWER(i, a, j, b) iff

a) (i PERFORMS a) and (j PERFORMS b),

b) INTENDS(i, j, b) and not INTENDS(j, j, b),

c) there is $k \in \{i, j\}$ such that $B^k(\text{rep}_k(a), \text{rep}_k(b))$].

5. APPLICATION

The process of application to some real system of a theory as given by a class of models in all areas of empirical science has the following form. First, data are collected and formatted in the theory's vocabulary²⁷. Second, it is tried to fit these data with the theoretical hypotheses. Identifying hypotheses and models²⁸ such fit essentially amounts to an existential claim²⁹. The data fit with the hypotheses if there *exists* some (hypothetical) model into which the data can be consistently embedded, i.e. which contains "parts" corresponding to the data in a natural way. If the theory can be successfully applied to some intended system in this sense we may claim that the system investigated is a social institution. Accordingly, the claim associated with the present theory is that all the intended systems described in the introduction are social institutions in the sense just explained. In other words, the data which can be collected from those systems all are embeddable in corresponding models.

Due to the complexity of our models it is impossible to provide a two or three-page example based on proper empirical investigation or data. Instead, let us consider an unspecific system which by appropriate historical studies could give rise to a real application. Three aims are pursued by these considerations. First, we specify what kind of historical data and methods are required to do a proper empirical study of an institution. Second, we want to show that all our models' components are present and capture important features of real institutions. Third, we want to exemplify our general view of application sketched in the previous paragraph.

²⁷Note that we describe the process of applying an already existing theory, not the process of inventing it. The theory is given beforehand.

²⁸The hypotheses define the models as those structures in which they are valid, and conversely, any useful class of models is defined by a set of hypotheses.

²⁹See Balzer-Moulines-Sneed (1987) for a detailed account of this idea.

One feature of this view which is particularly relevant to the present theory is that it does not presuppose a distinction between theoretical and observational terms which is often made in order to separate "reliable", "objective", observational data from "merely" hypothetical hypotheses. Such a distinction being very problematic even in the natural sciences³⁰ we think there is no reason to insist in austere observational foundation which simply is not feasible. A theory *T*'s data consist of all atomic sentences of *T* for which there are sufficiently reliable means of determination, sufficient reliability often being a matter of agreement in the respective scientific community. This view goes together with a very liberal conception of data: by a datum we understand every atomic statement which can be obtained in a systematic way. Roughly, this means that it be obtained from other data or hypotheses in a unique way as guaranteed by some regularity.³¹ This notion does not insist in reproducibility as it occurs in measurement in the natural sciences (which cannot be achieved in sociology) but keeps enough substance to make data a non-trivial matter of intersubjective (and in this sense objective) agreement. In particular, we do not insist in methods of determining the "objects" occurring in a system (like action tokens, action types, individuals and groups) in a way completely neutral and independent of the language and intention of the investigator. In the social sciences it seems necessary and adequate to admit for a moderate amount of antecedent understanding to provide the investigator with a first rough guide for application.

We begin our example by looking at a realistic set of empirical or historical data. Consider a system with three groups as realized many times in medieval European villages: one group consisting of the local nobleman (a count, say) plus his family, a second of the peasants and their families, and a third of "intermediate" persons: priest, teacher, servants.

It seems relatively easy to determine the individuals and actions occurring in the system as well as the PERFORMANCE relation. By direct inspection as a competent speaker of the language or by historical studies we may collect a set of descriptions of action tokens (printed in *italics* below) together with a list of statements of the form (*i_j* PERFORMS *a_j*), *j* = 1, ..., *m* about which person performs which action. Also, the determination of action types does not seem to pose any particular problem for our theory. Things are different for the remaining macro concepts: groups, characteristic function, and status relation. How can these be determined? If we try to determine each of these notions on its own, and independently of our theory, we run into difficulties. Concerning the groups an investigator with different intentions (biological or medical, say) would perhaps arrive at a very different grouping. Even the sociologist who understands the system along our lines has different possibilities of grouping, corresponding to different levels of detail. She may take a coarse grained group structure lumping together nobility and clergy, or the one indicated above, or proceed even more fine grained differentiating, say, between male, grown-up peasants, women, and children inside the larger "group" of peasants. Concerning the characteristic function it is not adequate to take all action types observed as being realized by members of a group to be characteristic for that group for in this way we would arrive at many types which simply are irrelevant in

³⁰See Balzer (1986) for a recent discussion.

³¹See Balzer (1990) for an elaboration of our view of measurement.

the institution under study or do not contribute to any differentiation of the groups. Statistical considerations and/or techniques from network analysis are required in order to achieve a simultaneous determination of groups and the characteristic function. We do not want to look at a particular method here, the important point is that such methods do not rely on the present theory. By contrast, it is difficult to imagine any method to determine the status relation which would not use A9, and therefore would be independent of our theory. So in order to avoid circularities it seems wise to avoid statements about Δ in the data.

In the system of a village we might obtain action types of the following kind:

- τ_1 : HUNTING
- τ_2 : EXERCISING for fight on horseback
- τ_3 : ORDERING
- τ_4 : WORKING in the fields
- τ_5 : FIGHTING with the fist
- τ_6 : SERVING as a beater
- τ_7 : SENDING one's children to the Sunday school
- τ_8 : READING
- τ_9 : TRANSMITTING orders, etc.,

and by applying some statistical method we might get a grouping of the following form:

- γ_1 : {COUNT, COUNTESS, CHILD_1, CHILD_2, MOTHER_IN_LAW}
- γ_2 : {PRIEST, TEACHER, SERVANT_1, SERVANT_2}
- γ_3 : {PEASANT_1, PEASANT_2, ..., WIFE_1, WIFE_2, ..., CHILD*_1, CHILD*_2, ...}

and facts about the characteristic function, like:

$$\tau_1, \tau_2, \tau_3 \in \chi(\gamma_1)$$

$$\tau_4, \tau_5, \tau_6, \tau_7 \in \chi(\gamma_2)$$

$$\tau_8, \tau_9 \in \chi(\gamma_3).$$

The remaining two notions, INTEND and POWER, are of a different kind. In contrast to the physics paradigm there is no measuring apparatus for these notions functioning independently of the observer. There is no hope of achieving such apparatus in the near future but also there is no hope of replacing notions like the two considered here by other, "measurable" notions of similar theoretical force. On the other hand it would be short-sighted simply to dismiss notions of that kind as useless for empirical theories. There are simple and effective means to determine intentions and exertions of power, namely those which every competent speaker of

the language used in the system has acquired together with learning the language. These means are communicable, investigators may disagree about the intentions as expressed by observed verbal and non-verbal behaviour, or corresponding historical data, and they may argue systematically about them (as done by historians and political scientists). We think that our abilities of ascribing intentions and power acquired through language competence may be used as a basis in order to determine notions like INTEND and POWER for the aim of applying our theory to empirical systems. We admit that these means are not the most reliable ones, but we hold that they are not unscientific *apriori*. To exclude them dogmatically (i.e. by pointing to the big brother of physics) would mean considerable impoverishment of social science.

From observing verbal and other kinds of behavior (or from corresponding historical facts) we might obtain a list of statements about INTEND and POWER. The count intends to hunt, and intends that peasant₁ serves as a beater. Peasant₁, on the other hand, intends to work on his field in the same time. The teacher intends peasant₂ to send his daughter, child₃, say, to the Sunday school. Peasant₂ intends his daughter to help him working in the fields etc.:

INTENDS(COUNT, COUNT, *hunt*)
 INTENDS(COUNT, PEASANT₁, *beating*)
 INTENDS(PEASANT₁, PEASANT₁, *work*)
 INTENDS(TEACHER, PEASANT₂, *sending*)
 INTENDS(PEASANT₂, CHILD*₃, *work*) etc.

POWER(COUNT, *hunt*, PEASANT₁, *beating*)
 POWER(COUNT, *ordering*, TEACHER, *transmitting*)
 POWER(TEACHER, *transmitting*, PEASANT₂, *sending*) etc.

It is much more difficult to get data, or to agree on data, about the superstructures which are likely to differ for members of different groups. If we think of a system in which nobility is in close contact with the court then very likely its language will be refined and contain many terms unknown or at least not used by the peasants. By blurring some idiosyncrasies present in each individual's language linguistic studies might yield spaces of propositions $\langle P^i, \leq^i \rangle$ for each individual i occurring in the village. Also, causal beliefs are likely to differ for members of the different groups. The peasants may believe, say, that an old woman living in the forest is a witch and may cause certain unusual things to happen while members of groups γ_1 and γ_2 do not have such causal beliefs. Also the priest may hold some causal beliefs involving his God which are not shared by the very mundane count. Though all these causal beliefs are hypothetical from the sociologist's standpoint there are methods of different degrees of reliability in order to infer them: verbal interrogation and observation of behaviour (or corresponding inferences on the basis of historical sources). It seems sound to assume that at least some of the causal beliefs $B^k(\text{rep}_k(a_i), \text{rep}_k(b_j))$ (for appropriate i, j, k) can be obtained in this way.

The representations of groups, action types and characteristic function in the superstructures can be determined if these items have verbal representations. In this case the terms in the language as used by the individuals themselves may be taken as representatives. Otherwise those representations are strongly hypothetical. In the example not all individuals may have terms for denoting group γ_2 ("clergy" is not very appropriate), the relations between groups and action types as captured by the characteristic function are not directly represented by terms, neither are the relations of subsumption (e^i in Sec. 2) of an action representation $\text{rep}_i(a_j)$ under an action type representation from T . Where appropriate representatives t_s can be assumed in the form of known terms of the language we may collect some statements about the individual representation functions $\text{rep}_i : \text{rep}_i(a_j) = t_s$ and $\text{rep}_i(\gamma_k) = t_s$, (for appropriate indices i, j, s, s').

The last feature to be considered are the social practises from which the relevant action types stem. These practises are difficult to trace. How and where did patterns of feudal behaviour typical for the noble persons in the system originate? They must have originated at some time, the medieval patterns did not exist in antiquity. We have to go back to the early middle ages when the first cavalry armies were formed, and the European type of the knight made its first appearance. We have to look at the formation of the catholic church in order to find the practises relevant for the priest and, later on in 11th and 12th century, for the teacher. The church also yields some practises for the other groups, like the holy communion, or the ways of dealing with birth, marriage, and death. Even at the side of the peasants we may find social practises, for instance in connection with ways of farming, of growing cattle, of dealing with sickness, or just of cooking. All these action types once had been "invented" and were delivered from then generation after generation. It is clear that a full statement of all the knowledge available about the different social practises involved here would blow up the set of data without end. By spending enough energy it certainly is possible to provide substantial collections of relevant data about the actions, actors, and the respective SOURCE and COPY relations connected with the action types considered above. Realistically, however, application of the present theory will not go into much detail concerning the social practises.

Having shown what kind of data are needed for the present theory, and how they can be obtained, let us now consider the question whether all our primitives are really important. No argument seems necessary here for the notions of action, action type, individual, characteristic function, the status relation, and PERFORM and POWER. First doubts might occur with respect to INTEND. Intentions are an essential ingredient in our characterization of power (as well as in human beings generally) because without intentions and the corresponding requirement A17-b we would be left with mere causal influence instead of power. This, in turn, would devalue the use of POWER in determining the status relation via A9, and leave the status relation without link to the micro base. So INTEND, in fact, is important to our theory.

A second doubt might arise for the superstructures. Omitting them would yield an "observationally equivalent" surface of behavior and core structure. So what is their use in the theory? There are various replies. First, superstructures are the points of cristallization for institutionalized behavior. Patterns of behavior can be formed

only together with internal representations. Second, superstructures are the carriers of education and ideology. Institutions typically get "fully expressed" only a generation or more after their first appearance. This is so because for later generations institutions are a "natural" part of the system. They get firmly impressed in the superstructures of the individuals by the process of education. As a consequence of this, thirdly, superstructures are crucial for the explanation of an institution's stability. Without recourse to superstructures we simply could not understand why in many cases the "lower" groups bear an institution for long periods. Though we do not focus on the explanation of stability in the present paper it is clear that our theory is able to provide such explanation, and that such explanation cannot be given without the superstructures.

The final items to be checked for importance are those occurring in the social practises. It might be objected that these are not only superfluous but even hindering because they introduce an element which practically escapes empirical investigation. There are two reasons why we think that none the less social practises are essential in a theory of social institutions. First, (in the absence of legal or formal definitions) they provide the major means for an identification of social groups, and often also of action types. In the example, the group of nobility even formally is identified by genidentity. Second, as already mentioned in Sec. 3, social practises provide a general basis for specializations in which conditions of an institution's fit to its surrounding may be studied. The dynamical part of an explanation of why a particular institution did develop and spread in a particular setting ultimately has to refer to things like our COPY relations: why do individuals take up and stick to certain kinds of behavior while they do not take up other kinds. Very roughly, we cannot ignore the immense historical depth of many of our most important social practises if we want to understand our most complex and important institutions.

Turning now to an exemplification of our general view of the process of application we have to ask whether a set of data as described above can be fitted with a model? We have to go through the various axioms, and see whether the data satisfy them or can be shown to be embeddable into a structure satisfying them. Since the status relation is not represented in the data an existential claim has to be made: *there exists* a hypothetical status relation which satisfies axioms A3, A4 and A9. On the basis of the data in the example such a relation indeed exists. We may define it by setting $\gamma_3 \triangleleft \gamma_2 \triangleleft \gamma_1$ and $\gamma_3 \triangleleft \gamma_1$, no other pairs of groups being related by \triangleleft . Clearly, \triangleleft is transitive, anti-reflexive, and has a maximal element as required in A3 and A4. Moreover, the full list of POWER relations available will verify—or at least be compatible with—A9. Most noble individuals exert power over clergy and peasants, most individuals in γ_2 exert power over peasants, but neither of these quantitative relations holds in the other direction. A2 and A7 can be satisfied conventionally, A6 stating that all individuals are involved in POWER relations is satisfied in the data, and the same holds for the axiom A8 of admissibility.³²

³²It is not easy to see how the collection of data has to proceed so that A8 will come out false. Basically, the data about the characteristic function will be obtained by observing many performances of different actions, and use these as a basis for abstracting groups and characteristic action types. Therefore a performed action has to be an outlier in the statistical sense in order to conflict with the requirement of being admissible.

Altogether the axioms for macro core and micro base come out true. The axiom for proposition spaces (A10, D4-1) is rather idealized, and subject to doubt, but not very essential for the overall claim that the system is a social institution. The other parts of superstructures are represented in the data only very partially. So they have to be completed in a hypothetical way. It is not difficult to find a set of hypothetical superstructures which satisfies A10 and A11.

Similarly, the axioms for social practises have to be satisfied essentially in a hypothetical way, by referring to hypothetical entities extending the few available data to the full structures required. There remain the two central axioms of D9. The content of the first axiom, A16, is that to every admitted pair there exists ("we can find") a "corresponding" social practise in which the pair is anchored. Consider for example the group of noble individuals and the action type of hunting³³. Clearly, hunting is a social practise even though it is impossible to specify the complete sets of individuals, actions, and the SOURCE and COPY relation. There must be historically first events of hunting and there is a tradition in which the techniques are inherited. It seems realistic to consider one of several different social practises here which may have been invented independently of each other in different periods and different regions. Anyway, by combining sparse historical data with the given admitted pair, it seems possible to claim that there exists some social practise into which these data can be embedded. The same holds for the other admitted pairs—with varying degree of plausibility. The axiom for the POWER relation, A17, finally seems to be satisfied as far as the available data are concerned. We see no problem in adding hypothetical entities at places where data are lacking (as for instance data about $\text{rep}_k(a)$ in A17-c so that the axiom comes out true. Altogether, we think the claim that the system considered is a social institution can be seen to be correct.

In our example we have social practises common to all the groups involved, for instance the holy communion (as long as the village is small enough and nobility does not celebrate separately). One might suggest that such practises are irrelevant for they do not serve for any differentiation. They play an important role, however, in the internalization of the different types of actions and the characteristic functions and thus may be quite essential for the institution in question. Our example also shows that POWER relations may exist "from bottom to top". The priest, for instance, by instructing the countess appropriately, may exert power over the count. Such mutual relations of POWER suggest to apply some notion of equilibrium to the net of POWER relations. Systems closer to equilibrium, so the corresponding hypothesis, are more stable over time.

Let us finally turn to questions of explanation. There are two basic notions of explanation. The first notion, called the *instance view of explanation*³⁴, deals with explanation of more complex entities, like sets of data, or laws. Such an entity is explained by successfully applying to it a theory in the way described above. Expla-

³³The fact that only the grown up, male individuals engage into actions of that type does not yield inconsistency with the axioms of admissibility for the latter are only necessary conditions of performance. Hunting is one of the characteristic action types of group γ_1 even if performed only by some subgroup. The same holds for other action types in all the three groups.

³⁴Compare Forge (1986) for a brief account.

nation thus amounts to systematizing complex data into one comprehensive pattern or "whole", to see how the data fit together in some particular way. In this sense of explanation our theory explains sets of data which are available about social systems of the kind intended. It explains, for instance, the set of data described before. In more realistic terms we may say that the theory provides a consistent picture or point of view from which all the actions and relations observed fit together and make sense.

The second notion of explanation is that of deductive nomological explanation. It aims at explaining an atomic proposition ("a fact") by means of deducing it from the theory plus appropriate initial conditions. Clearly, the latter type of explanation is just a special case of the former. Deducing an atomic sentence from initial conditions is a special case of showing that the set of both is explained as an instance of the theory. According to the deductive nomological view various explanations of concrete behaviour can be given in the present theory. We can explain power relations in terms of intentions, performance and causal belief, we can explain single actions in terms of power, we can explain intentions and even causal beliefs in the same way. We can explain statistical differences in exertions of power among different groups, and so on. We may explain, for instance, why groups of peasants obey the court's order under conditions in which they could easily overcome him, and in which execution of the order is rather unpleasant for them. Or we may explain why the court's children are educated in a way utterly different from that of the peasants' children.

In order to obtain more comprehensive, far reaching, or critical explanations of social phenomena the theory either has to be joined with other social theories³⁵ or to be further refined. Joining it with some form of decision theory we might obtain deeper explanations of "subordinate" behavior in terms of admissibility. The basic intuition here is that possible "subordinate" actions or reactions to be evaluated in a model of decision theory in an institution are constrained by the frame of admissibility. In the decision model relative to an institution the subordinate agent considers and evaluates only alternatives which are admissible, so her set of action alternatives is severely narrowed down in comparison to what would be feasible in the absence of the institution. On the basis of this restricted set of alternatives she chooses *rationality*, i.e. as described by the decision model, but the action chosen might look quite irrational if the institution would be left out of consideration. By further refinement, on the other hand, we can achieve a real alternative to the game theoretic account of how and why institutions emerge. The basic "mechanism" is present in the models already: Social institutions emerge as the result of new ways of exercising power which are invented and found to work successfully in favour of the superordinate agents. Often, the full final pattern of actions and reactions develops from one single new action type which is invented as a new way of exerting power. Therefore it is not necessary to see the emergence of an institution as the introduction in one step of a whole finished pattern of action types. The pattern itself may develop in different possible ways (e.g. by trial and error)

³⁵In line with the thesis of unity of the social sciences often put forward by great scholars. See Braudel (1980) for an example.

as reaction to just one new action type. Once the resulting pattern gets stable the institution originates and grows in the interest of the groups in the "upper part" of their core structure. These groups therefore are interested in having corresponding superstructures built up in the other individuals, and that is why institutions remain relatively stable even when the conditions favourable for their emergence are gone.

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