

TIME AS A QUANTITATIVE INDEX OF
INTER-PERSONAL RELATIONS

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The original definition of sociometry was that it "deals with the mathematical study of psychological properties of populations, the experimental technique of and the results obtained by the application of quantitative methods." (2) This definition, made seven years ago, has remained remarkably close to the life-line of the subject, as can be seen from the sociometric works published since that time.

The phase to which most attention has been given by workers in the field is the precise presentation and analysis of the results of tests. Among the methods employed in analysis are quantitative and structural analyses of choices (1,2), the sociogram (2,3), space-time diagrams (4), the sociometric chance experiment (5), ratio of attraction (sociometric status) of an individual or group (2,5), sociometric scales, the Chi-square test, the algebraic matrix and mathematical formulations.

But the broader aspects underlying sociometry as a philosophy of society and of government have remained entirely undiscussed. It is only from this deeper background that we can bring to light the motives behind our methods and the goals which can be reached with their aid, in research as well as in the patterning of human inter-relations.

The desire to quantify and generalize results has been too conspicuous compared with the greater need to refine our methods of measurement--to sharpen and to make more precise our instruments of exploration. This phase of sociometry has been much neglected. At this stage of its development, more attention should be given to its basic processes--the theoretical development of its methodology.

THE ASSETS AND DISADVANTAGES OF THE PRESENT
SOCIOMETRIC TEST AS A TOOL OF MEASUREMENT

The original sociometric tests were made on a basis of choice, one person choosing other persons to whom he was attracted. The number of choices was limited to two, three, five or more, depending upon the size of the group and the criterion around which it was formed. All conclusions made, whether derived from a quantitative, structural or statistical analysis of the test findings, were definitely affected by the method used in the tests: the method of limited choice.

We were aware, soon after the first tests were given, of numerous methodological difficulties inherent in the procedure itself. First arose the question: what quantitative weight has a "choice"? If the unit of choice is, in itself, undefinable and irrational, how can it be considered an adequate measuring-rod? It appeared that, whereas the method of choice had done well and been reasonably accurate in the early period of sociometric work, in the long run it might not satisfy the demands of strict scientific precision.

Second, the difference between a first and a second choice, or between a first and a third choice--that is, their relative weights--was not precise. The subjects themselves were not able to define clearly the width of the gap between a first choice and a second choice, for example, and we were not able to express, in objective terms, the relative rank of these preferences.

The first choice appeared to have the greatest weight and persistence, and to be the only preference-level which was clearly differentiated from any lower preference-level (6). This distinction of feeling was not experienced by a subject when it came to the gap between second and third, third and fourth choices, etc., and the greater the distance from the first choice, the less clearly was a difference felt.

Third, the limitation of choices to two, three, five, or any stipulated number, may not have given expression to the full spontaneity of the subjects; that is to say, in addition to the number of choices--although perhaps of a lower rank--might have been felt but not indicated by some of the subjects. Such a rigidity of technique must also be a barrier to total exploration.

Fourth: in the course of actualizing the choices, the three partial errors indicated above might have produced a cumulative error and a consequent reduction in the optimum of satisfaction which is expected in inter-personal assignment.

Fifth: tests were given at six- to eight-week intervals. Since it was impossible to record any changes in feeling which might take place during these intervals, the subjects who had these changes in feeling were denied an optimum of satisfaction during the intervals--not the ideal condition, especially for subjects who, as isolates, have a great need for affection.

Sixth: sociometric tests to date have been made around the following three categories: the individuals of the community in which the subject is tested are either known or unknown to him; they are chosen or unchosen by him; and they are liked or disliked by him, or he is indifferent to them. Just as it was difficult to determine the weight of a choice, it was also difficult to weigh the "intensity" of liking or disliking and the respective weights of indifference. Besides, the intensity of a first choice which one individual makes for a certain person may differ from the intensity of a first choice which another individual may make for this person. The best that could be done was to consider three categories of people in a given group, from the point of view of a subject: the people whom he likes and wants to have in the group; the people whom he dislikes and wants to have out of the group; and the people to whom he is indifferent, yet would accept if they were to remain in the group.

The absence of a method for quantitatively differentiating these and other categories of people seemed to be another liability. Theoretically, what was wanted was a sociometric procedure which would concentrate all the people related to a given subject into one and the same continuum--into one single category, however many degrees of difference might exist between them--or, at least, to arrive at one axis with two poles: the one pole of maximum attraction, the other of maximum repulsion.

In order to remedy these methodological difficulties, several suggestions have been made (8), for repairing the most flagrant errors. As a procedure to weigh the intensity of choice or preference, the sociometric test was modified: the subject

is asked to name as many persons as he wishes, on the same preference level, if he feels equally strongly attracted to them. In this fashion, the subject is allowed to express, with maximum spontaneity, his feelings for persons on each preference or choice level, and this, of course, in regard to any criterion. Further, an unlimited number of choices is allowed to the subject in order to determine whether those chosen will become still more chosen and the unchosen ones remain unchosen, however many choices the subject is permitted to express.

These correctives did not satisfy fully and therefore, in 1937, the present study¹ was begun. It is an effort to supplement and integrate the method of choice or preference with a more precise technique.

TIME AS A QUANTITATIVE INDEX

In the present research, attractions are expressed in time-units instead of as choices or preferences. The subjective, unmeasurable factors involved in choices and preferences are at least partly--if not wholly--eradicated. The subject has at his disposal no definite number of choices, since any stipulated number would artificially limit his spontaneity, but instead is given new instructions. He may have, for instance, on a given day, three hours' time for visiting friends or receiving them. The number of friends who are within reach may be seven: A, B, C, D, E, F and G. The subject is told to make up his mind with whom he wants to spend these hours and how he is going to distribute them. He may prefer to spend his time alone, or, more accurately said, to spend it with certain objects or in certain tasks, such as reading, writing or relaxing. In this event, of the three hours, one hour and fifteen minutes may go to reading, half an hour may go to listening to the radio, forty minutes to writing and the balance--thirty-five minutes--to relaxation. Thus, the attraction of these activities would completely outweigh, for him, that of the persons A, B, C, etc.,

1. The sociometric tests on which this study is based were carried out in Cottage 8 in the New York State Training School for Girls, Hudson, N.Y. The authors are greatly indebted to the cooperation of the cottage mother, Miss Dorothy Higgins.

who may have wished to see him. The time they would receive from him, then, would be zero minutes, in all seven instances. At another time, however, he might want to receive some of these friends. In this instance, he may give, of the three hours, an hour and a half to D, thirty minutes to G, twenty minutes to F, fifteen minutes each to B and C, ten minutes to A, and zero minutes to E.

The advantages of the time-index, compared with the choice method, are several. The subject is still choosing spontaneously the persons to whom he is attracted, as before, but instead of giving them a first, second and third choice, etc., he gives to each as much time as he wants to, out of the time at his disposal. Now it happens that time, as a frame of reference, is one of the most accurate standards in our culture. Our day--indeed our whole life--is broken up into and can be expressed in so-and-so many hours, minutes and seconds. For most people in our civilization, time is an index of the value they attribute to an object or performance, or to the person with whom they spend the time. Time appears to have a more inclusive character than any other standard we know of. For instance, it is more inclusive than money; in a capitalistic society, some people have more money, some have less; in a communistic society, money may not exist, but time units are equally the property of all in any type of society: it is a treasure for everyone, in equal measure. The poorest and the richest, the weakest and the most powerful persons--they all are, in reference to the time-index, equally resourceful and equally limited.

Let us see, now, how the time index functions in a tabulation of the case cited above. The amount of time passing back and forth between the subject and his friends is shown in the table on the following page. The time-scale suggests implicitly a first, second, third, etc., choice for each of the eight, and we can now also calculate precisely the weight of each preference level. We find, for instance, that the subjects like D nine times as much as A, six times as much as B and C, four and a half times more than F, and three times more than G. E, for whom he has no time at all, may be a person to whom he is indifferent or whom he dislikes. This indicates that the time method cannot be used by itself, but needs supplementary devices if we wish to record and weigh repulsions. Nevertheless, even in its simplest form,

it puts all the persons who are related to a subject into one continuum, and indicates accurately what importance each person has for him.

RECEIVERS

	Sub- ject X	A	B	C	D	E	F	G	To- tals
Sub- ject X	x	10	15	15	90	0	20	30	180
A	20	x	10	25	60	35	30	0	180
B	30	0	x	0	55	0	10	85	180
C	20	10	30	x	70	0	20	30	180
<u>Choosers:</u> D	100	20	10	0	x	0	30	20	180
E	60	10	30	20	50	x	10	0	180
F	40	10	20	30	60	0	x	20	180
G	60	25	30	15	40	0	10	x	180
Totals:	330	85	145	105	425	35	130	185	1440

Another aspect of the time-scale is that we have, for every individual, a universal frame of reference, i.e., the time he has available each day--twenty-four hours. Against this basic frame of reference can be compared any amount of time he would like to give spontaneously to persons, things or tasks, and the amount of time he is actually able to give to them. In comparison to this, the choice method, un-supplemented by a time-index, has the peculiarity that the volume of choice which a person can distribute is uncertain and practically unlimited.

A combination of the time-scale with the choice method is desirable in many cases. After the time-scale of a person has been secured, he may still be asked to express as many choices as he wishes, disregarding the fact that he may now have no time for these persons, although he may have, in the future. These choices would give us a clue to the understanding of the "collision of choices" in a person and the struggle within him between the time-index, which restrains him to so-and-so many hours a day and therefore limits him to so-and-so many choices and persons, and his imagination, which carries him away from the realities and for the satisfaction of which he would have to have far more time than is

given to any one person.²

The time-scale illuminates many other aspects of a person's status. On one hand it informs us as to the people who wish to spend time with him--but whom he does not wish to see--and on the other it indicates the people who ignore his wish to spend time with them. If a person persistently omits giving time to another person who has, with equal persistence, been demanding it from him over the course of numerous tests, the disproportion between the time demanded and the time withheld may suggest something of a negative quality--a rejection. As such a conclusion cannot be reached off-hand, it must be checked against a procedure which informs directly of the number and weight of the rejections, as, for instance, personal interviews. If a person does not wish to spend any of his time with anyone at all, regardless of the number of others who would like to spend their time with him, then he is an isolate, but by his own choice, and may be found actually surrounded by many people from whom he tries to withdraw. If a person does not receive time from anyone, neither from those whom he chooses nor from others, then he is a true involuntary isolate.

THE TIME SCALE AS APPLIED TO A DISCUSSION CLUB

Twenty-one subjects in Cottage 8 formed a discussion club in which, at two-week intervals, one of the members gave a lecture on a popular topic. Each lecture lasted half an hour, and after it ten minutes were allowed for discussion. The lecturer, at each particular meeting, was instructed to distribute these ten minutes among the members of the club whom she wanted to have discuss her presentation. She was free to give the whole ten minutes to one person or to break the time up into as many divisions as she thought advisable. She was therefore adequately motivated to choose as discussants the people who would give her good support and not

2. The time-index may also be found valuable in other near-sociometric tests such as "social distance" tests and the various attitude scales introduced by L. L. Thurstone and others.

disparge her lecture. As a different member lectured at each meeting, in the course of time each girl in the cottage had an opportunity to show among whom she would distribute her ten discussion-minutes.

Of the twenty-one subjects, G, for instance, gives F five minutes, J three minutes and I two minutes of her allotted ten. The five minutes to F has obviously the rank of a first choice and the first choice is now precisely expressed, for if we call one minute the unit of intensity, then first choice has, in this case, five intensities, second choice has three intensities and third choice has two. The gap between first and second choice is two intensities and that between second and third choice is also one intensity. There are other cases in this test in which the distribution is 7-2-1; then the gap between first and second choices is five intensities and that between second and third is one intensity; still other cases where the distribution is 5-4-1 and the gap between first and second choices is one intensity and that between second and third, three intensities. In a few cases the full ten minutes was given to only one person.

Of these three club-members, F gave four minutes to G, J gave two and I zero minutes. A sociogram expressed in time-units would therefore bring pair-relations into a precise expression. We might see two persons choosing each other as first choices, yet giving each other an unequal amount of time or, in another case, two persons might give each other an equal amount of time and for one person this might express her first choice (because she has given everybody else less time) while, for her correspondent, this amount of time might express a second choice (because she had given someone else still more time). One can manipulate still further along such lines and appreciate that the time technique, if applied to a situation where the time value is fully experienced by the subjects, it can provide a complete quantitative analysis of the sociometric structure.

THE TIME-SCALE AS APPLIED TO A DINING-ROOM

The same technique, but slightly modified to fit the circumstances, has been applied on a larger scale to a different life-situation. The same twenty-one subjects, living in Cottage 8, were given each

day for eight weeks a sociometric test designed to determine their table-partners for the next day. Because the size of the tables necessitated each girl's having three others as table-companions, the girls were told to choose, as usual, first, second and third. Now, instead of telling the girls directly anything about time, the average duration of each meal was determined. Since an average of twenty minutes was allotted to each meal, the amount of time which two or more girls could spend together during the three meals in any one day was one hour, and so we based our calculations on one hour, as a time-unit. Thus we gained a basis for quantifying by time-units their changing relationships from day to day, for we could assume that the selection of a table-partner was now equal to the wish to spend one hour in a meal-situation with that girl. In this way we could gain the methodological advantage of expressing an attraction in units of one hour.

By this means a pair-relationship, also, can be expressed in a far more diversified and precise manner. For instance, an individual, A, gives one person, with whom she is "mutual," one hour during the first week of the test; this person reciprocates with seven hours, during the same period. Another person, to whom A gives one hour, reciprocates with only one hour. A third person to whom she gives one hour reciprocates with three hours. The status of every individual--that is, her social ranking--can thus be expressed, from day to day, from week to week and for the full eight-week period of the test, in time-units, or hours. We were able to rank the twenty-one tested individuals from the lowest number of hours received to the highest, and to calculate the total number of hours received by any one individual for the whole period or any fraction of it. We could also determine the rate of change in hours received from day to day and from week to week.

There is another aspect from which the time method can significantly be compared with the limited choice method of testing. Time, as a measure, will be the more valid, the more conscious the persons tested are of the value of their time. Relationships between adults may readily be measured by a time-index, but the more immature the individuals to be tested, the less sensitive will they be to the value of their time. For young children, for instance, the choice technique may, in general, still prove the

best, for it is necessary that a sociometric test be so constructed that it reaches its subjects on their most responsive level, because if the procedure exceeds the comprehension of the subject, it will fall short of bringing the subject into emotional relationship with the test procedure.

Still another important point is the situation to which a sociometric test is applied--in other words, the problem of the criterion. If it is a school-situation, the significance of time and of spending time with others is awakened comparatively early. Even school-children can appreciate the giving of time quite as well as the giving of choices. In such situations, therefore, the combined time-choice method would be used to advantage. In situations which involve great intimacy, however, such as marriage--even if the tested subjects are fully sensitive to time values, they are here face to face with situations where any limitation of time would be meaningless. Hence this sort of situation, with adults as well as children, will return more objective results with the simple choice method. However, in most situations involving a greater psychological distance, such as school-room and work situations, dining-table placements, etc., the time technique will be found preferable. The status of the individual, when accurately expressed in relation to such criteria, will be found to reflect, also, the subject's position in his more intimate groupings, if cautiously interpreted.

Before the sociometric test is given, a certain amount of consideration may be necessary. A sociometric investigator should, first of all, pay the greatest attention to the tools he is about to use. Thoughtful adjustment of the method to the situation and of the criterion to the subjects, carefully-worded instructions for those to be tested, a full visualization of the effects the test may have upon them--these are all still more important, in the present stage of sociometric work, than mathematical formulations, however desirable the latter may be in the end. The finer outcome depends upon finer testing-instruments.

On the following page is a tabulation by the algebraic matrix method³ of the total hours given and

3. H. H. Jennings first applied the algebraic matrix to sociometry in her analysis of Hudson material in 1934; she

TIME TABULATION
Total hours given and received by 21 persons

RECEIVERS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	Ex- tras	To- tals
A:	x	16	15	43	29	52	1	2	1			4										5	168
B:	4	x	4	40	54	3	1	38			7	1	12	37								6	168
C:	7	21	x	1	10	5	56											3				8	168
D:	52	16	x	x	8	44						1	3	1								1	168
E:	49	42	10	10	x	2	1	12	26		2	7	4				4					11	168
F:	45	5	10	45	2	x	5	10	2	17	16											4	168
G:	9	3	7	2	4	x	3	21	51	41		3	16									4	168
H:	22	54	18	1	6	x	5	7	1	19	19											5	168
I:	40	2	41	34	8	18		x	12	4		5										4	168
J:	4	1	4	10	3	8	51	7	17	x	29	4	7	17								6	168
K:	13	16	3	5	15	44	1	10	35	x		3	12									3	168
L:	27	14	37	3	6	2	6	41		1	x	9										4	168
M:	28	12	52	10	15		2	32		4	5	x										4	168
N:	14	33		52		6		51	2													5	168
O:	1	4		1	1	58		1	52	43												3	168
P:	21	14	12	6	4	7	7	18	4	8	2	1	3	5	x	5	7	1	14	1		1	141 ^a
Q:	48	12		17	14	37		5	2	11	3	2	x									13	168
R:	3	2	56		1		53				49	1										8	168
S:	33		6	20	1	38	19		4	19	9	3										14	168
T:	4	39	16		25	1		11	1		3	3	16	2	22	13	1					9	168
U:	38	4	1	36		24	10	1	1	2	2	1	5	3	14	2	x					12	156 ^b
Totals:	391	306	298	292	283	243	240	238	229	210	151	106	106	59	57	43	35	31	29	28	6	110	3489

a) Absent 9 days.
b) Absent 4 days.

received by each of the twenty-one girls in Cottage 8 at the New York State Training School for Girls, Hudson, N.Y. during the eight weeks beginning November 12, 1937. For each of the fifty-six days, the girls chose three table-partners for one hour (the average duration of three meals) and therefore each girl had at her disposal 168 hours, but no more than 56 hours could go to any one girl. These totals were compiled from the daily sociograms.

As can be seen, the girls are shown by letters, A to U. In the cases of P and U, the former was absent for nine days and the latter for four, making the total hours at their disposal 141 and 156, respectively.

The column on the left shows the subjects as choosers, and the distribution of their time can be read transversely to the right from each letter. The horizontal line of letters shows them as receivers, and the various amounts received can be read vertically downward from each letter, with the total at the bottom.

The subjects are arranged in the order of their ranking in total hours received, A receiving 391 and U receiving 6. The column of "extras" at the right represents hours given to girls who left the cottage so early in the test that they were not included in the tabulation and their distribution of hours not shown.

This arrangement makes it possible to see at a glance the relationship--expressed in hours--of any two girls for the period of the test.

THE VALUE OF TIME-SCALES

For the analysis of the findings of this test, sociograms (not included here) and the algebraic matrix have been used. The latter has been found to be an essential supplement to the sociogram in quantitative study, but it cannot replace the sociogram when more complex structures such as chains, triangles, networks and other intricate inter-personal formations are to be explored.⁴ The sociogram can portray all

(Footnote continued) included tabulations by this method in her study on "Leadership," *Sociometry*, Vol. 1, 1937, pp. 124-125, and suggested its use in this article. See also Professor Stuart C. Dodd's article in this issue.

4. See Irwin T. Sanders, "Sociometric Work with a Bulgarian

the sociometric findings of a population of any size. The technique is to establish first the primary sociograms of the small groups in a community and then to build secondary sociograms in which each sociometrized group figures as a unit and the sociometric relations between the groups are portrayed. This process is then repeated again and again until the group of the required size has been reached (3,4).

The analysis of our time-tabulation shows that one individual, A, is wanted for a total of 391 hours during the eight-week period. To satisfy the desires of all who chose her would take eighteen weeks and five days, under the existing system of seating four girls at a table--or, if the tables were larger, she would have to eat every meal for the eight weeks of the test with seven other girls, instead of the regulation three. Another individual, U, is wanted for only 6 hours during the eight-week period. If only those who chose her were to sit at table with her, she would have to eat alone for 50 out of the 52 days she was present during the test, or, in other words, have to eat 150 out of 156 meals alone. Between these two extremes fall the time-scales of all others tested.

Using the time-tabulation as a starting-point, calculations were possible which led to many different observations. For instance, we saw that the number of persons who, on one day or another, were not given any time by anyone was ten out of the twenty-one, or 47.6 per cent of the group.

Another result of analysis was the calculation of the amount of time each person shares (as a mutual choice) with each other person during the eight-week period. For instance, subject A shows the desire to spend 29 hours with subject E, who reciprocates with a desire to spend 49 with A; only the smaller of the two amounts can be common to both, or shared. Consequently it is the amount of hours that A gave to E--29--that is actually shared (the balance of E's amount given (20) remains unreciprocated by A, (or wasted). With C, A wants to spend 15 hours, but C has given her only 7, so it is the latter amount that is shared, and A's balance of 8 that is wasted,

(Footnote continued) Woodcutting Group, "Sociometry, A Journal of Inter-Personal Relations, Vol. 11, No. 4, pp. 58-68.

this time: Subject A succeeds to such a degree in having her time shared that 132 hours out of the 168 at her disposal are given to persons who reciprocate with an equal amount of time--"mutual" time. The total amount of mutual time which A has with persons of the group is a measure of the intensity of the tele factor operating between them and A. The balance--31 hours--of her available 168 hours is a measure of the time given by A which was unreciprocated (by six people). The largest amount of mutual (shared) time expressed in this test was 51 hours expressed by G and J to each other. (It must be remembered that the maximum number of hours one person could give to another in this test was 56.)

The ratio of attraction, expressed in time units, is the number of hours received by a member of a group (X) divided by the maximum number of hours it is possible to receive (M). The general formula would be, then: ratio of attraction = X/M . In this case, the maximum number of hours it is possible to receive (M) is 3489, and, in the case of A, the number of hours received (X) is 391. A's ratio of attraction would then be .112. For U, the ratio would be .0017. This formula is one of the ways in which one can express the sociometric status of a person within his group and in reference to any specific criterion.

Each relationship here is expressed in time-units. It is possible that a subject may have some sort of relationship which is not thus expressed to the other people in the group to whom he gave no time. Some may be definitely rejected and there may be others who are acceptable to him, but the relationship was not strong enough to warrant the distribution of any time.

It is at this point that the time-technique must be combined with some form of choice-technique. After having distributed all of the available time, the subject might be told to select any number of other persons in the group--on one choice level--who could be used as alternate table-partners in the event that those chosen could not, for one reason or another, perform in that capacity (acceptance).⁵ Then

5. See Time Formula for sociometric status on pp. 78 and 79 U of this article. It is obvious that these additional choices (acceptances) can also be weighed in accordance with the time-scale.

the subject could be asked which of the others she definitely rejects. When these have been selected, there may remain another category consisting of those who have not received any time from the subject, nor been rejected, nor selected as alternates on the one level.

It can be assumed that the presence--or absence--of the persons in this fourth category means nothing to the subject--it has no social value. Thus she would have four categories: those chosen on a time basis, those chosen as alternates, all on one level (accepted), those towards whom she has no feeling (indifference) and those whom she rejects.

Amounts of time given out	Chosen or accepted	Indifference	Degrees of rejection
Maximum Attraction		Zero Time	Maximum Repulsion

This is a schematic construction, showing a possible pattern of one person's attractions and repulsions within his group.

It was possible to examine in detail the range of persons to whom a subject distributed the time at her disposal, and the persistence, day after day, of the choices thus expressed. It has been found to be a general tendency that the higher the sociometric status of a subject, the smaller will be the number of persons with whom she wants to be associated, and, conversely, the lower the sociometric status is, the larger is the range of persons she wants to reach during the course of the test. It is as if a person of a lower sociometric status were feeling her way into some permanent relationship, and meeting with no response, she scatters her choices with little sense of discrimination, and the person of a higher status exhibits, whether through wisdom or a natural affinity, a fine sense of discrimination in choosing relatively few others on the high sociometric status-level.

An interesting phenomenon is the time a person is willing to spend choosing a certain person again and again, only giving up her efforts when constantly repeated choices bring no answer in the process of re-assignment. At other times, such tenaciousness is rewarded by a mutual choice which may persist

for some time. An illustration of an instance of this sort was found in the relationship between subjects M and B. A study of their positions in the daily sociograms showed how M, with an inferior sociometric status, contrived to bring herself to the notice of subjects with a higher status. Throughout the entire period of the test she kept trying to establish a relationship with the subjects who ranked first, second (B), fourth and eighth in the group, while her own ranking was fourteenth. She succeeded, after being unsuccessful with three of them, in achieving a two-week pairing with the second in ranking--B.

It is often observed that a person entering a group needs a long period of time until he is able to attract any other member of the group and manage to establish a permanent association (marriage, a life-long friendship, etc.) with that member. By following up the sociograms, we can see the chain of persons who made possible the linking-up of these two persons. Those in between, who formed the chain, appear insignificant to our pair, but, as carriers of a tele process, they have an important sociometric function. To discover what affinities exist between the intermediate persons (and their complex of rôles) and A, on the one hand, and B, on the other, is a problem which deserves a thorough investigation. Is there any meaningful relationship discoverable between person and person, from the point where A enters the chain, to the person nearest to B? Is perhaps the tele factor, operating as a potential, shaping the attraction-pattern between A and B?

The most elusive problem up to date has been the measurement of rejection. Whereas we had an approach to it in the various choice-levels when we were dealing with attractions, there seemed to be no way in which to estimate, quantitatively, the social value of rejections. Since it is evident that rejections play an enormous part in determining the status of an individual in the community in which he lives, the following technique is suggested as a tentative point of departure in quantitative evaluation of rejections.⁶

6. Ernst Fantl, Assistant Physician at Beacon Hill, is making a study of quantitative tele structures in which money, instead of time, is used as a measuring-rod.

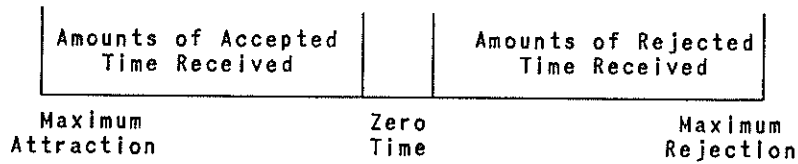
All the subjects in a group are considered as participants in a business situation in which they ask for appointments, expressed in time units, with other members of the group. After the test, it is observed that A asks for appointments with B, C and D for one hour, half an hour and ten minutes, respectively. They do not, however, ask for appointments with A; their time is allotted elsewhere. Interviewed, they all three express rejection of A. In an attempt to estimate the weight of their feelings of rejection toward A, we recognize their rejections as genuine, but inquire further into the intensity of their several rejections with the idea of attaining some quantitative expression of them. They are asked, since all the available business time on the day of the test is distributed, whether they would be willing to give A an appointment of some length, however, small, on the next day or in the near future. Although all three reassert their rejection of A, we are able, on this basis, to get a further reaction. B grants A a five-minute appointment for the following day, even though he realizes that an hour's time had been requested. We therefore record five minutes on the positive-tele side of A's scale and fifty-five minutes on the negative-tele side. C accepts a future appointment with A for fifteen minutes and rejects him for the same amount of time, and we record a further fifteen minutes on both the positive-tele and the negative-tele sides of A's scale. D, however, will not consider giving A any time, even in the future, and we consequently record the ten minutes on the negative-tele side. In this way we get approximation--expressed in time units--of the intensity of these three rejections. This represents a start in the direction of the ideal of expressing rejection in the same unit of measurement as attraction.

Our original formula⁷ for the ratio of attraction (sociometric status) for an individual or a group, was $\frac{Y^1}{(N^1 - N) \times X}$, in which Y^1 equals the number of actual choices received by the individual or group from the population of the whole community, N^1

7. See Sociometry, Vol. 1, Nos. 3 and 4, Statistics of Social Configurations, pp. 367-369, also Who Shall Survive? pp. 101-103.

equals the size of the population of the community, N^1 equals the size of the population of the group and X equals the number of choices per individual, or, if Y is the number of choices received in a group by its own members and Y^1 equals the total number of choices from inside and outside the group, the formula is

$\frac{Y^1 - Y}{(N^1 - N) \times X}$. Let us say that $(N^1 - N) \times X$ equals P , the maximum number of choices possible which a group (or an individual) can receive from the total population of the community. Then, if we call the time unit of one hour, one minute, etc., t , the formula is modified thus: $\frac{(Y^1 \times t) - (Y \times t)}{P \times t}$.



The above diagram illustrates, schematically, a time-scale which takes the measurement of rejections into account. If we consider t as the time unit of attractions, $-t$ can be considered the time unit of rejections, and the formula can be modified thus: $\frac{[(Y^1 \times t) - (Y \times t) + (Y^1 \times -t) - (Y \times -t)]}{(P \times t)}$,

so as to include the rejections as well as the attractions received by a given person or group. The total amount received of accepted time and the total amount received of rejected time, is divided by the maximum amount of time the person or group can receive in the

given community or more simply $\frac{T_1 + T_2}{M}$.⁸

It is from sociometric studies like this, made on a time basis, that we may be able to anticipate and predict with some degree of precision not only the status which a person may gain in a group, but also the relationship of his position to the positions of many other persons between whom he is bound to operate if they are thrown together in the

8. The quantum of time resulting could also be divided by the maximum amount of time by which a person or a group could be rejected in that community, or $(P \times -t)$.

same community. At this point, the direction of sociometric research and psychodramatic research must enter into close collaboration in order to gain at the same moment insight into the inter-personal structure as well as the rôle structure of the group.

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