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The Cognitive Structure of Social Categories*

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Support for the prototype theory of categorization was found in a study of the structure of social categories. Though occupational terms such as DOCTOR are socially defined, they do not have the classical structure their clear definitional origins would predict. Conceptions of social categories are richer and more complex than those of physical object categories and subjects agree upon them. Comparison of various instructions for eliciting attributes of categories showed that whether subjects are asked to define a term, give characteristics, or describe ways they recognize members of categories, the attributes they list contribute to a prototype structure. These data provide evidence against the view that prototype structure is relevant only to an identification procedure and not to the core of concepts, as has been suggested.

INTRODUCTION

Human categories have traditionally been analyzed as classical, that is, as consisting of attributes which are critical for membership, and which confer full and equal status upon all members (Smith & Medin, 1981). Studies in the prototype paradigm launched by Rosch (1975) have shown category membership to be a continuum. Prototypical members have the most features in common with members of the same category and the fewest features in common with contrast categories, and therefore bear the greatest "family resemblance" to other members.

Family resemblance structure has been demonstrated for concrete categories of physical objects such as FURNITURE and FRUIT (Rosch & Mervis, 1975), abstract categories such as emotions (Fehr & Russell, 1980),

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personality types (Brewer, Dull, & Lui, 1981), and events (Graesser, Gordon, & Sawyer, 1979). The present study takes up the social category, which is both abstract and concrete: concrete, in that instances are physical objects (persons); abstract, in that instances are not observable, since they are fulfilling a socially defined role. A person sitting at a desk could either be a secretary or a professor, and which is true cannot be decided by looking.

A psychological difference between natural and social categories is predicted because social kinds such as SECRETARY exist as a result of social conventions (Dahlgren, 1983). Society defines the functions of secretaries in relation to the goals of the institutions in which they work (Mandelbaum, 1973). These defining features are potentially available to the average person, at least for common categories. In contrast, the essence of the kind APPLE is to be found in its chromosomal structure, so that society takes APPLE as a given and tries to discover its essence. Even scientists do not know the defining criteria for many natural kinds. Artifacts such as CHAIR should be intermediate in this respect. Their intended uses are social-conventional, yet once produced their physical, observable features can be directly related to function, making them givens psychologically. These distinctions may mean that people have criteria for social categories, but not for physical object categories, which instead have prototype structure.

In the debate over the classical model of criterial features in semantic representation, linguists assume that social-conventional terms are criterial. Advocates of the classical model are criticized for choosing examples such as BACHELOR which are favorable to their view precisely because reasonably accurate criteria can be given for them (Bolinger, 1965; Putnam, 1975). Schwartz (1979) argues that concrete nouns should be divided for semantic description into those with criterial definitions (nominal kind terms) and those which lack them (natural kind terms) because their defining characteristics are unknown. Among the criterial kinds are social roles, relations among people, and legal terms.

The prediction of criteriality for social categories has been countered by citing unfamiliar vocabulary, such as obscure tax laws. However, granting that average speakers do not have criteria for them, surely experts, particularly the lawmakers, do. In contrast, the whole of society is in the position of discovering criteria for natural kinds (see Putnam, 1975). In any case, the present study considers the social categories WORKER, PROFESSIONAL, EMPLOYER, and POLITICIAN, which are all familiar. They rank in frequency with the everyday words BALL, PAN, SUGAR, and LUNCH, respectively (Francis, Nelson, & Kucera, 1982).

Another predictable psychological distinction between natural and social categories is the complexity of information in their cognitive representations. Physical object categories are conceived in terms of form and function (Rosch, 1978). Social psychologists (Gelman & Spelke, 1981;

Hamilton, 1979; Schneider, Hasdorf, & Ellsworth, 1979) find that persons, just as other objects are conceived in terms of appearance and behavior (form and function), but also in terms of social context and personality traits. The designated social role (occupation) of a person affects person perception (Cohen, 1976). An added dimension is that the internal states of persons are hypothesized. Behavior is interpreted as to its intent and as evidence for personality traits. Social categories are learned late and full understanding of them develops slowly (Anglin, 1977; Clement, 1978; Haviland & Clark, 1974; Lockhart, Abrahams, & Osherson, 1977). In summary, persons are conceived in a richer and more complex way than are physical objects.

Cantor and Mischel (1979) point out that person categories are more complex than object categories because (a) persons can be classified according to multiple schemes, (b) within any given taxonomy, subordinate-person categories may belong to multiple superordinates, and (c) disjointness of sets is violated in person taxonomies. They argue that added complexity does not necessarily imply that person categorization differs from object categorization. Their studies demonstrate the existence of a basic level of abstraction for social categories which provides the richest, most vivid, and distinctive image.

The differences between social and natural kinds predict differences in human categorization. The social-conventional nature of social kinds predicts classical structural for social categories rather than prototype structure. Because of the abstractness of social kinds, they should be conceived in a less perceptual way than natural kinds. That social kinds consist of persons predicts more complex cognitive structures for social than for physical object categories. The present study is designed to determine whether prototype structure exists for social categories, whether the cognitive structure of social categories is more complex than that for physical object categories, and what the relative importance of perceptual and abstract features is in their cognitive representation. First, a family resemblance test is performed on four social categories. Second, conceptions of one social category are investigated using three different instructions designed to elicit mainly abstract or mainly perceptual features. This experiment is relevant to whether prototype structure affects both the core and the identification procedure for concepts.

EXPERIMENT 1. FAMILY RESEMBLANCE

Four superordinate social categories were chosen: PROFESSIONAL, WORKER, EMPLOYER, and POLITICIAN.[1] The methods of Rosch and

[1] "Category" means superordinate category and "term" means subordinate category. Capitalized items are categories and italicized items are attributes.

Mervis (1975) were replicated in order to clarify the comparison between concrete categories and social categories. Social terms in these categories with a wide range of frequency in English were chosen. Prototypicality rankings were established for them. Separately, family resemblance rankings were computed from free-listings of attributes. The two rankings were then compared.

Category Norms

Rosch and Mervis (1975) chose terms from Battig and Montague (1969) norms, which are frequencies of terms elicited in response to superordinate category names. Similarly, terms in the categories OCCUPATION or PROFESSION and ELECTIVE OFFICE were chosen for the present study. As Battig and Montague lacked norms for WORKER and EMPLOYER, frequencies were obtained for them from 55 Pitzer College undergraduate volunteers.[2] They were given 30 s to list as many terms in a category as they could think of. The listings were compiled to produce norms for the categories WORKER and EMPLOYER.

Prototypicality Ratings

Eighty-five undergraduate students at Pitzer College rated 50 terms in each superordinate category selected to cover the whole range of norms. The mean goodness-of-example rating was used to rank the terms, yielding a prototypicality ranking for each of the 50 terms in the four superordinate categories. (See Table I for the ranks and the rating means upon which they are based.)

Reliability of Prototype Ratings

To test the reliability of the ratings, split-half Pearson product-moment correlations were performed on the means of the prototypicality ratings. On three random splits of the subjects, all correlations were significant, (two-tailed test) with r ranging from .69 to .91. Subjects reliably exhibit internal structure for social categories, just as they do for physical object categories.

Prototypes and Word Production

To determine whether prototypicality is related to production of instances in response to the category name, members of categories were ranked accord-

[2] In all the experiments, subjects were eliminated until only native speakers of English remained.

TABLE I
Prototypicality and Family Resemblance Ranks of Terms in the Study

WORKER

Word	Prot Rank	Mean Rating	Fam Rank	Fam Measure	*N* Attribs
PLUMBER	1	1.85	6	331	52
MECHANIC	2	1.87	14	265	56
CARPENTER	3	1.95	2	367	63
GARBAGE MAN	4	1.98	7	313	45
BLUE COLLAR WORKER	5	1.99	3	348	57
LABORER	6	2.00	4	338	46
DITCHDIGGER	7	2.11	5	336	47
FIREMAN	8	2.29	17	252	54
ASSEMBLER	9	2.35	16	258	42
POSTMAN	10	2.41	10	298	51
DISHWASHER	11	2.48	11.5	278	39
SECRETARY	12	2.68	8	311	50
RESTAURANT EMPLOYEE	13	2.68	9	301	56
DRIVER	14	2.92	13	270	58
TECHNICIAN	15	2.94	18	245	48
WHITE COLLAR WORKER	16	3.15	1	414	79
COMPUTER PROGRAMMER	17	3.17	19	223	56
BARTENDER	18	3.33	15	263	48
HOUSEWIFE	19	3.58	11.5	278	65
STUDENT	20	4.30	20	173	46

EMPLOYER

Word	Prot Rank	Mean Rating	Fam Rank	Fam Meas	*N* Attribs	Adjusted Fam Rank	Adjusted Fam Measure
BOSS	1	2.00	15	375	48		
OWNER	2	2.05	17	359	52		
MANAGER	3	2.67	12	406	48		
CORPORATE PRESIDENT	4	2.94	6	457	52	1	129
DEPARTMENT HEAD	5	3.02	4	472	63	2	122
CORPORATE DIRECTOR	6	3.12	9	432	50	3	139
SUPERVISOR	7	3.21	2	476	53	4	118
MANUFACTURER	8	3.29	14	385	59	5	95
ADMINISTRATOR	9	3.42	1	484	55	6	121
EXECUTIVE	10	3.48	7	447	52		
CHIEF	11	3.57	19	286	31	7	84
FOREMAN	12	3.60	18	342	48	8	83
SUPERINTENDENT	13	3.69	11	420	55	9	106
CHAIRMAN OF THE BOARD	14	3.95	3	475	53	10	164
BUSINESSMAN	15	4.03	10	430	60	11	99
BANKER	16	4.16	8	435	55	12	115
COLLEGE PRESIDENT	17	4.36	5	467	68	13	120
TASKMASTER	18	4.47	6	366	45		
MILITARY OFFICER	19	5.26	20	250	47	14	90
CLERK	20	5.72	13	400	64	15	39

(continued)

TABLE I (continued)

POLITICIAN

Word	Prot Rank	Mean Rating	Fam Rank	Fam Meas	N Attribs
GOVERNOR	1	1.54	9	442	54
SENATOR	2	1.59	4	495	58
CONGRESSMAN	3	1.65	8	445	50
MAYOR	4	1.69	1	532	66
CITY COUNCILMAN	5	2.27	2	523	55
PRESIDENT (OFFICE HOLDER)	6	2.28	3	515	60
LESIGLATOR	7	2.55	11	431	57
ASSEMBLYMAN	8	2.85	7	483	65
TREASURER	9	2.99	17	331	46
SHERIFF	10	3.44	14.5	383	57
JUDGE	11	3.63	12	409	58
COMMISSIONER	12	3.70	14.5	383	47
SCHOOL BOARD MEMBER	13	3.72	13	399	57
DELEGATE	14	4.07	6	485	61
FOREIGN MINISTER	15	4.18	16	368	48
CHIEF OF POLICE	16	4.67	5	488	65
OFFICIAL	17	4.73	10	439	57
DEPUTY	18	5.01	18	315	60
COUNTY CORONER	19	5.06	19	237	37
DOGCATCHER	20	6.16	20	175	48

PROFESSIONAL

Word	Prot Rank	Mean Rating	Fam Rank	Fam Meas	N Attribs
DOCTOR	1	1.36	8	326	52
LAWYER	2	1.48	5	349	58
DENTIST	3	1.58	9	323	53
ENGINEER	4	2.10	13	285	47
PROFESSOR	5	2.32	1	378	56
ACCOUNTANT	6	2.53	10	305	56
PHARMACIST	7	2.58	7	342	55
NURSE	8	2.61	2	366	71
SCIENTIST	9	2.67	4	351	59
TEACHER	10	2.89	6	344	64
MEDIC	11	3.13	11	295	49
STATISTICIAN	12	3.19	16	270	45
WRITER	13	3.24	14	278	51
MUSICIAN	14	3.42	12	287	63
ARTIST	15	3.48	18	233	50
CLERGYMAN	16	3.59	17	250	57
URBAN PLANNER	17	3.69	3	355	62
DIETICIAN	18	3.74	20	223	44
SOCIAL WORKER	19	3.77	19	224	39
LIBRARIAN	20	4.15	15	277	44

Note: PROT RANK is prototypicality rank based upon the next column, MEAN RATING on a scale of 1 to 7 for typicality. FAM RANK is family resemblance rank based upon the FAM MEASURE in the next column, which was the sum of weighted attributes.

ing to their frequencies in the production norms (the present study's or Battig and Montague's). A Spearman rank-order correlation was performed on these rankings in comparison with the prototypicality rankings. All correlations were significant: PROFESSIONAL, $r = .74$ ($p < .01$), WORKER, $r = .52$ ($p < .05$), EMPLOYER, $r = .41$ ($p < .10$), and POLITICIAN, $r = .76$ ($p < .01$). In general, the finding supports the importance of prototype structure in the cognitive representation of social categories.

Verification of Superordinates

To determine whether the category names PROFESSIONAL, WORKER, EMPLOYER, and POLITICIAN were, in fact, superordinate to the basic-level terms in the study, superordinates and subordinates of the basic-level terms were obtained from 25 students. Subjects were asked to list a more inclusive category, if possible, on a randomized list of the 80 basic-level terms. WORKER, PROFESSIONAL, POLITICIAN, and EMPLOYER were used by 81 to 89% of the subjects, conforming that they are superordinates.

The Family Resemblance Measure

Subjects. Subjects were 400 volunteers in linguistics and psychology courses at the University of California at Los Angeles.

Stimuli. Twenty words in each superordinate category were selected from among the 50 which had been rated for prototypicality so that the full range of prototypicality would be achieved and no subordinate of any member was included (eg., DOCTOR, SURGEON). The terms in each category are listed in Table I in order of their prototypicality ranks. Subjects were given booklets containing four terms chosen at random, one from each of the four categories. Their order in the booklet was random. Twenty subjects responded for each of the 20 terms in each of the 4 superordinate categories. Any subject who misunderstood a term was replaced.

Procedure. The instructions followed those of Rosch (1975) for eliciting features of basic objects, except that attributes of persons were suggested.

Results. To compute family resemblance scores, the terms in a category were credited with each attribute listed for it by subjects. To decide which different phrases to count as the same attribute, four judges reviewed all the responses and developed sets of synonymous phrases such as *educated, college, higher education* for professionals. In addition, two judges reviewed these and further credited terms with attributes which had been listed for

another term in the same category, and which was clearly and obviously true of this term as well. There were few additions, (one or two per term). Then each attribute was assigned a weight consisting of the number of terms in the category that had been credited with that attribute. The family resemblance score for a term was the sum of the weights of the attributes listed for it. Using these scores, a family resemblance rank was assigned to each term. The rankings appear in Table I as the third column under each category name, followed by the sum of weighted attributes in column four.

A Spearman rank-order correlation was performed on the prototypicality ranks and the family resemblance ranks. In the case of ties in the family resemblance ranks, a Pearson was used instead. For three of the categories, the correlation was significant: POLITICIAN, $r = .65$ ($p < .01$), WORKER, $r = .5$ ($p < .02$), and PROFESSIONAL, $r = .62$ ($p < .01$). It was not significant for EMPLOYER, $r = .13$.

To eliminate the possibility that the results were confounded by the large number of unique attributes, the family resemblance scores were recomputed using only nonunique attributes. A Spearman rank-order correlation was performed between the new family resemblance ranks and the prototypicality ranks. The results were similar: POLITICIAN, $r = .64$ ($p < .01$); WORKER, $r = .86$ ($p < .01$); and PROFESSIONAL, $r = .48$ ($p < .05$); and not significant for EMPLOYER, $r = .19$.

A closer look at the EMPLOYER category suggested that a number of the terms (BOSS, OWNER, and MANAGER) might have been synonyms of the superordinate rather than subordinates of it, even though subjects had listed the terms as members of the EMPLOYER category in the elicitation described above. Potential synonyms of the superordinate, as judged by 10 people, were eliminated from consideration and the family resemblance scores were recomputed for the 15 remaining terms. Adjusted ranks are listed on the right side under EMPLOYER in Table I. A Spearman rank-order correlation was performed between the new family resemblance ranks and the prototypicality ranks of the remaining terms. The result was significant, $r = .65$, ($p < .01$). The initial lack of correlation between family resemblance and typicality for the category as a whole was apparently due to misidentification of some of the terms as members of the category.

The correlations between prototypicality and family resemblance could be due to subjects knowing more attributes for typical members (Malt & Smith, 1982), so that heavier weights for typical members arise from a larger number of unique attributes rather than from shared attributes. To eliminate this possibility, the average attribute weight for each category member was computed by dividing the sum of weighted attributes by the total number of attributes listed for it. (The fifth column of Table I contains the number of attributes listed for each term.) The terms were ranked according to average attribute weight, and Spearman rank-order correlations were computed with significant results: POLITICIAN, $r = .72$ ($p < .01$);

WORKER, $r = .64$ ($p < .01$); PROFESSIONAL, $r = .47$ ($p < .05$); and insignificant results for EMPLOYER, $r = .34$. As in previous calculations, results for the shortened list of EMPLOYER terms were significant, $r = .75$ ($p < .01$). Family resemblance, then, was due to shared attributes and not to a proliferation of unique attributes for prototypical members.

Discussion

Contrary to our expectation, social categories were found to have a family resemblance structure in which the most prototypical members have the most attributes in common with other members of the category for three of the four categories. Rosch and Mervis (1975) found correlations around .80 while the results for social categories were somewhat lower, but nevertheless rather strong.

Prototype Structure and Culture

Prototype structure for social categories should reflect cultural factors more than the correlational structure of reality which is said to explain prototype structure for physical objects (Mervis & Rosch, 1981) and categories of environmental scenes (Tversky & Hemenway, 1983). One measure of cultural importance is word frequency, which is the number of times the word naturally occurs in a chosen corpus. Comparing word-frequency rank for the one-word terms (Francis & Kucera, 1982) with prototypicality rank, a Spearmen rank-order correlation was significant for three of the superordinates: PROFESSIONAL, $r = .37$ ($p < .1$) $N = 19$, EMPLOYER, $r = .51$ ($p <$,05) $N = 17$, and POLITICIAN, $r = .44$ ($p < .05$) $N = 17$. It was not significant for WORKER, $r = -.19$. This finding is consistent with a cultural explanation of prototypicality.

If culture is important in the explanation of prototype structure for social terms, real-world frequencies of occupations should not be (Kahneman & Tversky, 1973). Only the frequencies for PROFESSIONAL and WORKER occupations in the U.S. population were available (U.S. Dept. of Labor, 1980). A Spearman rank-order correlation was performed between ranks according to occupation frequency and prototypicality. The results were not significant. As predicted, frequency in the environment does not contribute to prototypicality for social terms.

EXPERIMENT 2. CRITERIALITY OF FEATURES

Given the constitutive nature of social categories, it was expected that features would be criterial. To examine this question, 20 additional subjects

free-listed attributes for the superordinate category names using exactly the same procedure as in the family resemblance measure. Comparing the attributes listed for the superordinates with those listed for their subordinates, no superordinate shared an attribute with all of its superordinates. EMPLOYER shared *authority* with 19 of its 20 subordinates, PROFESSIONAL shared *educated* with 19, and POLITICIAN shared *educated, male, intelligent* and *authority* with 18. That few attributes were shared by a large proportion of the 20 members of a category may be seen in Figure 1, which shows how many attributes, averaged across all four superordinates, were shared by subordinates in the same category. Further, some shared features are clearly not necessary, such as *male* and *intelligent*. The results tend to support the Rosch and Mervis (1975) finding that attributes are not criterial for superordinates. It could be argued, however, that subjects did not list attributes in common with the superordinate because they listed only those attributes useful in distinguishing a category from its implicit contrast classes. Which features are viewed as necessary by subjects requires further investigation.

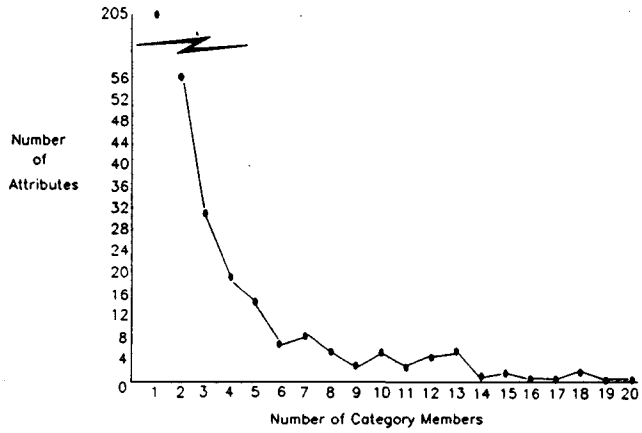

Figure 1. Number of Category Members Sharing an Attribute

EXPERIMENT 3. INTERSUBJECTIVE AGREEMENT ON ATTRIBUTES

In free-listings, a large number of different attributes were listed, which is not surprising given the fact that cultural stereotypes are associated with social terms. Further, there was an inordinate number of internal trait attributes such as *arrogant* and a lack of functional ones such as *healer*. The possibility existed that, when given the instruction "list characteristics," subjects interpreted the instruction to mean personality traits. Such an in-

terpretation was impossible for the physical object categories in the Rosch and Mervis study.

To test whether there was agreement on these attributes across subjects, typicality ratings for the attributes listed by at least two subjects were obtained. Eighty-five students were given lists of nonunique attributes which had been listed for a random selection of three terms from each of the superordinate categories (see Table II). Only 12 were selected to cut down the number of attributes to be rated, which was over 25 per term. Subjects were asked to rate attributes on a scale of 1 to 6 for how typical they were of persons in the occupations or positions. The mean rating across all subjects, terms and attributes was 4.6, which meant "moderately typical." The average rating of each attribute was compared with the number of subjects who had produced that attribute for that term in the free-listings of Experiment 1. A Pearson correlation was performed on these pairs of numbers and r was .29. Since N was large (327 attributes), r was transformed into a significant z value of 5.25 (reliable at the $p < .0001$ level). This shows that when subjects free-listed attributes, they tended to list those attributes which are considered typical of the categories. For example, more subjects listed *medical* than listed *golfer* for DOCTOR and *medical* is considered more typical of doctors than is *golfer*. Thus, free-listings reflected shared conceptions, even though the content of the attributes was often culturally stereotypical. On the other hand, the objection has been raised that the correlation here may be due to a large number of relatively unusual features with low ratings, rather than to any real intersubjective agreement. The extent of agreement needs additional study.

Next, results of attribute ratings were compared with the previously described measures. Table II lists the mean rating of the attributes by term

TABLE II
Mean Rating of Attributes X Other Measures

Term	1 Mean Attribute Rating	2 Mean Prototypicality Rating	3 Word Freq in English	4 Word Production
MAYOR	4.68	1.69	47	23.8
GOVERNOR	4.57	1.54	118	22.1
JUDGE	4.65	3.63	81	3.1
PROFESSOR	4.63	2.32	78	11.3
DOCTOR	4.65	1.36	349	43.4
LAWYER	4.68	1.48	69	32.3
CORPORATE PRESIDENT	4.70	2.94	—	6.0
MANAGER	4.77	2.67	44	6.0
BANKER	4.68	4.16	20	2.0
DRIVER	4.63	2.92	79	3.0
SECRETARY	4.62	2.62	210	7.0
MECHANIC	4.62	1.87	22	5.0

in column 1, the mean prototypicality rating for the term in column 2, the term's word frequency in English in column 3, and the number of subjects who produced it in response to the superordinate category name (normalizing Battig and Montague scores to our present study scores) in column 4. The Pearson r values for columns 2 through 4 as compared with column 1 are as follows:

1. Mean attribute rating X mean typicality rating for term $r = .29$.
2. Mean attribute rating X word frequency in English (all) $r = -.26$.
3. Mean attribute rating X word production (all) $r = -.03$.

None were significant. Mean attribute rating did not correlate significantly with either word frequency or word production in response to category name, even though both of the latter correlate significantly with typicality as described above. In summary, the extent to which subjects agreed with each other about the attributes of terms was not related to the importance of the terms as indicated by any of the other measures.

EXPERIMENT 4: ATTRIBUTE LISTINGS USING THREE DIFFERENT INSTRUCTIONS

It has been suggested by Armstrong, Gleitman, and Gleitman (1983) that prototype structure is not relevant to the core of concepts, but only to a cognitively distinct identification procedure. In other words, people identify members of categories using prototypes, but define categories differently. If such a distinct procedure exists, it presumably processes perceptual features. This suggests looking at the effects on prototype structure of varying the instructions for attribute listings so that some instructions elicit defining (or core features) and others elicit more perceptual (or identifying features). To this end, new instructions were developed and a family resemblance test was performed on a social category using three different instructions: one which asked for "characteristics common to and characteristic of" category members (as in Experiment 1); one which asked for definitions of category members; and, one which asked for "ways of recognizing" instances of category members. The category HOSPITAL EMPLOYEE was chosen to contextualize and, thereby, eliminate some of the wide variability of responses. It has more than half its members (18) in common with, or substantively similar to, the categories of Experiment 1.

Prototypicality Ratings

Thirty-seven terms were drawn from a list of employee titles from the personnel department of a large hospital in Los Angeles. Any occupational

titles which were unfamiliar and/or euphemistic (e.g., SANITATION ENGINEER for JANITOR) were translated into more familiar equivalents. First, prototypicality ratings for the terms were obtained from 41 Pitzer students. The procedures were the same as used in Experiment 1. Members of the category were ranked based upon mean prototypicality ratings (see column 1 of Table III).

TABLE III
Family Resemblance Ranks Using Three Different Instructions

	Family Resemblance Ranks			
	Prototypicality Rank	Characteristics	Definition	Ways of Recognizing
DOCTOR	1	16	8	1
SURGEON	2	3.5	7	9
NURSE	3	8	1	3
X-RAY TECHNICIAN	4	20	20.5	23
ANAESTHESIOLOGIST	5	7	9	32
IV NURSE	6	12	11	4
INTERN	7	11	10	16
RADIOLOGIST	8	5.5	17	31
RESPIRATORY THERAPIST	9	9	12	2
LICENSED VOC NURSE	10	19	6	11
PRACTICAL NURSE	11	1	2	6
ECG TECHNICIAN	12	5.5	10	25
LAB TECHNICIAN	13	16	4	12
PHYSICAL THERAPIST	14	24	22.5	30
OCCUPATIONAL THERAPIST	15	29	34	18
NURSE'S AID	16	3.5	3	20
ORDERLY	17	27	5	7.5
PHARMACIST	18	2	15	7.5
CLINICAL CHIEF	19	28	20.5	13
RESIDENT	20	22	13	17
WARD CLERK	21	26	24	5
ADMITTING OFFICER	22	23	29	33
DIRECTOR	23	18	16	21
SOCIAL WORKER	24	13	35	15
FOOD SERVICE WORKER	25	35	28	24
PRESIDENT	26	31	18	26
BOTTLE WASHER	27	33	25	34
JANITOR	28	32	22.5	28
SECRETARY	29	21	14	14
VICE PRESIDENT	30	14	33	35.5
TRANSPORTER	31	34	30	19
MEDICAL TRANSCRIBER	32	30	36	37
STEWARD	33	36	31	27
MESSENGER	34	25	26	22
PARKING ATTENDANT	35	37	37	29
ELEVATOR OPERATOR	36	10	27	35.5
LIBRARIAN	37	16	32	10

To compute family resemblance based on three instructions, 89 subjects in each condition were asked to list attributes for 10 terms in the HOSPITAL EMPLOYEE category. The three instructions were: (1) list characteristics (as in Experiment 1), (2) define the terms, and (3) list attributes which would "normally help you recognize people" in the occupation.

All attributes listed were designated by three judges as internal, perceptual, functional, or relational. Internal attributes described personality traits or education; perceptual described external, observable characteristics; functional were functions such as *types;* and relational were interpersonal such as *gives orders.* Table IV shows the mean number of responses per category under each of these three instructions. The instructions differed from each other significantly as to these means in almost all cases. Most importantly, the "ways-of-recognizing" instruction differed in the number of perceptual attributes from both "characteristics" and definition instructions, $F(2,267) = 89.5$ and $p < .001$. The characteristics instruction elicited significantly more function attributes than the other two, $F(2,267) = 145$ and $p < .001$. It was notable that the "define-this-term" instruction did not elicit more functional attributes. Instead, internal attributes predominated.

These results show that instruction was significant and that people have complex conceptions of social categories: a general description including a preponderance of functional attributes, and a more detailed visual description with perceptual attributes.

TABLE IV
Mean Proportions of Attribute Types Listed for Three Instructions

	Characteristics	*Ways of Recognizing*	*Definitions*
INTERNAL	.1157	.1624	.3619
PERCEPTUAL	.1634	.4785	.2164
FUNCTIONAL	.5435	.1780	.1728
RELATIONAL	.1760	.1796	.2473

Family Resemblance Measure on Three-instruction Data

Did the different instructions affect prototype structure? Family resemblance measures were calculated as in Experiment 1 for members of the category, separately for each of the three instructions. The members were ranked according to family resemblance scores as before. These ranks are to be found in columns 2–4 of Table III. A Spearman rank-order correlation was performed comparing family resemblance and prototypicality rankings. All three correlations were significant with $p < .01$: characteristics instruction, $r = .57$, ways of recognizing instruction, $r = .50$, and defining instruction, $r = .73$. Apparently, the perceptual/defining difference in features is irrele-

vant to prototype structure. If anything, defining features correlate better with typicality than do perceptual features.

Armstrong, Gleitman, & Gleitman (1983) demonstrate prototype structure for categories which are undeniably criterial such as "odd number." They could regard the results of Experiment 1 as consistent with their view that prototype structure tells us nothing about cognitive representation of natural categories because it doesn't distinguish natural categories from more clearly defined categories such as social-conventional ones, since prototype structure has been demonstrated for both. Though the results here don't directly counter that argument, they do militate against the suggestion by Armstrong et al. that the nature of the core of concepts is still mysterious and that prototype features are only relevant to a cognitively distinct identification procedure. Experiment 4 shows that whether defining or perceptual features are considered, family resemblance structure is evident. Therefore, the role of prototype structure in the cognitive representation of social categories is not exclusively that of an identification procedure.

Were Categories Classical?

The results of Experiment 4 raise the question whether the features listed by subjects for the definition instruction were, in fact, definitions. To decide this, seven judges reviewed the attributes listed by one-third of the subjects for each term (following Rosch, 1975, as a cutoff for "attributes in common"). The judges determined whether the attributes included all the necessary and sufficient features of the category.[3] None of the attribute lists was unanimously judged to contain a classical definition. The mean score was 2.7 judgements in favor and 4.3 against the attribute lists being definitional. In general, the listing included a number of necessary features, but not all of them. Table V gives examples.

Whether defining features accounted for family resemblance scores was determined by considering all the attributes listed. Table VI indicates the attributes with the heaviest weights among the six terms with the highest family resemblance. Many were defining, while others clearly were not. For example, both *male or female* and *female* were listed for several terms, which was not even consistent, much less defining. Subjects were incorrect about the feature *trained* for ORDERLY. *Wears white* and *female* are typical, but not necessary features.

Family resemblance is explained by the fact that among the 20 subjects for a term, some subject mentioned each of these heavily weighted defining

[3] Terms for which subjects agreed upon a definition which was a grammatical transformation of the words in the category name were ignored.

TABLE V
Examples of Agreed Upon Attributes in the Definition Instruction

ANAESTHESIOLOGIST
Monitors patient
Administers anaesthesia
Works in surgery
CLINICAL CHIEF
Highest rank
DOCTOR
Medical training
Diagnosis and treatment
Helps people
FOOD SERVICE WORKER
Distributes food
Prepares food
NURSE
Assists a doctor
RESIDENT
Works in hospital
In training
SECRETARY
Answers phones
Types
Paperwork
Works in office
Administration
Menial

TABLE VI
Attributes with Heavy Weights in the Definition Instruction

	Terms by Family Resemblance Rank					
	Nurse	Practical Nurse	Nurse's Aide	Lab Technician	Orderly	Licensed Vocational Nurse
Patient care	x	x	x	x	x	x
Assists	x	x	x	x	x	x
Trained	x	x		x	x	x
Male or female	x	x	x	x	x	x
Female	x	x			x	x
Wears white	x		x	x		x
Low pay	x		x	x	x	
Cleans		x	x	x	x	
Treatment	x	x	x	x		x

features. The total set of attributes listed for a term by all subjects contained some, but not all, the necessary and sufficient features. Individual subjects listed only one or two defining features, as illustrated below with a sample of NURSE listings:

Subject 1. *assists a doctor, patient care, supervised by a doctor*
Subject 2. *assists a doctor, treatment*
Subject 3. *assists a doctor, caring, cheerful*
Subject 4. *routine tasks*
Subject 5. *trained, patient care, assists a doctor, caring*

Subjects listed a mean of 1.75 of the defining features in Table VI (plus one other specific to NURSE, *fewer responsibilities than a doctor*).

Complexity

That persons are conceived in a richer and more complex way predicts more complex information in the cognitive representation of social categories than is found for physical object categories. Ashcraft (1978) reports an analysis of attribute listings replicating Rosch (1975) on 17 categories of physical objects, using the same kinds of instructions as used in Experiment 1. Data is provided on the three most- and three least-typical members of each category. We compared attribute listings for the three most- and least-typical terms in social categories (24 in all) with those in physical object categories. To compare complexity of information, we used a classification scheme for attributes similar to the one used in Experiment 4 (see Table VII). "Function" means function in relation to human society (*food* for RICE, *runs state* for GOVERNOR). Behavior classifies actions other than functional ones (eg., *flies* for BLUEJAY, *hard worker* for DOCTOR). The five most frequent attributes listed for each term in the subsets from Ashcraft and Experiment 1 were classified acccording to the scheme in Table VII. Proportions of attributes are listed in Table VIII.

TABLE VII
Attribute Classification Scheme

	Physical Object Examples	*Social Examples*
Perceptual	orange, round	wears white, female works in a lab
Functional	seat, vehicle, food	takes care of sick people, types, runs state
Behavioral	flies, buzzes, roars	looks in rear-view mirror, hard worker
Relational		aspires for higher political positions, works well with people, high income
Internal		knows right from wrong unimaginative, intelligent college graduate

TABLE VIII
Complexity of Information by Type of Term

	Perceptual	*Functional*	*Behavioral*	*Relational*	*Internal*	*Other*
Physical Object Categories	.75	.16	.05			.04
Social Categories	.12	.24	.05	.25	.34	
Social Categories (all attributes)	.21	.12	.09	.27	.30	

This analysis indicates that the cognitive representation of social categories contains more kinds of information than that of physical object categories, which are conceived mainly in perceptual terms. Information in the cognitive representation of social terms describes social function, the relations of persons in the category with other persons, both on the job (*has employees, takes orders*) and in a wider social sense (*upper class*), and internal traits (*intelligent, stern, college educated*). To ensure that the proportions of types of attributes was true throughout the data, all of the attributes listed, not just the high-frequency ones, for the same 24 social terms were classified. Proportions are indicated in the third row of Table VIII, and are very similar to those for the high-frequency attributes.

Attributes listed for social terms are more complex concepts themselves. They contain complex syntactic constructions which reflect the social interactive nature of social categories, such as *forces others to work, political leader of a state, aids people in dieting*. The proportion of attributes expressed in more than one word was .46 for social terms and only .01 for physical object terms. The proportion employing verbs (as opposed to nouns or adjectives) was .22 for social terms and .09 for physical object terms.

CONCLUSION

Social categories, which are both concrete and abstract, were found to have prototype structure. Prototype structure is relevant to both the core and the identification procedure of social categories. The cognitive representation was found to be more complex than that of physical object categories. Though prototype structure is an important aspect of the structure of social categories, there is surely much more to their cognitive structure. Effects of social context, linguistic context (Roth & Shoben, 1983), cultural stereotyping (Locksley, Hepburn, & Ortiz, 1982), and folk sociology (Dahlgren, 1983; Salter, 1983) deserve further research.

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