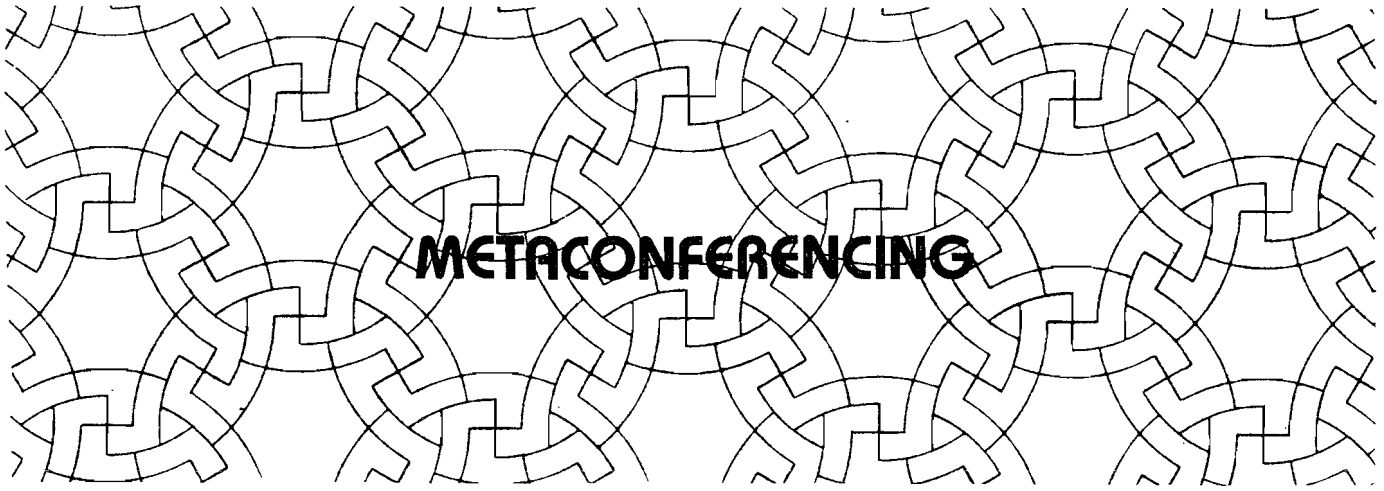
V METACONFERENCING TECHNIQUES

The first two papers describe two uses of a computer-based technique for mapping the relationships between people and issues at a conference. The third discusses a possible non-computer method for mapping the progressive convergence of perspectives at a conference. The final paper explores the value of Chinese non-linear insights into the way in which a network of people, such as at a meeting, can shift through a network of conditions. The implication is that conferences could become significantly better and more tranformative if participants could understand the map of such transformation pathways. In an annex an interpretation of the Chinese understanding of such conditions is given with reference to a network of participants such as at a conference.



– *discovering people/viewpoint networks in conferences*

Based on documents, tables and maps prepared by Stafford Beer, Syd Howell, Alan Mossman, and Gordon Pask

Introduction

This paper gives an overview of the process and the results of the « Call to experiment » launched by Stafford Beer, Past-President of the Society for General Systems Research (SGSR), during the recent international conference of the Society in London. The theme of the conference was : « Improving the human condition; quality and stability in social systems ». His justification for the experiment in an inaugural address, appeared in a previous issue of Transnational Associations (1). A description of the process as an aspect of « participant interaction messaging » appeared in an earlier issue (2).
Stafford Beer's specific proposal to the 228 participants is reproduced here (see Insert 1). The following description is that of an interested participant and does not necessarily reflect all the concerns of the people who made the whole experiment happen, namely Stafford Beer and his colleague Gordon Pask (who initiated the idea and Alan Mossman and S D Howell (who made it work with some assistance from the others).

Description of Round 1

Step 1 : Statement formulations
Participants responded enthusiatically to the proposal. Cards bearing statements were prepared and left in the « message box ».

Step 2 : Editorial regrouping
The cards were sorted into « foci of concern » in the light of the judgment of the metaconference team. This resulted in 69 « statements » which were typed in sequence on a numbered list (see Insert 2).

Step 3 : Statement list for participant response
The list was reproduced and distributed to participants. The list was introduced by some remarks. As indicated, people were asked to respond very quickly – and did so. They were also free to introduce new statements on cards, by mailing them in the same box in which the lists were returned.

Step 4a : Computer processing (people correlations)

Each reply received from participants was numbered for identification during data manipulation. Of the 114 replies, 19 were anonymous (although 11 of these seemingly because they forgot to insert their names, for they later identified themselves, after the data had been processed). The time-consuming part of the task (since no typists were available) was feeding the data into the computer system via a terminal. Once in, a standard statistical programme was used to correlate the patterns of response of each participant.

This took less than a minute of computer time at some distant location in the network. The results were then printed out in tabular form as indicated in Insert 3. It shows, for a given pair of participants, the degree of correlation between the pattern of their responses to the 69 statements (0.00 being zero; 1.00 being total; with – indicating negative correlations).

Because of the format of the table it was printed out in several sections which were attached together with adhesive tape (making a table of 50 x 180 cm).

INSERT 1 Stafford Beer's Proposal

- *A large supply of small blank white cards is available in the reception room.*
- *I ask everyone to subscribe to a single statement, written on a card, at least by the time proceedings begin tomorrow morning, and to mail that card in the postbox provided there.*
- *What statement ? That is for you to decide. It should be something relevant to the purposes that brought us all here. It could be a declaration, a comment, a question, an injunction, or something else that you want to put down. But it should be something you regard as important.*
- *Watch out for motherhood statements. In case anyone present does not know this trick : make sure that the negative of the statement would find defenders. If not, you have made an empty utterance.*
- *Perhaps you have more than one statement to make. Then please use more than one card – otherwise sorting becomes impossible.*
- *Please make a conscious effort to avoid the accepted categories : of this conference, of world-affairs, and (forgive me, but especially) of your own specialism.*
- *You might say something that has never been regarded as relevant; or someting which – because of the logic of accepted language – could not even be said. In that case, your powers of communication will be strained.*
- *So far I have spoken to you individually, because I believe in the individual. Make your personal statement, ascribe your name, and post it – by all means. You personally are the unit subset of a group.*
  Then what became of the self-organizing groups of two or more ? Easy : if they can agree on a statement, then all of them add their names.
- *I asked earlier that each of you should « subscribe » to a statement by the morning, and avoided the phrase « write a statement », for just this reason. The more people who discharge the obligation that I am trying to lay on them in group form, the better. Each can make a statement of his own too, of course, but it would be good to catch on to the synergy of emergent groups as soon as we can.*
- *Please PRINT your names.*

■

Step 4b: Computer processing (statement correlations)
Once the data had been inserted for Step 4a, it was also available to determine the correlations between the statements (Using the same statistical technique). « Correlation » between any pair of the 69 statements then means the degree of similarity of the profile of responses to those statements amongst all responding participants. This of course does not mean that all respondents attached the same meanings to the answers they gave. The results were printed out in the same way as for Step 4a.

Step 5a: Communication of results to participants (tables)
The two tables (people correlations and statement correlations) were attached to a wall in the reception area, and were the focus of much interest and discussion, if only arising from curiosity. The two people responsible, Alan Mossman and Syd Howell, explained to individual participants with whom they were indicated as being linked.

Step 5b: Communication of results to participants (maps)
They also used the tabulated information on people to draw out manually network maps of the linkages between people (see Insert 4) in the light of the degree of correlation between them. Simple maps could be constructed by neglecting all but the higher degrees of correlation (see Insert 5). More complex maps could be constructed by including lower degrees of correlation. In each case « isolated » individuals were omitted from the maps, or listed on the edge of the map. On the maps the participants were identified either by number only or also by name. The latter could of course be obtained from the table. The maps were the focus of even more interest than the tables, for obvious reasons.

Step 5c: Communication of results to participants (card display)
The cards, once processed by the « editorial group » were stuck on a wall in the reception area. The wall was roughly divided into labelled zones which thus served to cluster the cards. The original intention was also to use the wall area to present statements that would be amalgamations of single-card statements. These would have been « metalinguistic to the formal proceedings ». Participants would then have been invited to subscribe their names to such statements. In practice the wall space was also used by participants to display comments that were not processed through the editorial group (or may have been deliberately rejected by them).

Comments on Round 1

Those conducting the exercise formulated a set of comments on the results of the first Round which were distributed with the invitation to participate in the second. The comments are as follows :

Comment 1 : *Interpreting « average » replies*
Like every aspect of this process, the « average » reply is corrupted with random noise. There is not only a legitimate randomness, from the different views which people hold, and the different meanings which they give to words, but also there is a less legitimate element of randomness, due to vagueness in the statements, and to the excessive compression of using a seven point scale.

Comment 2 : *« Agree » vs. « Important »*
The implication that « agree » and « important » could be handled together on the seven-point scale was unsatisfactory. They were meant to be complementary, but in fact they clashed. Since it is not possible to cope simultaneously with « agree/disagree » and « important », participants are asked to **rate Round 2 statements in terms of « agree/disagree » only.**

Comment 3 : *How to determine a view*
We suggest applying a crude filter to reduce « noise » in the replies. If the response was only one or seven, with probability 0.5 we should ignore differences of less than 0.5 between the mean replies, for a 95 % confidence interval. In the noisier, multinomial conditions here, we suggest that a mean score of 5 or over may possibly qualify as a « resolution of the metaconference ». This of course ignores all clashes in meanings held, as all resolutions do. (There are at least three « meanings » to statement 10). The next problem is discussion and persuasion !

Comment 4 : *Resolutions of the metaconference (average score ⩾ 5)*
These may be meaningful votes or may just be « motherhood » statements. Which do you think the following statements are ?

(1) 'Don't design the future unless...'
(3) 'The conference should include doers...'
(13) 'If one cannot understand how one is part of the problem...'
(30) 'The political nature of systems practice...'
(32) 'Set up an effective network...'
(33/42) 'GST in schools'
(43) 'Quality is **not** stability..' (Contradicting the conference title?)

If the same rule is applied in the opposite direction, the conference firmly **rejected** only two statements :

(10) 'The aim of science is 50 - 50 disagreement' (Do we really believe that science should only research what is not in doubt ?)
(60) 'Ideas are of secondary importance to the names one gives them...'

Comment 5 : *Standard Deviations of replies*
We hoped to find varying levels of agreement and disagreement, but the differences are probably not meaningful, except perhaps that statement (3) 'Doers versus thinkers' produced more unanimity than (41) 'Central control is incompatible with local autonomy'. (The conference was evenly divided on this, on some basis or bases. Some relation between mean reply and standard deviation is of course expected in these conditions).

Comment 6 : *Clusters of statements*
Our manual review of the cards suggested (to us !) several 'foci of concern'. Not only are opinions divided on these foci, but the 'foci' themselves seem not to be compatible :

- *What is the nature of the good*
- *I know the nature of the good*
- *How could one 'control' society ('one' and his objectives being variously assumed)*
- *We need new notation for qualitative relations*
- *We must avoid jargon*
- *We must explicate ourselves and educate others*
- *We must act on specific problems*
- *We are inward looking eccentrics*
- *SGSR is...*
- *The Conference process is...*
- *Systems are explicable - or not ?*
- *Systems are personal constructs - (the converse hypothesis might be more interesting.)*
- *Systems are objective facts*
- *Systems are fortuitous in Nature generally.*

Comment 7 : *Correlations of the statements*
How should we relate the machine and member-generated clusters to the schema just given above ? (Given that product-moment correlations are not necessarily a stable metric on ordinally collected data).
Correlation can arise for any and no reason (we ignored correlations below .35. **If** the variables had been cardinal and normally distributed, the 95 % confidence interval around zero would have been ± 0.20).
Correlated statements would relate to 'issues', if and only if : the respondents attached the same meanings both to statements and replies, and if 'issues' themselves did not have accidental overlaps, in the attitudes they provoked.

Comment 8 : *Uncorrelated statements*
There is a striking number of statements which are uncorrelated with all others. ie. the conference members showed no tendency to group them with other statements.
These statements may not all be 'issues'. Some are isolated statements of value or belief, across which every member holds his own pattern of views. Others arise from loose definitions, or from unshared meanings. Which do you think applies in each case ?

(4) Systems theory may be unique per person
(5) Attitudes change only in catastrophes
(7) Create a unified symbology
(8) 'Free expression' leads to oppression of the meek
(10) Science tries to find statements subject to disagreement
(13) If one cannot understand one is part of the problem...
(20) We create rather than discover reality
(21) Discursive processes - biased ?
(34) Salvation lies in applied theory
(39) Variety reduction the key to system formation. (Tended to be rejected)
(43) 'Quality' is not 'stability' (Accepted)
(46) GST is a perspective
(47) Ontogenesis
(48) Nature writes symphonies (This piece of anthropmorphic analogy was accepted)
(57) Better social conditions before better character (Rejected ?)
(63) Paradigm stages of GST
(67) Science and art of GST

Comment 9 : *Clustered statements*
The titles we give the clusters are provisional and provocative. Do you object to the title of the cluster, or where you find yourself clustered ? Discuss and persuade !

(1) Complaints about SGSR/Systems General: eg. 6, 11, 15, 16, 18, 25, 26, 36, 42, 50, 51 (Did the group accept these on balance ?)
(2) Need to spread the GST gospel, mixed with a general

INSERT 2 Round 1 Statement List/Questionnaire

- *Here is a list of statements which you, the Conference Members, have severally made.*
- *Will you now help us ?*
- *We invite you to compress your opinions on each of these statements into a single number; a rating from : 1 to 7. For example :*
  1 = disagree/feel unimportant
  4 = don't know/neutral
  7 = feel important/agree
  Please enter the appropriate number against each statement in the space provided.
- *We have edited some of the statements slightly, in order to make this form of answer somewhat less unnatural.*
- *200 people and 70 statements means we need 14,000 judgements from the conference, by the end of tea time today at the latest.*
- *Remember this is the first iteration.*
- *We are in experimental mode, so please feel free to examine or criticise our data and methods.*
- *Fresh statements or additional information should be made on cards as before.*
- *Indicate your name (not obligatory).*
- *If you do this we can report :*
  - *The level of agreement and disagreement about issues.*
  - *The way you Conference Members have grouped the issues by pour collective judgements.*
  - *The way you the Conference Members form clusters in the way you hold opinions.*
  - *Lastly we will report to you personally the other two people who agree most and disagree most with the total pattern of judgements that you have expressed.*

1. *Don't design the future unless you can take the responsibility of living in it. (...)*
2. *Elections are the outcome of coercion, or of monetary manipulation of informational channels. (...)*
3. *The Conference should include « do-ers » as well as « thinkers » (...)*
4. *System theory may be unique per person. The task of the system sociologist theorist is to be able to describe these thinking - forms. (...)*
5. *Attitudes undergo major modifications in catastrophic situations only. (...)*
6. *'Systems' ineffective. (...)*
7. *All efforts to be directed towards the generation of a unified symbology, so that systems in diverse areas of study can all be seen to be special cases of this highly generalized supertheory. (...)*
8. *In taking measures to favour the free expression of human values, societies weaken themselves, creating conditions which diminish their ability to protect the safe and free existence of their most civilised human members. (...)*
9. *General systems theory can reduce prejudice. (...)*
10. *The aim of science is to find statements on which people disagree 50 - 50 %. (...)*
11. *SGSR is dying ! or pathological. (...)*
12. *Develop a non-mathematical notational scheme for complex, dynamic phenomena. e.g. music, labanotation. (...)*
13. *If one cannot understand how one is part of the problem, one cannot understand the nature of the solution required. (...)*
14. *You must lose yourself to find yourself. (...)*
15. *My first aquaintance with systems people : peculiar men who have lost themselves in their systems. (...)*
16. *The hierarchy of the SGSR is becoming a pathogen to the SGSR, & systems ideas generally. (...)*
17. *The Society is badly in need of anomalous behaviors, and deviation-amplifying strategies, if it is to move to new levels of organisation. (...)*
18. *« Conference proceedings » which stretch the arm do not stretch the brain. (...)*
19. *Much « systems » research now seems to be looking at variables from the larger system with an old, non-systemic epistemology. (...)*
20. *We increasingly create rather than discover. (...)*
21. *If there exists a discursive procedure that guarantees a consensus, then it must first be demonstrated that this procedure is not biased in favour of any particular consensus. (...)*
22. *TV and the novel are the only effective ways of changing cultural values. (...)*
23. *Even GST-people will not solve problems of war, racial conflict, prejudice, inequality etc., Let us not frustrate ourselves/society by claiming that we can improve « quality & stability in social systems ». (...)*
24. *Systems do not have boundaries, but only limits set in the analysts' imagination, so systems are imaginary. (...)*
25. *'Systems' are ways of communicating our ideas about phenomena to ourselves and others. Nothing else. The communication is currently ineffective. (...)*
26. *The lack of progress in 25 years of SGSR is to a large extent due to the fact that many of the pioneers blundered in with ontological statements without realising that in producing ontological gnats they had swallowed a camel. (...)*
27. *You cannot create a viable system through revolution, it must evolve. (...)*
28. *Choose a pet distressed area in the world. Apply GST on a gigantic international cooperative scale (à la IIASA ?). (...)*
29. *Let SGSR form task-oriented cells for the next decade to address specific societal issues (energy, health etc.,). (...)*
30. *The political nature of systems practice needs to be critically examined. (...)*
31. *Highest SGSR resource priority should be given to modelling and measuring patterns & flows which sustain the desire to survive. (...)*
32. *Set up an effective communication network for mutual exchange of new ideas on general systems and its applications. (...)*
33. *System theory should be included in the secondary (possibly primary) school curriculum. (...)*
34. *The human condition will only improve with action (application) of theory. (...)*
35. *Improving the human condition (whilst a marvellous faith) is neither susceptible to careful definition, operational meaning nor unambiguous pursuit, unless that objective is severely decomposed and pursued at many appropriate levels of resolution. (...)*
36. *The systems movement is characterised mainly by an unquestioned crude positivism which simply assumes that systems are realworld entities : A phenomenological paradigm of learning is preferable to the positive paradigm when the concern is real-world human activity. (...)*
37. *Respect for the enterprise shown in mounting this experiment should not blind us to a fatal flaw in it as a would-be example of a self-organising social system. The cards will be prepared and the patterns spotted (more, one hopes, than mere counting by two people). Since they cannot step outside their own weltanschauungen all we can get is a digest of the cards distorted by their frames of reference. Now in a real self-organising social system every single member simultaneously « sifts the cards » and acts according to his or her perceptions. So the verdict has to be : a gallant try but not worth doing. ( )*
38. *I can't get outside of hierarchies ! (..)*
39. *Reducing variety is the key to systems formation. (..)*
40. *Procedures, rules and milieu conditions that attract humans to a new, small social system trend to evolve into unsatisfying, non-productive contraints as the system becomes large and densely populated. (..)*
41. *Teachers should assimilate GST into the teaching of specific disciplines.(..)*
42. *This conference is really about how to admit the existence of god without embarrassing your friends ! or upsetting your concepts ! (..)*
43. *Quality in social systems is not stability but a ceaseless, qualitative development towards something better. (..)*
44. *Living systems' development is better facilitated through a process of non-coercive recognition and symbolization of their international structures of experiencing. (..)*
45. *Change the election option in all societies' elections to always have one option « NONE OF THE ABOVE ». (..)*
46. *G.S.T. is a perspective. Any « theory », methodology, method must come out of the perspective (..)*
47. *Ontogenesis : ignoring our relationship with what we know, we can only be known (and so, entailed) by the objects of our knowing; we grow-impotent (..)*
48. *Nature writes symphonies not legislation. (..)*
49. *Central control is incompatible with local autonomy. (..)*
50. *SGSR has proven to draw its juice from some gifted men but it is a dry stalk by itself : no fruit, no future. (..)*
51. *The General Systems Research movement exists mainly to provide an intellectual therapeutic safetyvalve and a psychic income for academic loners - « Academic Gipsies » – who are reluctant to join the vibrant living world.(..)*
52. *Use cybernetics and general systems to develop a new approach to economics. (..)*
53. *It is appropriate for system scientists to become missionaries and covert decision makers to the general systems faith. (..)*
54. *SGSR to publish leaflet explaining system science, successes, heroes, failures and ongoing research areas, emphasising fundamental differences from mainstream of disciplines. (..)*
55. *What is learned from the Meta-Conference ? Cohesions that occur will not be shared with us. (..)*
56. *Systems are real, nothing is true, my mind is hungry and over to you. (..)*
57. *Improvement of social conditions must precede improvement of character.( )*
58. *The undisciplined General Systems become a bag of tricks to be sold, not a milieu in which we can learn from each other. I propose the formation of a Committee on Discipline, to examine and propose remedies for this problem (..)*
59. *Developing « Systems Language » does not mean obliterating « other » terms established in other disciplines – we need a correspondence. (...)*
60. *Ideas are of secondary importance compared to the names one gives to them (...)*
61. *Impressing the human condition depends entirely on the ethical standards (particularly self-denial and regard for others) accepted and acted on by each individual in society. (...)*
61. *SGSR should get involved in application projects – either as consultants/participants or as originators. (...)*
62. *The major variables in human social systems are political/attitudinal. (...)*
63. *A new paradign has three stages :*
    (1) In-stage : It has become a fashion.
    (2) Disillusion
    (3) Normalization : the paradigm is judged according to its merits.
    We may be somewhere in Stage 2 or in transition to 3 1/2. Moral : Declining membership does not matter. (..
64. *A summary without a problem is a bore. (...*
65. *Boundaries are by definition undefinable except in terms which negate their existence. (..*
66. *There is no concept of quality without the possibility of making or finding boundaries. (...)*
67. *The science - and art of systems thinking is the science and art of finding (or elucidating) conceptual pegs on which to hang (or crucify) our idiosyncratic vision of the world. (...*
68. *SGSR will not usefully survive another 25 years if it continues its march towards hierarchic governance. (...*
69. *The proliferation of the limited liability company is a manifestation of a pathological condition (of our culture). (...*

'activism' towards project work eg. 28, 32, 41, 52, 53, 54, 59, 61
(3) Some 'radical' attitudes eg 15, 45, 56, 60, 68
(4) An 'intellectual liberal' attitude eg. 12, 17, 28, 44.

Comment 10 : *Correlations of people*
The charts are on display, together with the correlation matrix, and the actual list of all the replies which were made.
Do the correlations mean anything ? We know that ambiguities abound both in the statements and in the single number answers. The correlations give equal weight to all the variables – not just the ones you personally feel strongly about (there are potentially 100 such 'personal' correlation matrices, each a selection from 2^{68}, or about 10^{20}, possible sets of questions). Only if a) two people held similar meanings; b) their respective correlations with each other were both high; c) the statements carried importance to each, would the correlations convey real similarity between two people. (But should we be trying to meet our opposites, or even 'uncorrelated' people ?)
In these circumstances, our release of the correlations is simply one more input to the conference. We don't know what effects **you** will cause that input to lead to. But... we were interested to see that a husband and wife had a correlation of .75 (nearly the highest), and that they had agreed on the meanings for the statements before deciding their answers. We also noted very little tendency for the members of any one institution to correlate !

Description of Round 2

Step 1 : *Statement formulations*
Participants were invited to drop statements in the message box at any time, so that this procedure was in operation in parallel with the later Steps of Round 1, as well as in response to its outcome. Cards were collected from the box by the 'editorial group' whenever convenient.

Step 2 : *Editorial regrouping*
The editorial group retained those statements from Round 1 which « looked like » potential « resolutions », together with some new statements emerging from Step 1, plus some statements they noted from the manual analysis.

Step 3 : *List for participant response*
The resulting list of statements (see Insert 6) was distributed to participants with the above comments on Round 1 and the invitation to respond as before (except that the scale 1 to 7, was now to signify from « disagree » to « agree », and **excluded** the notion « unimportant » and « important »). It was also clearly indicated that the computer processing would only be undertaken if « a clear majority of the conference responds ».

Step 4a : *Computer processing (people correlations)*
This was a repetition of Round 1 Step 4a. Of the 84 replies, only 1 was anonymous, although there may have been several pseudonyms (since a few people could not be identified from the participant list – maybe they did not register).

Step 4b : *Computer processing (statement correlations)*
This was a repetition of Round 1 Step 4b.

Step 5a : *Communication of results to participants (tables)*
The two tables (people correlations and statement correlations) were only available for the closing plenary session for inspection by participants. It was however possible to draw conclusions from them for a verbal presentation to the closing session.

Step 5b : *Communication of results to participants (maps)*
A network map of the participant linkages could only be prepared after the event (see Insert 7). None was prepared from the statement correlations (as was the case for Round 1).

Comment on Round 2 (in comparison with Round 1)

Comment 1 : *Different participation*
In Round 1 there were 114 participants. Of these 56 participated in Round 2, which had 84 participants altogether. This information may not be completely accurate because some of the 8 who remained anonymous after Round 1 may have participated in Round 2 (there was only one « anonymous » person in Round 2).
It would not be appropriate to conclude too much from this turnover in participants. In an academic conference it is normal for people to attend for only brief periods which may have ensured their participation in the first or second Rounds only. It is also to be expected that those who emerged from Round 1 as « well-connected » in the network map would be reinforced in their interest in Round 2 and the process in general. Conversely, those who emerged from Round 1 as « poorly connected », world not be especially interested in Round 2.

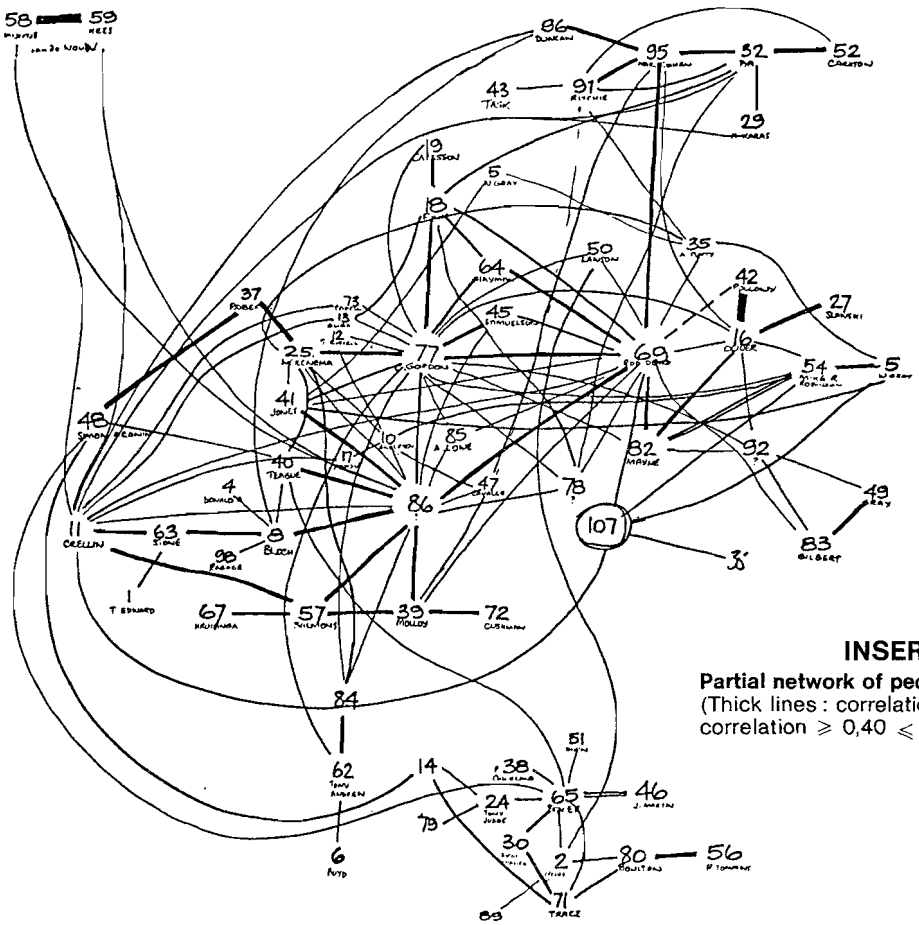
Comment 2 : *Resolutions of the metaconference*
The average and standard deviation of responses by participants to the 25 statements (see Insert 6) are given here in a corresponding table (see Insert 8). In the light of Round 1 Comment 3, it was concluded that Statements 1, 2, 4, 5, 7 (especially in the light of 3), 15, 19, 20, 21, 23 and 25 could be considered to be « resolutions ». There is of course a problem of concealed differences in interpretation, although these would also be present under other conditions. With regard to the standard deviations, Round 1 Comment 5 should be noted.

Comment 3 : *Content of resolutions*
It is clear that the « resolutions » are far from being earthshaking. As with many sets of resolutions they suffer from not having been conceived in terms of the addressee. As such they have fallen into oblivion already. The content of the statements for Round 1 was equally uninteresting – particularly if it was supposed to reflect what individual participants held to be most important in relation to the conference. The question here is whether this is a reflection of the metaconference process or did the latter merely reveal the banality of what is central to the preoccupations of a set of intelligent people at an international conference of this type ? Of course it is easy to argue that the methodology was such that the process cannot be said to have revealed anything. However if the process did reveal what can be considered as the symptoms of partici-

INSERT 3 : Portion of computer people-correlation tabulated output for Round 1

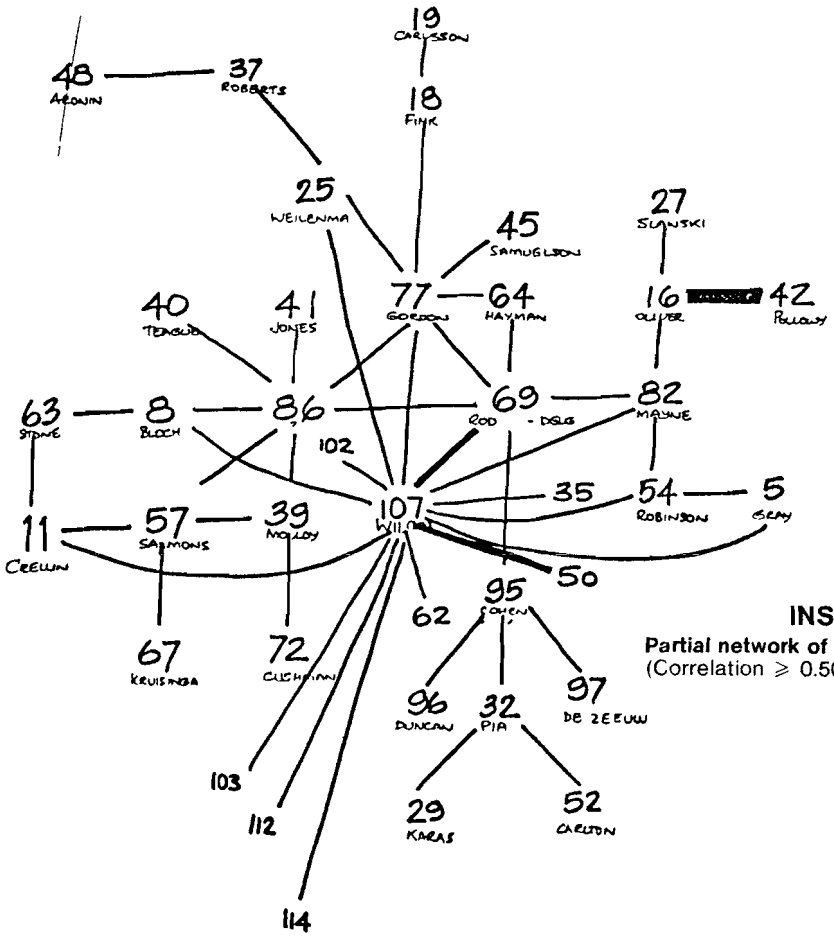
(Participant names and allocated numbers in left margin; participant numbers also head each column. Example : Donald (4) and Bloch (8) have positive correlation 0.40 giving thin line connection on Insert4 map. Black circles and triangles were used to highlight signifiant correlations when drawing maps. Note absence of high negative correlations).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1 D.EDWARD	1.00	0.27	0.15	0.28	-.20	0.09	0.32	0.37	0.10	-.06	0.24	-.31	-.14	0.30	0.09	0.07	-.06	-.11	-.15	0.12
2 GEOFF.P.	0.27	1.00	0.07	0.18	0.18	0.07	0.27	0.26	0.16	0.13	0.19	0.09	0.30	0.07	0.12	0.25	0.18	0.22	0.12	0.03
3 BLODWF.A	0.15	0.07	1.00	0.03	0.21	0.16	0.14	0.17	0.07	0.06	0.22	0.01	-.10	-.03	0.17	-.06	0.04	0.12	-.05	0.30
4 DONALD.A	0.28	0.18	0.03	1.00	0.16	0.12	0.02	0.40	0.13	0.16	0.12	0.08	0.04	0.09	0.25	0.19	0.16	0.21	0.14	0.02
5 W.GRAY..	-.20	0.18	0.21	0.16	1.00	-.01	-.10	0.16	-.05	0.34	0.39	0.06	0.26	0.07	0.03	0.24	0.24	0.23	0.29	-.13
6 BOYD.G.M	0.09	0.07	0.16	0.12	-.01	1.00	0.14	0.17	0.24	-.09	0.23	0.21	0.13	-.18	0.29	0.10	0.16	0.22	0.16	0.24
7 NAUGHTON	0.32	0.27	0.14	0.02	-.10	0.14	1.00	-.03	0.33	-.28	0.20	-.02	-.13	0.18	0.10	0.05	0.07	-.02	-.01	0.09
8 A.BLOCH.	0.37	0.26	0.17	0.40	0.16	0.17	-.03	1.00	0.11	0.29	0.32	0.08	0.18	0.17	0.25	0.29	0.13	0.10	0.09	0.17
9 C.HAHN..	0.10	0.16	0.07	0.13	-.05	0.24	0.33	0.11	1.00	0.12	0.26	0.13	0.31	0.01	0.27	0.07	0.14	0.17	0.21	0.02
10 ANDERSEN	-.06	0.13	0.06	0.16	0.34	-.09	-.28	0.29	0.12	1.00	0.23	0.42	0.27	0.32	-.06	0.32	0.41	0.14	0.24	-.02
11 CRELLIN.	0.24	0.19	0.22	0.32	0.39	0.23	0.20	0.32	0.26	0.23	1.00	0.25	0.46	0.05	0.26	0.29	0.45	0.35	0.26	0.01
12 TRUSSELL	-.31	0.09	0.01	0.08	0.06	0.21	-.02	0.08	0.13	0.42	0.25	1.00	0.18	0.08	-.02	0.32	0.24	0.34	0.22	0.37
13 OLIGA...	-.14	0.30	-.10	0.04	0.26	0.13	-.13	0.18	0.31	0.27	0.46	0.18	1.00	0.08	0.24	0.30	0.37	0.43	0.39	-.10
14 HANSEN..	0.30	0.07	-.03	0.09	0.07	-.18	0.18	0.17	0.01	0.32	0.05	0.08	0.08	1.00	0.03	0.11	0.20	-.17	-.00	-.06
15 FELIX.WO	0.09	0.12	0.17	0.25	0.03	0.29	0.10	0.25	0.27	-.06	0.26	-.02	0.24	0.03	1.00	0.23	0.29	0.20	0.08	0.19
16 WTOLIVER	0.07	0.25	-.06	0.19	0.24	0.10	0.05	0.39	0.07	0.32	0.29	0.32	0.30	0.11	0.23	1.00	0.28	0.19	0.12	-.10
17 KOHOUT...	-.06	0.18	0.04	0.16	0.24	0.16	0.07	0.13	0.14	0.41	0.35	0.24	0.37	0.20	0.29	0.28	1.00	0.29	0.30	0.07
18 FINK....	-.11	0.22	0.12	0.20	0.28	0.22	-.02	0.10	0.17	0.18	0.35	0.34	0.43	-.17	0.20	0.19	0.29	1.00	0.16	-.15
19 CARLSSON	-.15	0.12	-.05	0.14	0.29	0.16	-.01	0.09	0.21	0.24	0.26	0.22	0.39	-.00	0.08	0.12	0.30	0.16	1.00	0.05
20 J.BOFILL	0.12	0.03	0.30	0.02	-.13	0.24	0.09	0.17	0.02	-.02	0.01	0.37	-.10	-.06	0.19	-.10	0.07	-.15	0.05	1.00
21 BACH....	0.07	0.11	-.08	0.05	0.12	0.03	-.12	0.18	0.20	0.27	0.13	0.17	0.25	0.18	-.01	0.13	0.24	0.27	0.01	-.12
22 ESPEJO..	0.19	0.05	0.25	-.09	0.18	-.04	0.17	0.08	0.01	0.02	0.29	0.05	0.07	0.23	0.11	0.03	-.13	0.07	-.22	-.06
23 RJWILLIS	-.04	0.35	0.04	0.02	0.26	0.20	-.06	0.14	0.03	0.17	0.14	0.26	0.06	-.13	-.13	0.10	-.02	0.22	0.04	-.01
24 JUDGE...	0.10	0.17	0.16	0.01	0.21	-.11	0.28	0.06	0.02	-.01	0.20	-.01	-.02	0.41	0.01	0.08	0.01	-.15	-.05	-.12
25 WEILENMA	-.08	0.10	-.01	0.35	0.27	0.02	-.08	0.32	0.01	0.39	0.25	0.37	0.14	0.15	0.16	0.14	0.34	0.15	0.09	-.02
26 CHIDSEY.	0.04	0.15	0.29	0.12	0.14	0.07	-.03	0.16	-.06	0.22	0.15	0.20	0.04	0.23	0.17	0.05	-.04	0.17	0.10	0.07
27 SLAWSKI.	0.19	0.23	0.14	0.04	0.22	0.21	0.12	0.31	0.20	0.32	0.30	0.23	0.24	0.20	0.06	0.31	0.29	0.3	0.21	0.05
28 GAINES..	0.01	0.06	0.19	0.13	0.09	0.03	0.01	0.21	0.08	0.07	0.25	0.18	0.15	0.20	0.29	0.04	0.05	0.1	0.17	0.15
29 K.KARAS.	0.01	0.02	0.30	0.06	0.28	0.16	-.29	0.28	-.01	0.39	0.30	0.32	0.30	0.02	0.27	0.37	0.34	0.3	0.08	0.10
30 CHAPIROJ	0.28	0.33	0.12	0.11	0.25	-.02	0.10	0.16	0.02	0.12	0.35	0.08	0.12	0.21	0.13	0.24	0.22	0.1	-.05	-.07
31 ROBNMORE	0.16	0.10	0.15	0.27	0.14	-.01	-.04	0.24	0.14	0.31	0.12	0.06	0.20	0.20	-.13	0.12	0.22	0.1	0.14	0.14
32 PIA.....	0.09	0.19	0.10	0.27	0.22	0.16	-.05	0.22	0.35	0.34	0.46	0.25	0.40	0.06	0.40	0.31	0.38	0.4	0.24	-.08
33 TRABERT.	0.02	0.30	-.10	0.21	0.06	0.06	0.12	0.05	0.18	0.05	0.19	0.14	0.27	0.01	0.04	0.09	0.15	0.2	0.06	-.15
34 BON.....	0.20	0.42	0.22	0.13	0.18	0.05	0.13	0.14	-.17	-.05	0.15	0.07	0.04	0.11	0.17	0.11	0.24	-.0	0.04	0.22
35 A.PUXTY.	-.03	0.29	0.16	0.09	0.40	0.11	-.03	0.28	0.01	0.39	0.31	0.30	0.32	0.20	0.15	0.33	0.20	0.2	0.18	-.17
36 M.SHAW..	0.02	0.04	0.05	0.11	0.12	0.01	0.06	0.20	-.03	-.01	0.13	0.04	0.03	0.13	0.01	-.18	-.11	-.0	0.09	0.11
37 CATHY.R.	0.28	0.23	0.01	0.06	0.15	-.01	0.23	0.32	0.11	0.30	0.24	0.13	0.09	0.21	0.26	0.06	0.27	0.1	0.08	0.12
38 CHECKLAN	0.33	0.36	0.37	-.18	-.05	0.17	0.15	0.22	0.02	-.11	0.09	-.21	0.05	0.03	0.08	-.06	-.12	-.0	-.13	0.29
39 K.MOLLOY	0.16	0.26	0.06	0.10	0.06	0.19	-.01	0.32	0.19	0.15	0.14	-.03	0.36	0.08	0.20	0.30	0.17	0.2	0.24	0.16
40 TEAGUE..	0.05	0.32	0.31	0.23	0.46	0.17	0.17	0.32	0.02	0.27	0.46	0.31	0.19	0.23	0.21	0.22	0.23	0.3	0.26	0.25
41 A.W.JONE	-.03	-.00	0.01	0.37	0.18	0.36	-.09	0.33	0.07	0.37	0.10	0.44	0.16	0.03	0.16	0.24	0.30	0.2	0.15	-.04



INSERT 4

Partial network of people from Round 1
(Thick lines : correlation 0.50; thin lines correlation ⩾ 0,40 ⩽ 0.49)



INSERT 5

Partial network of people from Round 1
(Correlation ⩾ 0.50)

pant « disease » it may be that future development of the process can help to remedy that disease.

Comment 4 : *Change in participant correlations (map)*
The network maps arising from Round 1 (Insert 4 and Insert 5) may be compared with that arising from Round 2 (Insert 7). It is unfortunate that processing of the data did not result in the same numbers being allocated to people in the two rounds, but even after establishing the correspondences it is clear that the network of Round 2 bears little resemblance to that of Round 1, in terms of who is linked to whom. Clearly since the maps were hand drawn in an unsystematic manner the structures cannot be compared as a whole. This limitation can be better understood in the light of an earlier participant map initiative by Peter and Trudy Johnson-Lenz (3). As one of the participants however, I cannot deny that although in Round 1 and Round 2 I am indicated as highly correlated with different sets of people, in each case one of the people (previously unknown to me in both cases) shared a very important range of concerns which it would have been difficult for me to express verbally in any simple statement. It would certainly have been difficult to relate such a verbalization to the statements in either Round. In both cases the shared interest was confirmed **before** the network map was available.
If there had been more Rounds, and if the statements had been of better quality and covered a wider range of issues in a more systematic manner, it is likely that the relationship between the maps would be greater. Also if all respondents had been indicated on the maps with an appropriate range of line thicknesses it would be much clearer what was happening. Other aspects of this question are discussed under « future possibilities » (below).

Comment 5 : *Number of Rounds (delays)*
it was not possible to have more Rounds because although it was a 5-day conference, the idea was presented on the first day. The list of Round 1 statements was distributed on the morning of the second. The replies were collected that same day and the results were available on the third day. The list of Round 2 statements was available on the fourth day and closing time for replies was mid-afternoon. The results were available at midday on the fifth day. The main delaying factor was the time taken for data input via the terminal using semi-skilled typists, which took about 6 hours in the evening for each Round. If this time could have been reduced, and the editorial work and statement typing streamlined, one or more Rounds a day could have been achieved if this were desirable.

Comment 6 : *Resources required*
Under the conditions of this experiment the resources required were very modest since the time of those involved was given freely. I understand that the computer processing (once the data had been input) involved less than an minute of central processor time all told. The terminal was available through a university institute.

Comment 7 : *Iterative philosophy*
During the experiment the « Rounds » were called « Iterations ». The intention was, through several iterations, to arrive at a convergence of viewpoints and to establish some measure of consensus. This approach is similar to that of the well-known Delphi forecasting technique. The question is whether seeking for convergence and consensus is what is most significant about Beer's initiative. It could be argued that it is a technique which does not require that variety be reduced in the manner of the Delphi technique. Meaningful results can be presented concerning the relationship between a diversity of viewpoints. The quest for consensus may be analogous to hunting the chimaera. It is not necessary, even if it is possible, and it encourages dangerous delusions concerning the stability of consensus and the structures that can be built upon it.

Future possibilities : analysis and tables

1 : « Tidying up » the package
Whilst all the elements of this experiment have been available for a number of years, it is only now that it is becoming easy to relate them to a conference environment. It is now quite feasible to rent a telephone-linked portable computer terminal for a conference, to feed the questionnaire data in from the conference site, and to print out the tables there. The question is whether in a given case it proves desirable to do it this way rather than to take the questionnaires round to any computer bureau (commercial or institutional) and have the data entered there, processed, and printed out on a high-speed printer.
With regard to computer programmes, the statistical programme is a standard one which any bureau should possess, whether for batch or on-line operation The experiment needs to be repeated in a number of settings to establish a checklist of recommended procedures and guidelines. Hopefully conference centres and professional conference organizers will see this as a useful addition to the services they already offer, which are in some cases computer-based.

2 : Round flexibility and variety
Once the procedures have been improved, many more Rounds would be possible. These may be conceived in various ways :
- a « converging » series of iterations (as Beer envisaged)

INSERT 6 Round 2 Statement List/Questionnaire

1. *Don't design the future unless you can take the responsibility of living in it.* (...)
2. *Systems theory should be included in the secondary (possibly primary) school curriculum.* (...)
3. *Ideas are of secondary importance compared to the names one gives to them.* (...)
4. *Quality in social systems is not stability but a ceaseless, qualitative development towards something better.* (...)
5. *The political nature of systems practice needs to be critically examined.* (...)
6. *We know what would be good for the Society, if only we could achieve it.* (...)
7. *The Conference should include 'do-ers' as well as 'thinkers'.* (...)
8. *The objective of systems theory in society is to provide the tools for controlling society.* (...)
9. *We are 'thinkers', not 'doers'.* (...)
10. *Systems are in principle capable of being explained fully.* (...)
11. *Systems in Nature are fortuitous, not designed.* (...)
12. *Systems have objective existence.* (...)
13. *Systems are only personal constructs.* (...)
14. *Personal constructs are systems.* (...)
15. *Interpersonal constructs are systems, and should be researched as such.* (...)
16. *Study of continuous quantitative systems has priority.* (...)
17. *Study of qualitative nets has high priority.* (...)
18. *Study of stochastic systems and entropy has high priority.* (...)
19. *Descriptive study of actual functioning social systems has high priority.* (...)
20. *Don't design a blueprint for the future, but let us contribute to a vision of a future that will fulfil human potential.* (...)
21. *The fulfilments of the consensus views so far will require education, action, consideration, underpinned by consistent theorizing. The conference should these things.* (...)
22. *Our understanding and communication about systems work would benefit from maintaining a clear distinction between technical action (problem-solving, value-exclusive) and practical action (meaning – communicative, value-inclusive).* (...)
23. *General systems theorists dont' necessarily have to solve problems from without; they can instead illuminate them for the immanent solution-finding (evolutionary) powers of the system.* (...)
24. *The SGSR should stop examining itself and get on with examining systems.* (...)
25. *Beware the hubris of the illusion of control of living systems.* (...)

- single Rounds based on a particular set of statements (whether formulated by, through, or without, an 'editorial group') in the light of specialized concerns emerging during the conference
- an « introductory » Round, specially conceived prior to the conference, as a set of statements from the pattern of responses to which participants could then determine with whom they may or may not share concerns (a « warm up conversation piece » to supplement the public relations function of introductory receptions and cheaper).

3 : Larger conferences

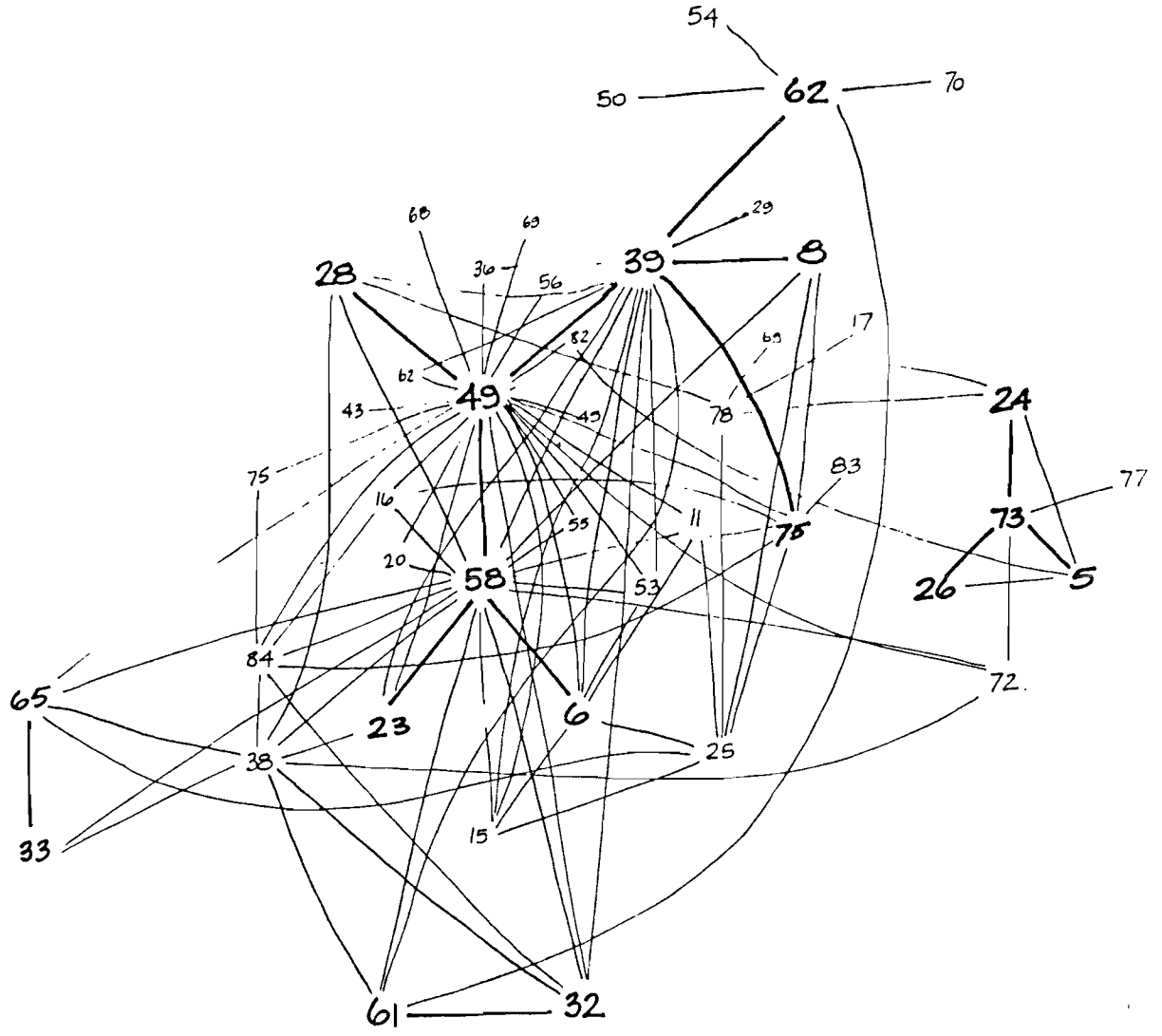
Whilst the possibilities of the previous point are interesting, it is important to be realistic about participant attitudes to questionnaires, and the data input and processing load in the case of large conferences. It may be less of a « drag » to participants if the statements are ordered in sets within the statement list, with the smaller sets preceding the longer sets. Participants could then be asked to give priority to the smaller sets and to stop as soon as they lost interest. Also they could be asked only to respond to the points with which they strongly agreed or disagreed, the remainder being treated as « uninteresting ». This could reduce the data input load, which would of course be important in conferences of over 100 people. There are of course constraints in using the standard statistical packages. These may limit the number of statements per Round or the number of participants. It is possible to get around this, somewhat unsatisfactorily, by splitting the Rounds. Another constraint may be the amount of computer memory or processing time required, depending on the computer.

4 : Edited tabular output

It would be helpful to have a specially designed interface programme to ease the task for those unfamiliar with statistical packages. This could also provide an appropriately edited tabular output. It would be convenient to produce summary « measures » for each individual in a table (especially in the light of the next point) and to facilitate comparison between data for succeeding Rounds.

5 : Social network characteristics

A number of indicators is available to express the position of a person (or a statement, for that matter) in a network, including centrality, range, intensity, and for the network as a whole, coherence. Special statistical packages are available to calculate these and they could be output in tabular form. (Information may be ob-



INSERT 7
Partiel network of people from Round2 (Thick lines : correlation ⩾ 0.75; thin lines : correlation ⩾ 0.6 ⩽ 0,74)

tained from : International Network for Social Network Analysis, c/o Professor Barry Wellman, Department of Sociology, University of Toronto, 563 Spadina Avenue, Toronto, Ontario M5S 1A1, Canada).

6 : Privacy considerations
Whilst participants may be very interested in how they individually are related to others in the pattern of responses, they may be somewhat reluctant that others should know their position within the pattern. This will depend on the conference and on the individual. The option of anonymity can be preserved by allowing the use of pseudonyms. Individuals can then choose to whom they reveal their identity in discussing the results. This ensures that « isolates » do not feel exposed. There are of course many interesting possibilities whereby participants may use multiple identities to express contrasting or « false » opinions in order to « distort » the dynamics. This is a characteristic of computer conferencing and has advantages as well as creating problems. Ethical problems may also be raised by the use to which the conference secretariat allows the data to be put.

7 : Correlation (connectedness) lists
In relation to point 4 (above), a simple computer programme could be designed to presen t a table of participant names in several columns, sorted as follows :
- col. 1 : name of participant (either sorted alphabetically, by number, or by decreasing average degree of correlation)
- col. 2 : names of participants with which the col. 1 name is correlated, sorted in order of decreasing correlation (possibly omitting insignificant correlations, although **negative** correlations may be especially interesting)
- col. 3 : names of participants with which each col. 2 name is correlated, sorted in order of decreasing correlation
- col. 4 : names of participants with which each col. 3 name is correlated, sorted in order of decreasing correlation.

Clearly column 4 would tend to have names on every line, whereas column 1 would tend to have only one name per computer page, for example. (The table would be many computer pages in length). The page would then be an interesting document to make available to the participant named in column 1. One such document could be sold to each such participant to cover the cost of this conference service. Other information could of course be included against each name in the light of point 5 (above), point 8 (below).

8 : Changes in correlations
Although the information is available by tedious visual comparison of the tables arising from each Round, it would be an advantage to be able to use a simple computer programme to compare the results of succeeding Rounds and to indicate the significant changes. Such could, for example, be indicated as extra information on the tabular listing described in the previous point.

INSERT 8
Round 2 statistics

	Average	Standard deviation
1	0.58	0.19
2	0.58	0.15
3	0.22	0.18
4	0.60	0.14
5	0.58	0.15
6	0.28	0.18
7	0.61	0.15
8	0.24	0.21
9	0.35	0.22
10	0.30	0.23
11	0.44	0.21
12	0.38	0.24
13	0.36	0.23
14	0.49	0.21
15	0.54	0.16
16	0.28	0.18
17	0.41	0.21
18	0.42	0.19
19	0.53	0.19
20	0.59	0.15
21	0.52	0.20
22	0.42	0.21
23	0.60	0.13
24	0.45	0.21
25	0.56	0.16

Future possibilities : mapping and tensegrity

1. Line-printer graphics
The major handicap in this whole approach lies in the problem of presenting the results in a manner which can be grasped by the uninitiated. The tables produced by the standard statistical packages are totally unsatisfactory as a medium through which to communicate with the average participant. Hand-drawing maps from those tables is a thankless, time-consuming task which is difficult to perform satisfactorily (even when a draft is produced). Unfortunately network maps cannot be satisfactorily generated on the conventional line-printer because of the difficulty of drawing lines at various angles. Before considering plotters (see point 3); it is worth investigating the possibility of using the advantages of the **high-speed** printer to generate the network **without** the lines. The main problem in network mapping is working out the best position to locate the nodes to which lines are to be connected. This is a neat problem which can be solved by computer. If the programme in question then simply lists out one computer page with the node numbers appropriately positioned, and follows it with a second page listing which numbers should be connected to which, the map drawing time is reduced ten-fold. The drawing process can be facilitated if the programme lists the approximate grid coordinates for each number indicated on the second page, and prints out that grid as a border to the first page. If the first digit of the correlation coefficient (+ or –), available to the programme for each number pair, is listed on the second page next to the pair then this can be used as a guide for the thickness (or colour) of the line to be draw manually between them.

2. Line-printer graphics (individually oriented)
The previous approach might prove satisfactory if only a few maps needed to be draw (as a task of the conference secretariat). It may however be more useful to produce « personalized » maps for each participant (e.g. in the case of a larger conference). In which case the programme should position node numbers around the specified node number (for the individual) centred in the middle of the page – one such page being produced for each participant, who could then be asked to cover the cost of this service. It would be up to the individual to connect up the nodes according to the instructions on the second page (as under point 1).
Obviously the same mapping programme could be used for node numbers signifiying statements rather than participants. (N.B. In order to facilitate comparison between maps arising from different Rounds, as discussed under Round 2 Comment 4, consideration should be given to printing the same pattern of numbers so that the numbers are not repositioned between Rounds).

3 : Graph plotters
It is quite incredible that it is the difficulties of network drawing which have held up the development of this whole approach and yet graph plotting devices have been available on the market for a number of years (and as a necessary device in the universities in which many conferences are held). The demand is not yet such that the portable plotters can be easily rented for short periods, but this could soon prove to be the case. It is quite feasible to think in terms of an on-line terminal-plus-plotter rented unit which could be used for the duration of a conference to draw out maps. This could tend to be a substitute for the single map compromise (see point 1), rather than the multi-map situation (see point 2), because of the slow speed at which such plotters work. Aside from the hardware problem, there is also the software problem of determining how the lines between two points should best be drawn. Packages to do this already exist.

4 : Ordered maps
The criterion for the construction of the maps in the points above is simply an « appropriate spread » to facilitate line drawing. The result, although highly desirable for lack of anything better, does not represent all that we might hope to achieve. The question is whether such maps can be organized according to additional criteria which would help to highlight significant patterns. In particular it might be asked why it is assumed that such maps are most satisfactory when they are « flat ». It is possible that greater significance might emerge if they were drawn as projections of a mapping onto some curved surface, or spherical approximation.

5 : Negative correlations and map cuvature

It is fairly obvious that a conference based on the pattern of **agreements** between people which ignores, or suppresses, any pattern of **disagreements** would be a rather insipid and uninteresting event. There are limits to the dynamics of mutual appreciation and to the number of people who can sustain it for any length of time. Conferences thrive on disagreements and responding to them is what much of conferencing is all about. It is therefore interesting that the spread of statements described above in Beer's experiment gave rise to **very little negative correlation.** Namely the participants tended to agree about their disagreement with certain statements.

The results seem to indicate an **insufficient pattern of basic disagreement.** And maybe this is what helps to make conferences so boring – disagreement is rarely expressed adequately. Those who disagree most violently tend not to attend, making the event into an exchange amongst those who basically agree on matters most important to them, and only disagree on matters of less importance to them. This contributes to the « flabbiness » of many conferences (a concept discussed elsewhere in relation to networks, see (4)). The challenge is to find ways of « tensing » conferences, or « tuning » up the conferences to a greater level of dynamism. It is possible that this could be achieved by seeking ways to balance the patterns of agreement and disagreement in new kinds of configurations (as has been argued elsewhere in relation to organizations, see (5,6).

The key to thinking about this is to consider « agreement » correlations **linking** nodes to be represented by strings (possibly of different thickness according to the strength of the correlation). Such a network of strings could be pushed into any shape without affecting its topology. But if the negative (« disagreement ») correlations are now represented by sticks **separating** nodes, the network can no longer be freely manipulated. There are constraints of course. If there were only disagreements (sticks) between people, it would be very difficult to modify the relationships between them – the conference would be blocked, or blown apart (as an « impossible » configuration of relationships determined by the sticks).

Fortunately there is a very interesting range of configurations in which the number of sticks and strings can be balanced. These are known as « tensegrities » (from tensional integrity) and are characterized by patterns of spherical symmetry (5,7). Briefly the strings form an approximation to a spherical network which is prevented from collapsing (like a net shopping bag) by the pattern of sticks which **separate** the nodes. Conversely, the pattern of sticks is prevented from disintegrating into an unconnected jumble by the network of **connecting** strings. The centre of the spherical configuration tends not to be crossed by sticks or strings in the more dynamically stable configurations. There seems to be no obvious reason why the configurations of agreement and disagreement in a conference should not give rise to equivalent balanced patterns. In which case we could expect to move beyond the kinds of maps indicated here (Inserts 4, 5, 7), in which the thicker lines of higher correlation « end » at the « edge » of the map.

6 : Towards engendering thematic tensegrities and geodesic conferences

We can now start to think how the above approach might be used to move beyond the idea of participating in a conference to discuss some predefined question or theme. How can we elaborate procedures which help to elucidate the **integrated** configuration of themes which are partially shared by a corresponding configuration of participants, in such a way that :

- the majority of participants perceive themselves each to be sufficiently « wellconnected » to a limited number of others
- the pattern of connections around each participant partially overlaps that around more distant other participants (i.e. minimizing total isolates, unless mutually acceptable as a stimulus – conference « roughage »), where distance effectively signifies **distinct** perspectives.
- the total pattern of connections is not **planar** with a periphery of outlying isolated participants, but rather it is an unbounded **curve** so that the pattern of connections is continuous in all directions (namely as on an approximately spherical surface).
- the pattern of positive correlation (local agreement) connections is counterblanced by a pattern of negative correlation (local disagreement) connections so that the maximum range of contrasting perspectives (variety) is deployed without tearing apart the pattern of agreement associated with the network as a whole.

This has the advantage of reflecting the widest possible spectrum of perspectives within the **consensual network** – without attempting simplistically to arrive at total consensus on **particular** issues (which would distort the network or rip it apart). Such an unbounded curved network does not have an « occupied centre ». The « centre » of the sphere is inaccessible to the surface network which defines it. It is this centre which is effectively the unstateable common reference point for the network – unstateable because no formulation from any particular local surface position would lead to « agreement around the whole surface ». It is the « emptiness » of the spherical network which effectively defines (or is an indication of) its utility to its participants and to the external world. It is a viable pattern which has defined itself in relation to other patterns in society (by having insideness and outsideness in Buchminster Fuller's terms, see (7)).

Areas of the surface of the sphere then indicate possible common interest groups (i.e. at a conference). But as the specified area is increased, the probability of the common interest group being « viable » decreases, because of the increasing disparity of interests thus « unbalanced » by the complementary part of the spherical network. In other words, once the « **horizon effect** » becomes signifiant, communication based on external referents, becomes a problem (because each area of the sphere is effectively exposed to a different data base).

The patterning of such thematic tensegrities could open up the possibility of **non-linear agendas** which could reflect more adequately the complexity of the social conditions which conferences attempt to encompass. This has been discussed elsewhere (8,9).

Moving away from « resolutions » based on unanimity or the « democratic majority » towards such variegated consensual outcomes is highly realistic, providing a stabilized (spherical) « platform » on which new forms of organized action can then be based. We can no longer depend upon **managing** action based on **agreement** (and the associated variety reduction), we have to find solutions to the more challenging problem of the **self-menagement** of (partially ordered) configurations of **disagreement** – and benefitting from the variety of perspectives thus encompassed.

« Resolutions » necessarily tend to give rise to simplistic hierarchical structures to implement them. By contrast, this approach delineates the pattern of the decentralized organizational network needed to operationalize the complex range of tasks reflected in the contrasting participant perspectives – whilst still maintaining its integrity.

Appropriate maps are required before we can start to explore the art of « maturing » the pattern arising from participant response to any particular set of statements. With such maps we can move beyond the dominant « flat earth » conceptuality into a more appropriate « spherical » mode (10).

Conclusions

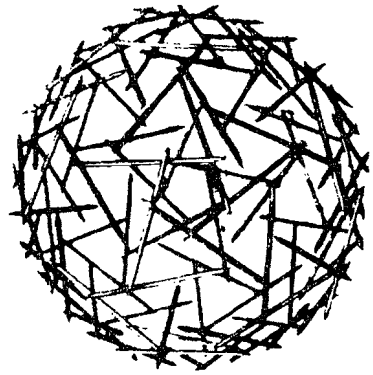
The experiment launched by Stafford Beer with the connivance of the outgoing President of the Society for General Systems Research, Richard Ericson, was a pioneering effort. Some of the results were of obvious interest to participants, but the experiment was judged a « failure » in that it did not significantly effect the conclusions of the conference or generate a breakthrough in response to its theme – as was the ambitious expectation.

The experiment was a « success » however in that it showed that appropriate resources could be assembled and that the various steps could be meaningfully carried out under real (non-laboratory) conditions in real-time by real people. It is possible to criticize the methodology particularly when compared to the sophisticated social network analysis techniques now available. But it is the fact that those responsible for the latter have never applied them to the reality of an international conference that makes Beer's experiment so

Thirty spokes share the wheel's hub;
It is the centre hole that makes it useful.
Cut doors and windows for a room;
It is the holes which make it useful.
Therefore profit comes from what is there :
Usefulness from what is not there.
– Lao-tzù. Tao Tê Ching.

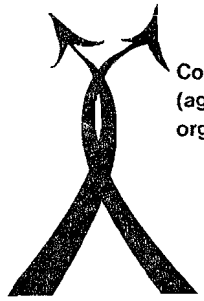
« Zero and the concept of emptiness, too, are comparatively late inventions (clearly because they too leave nothing to hold onto in explaining them). Even now we find it hard to conceive of emptiness as such : we only manage to think of it as the absence of something positive (*). Yet in many metaphysical systems, notably those of the East, emptiness and absence are regarded as more fundamental and ultimately more substantial than presence. This is also connected with the fact, now acknowledged by most biologists, that symmetry, being the natural condition of an unstressed situation, does not require explanation, but on the contrary it is asymmetry which needs to be explained. »
– Christopher Alexander. Notes on the Synthesis of Form. Harvard University Press. 1971, p. 197.

The wise man therefore... sees that on both sides of every argument there is both right and wrong He also sees that in the end they are reducible to the same thing, once they are related to the pivot of Tao. When the wise man grasps this pivot, he is the center of the circle, and there he stands while « Yes » and « No » pursue each other around the circumference ».
– The Way of Chuang Tzu, interpreted by Thomas Merton, Londen, Unwin, 1970.

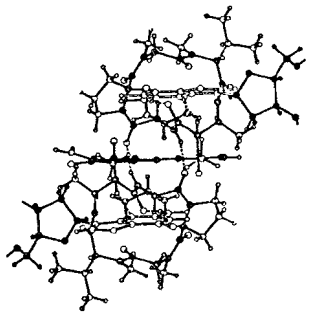


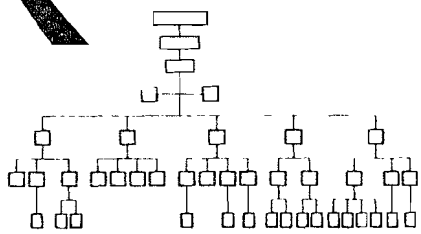
Tensegrity conferences

Conference networks (associative network of topics or informal network of people)



Conference hierarchies (agenda topic subdivision of formal organization of people)





Towards a new recipe for conferences : blending networks and hierarchies by weaving together patterns of agreement and disagreement around an « empty » centre (*)

significant by comparison. Like it or not, we depend upon conferences to improve the social condition. So we need to look for ways to improve them – considerably. Now that Beer has shown the way, it is fairly easy to see how the technique itself might be improved, although further experiment is of course desirable. The main barrier to further advance is in fact the trivial one of « tidying up » the relationship between the non-financial resources required and reducing the dependence on scarce skills.

As indicated in the various « future possibilities » (above), conference groups could themselves « experiment » in many interesting ways, moving – as outlined – towards the development of totally new viable structures. This would considerably increase the value of conferences for all concerned. We are not yet out of the sterile wilderness of present-day conferences, but at least we now have a worthwhile direction in which to move. ■

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8. *Interrelating viewpoints in complex meetings.* ***Transnational Associations,*** *30, 1978, 12, pp 542-548.*
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10. *The future of comprehension; conceptual birdcages and functional basket-weaving, (forthcoming).*

During the World Forum of Transnational Associations (Brussels, June 1980), these techniques were further developed using a computer to construct the « maps » of people relationships. This has been described, with further possibilities, in a paper titled : « Metaconferencing possibilities », which may be printed in a forthcoming isuue of *Transnational Associations.*

(*) The innovation in the 10th century whereby zero was incorporated as a symbol into the number system is considered one of the most important achievements of the human intellect. It eliminated the need for cumbersome systems (e.g. the Greek or Roman) which severely impeded logical manipulation of numbers. Is it possible that the next quantum leap in organizational innovation is concealed by widespread irrational abhorrence of any apparent « organizational vacuum » ? This might be the « zero » in the progression in organizational complexity. Does the « emptiness » of the tensegrity represent such a zero – the beginning of the linear progression 0, 1 2, 3... 9 or, in combination, the start of a new cycle from 10, 11... ? Perhaps current organization is trapped in an analogue to « Roman thinking » : I, II, I... VIII, IX... LXII

METACONFERENCING POSSIBILITIES *

1. Introduction

This document describes investigations subsequent to the article « Metaconferencing » (Transnational Associations, 1980, 8). In that article it was suggested that on-line terminal access to computer facilities from a conference site could open up an entirely new approach to the conference process. The first part of this document outlines, in the light of discussions with an international computer time-sharing service (CEGOS-TYMSHARE), specific possibilities which are described in more detail in the second part of the document. This also includes examples of results and the computer instructions used to obtain them during the course of the World Forum of Transnational Associations (Brussels, 1980).

2. Participant questionnaires

A series of questionnaires to participants based on selected **viewpoints,** is planned. The first is included here and is self-explanatory. It is received by the participants in their registration folders.

3. Data input from questionnaires

For the first round, the questionnaires are sent to CEGOS-TYMSHARE after the first morning session. The responses are typed into a computer storage file with the indication of participant name/pseudonym. The advantages of doing this off-line are speed and reduction in risk of errors. There is no limit to the number of participants or questions.

4. Conceptual distance separating participants or viewpoints

The data is processed using a standard **factor analysis** routine. There are practical limitations on the number of participant responses that this routine can reasonably handle. These are primarily cost limitations because of the non-linear increase in processing time required as the number increases. Thus for 100 participants answering 30 questions each the cost is of the order of 2.000,– Belgian Francs ($ 65.00) for 3.000 elements. This is the major cost factor.

5. Plot of graphical display (« map »)

Only a few instructions are required to get the terminal to print out a graphical display. Because of the complexity of the calculation, the results can only be considered a simplification in **two**-dimensions of a **many**-dimensional situation. However, compared with the conventional **one**-dimensional meeting agenda of a series of poorly related items, this is already a major step forward. There are a number of possibilities.

5.1. All participants

In this form all participant names (or pseudonyms) are printed out on an area of specified dimensions (Document 1). The names are positioned so as to reflect the « distance » between the participants in the light of the degree of difference between their responses.

5.2. All viewpoints

In this form the number of each statement in the « questionnaire » is printed out on an area of specified dimensions in a manner similar to that for the participant names. The identifying numbers are positioned so as to reflect the « distance » between the viewpoints as perceived by the participants.

5.3. Partial maps

There may be several reasons for producing portions of either of the above complete maps :

(a) Points on the display may be crowded on top of each other so that they cannot be distinguished.

(b) Paper width on the terminal maybe too narrow, such as to cause crowding as in (a).

(c) Detailed maps may be required, around a given participant or viewpoint, for example.

Partial maps are then produced, using an appropriate scale (These can be attached together with adhesive tape if desired).

6. Clusters of participants or viewpoints

As a possible alternative or complement to **factor analysis** (point 4 above), a different routine may be used to create categories.

6.1. Participants

In this case, the number of categories into which the participants are to be grouped is specified (e.g. 5). As a result the names are clustered into those (5) categories according to an assessment of the degree of difference between the participants in the light of this response to the viewpoints.

6.2. Viewpoints

An analogous procedure is adopted to that for participants. The clusters provide an indication of the relatedness between viewpoints as perceived by participants – namely how they would tend to group them for a given number of categories.

In both cases the computer in fact calculates which cluster a participant or viewpoint belongs to when the total number of categories is 1, 2, 3, 4, etc. The resulting list, for a given choice, is therefore a column selected from this table (which may be used for later calculations).

7. Proximity lists

On the basis of the factor analysis (point 4 above), lists may be established in relation to **individual** participants or viewpoints. With a few additional intructions, this may be done systematically for all of them.

7.1 Participants

For a given participant lists may be printed out of

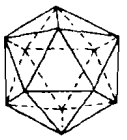
(a) Names of a **selected number** of other participants who are **closest** to him in terms of an absolute measure of distance between them defined by the difference between their viewpoints responses.

(b) Names of a **selected number** of other participants most **distant** from him.

(*) Prepared on the occasion of the World Forum of International/Transnational Associations, Brussels, 1980.
An introduction to this technique appeared in **Transnational Associations,** 1980, 10, p 411-420

	A	B	C	D	E	F	G	H	I	J	K	L
A	X											
B	±	X										
C	±	±	X									
D		±	±	X								
E	±	±			X							
F		±		±	±	X						
G	±				±		X					
H				±				X				
I			±	±				±	X			
J	±		±				±		±	X		
K							±	±	±	±	X	
L					±	±	±	±			±	X

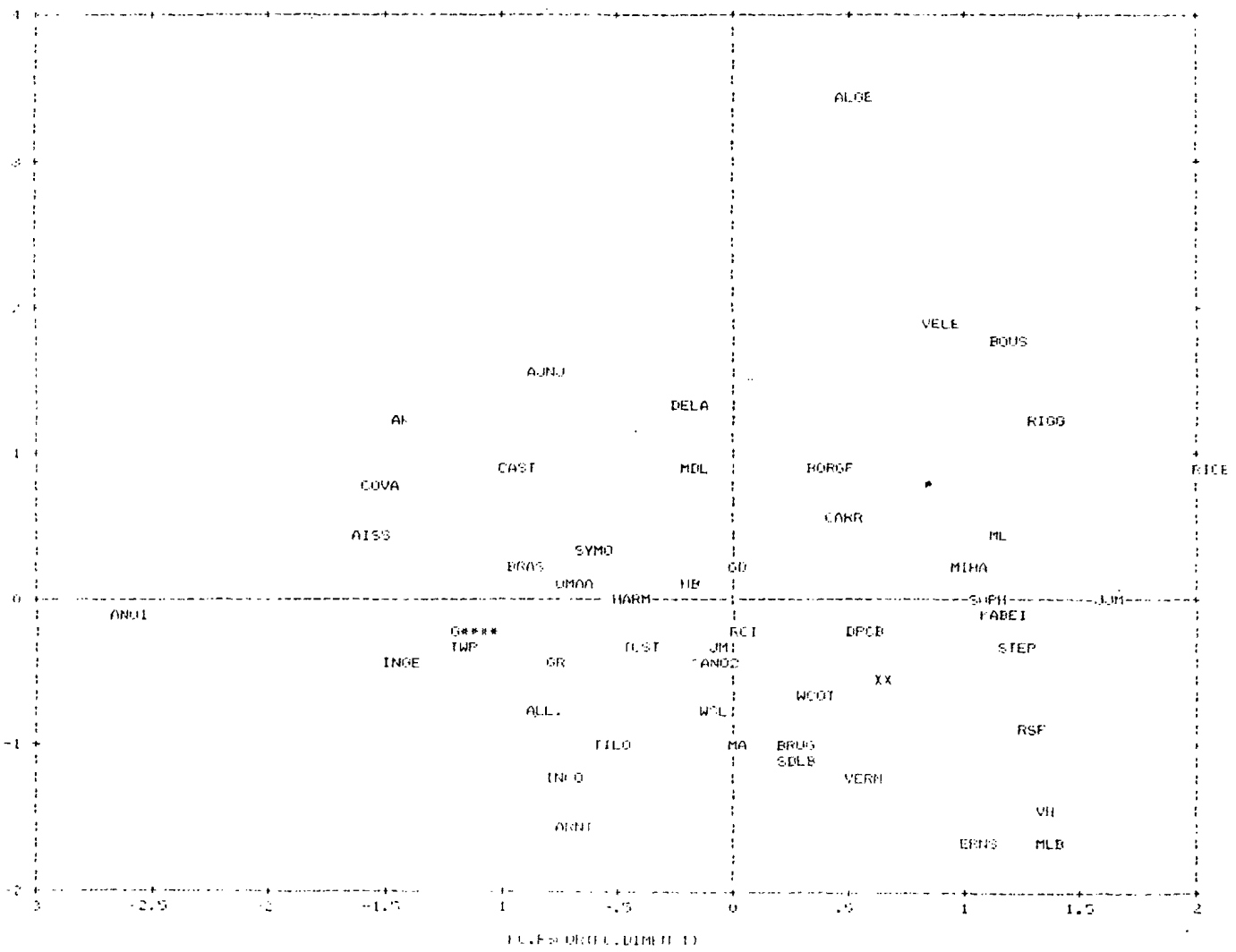
Fig. 6 : Icosahedron



PARTICIPANTS

Document 1 - Map of the « distances » between participants on the basis of a computer analysis of their responses to the first round of a questionnaire (the map represents one « slice » through the 3-D space wihtin which the results were represented).

TYMSHAREBELGIUM



Figures to aid reflection on computer problems of pattern recognition

Fig. 1

Participant respondents	1	2	3	4	5	6	7	8
A	+	−						
B	+	−	+	−				
C			+	−	+	−		
D					+	−	+	−
E	+	−					+	−
F								
G								
H								

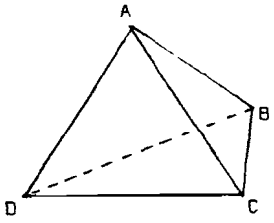
Viewpoints/ Questions

Fig. 2

	1/2	3/4	5/6	7/8	9/10	..	..	..
A/B	±							⋰
B/C		±					⋰	
C/D			±			⋰		
D/E				±	⋰			
E/F				⋰	±			
F/G			⋰			±		
G/H		⋰					±	
H/I	⋰							±

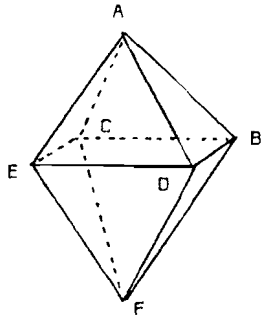
	A	B	C	D
A	X			
B	±	X		
C	±	±	X	
D	±	±	±	X

Fig. 3 : Tetrahedron



	A	B	C	D	E	F
A	X					
B	±	X				
C	±	±	X			
D	±	±	⋰	X		
E	±	⋰	±	±	X	
F	⋰	±	±	±	±	X

Fig. 4 : Octahedron



	A	B	C	D	E	F	G	H
A	X							
B	±	X						
C		±	X					
D			±	X				
E				±	X			
F	±				±	X		
G	±		±		±		X	
H		±		±		±		X

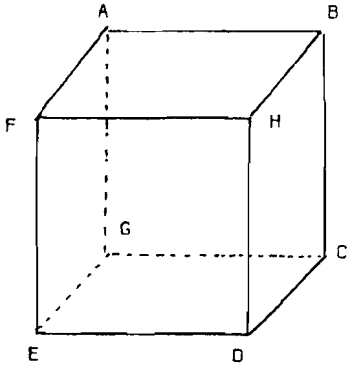


Fig. 5 : Cube

7.2. Viewpoints

Similarly for a given viewpoints, lists may be printed out of

(a) Viewpoints **closest** to the given viewpoint, as perceived by participants.

(b) Viewpoints most **distant** from a given viewpoint.

Note that because this is based on an absolute measure of distance it conveys more information than the plotted graph (map) of point 5 which is merely a projection.

8. Global measures of distance

8.1. Average for participants

The average distance between all participants may be computed from which lists may be established of

(a) Participants who are « closer » together than the average (« the central clique »).

(b) Participants who are more « isolated » than the average.

These lists may be refined by narrowing the parameters.

8.2. Average for viewpoints

A similar procedure may be adopted for viewpoints, namely the « core » and « isolated » viewpoints.

8.3. Standard deviation for participants

The standard deviation of the distance between participants may be computed as an indication of the level of disagreement between them.

8.4. Standard deviation for viewpoints

A similar procedure may be adopted for viewpoints as an indication of the level of « incompatibility » between them.

9. Detailed analysis of responses

Tables may be easily produced giving the responses by participant to viewpoint statements with an analysis of these.

10. Comparison between successive rounds

All the above can be based on responses to one questionnaire. If a second questionnaire is subsequently used the responses may be analyzed in the same way. It is however useful to examine ways in which participant opinions appear to have shifted from one round to the other. This may be done as follows :

10.1 Based on factor analysis results (distance)

The change in the distance between any two pairs of participants may be computed. Whilst this may be easily done for any given participant pair, time/cost constraints appear once this is done for all participants in cases when these exceed about 500-1000.

10.2 Based on cluster analysis results (groups)

Using the tables (see point 6 above), an analysis may be made of the change in the way each participant is grouped in the case of 1, 2, 3, 4, etc. categories.

11. Configuration possibilities

The results indicated above enable participants to get some impression of how the conference as a whole may be analysed. This **may** suggest actions which individuals could take individually or collectively. A further step may be envisaged, at least as an experiment. The question is whether it is possible to use the questionnaire information to recommend configurations of participants for dialogue or group discussion.

A first step in this direction is the indication of the participants who are closest to one another (as was described above). If however it is assumed that participants benefit more from discussion with those who are most dissimilar, this possibility was also described above.

A more useful refinement may be that participants would benefit most from discussing with others who represent a compromise between those two extremes namely :

- not too similar, and
- not too different.

This assumes that this would provide sufficient « common ground » and sufficient stimulating « differences of opinion ».

11.1. « Doubles »

The results may be used to indicate, for each participant, other participants for whom :

- roughly 50 % of the responses are very similar
- roughly 50 % of the responses are very different.

11.2. « Triples »

The analysis may be extended to cover groups of 3 people who have a similar overlap of shared and divergent opinions.

11.3. Groups

Clearly the analysis may also be extended to recommend the creation of groups with a balance of divergent and shared opinions. Note however that, especially for groups of more than 3, there are two possible approaches to this analysis :

(a) Same opinions strongly held by all group members. In this case it is only the strong differences of opinion between pairs of group members which vary from pair to pair.

(b) Both shared opinions and differences in opinion vary from pair to pair amongst the group members.

Groups of type (a) can lose a member without affecting the basic consensus linking all members together – although some members may thereby lose the stimulus of disagreement. Groups of type (b) are more fragile because each member is essential to the viability of the whole. Much greater diversity is possible in such groups.

11.4. Stabilized groups

The groups of type (b) above are derived from an essentially dualistic analysis of patterns of similarities and differences of opinion. By extending the analysis to locate somewhat more complex patterns, a new type of high diversity may be found which is not as vulnerable as the type (b) group. These are the tensegrity groups described in the previous metaconferencing paper.

The following remarks indicate a direction for exploration **only.** They require further refinement before making use of the computer analysis which can be easily adapted to them.

(a) A simple type (b) situation is illustrated in Fig. 1 (The matrix would be held by computer). The combination of two people, A and B, answering two questions, 1 and 2, such that they agree strongly (+) on 1 and disagree strongly (–) on 2, may be represented more compactly as in Fig. 2. Already it would be interesting to investigate groups of this kind. But the longer the « chain », the greater the probability that it would be unstable and unmeaningful to those in it. A second chain might however be present (dotted) to increase its integrity. And perhaps other patterning features could be present which could be detected by computer in order to recommend the creation of such a group within a larger conference (of questionnaire respondents).

The issue is whether it is possible to detect more interesting patterns which would signal the possibility of more interesting groups. The tensegrity structures all involve 3-dimensional patterns but it is not clear how these might be detected in a 2-dimensional matrix.

(b) Consider the simplest example of a **tetrahedral** pattern. This may be represented in Fig. 3 when the intersection of A and C for example means as in Fig. 2 that A/C are « bound » together by agreement (+) and disagreement (–) on one or more questions. (Such pairs could be easily selected out of the larger matrix of respondents). Note that all cells below the diagonal are filled – this is definitely a minimum condition.

(c) The next most complex form (in the Platonic series) is the **octahedron.** This is one of the two principal forms important for tensegrity patterns. This may be represented in Fig. 4. Note that there are now empty cells below the diagonal and that these form a line – namely a detectable pattern. Note also, however, that this line could equally well have been parallel to the diagonal if the points on the octahedron had been lettered in a different order. But it would still be a line. (The line derives from the missing links across the empty centre of the octahedron – the cells constituting it reflect the axes of symmetry of the form.)

(d) In Fig. 5, the matrix for another (of the 5 Platonic) forms is given, namely the **cube.** Note that the cube is **not** suitable as a basis for tensegrities since it is unstable unless the faces are triangulated. This instability may be said to be reflected in the proportion of unfilled cells in the matrix.

(e) In Fig. 6, the matrix for the other principal form (also Platonic) which is important for tensegrity pattents, namely the **icosahedron.** There is greater order in this matrix than is immediately evident and this can be brought out by (computer) reordering of the rows and columns. The disorder results from the arbitrary lettering of the form.

(f) There is a progressive increase in the proportion of unfilled cells from Fig. 3 to Fig. 6 (excluding Fig. 5). In fact by omitting one further intersection from each row/column of Fig. 6 the pattern of another form, the **cuboctahedron,** is obtained. This may also be used for a tensegrity.

(g) As a final example, showing how a basic form such as the octahedron gives rise to more complex patterns, consider the **2-frequency octahedron** in Fig. 7.

What these patterns seem to signify are the conditions of equilibrum for **minimal bonding requirement.** In other words they indicate the **most complex groups that can be created with minimal consensus.**

Returning to the questions represented in the matrices of Fig. 1 and 2, these could be conceived as forming a third dimension with the matrices of Figs. 3 to 7. This opens up interesting possibilities for analysis and pattern recognition, but much further reflection is required for designing computer routines to make use of it. (Further study may benefit from the Japanese discipline of « go », which is specifically concerned with the elegance of the evolving balance between opposing patterns).

Clearly in the first round of a metaconference the selection of questions may not distinguish sufficiently strongly between the participants. They may not give the opportunity for **strong** and **variegated** patterns of agreement/disagreement bonds between participants. A means is required to discover for later rounds, more fundamental questions which **polarize** the participants more strongly, but in a **variety** of ways.

A « highly tuned » conference would thus be one in which there was :

- profound polarization on many issues
- equivalent agreement on other issues
- an appropriately variegated pattern so that the network of agreement contained the polarization, and the polarization enriched the agreement (namely much more than a simple division into opposing camps).

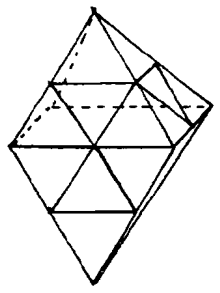
12. Conclusion

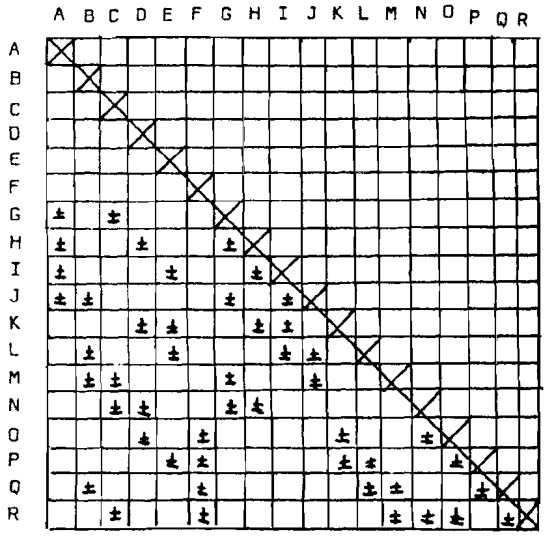
There are clearly many possibilities of which the value and constraints can only be determined in practice. But other opportunities will be required to push the analysis further as indicated in point 11.4 (above).

In response to the question « why produce such documents » one could imagine that the ideal conference centre of the future – modifying the motto of the oracle at Delphi – might bear the following phrase over its doors : « Conference : Know Thyself » Such documents contribute to that end.

The computer-assisted search either for questions which could move a conference into a highly-tuned condition, or for groups of participants which could function in such a condition, may appear time-consuming and not worth the effort. However, if the metaphor can be forgiven, it is rather like mining for gold. But it is worth the effort. Or, with a slightly different metaphor, it is a question of locating diamonds in dross, the most valuable being those of the largest number of carats. Such are the patterns which it seems could be discovered with a new approach to conferences.

Fig. 7 : 2-frequency Octahedron





INTERRELATING VIEWPOINTS IN COMPLEX MEETINGS

the Horus wall-display technique (*)

Summary
This note responds to the problem encountered in meetings of many kinds when a complex of interrelated issues is discussed by participants having very different standpoints and approaches. Usually each participant's contribution is received politely, but very little is achieved towards linking it to others presented, especially when the papers and presentations are lengthy and somewhat difficult to digest. No satisfactory integrating perspective exists (a) to guide the evolution of the meeting; (b) to help participants to see the points of agreement and disagreement in context, or (c) to show participants what they have achieved (or failed to achieve). The note outlines a proposed method for maintaining and developing, during the course of a meeting, a visual representation or overview of the basic substantive points which are determining the evolution of the meeting (**). The method is presented here in a way which permits one or more different methods of representation to be selected for use on a particular occasion, depending on need.

Type of meeting

The display envisaged should be useful for a wide variety of meetings
- in a small group meeting (possibly within the meeting room as a wall display or on a blackboard)
- in a small conference (possibly located in the foyer, if not in the plenary room)
- in a large conference (in the foyer).

In this description it is envisaged that the display could be used in :
- scientific meetings, in which « rational », « factual » presentations are made
- programme-oriented meetings, in which an attempt is being made to elaborate a programme of action
- other kinds of meetings, in which much greater emphasis may be placed on values, insights, people-participation, experiences, etc.

Limitations appear to be :

- if the meeting topics are perceived as well-ordered and treated as effectively separate (with no immediate interest or concern as to their interrelationship), then little purpose is served in trying to handle them all on one display. Separate displays could then be used for each topic, although in such cases there may be little desire or need to do so;
- if the presentations are by key resource people intending to inform participants, rather than to stimulate discussion and evoke immediate responses, there may be little motivation for preparing such a display or observing it. This would tend to apply in the case of many conventional meetings.

Use of the display is indicated when :

- part of the concern of the meeting is to interrelate complex issues, presented by people with very different viewpoints and approaches, to participants with differing viewpoints and sympathies;
- it is intended that interaction between participants should move the whole meeting towards a new level of understanding whose gradual emergence needs to be supportively represented;
- there is concern that discussion may drift from point to point, stimulated by each presentation, and that the challenge and opportunity of the compatibility and incompatibility between points will not result in any creative response leading to the emergence of a new level of significance or synthesis;
- part of the difficulty lies with finding a more meaningful method of ordering the predefined issues and relating them to those which emerge during discussion;
- participants are prepared to recognize the reality of the dynamics opposing or linking groups of participants advocating different viewpoints, especially when this is seen as a step towards appreciating their complementarity.

Distinguishing basic points (1)

A conventional presentation of whatever kind contains **basic points** and **associated comments.** The various kinds of basic point can usually be briefly formulated in one sentence statements. The associated comments tend to require many sentences or paragraphs. **The challenge is therefore to extract the basic points from a presentation and to display them in relation to those from other presentations or interventions.**

In Table 1 is given a structured list of the kinds of suggested **basic points** (or primary elements of inquiry or concern). The list of items included under each heading is **not** necessarily complete, nor are the items necessarily mutually exclusive (i.e. there may be overlaps). The headings themselves are merely the result of a first effort to distinguish between different types of basic points. An effort has been made to respect the kinds of points which emerge in « rational » discussion as well as those which emerge in other (or broader) kinds of interaction.

Clearly in a given case **it may only be useful to extract a few of these points,** or to regroup them into a small number of categories. Of course, other kinds of points could also be selected.

The **associated comments,** or secondary elements of inquiry and concern, include the following :
- historial background and its interpretation
- prior research
- current facts and data
- explanatory comment, discussion, argument

(*) Paper prepared for the workshop on new forms of presentation (Geneva, February 1979) of the Goals, Processes and Indicators of Development project of the United Nations University, Human and Social Development Programme.

(**) Horus: Holistic Overview and Representation of Underlying Structure.

- implications, elaborations, predictions
- discussion of alternative explanations or models
- definitions of terms, concepts, etc.
- formal deductive elaboration of theory, including derived propositions and hypotheses
- methodological considerations, operational statements
- advocacy, exhortations, anecdotes
- illustrative examples.

This proposal is not concerned with developing any new method of handling this type of information.

Relationships between basic points

Relationships are established or emerge between basic points either

(a) during the course of a conventional presentation,
(b) in the discussion stimulated by it, or
(c) as a result of group discussion initiated independently.

The challenge is to find a way of representing these relationships as a means of providing a contact within which the significance of any particular point can be seen in relation to the whole.

In Table 2 relationships have been grouped under headings. As with Table 1, the grouping is only tentative and the list of relationships under each heading is not necessarily complete.

It is surprising that research has not yet established a comprehensive typology of relationships, although partial typologies abound (2).

Clearly in a given case **it may only be useful to distinguish a few kinds of relationship,** regrouping them into a smaller number of categories (e.g. agreement, disagreement). Alternatively, others could be added reflecting different kinds of linkage.

Representing the basic points and relationships

The display envisaged would consist of a large wall-space, e.g. 2 metres by 3 metres, or more (3).

This could be:

- a conventional **blackboard,** in which case chalk markings would be used
- a **cork-board,** in which case the surface would be divided up by coloured thread or ribbon between pins, with wording on cards
- a **plastic surface** (whether hard or soft, roll-up, material), in which case marker pens would be used, possibly with wording on cards attached with tape
- a **metallic surface,** in which case the surface would be divided up by coloured thread or ribbon between magnetic markers (also used to attach cards).

Clearly any such surface can be divided into **areas** and **sub-areas.** Attachable **cards** can be used to carry various kinds of information (e.g. the statement of a

Table 1 – Types of basic point *(tentative)*

I – Issues:
Domain of inquiry or concern
- questions
- problems
- needs, requirements
- sources of anxiety
- constraints
- lacunae (domains of ignorance)
- irrelevancies
- language-determined domain (symbol system constraints)
- concrete, specific preoccupations

II – Initial intellectual position:
Basic statements about nature of domain of inquiry or concern
- principles
- assumptions (a priori)
- position statements

III – Preferred analytical approach (« Left brain »):
Basic statements about appropriate process of inquiry or approach
- generalization from events (induction)
- deduction (logical)
- philosophical
- empirical
- empirically based assumptions (« basic facts »)
- constraints

IV – Preferred contextual approach (« right brain »):
Basic statements about appropriate process of inquiry or approach
- dialogue, discussion, negotiation
- revelation (« attunement to reality »)
- devotion, prayer
- experiential (« truth thru learning »)
- self-criticism, introspection
- integrative
- consultation of authority (law, chief, oracle)
- altered states of consciousness
- aesthetic/dramatic participative portrayal
- action, demonstration (« talk is counterproductive »).

V – Explicable values and goals:
Statements of underlying purposes and preferred outcomes of inquiry and approach
- values
- goals, purposes, objectives.

VI – Pre-logical preferences:
Statements of temperamental preferences for acceptable end-states (e.g. with respect to the extreme positions of the following dimensions)
- order, system, structure
- static, changeless, eternal
- continuity, wholeness, unity
- identification with external reality
- clear, direct, sharp experience
- self-explanatory spatio-temporal world
- spontaneity, chance, accident
- disorder, fluidity, chaos
- dynamic, genetic process
- discreteness, plurality, diversity
- detachment from external reality
- subtle experience pregnant with meaning, nuances
- metaphysical frames of reference
- law-governed, definable processes

VII – Outcomes and conclusions:
Statements about the resolution of the inquiry or concern
- basic conclusions, answers
- conflicting conclusions
- inconclusion
- participant satisfaction
- participant dissatisfaction

Table 2 – Types of relationship between basic points *(tentative)*

A. Evaluative (positive):
Namely a positive evaluation of one basic point, which could be linked to another point in terms of which it is so evaluated
- valid, correct
- acceptable
- elegant.

B. Evaluative (negative):
Namely a negative evaluation of one basic point, which could be linked to another point in terms of which it is evaluated
- invalid, wrong
- illogical, self-contradictory
- inconclusive
- awkward
- abstruse, incomprehensible
- simplistic
- unacceptable
- inappropriate, alien.

C. Comparative (positive):
Namely a positive comparison between two basic points
- supports
- complementary
- compatibility
- agreement.

D. Comparative (negative):
Namely a negative comparison between two basic points
- contradictory
- inconsistent
- incompatible.

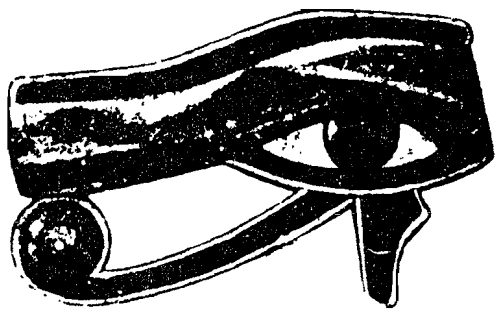
E. Comparative (logical):
Namely the standard logical relationships between two points
- identity
- included in
- included by
- overlaps.

F. Comparative (structural)
- isomorphism
- equivalence.

basic point) and may therefore be of different colour, shape or size. **Card pins** (or other forms of attachment) may be used to qualify information (e.g. evaluative comment, as in Table 2). **Thread/ribbon** (or marked lines) between cards may be used to denote various kinds of relationship according to colour or size. (A qualifying comment might be attached in the form of a small card, if necessary). **Lists** can be used to accumulate (e.g. on the outer perimeter of the display) information which would result in a clutter of unnecessary cards.
If desirable, cards may carry additional information like « originator of statement » (e.g. group, session, or participant **name** or **number**). Participant numbers could also be indicated on card pin heads, particularly for evaluative comments (see below).

Allocating significance to display possibilities

This description deliberately avoids stressing a particular display formula since it is much better for the organizing group to adapt the possibilities to the scope and preoccupations of their own particular meeting (and/or to adjust the display in the light of usage). However, as a guide to the process of selection, Table 3 is provided. This matches the basic points and relationships against the dis-



Horus *A god of ancient Egypt and the son of Osiris and Isis. Often represented by an eye such as the detail above from a gold pectoral from the tomb of Tutankhamon. Symbolizes the need for an unifying overview, for vigilance, and for unrelenting acuity in the maintenance of a just equilibrium between adversaries in order to ensure the triumph of the forces of light.*

Diagram 1 – Example of a useful display form

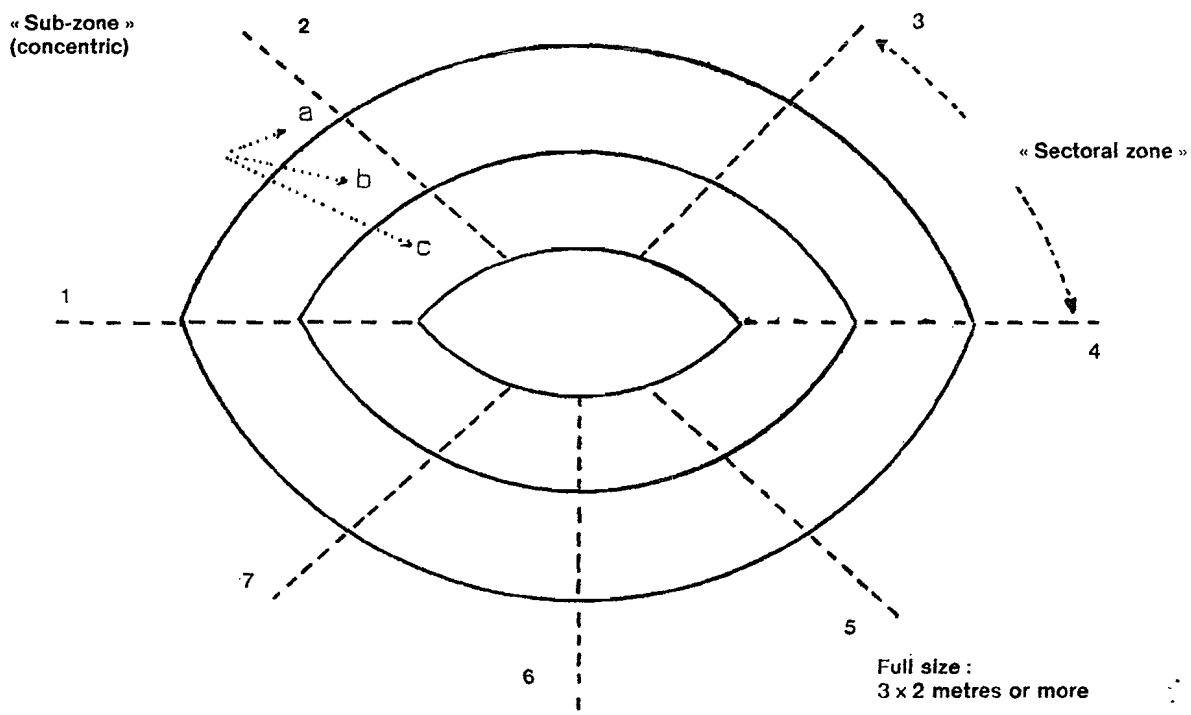


Table 3 - Display design : Matching wall-display options with meeting content

	Meeting content \ Display options		Area options: Ellipse/circle: a. concentric zones	Ellipse/circle: b. sectoral zones	Ellipse/circle: c. sectoral subzones	Rect./square: a. zones	Rect./square: b. subzones	Rect./square: c. sub-subzones	Other: sphere, cone, other	Cards: colour, shape, size	Lists: colour, position	Links: colour, width	Card pins: colour, size
	Predefined topics												
Basic Points (Table 1)	Emergent issues/ subtopics	I											
	Initial positions	II											
	Intellectual approach	III											
	Contextual approach	IV											
	Explicit values	V											
	Prelogical preferences	VI											
	Outcomes/ conclusions	VII											
	Other (Integrative)												
Relationships (Table 2)	Evaluation (positive)	A											
	Evaluation (negative)	B											
	Comparison (positive)	C											
	Comparison (negative)	D											
	Comparison (logical)	E											
	Comparison (structural)	F											

N.B. – Mark appropriate positions in this table to aid in design of display. Only a few categories need be used; they may also be grouped (see Table 4, for example).

play possibilities. It may be filled out in the light of particular requirements.

(N.B. – This table is **not** the display, but a guide to designing one).

As a guide to further reflection about the possibilities, one interesting distribution of areas is presented in Diagram 1. A circular form is convenient because it allows interrelationship between concentric and sectoral zones; in addition the centre can be highlighted as a point of focus or integration. The ellipse is slightly more practical in that it is easier to read cards (with typescript) pinned high up on such a wall-display rather than a circular one (4). In Table 4 two possibilities for using the areas in Diagram 1 are given. Table 4 is a simplified form of Table 3. The differences between the two formulae illustrate the flexibility of the technique.

Use in practice

There are of course a variety of ways in which the display could be used in practice. Although not necessary, it is probably desirable that the display be prepared before the meeting on the basis of background papers or ideas.

1. Changes to the display could be made after deliberation by a suitably motivated workgroup on the basis of the evolution of the meeting, and **group or faction consensus** on particular basic points.
2. Changes to the display could be made on request by participants to the person(s) responsible for it (and standing by it). Participants could formulate basic points directly onto cards, or have them typed. Relationships could be inserted at their request. A record of such requests could possibly be kept, particularly if the originators of each change are not identified (or if some are entered for other participants).
3. Changes could be made to the display by participants themselves with or without the guidance/assistance of a responsible person.

Clearly, the last approach makes the whole exercise much more participative, which may be highly desirable in certain meetings. On the other hand some thought should be given to protecting the display from casual or deliberate misuse. This is specially the case if use is made of the **evaluative option** (Table 2 : A or B as a vote). Some of the possibilities for this include :

1. Evaluative indications could be made via a special workgroup (Procedure 1, above).
2. Evaluative indications could be made by selected participants (e.g. those who have contributed to debates). The card pins could identify the participant by number. (This corresponds to Procedure 2, above). Alternatively, if many participants use this facility, their names could be transferred (if necessary) to a list on the edge of the display.
3. Such indications could be made by any motivated participants (Procedure 3, above).

It is with the last approach that difficulties may arise, depending on the nature of the group and the capacity for self-restraint (in the absence of filters and gatekeepers). On the other hand, the openness is a considerable stimulus to a new form of participation which combines some of the advantages of voting and wall messages (5).

An appropriate choice must be made by the organizing group and modified in the light of on-the-spot experiences. **It is important to note that a very simple form of the display may be used** by grouping categories to correspond with the visual tolerance of participants.

Table 4 : Examples of two formulae for the display form above (Diagram 1, p. 544)

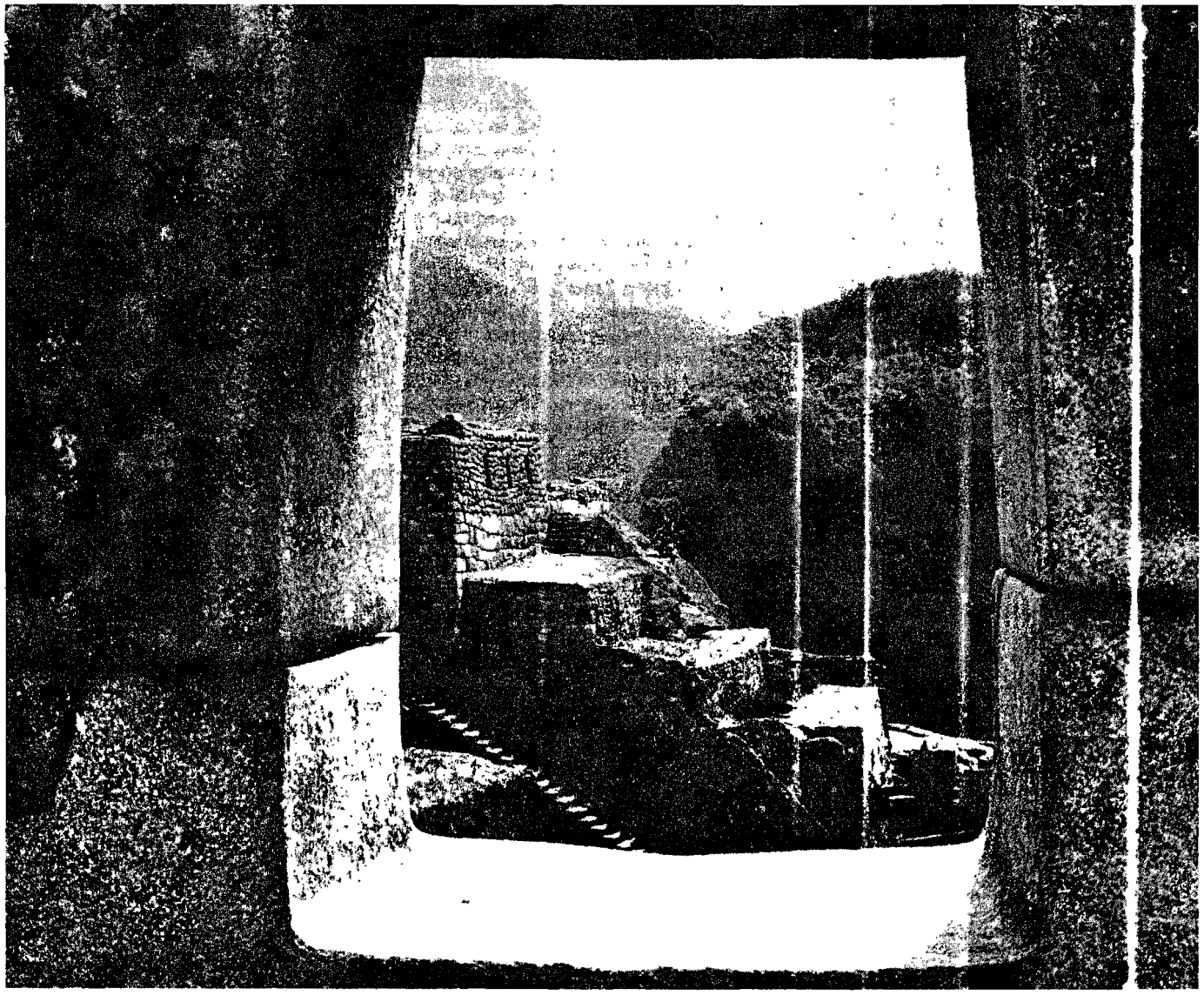
Meeting content / Design options	Predefined topics	Basic points	Relationships (agrement)	Relationships (disagreement)	Card location in sub-zones		
					Individual viewpoint	Subgroup viewpoint	Group viewpoint
FORMULA 1 Sectoral zones Concentric zones Card colours Ribbon colours	1-7	1-4	1	2	a	b	c
FORMULA II Sectoral zones Concentric zones Card colours Ribbon colours	1-5	1-7	1	2	List	a-b	c

N.B. - This is a simplified (and modified) version of Table 3 with options taken for the two cases. Switching the significance of the sectoral zones and card colours results in very different displays.

Further possibilities

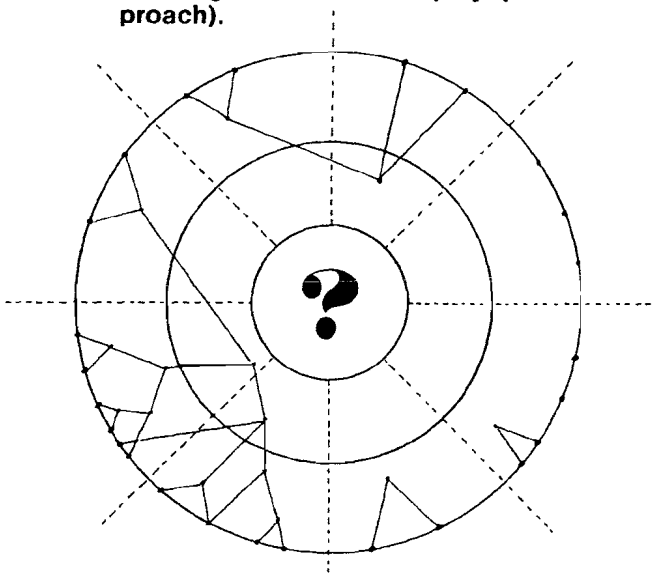
1. In certain circumstances it may be worth using parallel or subsidiary displays, particularly where it is necessary to handle questions **internal** to some issue area.
2. In some cases it may be useful to relate such **structural** displays to displays of **illustrative** images (photos, etc.). Cards referring to locations on the image display could be inserted on the structural display at appropriate locations (and vice versa). Similar cards could be used to refer to film showings.
3. It would be useful to prepare standard roll-up displays (e.g. on a plastic surface) on which are faintly preprinted in some detail a complete range of basic points and relationships. Points made in the meeting would then be superimposed where relevant (6).
4. Displays, especially when pre-printed, could give particular attention to time, from two completely different viewpoints:
   - the dates between which a particular basic point or relationship was advocated, to show historical development, where relevant (namely phylogenetic development)
   - the education/age levels between which a particular basic point or relationship is recognized, to show when new perspectives become appropriate (namely ontogenetic development).
5. If a display changes rapidly during a meeting, it can be periodically photographed as a visual record of the evolution of the meeting.
6. Special areas may be provided on the display:
   - for basic points commenting on the display itself (« this whole approach is manipulative... », etc.) by those alienated by such a technique
   - for integrating comments which set out to interlink the viewpoints emerging on the display (see below). In a circular display, this could be the central area, for example.
7. A circular or ellipse display may be used to emphasize any integration between perspectives. Positions closer to the centre may be used for more central points. Relationships of agreement (or compatibility) between such points may be used to « pull » them to positions closer to the centre, whereas those of disagreement may be used to « push » them out to the periphery. The pattern of agreement/disagreement (coloured ribbons) could provide a very graphic indication of the relative integration/fragmentation of the meeting (7). The development of this possibility could be very significant as a chart of meeting progress.

Photo: Unesco/E. Hersog.



8. The relationship to such meeting procedures as Syncom could be explored, since the display could provide a visual recrod of what is occuring within and between the Syncom sub-groups.
9. With the increasing interest in computer conferencing and conferences linked via satellite (8), there are two further possibilities:
   - displays may be maintained and used to provide a visual link between participant verbal contributions on particular points;
   - computer conferencing software may be designed to relate typed contributions to positions on such a display, ar possibly to generate update cards for insertion on maps at each terminal location.
10. The relationship of such a display to the computer-assisted production of participant group « mental models » could also be considered (9).
11. The relationship of such a display to the recording of the evolving relationships between factions or affinity groups (10) within a conference could also be considered. Such a display should facilitate such an evolution.
12. Especially when such a display is used in a small meeting room, there may be types of meeting in which participants can focus their comments in relation to the display (as with a blackboard). In the interplay between discussion and changes to the display, any evolution in the pattern of agreement/disagreement (11) can be visually supported to counteract tendencies to obscure integrative clarity when it has been achieved.

Diagram 2 – Convergent network display (an alternative approach).



Initial, starting or fundamental points are positioned on the circumference in the sectors (according to topic). Points citing them, based on them, or derived from them are positioned more and more towards the centre - as the meeting progresses (and if it generates new insights).

An alternative approach

A somewhat different approach that merits investigation may be envisaged in the light of network presentations such as for CPM (Critical Path Method), PERT (Program Evaluation and Review Technique) and in citation analysis. In CPM and PERT networks a single node is indicated as the start point from which the network develops, with a single node as the end point to which the network converges. However as illustrated by Diagram 2, if many independent start points are allowed, they can be positioned around the circumference of a circle by sector (e.g. according to topic, as discussed above). Points derived from (or subsequent to) others on the circumference are positioned towards the centre. Further development leads to convergence of the network as a whole on the centre from its circumferential origins. Unlike CPM and PERT, at any particular time the « end point » remains undefined and dependent upon further development of the encircling network (12).

The difference from the previous displays is clearly that new contributions which do **not** build on existing achievements are seen as (a) reinforcing those achievements, either usefully or unnecessarily, or (b) undermining them, as the case may be. Two contrasting possibilities, for example, are to use the circumferential points to represent specific factual details or, alternatively, abstract general standpoints. In the first case convergence on the centre can be used to record progressively more abstract points. In the second, convergence records emergence of more concrete practical viewpoints (e.g. a specific action programme).

The concentric rings can in each case be used to denote points at different levels of abstraction. If an effort is made to juxtaposition associated topics (represented by sectors), then citation links to points in distant sectors (i.e. across the centre) are less frequent. If a new approach is recognized, an extra sector could be added.

This is therefore a method of ordering information which makes it evident which points need to be considered in order to move on to a new level of significance or synthesis. Variations of it could be developed to focus group discussion or policy debates. ■

References:

(1) I am indebted to David Horton Smith for extensive discussion of the contents of this section and the following one. He should not be held responsible for their present inadequacies. A.J.

(2) Eric de Grolier. A study of General Categories. Paris, Unesco, 1963.

(3) In special cases it may be possible, or useful, to use a nonflat surface, such as a *cone* or a *sphere*, e.g. if it was desired to stress some integrative or wholistic concept. In the case of a *flat surface*, it may be an advantage to be able to raise and lower the display to permit adequate access to the whole surface, particularly to read cards. (e.g. some blackboard systems)

(4) Horus, the name suggested for this wall-display approach, is derived from: Holistic Overview and Representation of Underlying Structure. The eye, an ellipse, is a symbol of the Egyptian god Horus.

(5) Yona Friedman has advocated a form of this for conferences of the World Future Studies Federation. Another form is of course favoured in China.

(6) Since many of the basic points have been established in many meetings, such a display should be available anyway to focus discussion.

(7) The « eye » of Horus could appear very « bloodshot » as a consequence of the degree of disagreement in some meetings – if red ribbon is used!

(8) For example the World Symposium on Humanity (April 1979) is schedule to link, via satellite, meetings of 3,000 people in Los Angeles, Toronto and London. Both video and computer conferencing will be used.

See also: A J Judge. Knowledge-reprensentation in a computer-supported environment. International Classification, 4, 1977, 2, pp. 76-81.

(9) See: Peter and Trudy Johnson-Lenz. Conference facilitation by computer-aided sharing. *Transnational Associations*, 29, 1977, 10, pp. 440-445.

(10) See: Emergence of interactive processes in a self-reflective assembly. *Transnational Associations*, 30, 1978, 5, pp. 271-275.

(11) Although hopefully more subtle patterns will become acceptable, based on complementarity between a diversity of « incompatible » perspectives. The agreement/disagreement duality is crude in comparison.

(12) The diagram could also be seen as representing a ringed tube or tunnel, with new segments appearing in the center as one « advances » down it – the old segments passing out of the field of vision. In some cases it may be useful to envisage the tunnel as looping back on itself in a circle (or even forming the throat of a torus). The sectoral dividers could also be envisaged as spiralling towards the centre (as with a rifle bore).

NETWORKING ALTERNATION

*– an alternation network of 384 pathways of organizational transformation interpreted for networks in the light of the Chinese **Book of Changes***

Part I

Introduction

This exercise is concerned with change and with the development of better ways of responding to its possibilities in various forms of socially organized activity. The exercise has only been applied to networks but, as will be seen, it could just as well be applied to **groups, organizations, meetings** or intentional **communities,** in each of which very similar challenges are faced.

1. **Networks** Networks and networking have become extremely fashionable over the past decade, even within the intergovernmental community, as a means of circumventing weaknesses perceived in conventional styles of organization. But in practice networks themselves have failed to live up to the hopes placed in them, despite their positive image and the appearance of enthusiastic publications in support of that image (1,2).

An example of such unbridled optimism is the following: « Just as bureaucracy is less than the sum of its parts, a network is many times greater than the sum of its parts. This is a source of power never before tapped in history: multiple self-sufficient social movements linked for a whole array of goals whose accomplishment would transform every aspect of contemporary life... most people don't see them – or think they are conspiracies ». (2, p.236)

The kinds of criticism that can be made are that:

(a) in some cases « network » is merely used as a substitute for what previously functioned with limited effectiveness under the name of « club » or « group »;

(b) networking tends to function by filtering out conflict and opposition and thus is ill-equipped to interrelate a diversity of perspectives, many of which may involve fundamantal disagreements (sometimes manageable by hierarchies in an « objectionable » manner);

(c) the informal strengths of networks have been transformed into weakneses through rejection of any form of compensatory self-discipline; networks tend to become « flabby » and subject to a variety of « networking diseases ». (3)

(d) networks tend to function as temporary vehicles for enthusiasm and are frequently abandoned as soon as unpleasant realities have to be faced;

(e) the networking philosophy is often geared to that of « positive thinking » which negates the possibilitiy of criticism and especially self-criticism, thus hindering collective learning for the development of the network.

The question is then whether there are any clues to ways of « tensing » networks to correct such tendencies (4). **What can be done to prevent the energy from draining out of networks ?** One approach has been discussed under the heading of « tensegrity organization » as a hybrid « marriage » between networks and hierarchies (5).

A related approach is to assume that networks fail to contain problems because they are effectively out-manoevered by the dynamics of such problems. As in the martial arts, a network must swiftly re-order its conceptual and organizational resources to keep up with shape-shifting and hydra-like transformations of the problematique. **The network may need to alternate between several modes of action and conception in order to respond effectively** (6, 7). If this is the case **how can we come to recognize the pattern of transformation pathways of which the network needs to be aware ?**

2. **Groups and organizations:** Clearly groups and organizations also need to be aware of the transformational pathways they may have to use to be able to contain problems effectively. Like networks, which are anyway a more loosely ordered form of organization, they may need to alternate between several modes of action or conception.

3. **Meetings:** Conferences have been usefully perceived as temporary organizations. In many ways they also resemble networks. They too tend to fail to live up to the expectations placed in them, especially with respect to response to the world problematique. As with networks, the significance tends to leak out of them, leaving the problems unaffected. There is little collective awareness of the transfornational and organizational dynamics of the problematique (8).

4. **Intentional communities:** The past decades have seen many attempts to establish intentional communities. Many have broken up because of inability to order their dynamics satisfactorily. Such « alternative » communities combine many of the features of networks, groups, organizations and meetings. As such they are faced with many of the same difficulties.

Chinese insights

It is debateable whether Western-style organization has reached the limits of its ability to improve its « effectiveness ». Even if this is not the case, it is possible that new insights can be derived from non-Western approaches, as is indicated by the current Western concern with the art of Japanese management. These would have the merit of breaking out of the currently criticized constraints of « eurocentric » modes of thought (9, 10, 11) that have been largely responsible for networking as it is presently known.

For example, the above challenge can be usefully clarified by an exercise in adapting the insights of ***The Book of Changes,*** otherwise known as the ***I Ching*** (12). This has been a major influence on Chinese thinking for 3,000 years, providing a common source for both Confucian and Taoist philosphy. As noted by R G H Siu: « For centuries, the ***I Ching*** has served as a principal guide in China on how to govern a country, organize an enterprise, deal with people, conduct oneself under difficult conditions, and contemplate the future. It has been studied carefully by philosophers like Confucius and men of the world like Mao Tse-tung » (13). For this reason the popularity of its (ab)use as an oracle should not be confused with the philosophy and insight embodied in its structure.

With the benediction of C G Jung (12), it has achieved wide popularity in the West over the past decades, inspiring many who have attempted to develop the practice of networking. Part of the merit of the book, as its title indicates, is that it purports to indicate complete patterns of changes, one of which has 384 **pathways** between 64 **conditions** that are recognizable both in an individual and in society. These insights have hitherto been interpreted in terms of the needs of the individual (of whatever degree of influence in society). Although basically they are addressed to the condition of any social entity, they have not been applied to organizations as such. Thus even though R G H Siu, cited above as one of the commentators on the ***I Ching,*** has managerial interests in addition to his research role as a biochemist at the Massachusetts Institute of Technology (MIT), his commentary is addressed to the individual.

It is interesting to note that not only did MIT publish his commentary, it also published a study by Siu on the nature of « Ch'i » (14). This is the psychic energy that an individual can accumulate according to neo-taoist philosphy. It may also be useful to conceive of it as the kind of « en-

ergy » which leaks out of networks or meetings when they fail to enter appropriately into the dynamics of change and development.

Interpretative exercise

The structure of the ***I Ching*** is based on 64 **conditions** (dynamic situations, perspectives, challenges, phases, or modes of action or conception) with which an entity may be faced. The underlying scheme is based on sets of 2 or 8 more fundamental conditions. The series could be expanded geometrically to 128, 256, 512 or more conditions. But as Siu notes : « The originators of the ***I Ching*** judiciously stopped at the practical limit of sixty-four. This number constitutes a classification sufficiently fine so as to provide useful types of situations, against which specific cases can be matched. Yet the subdivisions are not so numerous as to be too cumbersome for a single scheme » (13, p. 3). For each of the 64 conditions there are six possible **sub-conditions** (behavioural responses) on which statements are also provided.

The text of ***The Book of Changes*** is often written in a notoriously subtle and poetic style. This in no way precludes an interpretation of its significance for organizations or, more specifically, for networks. Such an interpretation has therefore been undertaken as an exercise in the following pages (*). By making the interpretation specific to networks, there is clearly a loss of generality, but this is compensated by a reduction in ambiguity. Subsequent evaluation will show whether this constitutes an unfortunate degree of distortion of the original insights.

The interpretation given is as faithful to the texts of the Richard Wilhelm translation (12) as seemed feasible. Some of the condition names have been adapted from those suggested by Siu (13). Hopefully this exercise will encourage others to produce a more helpful interpretation.

No extraneous insights have been introduced. In elaborating each statement the basic constraint was that it should be **briefly** formulated with respect to a « network » and that any terms used should be credible in a networking context. It is debateable whether the texts should instead have been focussed on a « group » or « organization » or even a « conference »; although this might have made them of more general interest. A somewhat similar procedure has been used in an exercise in generating a « Universal Declaration of Rights of Human Organization » from the articles of the « Universal Declaration of Human Rights » (15).

The formulation of the statements here can be criticized because the orientation is not always consistent. In some cases they are formulated as injunctions as to what the network « should » do. In other cases they are formulated in terms of explanations as to the probable consequences of the network acting in a certain manner. Or else they are expressed in terms of what the network « could » or « might » do. The original texts place the burden of choosing between such interpretations on the reader.

It is important to recognize that the original text permits a complex of interpretations, encouraged by the nature of the Chinese language. For each condition the central meaning is underdefined, although clearly delimited by a complex of connotations based on terms that « alternate » subtly in meaning between emphasis on : abstract or concrete; operator or operand; noun or verb; action or actor; problem or opportunity. Any word can often be beneficially replaced by a synonym or an alternative grammatical form. Quite distinct conditions may acquire apparent similarity as a result of the specificity of the words finally chosen – a choice that amounts to a « frozen » distortion of the connotation dynamics by which the underlying meaning is embodied (see insert on « Resonance hybrids »). The (undeterministic) significance in fact emerges through alternation of attention between the possible (deterministic) interpretations – in sympathy with the theme of this paper (see also ref. 7).

An exercise of this kind is therefore rather like attempting to « tune » a « semantic piano » in order to distinguish meanings effectively, even though no one tuning system can satisfactorily bring out all the possible relationships between the connotations (*). Longer interpretations may offer greater clarity, as in those of Wilhelm (12) or Siu (13). Needless to say, as an exercise by one person, the results given here for networks call for further « tuning » and should therefore be viewed with reservation. Furthermore, it should be noted that the presentation given here does not do justice to the more sophisticated relationships embedded in the structure of the ***I Ching.***

Transformation pathways

It is the network of 384 transformation pathways between the 64 conditions into which an entity can supposedly get « trapped » that is perhaps the most interesting feature of this exercise.

In the following pages each of the 64 numbered conditions is briefly described, accompanied in each case by descriptions of 6 possible transformation pathways from that condition. These may also be understood as the possible « levels » of skill with which that condition can be faced. **The number following each transformation possibility indicates the new condition with which the network is then purportedly faced.** It should be emphasized however that these are merely the high probability transformation pathways. Another set of pathways given here is that of the actual sequence of the numbered conditions. The « acausal » reason for each such transformation is given in italics at the end of each condition on the basis of one of the classic commentaries on the sequence (12). Read separately, **the italic text constitutes an interesting acausal cycle,** with many links of immediately comprehensible relevance to current world conditions (e.g. progress-decline-community (35 to 37), adversity-basic need-revolution (47 to 49), or liberation-deficiency-aid (40 to 42).

If in a particular condition the network engages in lower probability multiple transformations the result is not apparent here, although ***The Book of Changes*** does employ a binary coding system from which this can be determined without ambiguity (*).

The range of possible transformation pathways encoded in this way is of great value in the light of contemporary efforts to grasp the nature of change in relation to human and social development.

Contrasting exercises

As a work of political philosophy, it is useful to contrast interpretations of the ***I Ching*** with an early Western equivalent, namely Machiavelli's ***The Prince*** (16). Both provide recommendations to rulers, but the ***I Ching*** also adapts its recommendations to the initiatives of the ruled. ***The Prince*** has been severely criticized (often inappropriately, given the instabilities of its historical context), because of the distinctly undemocratic values of the princes for whom it was designed. In contrast, built into the ***I Ching*** is the progressive discovery of « superior values », however these are to be understood by the user.

As with Machiavelli's advice, the networking precepts from the ***I Ching*** could prove as valuable to the « ill-intentioned » as to the « well-intentioned ». It would be interesting to compare the precepts given here with those in the network operations manuals of intelligence services and revolutionary groups, given their respective understanding of « superior values ». It is worth noting that another set of 394 Chinese precepts, in Sun Tzu's classic ***The Art of War,*** has received considerable attention in modern military academies (17). It is based on the principle that it is the supreme art of war to subdue the enemy without fighting. Contemporary students of organizational life have also benefited from an adaptation of Machiavelli's insights by Antony Jay to the management of corporations (18).

Organization sociologists do not appear to have had the ambition (or the presumption) to attempt such a transformation map. Although in 1958 March and Simon published a study, now a classic, tracing parts of what might have become such a map (19). This does not appear to have been followed up. Literature reviews have since resulted in the production of « inventories » of concepts for organization effectiveness, as in that of J L. Price (20)

(*) See page 149

(*) Valuable insights into the nature of this semantic problem, given the possibilities of alternative tuning systems, can be found in the works of E G McClain (31, 32). An earlier experiment focussed on « tuning » interrelated cross-cultural concept sets having from 2 to 20 statements each (33).

(*) Leibniz is reported to have been influenced in the 17th century by the binary code of the *I Ching*, which could therefore be said to have influenced the design of modern computers. The striking relationship to the genetic coding system has also been explored (34).

with 31 propositions, or more recently in that of D H and B L Smith with approximately 400 concrete suggestions, especially for voluntary associations (21).

Of special interest is the exercise of Edward de Bono who has produced an **Atlas of Management Thinking** (see insert). This identifies 200 functions or « complex situations » which bear a striking resemblance to those derived from the **I Ching.** The Western managerial sciences have given rise to many treatises on problem solving in organizations. One of the originators of systems science, Russel Ackoff, has condensed his understanding of the art of problem solving into 34 « fables » (22). Semi-humorous insights have also emerged in the form of numerous « laws » (Parson, Peter, etc), culminating in their synthesis in John Gall's 32 « axioms » in ***Systemantics*** (23). Another semi-humorous approach, inspired by the holds and positions in the martial arts, is that of Thierry Gaudin who has identified 21 institutional « katas » (24). It is appropriate to note that the control of « ch'i », mentioned earlier, is basic to the Eastern martial arts.

Western efforts to provide (world) systems models of the interrelationships between socio-political conditions fo societies (as opposed to socio-economic conditions) have been modest and of limited success (*), compared to the preferences for lengthy textual discourses of which Machiavelli's is an early form. It is therefore surprising to note that in the East a number of societies have produced religiously-inspired board games with squares denoting value-based psychosocial conditions, linked by a variety of transformation pathways, in a manner similar to systems flow charts. Precepts (possibly embodied in chants) are associated with the definition of each condition and the developmental challenge it constitutes. Examples are : a Tibetan game (72 conditions) with a Bhutanese version (64 + 13 conditions) and a Nepalese version (25); a Korean game (169 conditions) and a Hindu equivalent (72 conditions), supposedly the prototype of Western « snakes and ladders » (26). It has been argued that the similarity between such games provides « the most perfect existing evidence of the underlying foundation of mythic concepts upon which so much of the fabric of our culture is built » (27).

Directly relevant to networking itself is the effort of Network Research (Denver) to produce a basic set of 5 rules of ***The Networking Game*** (28). These reflect the practical recommendations which have emerged from Western insights into the art of at least one form of networking. Academic work on social networks tends to be concerned with descriptive analysis rather than with any attempt to empower such networks to act more effectively. Intergovernmental bodies, such as the United Nations University, with a declared commitment to a network mode of action, have not yet elaborated any such set of guidelines.

Alternation

The vital point that emerges from this Chinese perspective is that it is not sufficient to conceive of organizational conditions in isolation, as is the prevalent tendency among Western networkers. The processes of change in which a network is embedded, or to which it responds, require that the network consider itself in a state of transience within a set of potential conditions. It courts disaster if it attempts to « stick » to one condition such as « peace ». If the dynamics of problem networks are not being contained by present strategies, as would appear to be the case, then organizational self-satisfaction is a recipe for the disaster-prone or the ineffectual. It creates a false sense of security. **Any condition may be right temporarily, none is right permanently (*).**

A network must continually « alternate » its stance within the network of transformation pathways in order to « keep on the ball » and « keep its act together ». As with a surfer, a wind sailor, or a sailor on a rocking boat, if it fails to change its stance it will be destabilized, according to the **I Ching,** by one of 64 changing conditions through which it is forced to move in a turbulent environment.

The developmental goal can then be conceived as somehow lying « through » the exit of this labyrinth of traps for the unwary. More satisfactorily, it is perhaps « in » the art of moving through these conditions as progressively clarifying the locus of a common point of reference undefined by any of them (cf, the Sanskrit phrase « Neti Neti », roughly translated as « not this, not that »). It is this art which is extolled in describing the use of the ***I Ching*** or of Eastern board games (13, 26). A similar notion has recently emerged from theoretical physics through the work of David Bohm (30). He stresses the nature of an underlying « holomovement » from which particularities are successively « unfolded » by our attention, only to be « re-enfolded » once again. The significance is more readily apparent in the case of « resonance hybrids » (see insert).

The problem for a network, an organization, an intentional community, a meeting, or even an individual, is then **how to « network the alternation pathways together »** and **how to « alternate through a transformational network ».** Hence the ambiguous title of this paper : « networking alternation ». Given that understanding of alternation seems only to be well-developed at the instinctual or sub-conscious level (e.g. walking, breathing, sex, dancing), the nature of alternation processes is explored in a separate paper on « alternation metaphors » (forthcoming). Extending the earlier metaphor of the

(*) For a recent general review, see J M Richardson jr (35), reporting in a special issue on « Models – tools for shaping reality, as well as reference 36.

(*) The situation is somewhat analogous to many team ball games where if a player tries to retain the ball it will be taken from him by the opposing side, or else the team is penalized. Furthermore networks opposing the « team » of world problems find themselves like novices having to deal with an opponent which handles the ball with a dynamism such as that of the Haarlem Globetrotters or a shell-game con-artist. The focus shifts continually and is often where it is least to be expected in order to take advantage of weaknesses.

Atlas of Management Thinking (29)

Edward de Bono, founder of the Centre for the Study of Thinking and director of the world's largest curriculum programme for direct teaching of thinking in schools, is renowned for his promotion of « lateral thinking », especially in management situations. He has recently produced an atlas « written specifically for the right side of the brain – the intuitive side ». For him an « atlas is a visual reference system, and although thinking is an abstract subject I believe we can create perceptual maps for its use ».

The problem is that we do not have adequate right-brain images for complex management situations. Hence the tendency to try to treat them through fragmented verbal descriptions lodged in the left brain. What de Bono does is to provide 200 images, each describing one such situation (e.g. confrontation, self-created problems, tolerance, etc). Each image is accompanied by a verbal commentary.

He suggests that the atlas references provide a shorthand notation for such complex situations, enabling people to be much more direct in labelling perceived opportunities and traps. « The clarity with which we see a situation is the basis for any subsequent decision or action ». Such thinking is very different from much of that of the academic or scientific world.

De Bono has coined the term « operacy » (to be contrasted with numeracy and literacy) as the much neglected skill of getting things done, solving problems, discovering opportunities, conceiving ventures, and organizing projects. « It is the more successful organizations that sense the need to develop further thinking skills because they attribute their success to their thinking. The less successful ones see no need because they blame their failure on circumstances ».

The **I Ching** may also be considered as an atlas of right-brain perceptions of complex situations for which an appropriate notation has been developed. Although it has the special merit of using a right-brain context to order the relationships between such situations. Like de Bono's atlas it also makes deliberate use of combinations of memorable « images » to « create a visual meta-language for situations ». The resemblances call for further study.

« semantic piano » however, the challenge for networks is then not simply to try to activate people by monotonous playing of single notes (e.g. « peace », « liberation », « development »), as presently tends to be the case. It is rather to acquire a perspective enabling them to collaborate in improvising exciting, rippling tunes with such notes (each of which is an ***I Ching*** condition) in order to bring out all the musical possibilities of alternation as explored in harmony, counterpoint, discord and rhythm (37).

In this sense **the true potential of networking lies in the transformational possibilities of « playing »** on such instruments. Such an approach could perhaps provide the « requisite variety » by which the world problematique may be tamed, without breaking the spirit it embodies.

A related challenge is then how to represent or map these transformation pathways in a memorable manner so that the range of possibilities becomes clear. In the ***Book of Changes*** a mnemonic system for the 64 conditions is given on the basis of 8 natural features of which people have both an instinctive and a poetic understanding (*). This contributes significantly to dissemination of understanding about relationships between such conditions in contrast to the restriction of interest in such matters in the West to scientific elites. The Eastern board games mentioned above are deliberately used for educational purposes, whereas very few in the West have access to the computer simulation exercises with an equivalent orientation.

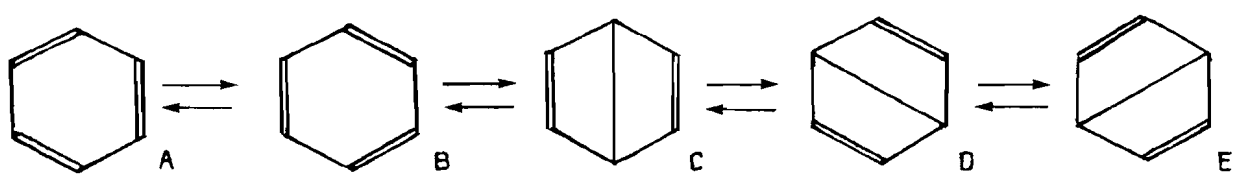
In the final part of this paper some possibilities for producing an adequate general map of the transformation pathways are discussed.

(*) The features include : mountain, lake, wind, thunder, light, ravine, earth and sky. Note the arguments in fevour of some such topographically based mnemonic system given in an earlier paper : « The territory construed as a map » (38).

Resonance hybrids : an illustration of alternation

Some chemical molecules cannot be satisfactorily described by a single configuration of bonded atoms. The theory of resonance is concerned with the representation of such molecules by **a dynamic combination of several alternative structures, rather than by any one of them alone.** The molecule is then conceived as « resonating » among the several conceivable/describable structures and is said to be a « resonance hybrid » of them. The classic example is the benzene molecule with 6 carbon atoms. This is one of the basic components of many larger molecules essential to life. Its cyclic form only became credible when Kekulé showed that it oscillated between structures A and B. Linus Pauling later showed that it in fact **alternates between all five forms below** (and as such requires less energy than for any one of them).

This concept could be used in designing/describing/operating organizations, especially fragile coalitions. It may be the key to the « marriage » between networks and hierarchies in tensegrity organizations (5). It could also be used to interrelate alternative definitions (or theories, paradigms, policies, etc.), where none of them is completely satisfactory taken in static isolation. The « undefinable » significance then emerges through the alternation process. The conditions of the **Book of Changes** can be conceived as constituting a resonance hybrid, whether collectively or individually.



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NETWORKING ALTERNATION

*– an alternation network of 384 pathways of organizational transformation interpreted for networks in the light of the Chinese **Book of Changes***

Part II

Challenge of representation

The first part of this paper called attention to the advantages of perceiving change in terms of a network of transformation pathways between 64 conditions of organization derived from the Chinese **Book of Changes** or **I Ching.** The challenge for any organization is then to learn how to « alternate » through such a network rather than get trapped in any particular condition. To facilitate the response to this challenge, ways must be found to map this set of transformation pathways so that it becomes comprehensible as a whole that can be consciously negotiated. This part of the paper discusses some mapping possibilities.

Elaboration of a circular sequence

Helmut Wilhelm reports (39) that in the Sung period (960-1127) of Confucianism the scholar Shao Yung produced a tabular representation of the **I Ching** elements. This « table » was also represented as a circle which he reproduces (*).

In this traditional representation the transformation pathways are implicit except for the circular sequence itself. It is however possible to render them explicit by simple adding them to the representation. One way of doing this results in a diagram such as Figure 1. The only lines added are for the six « high probability » transformation pathways associated with the six sub-conditions of each of the 64 conditions, as described in the text accompanying this paper (**).

Before commenting further on Figure 1 some basic points must be made about the traditional circular sequence. It is made up of 64 distinct « hexagrams ». The hexagram is the traditional Chinese way of representing a change condition by a binary code of 6 broken or unbroken lines (which can be considered identical to the binary bit-code used in modern computers). But there are at least two fundamental points about any such code, as pointed out in the case of computers by Xavier Sallantin (40) :

- there must be agreement as to what represents « broken » (or « on »), as opposed to « unbroken » (or « off »), or else the code may be mis-read as its own « negative »;
- there must be agreement as to how the hexagram (or computer bit sequence) should be read, whether up-to-down (or right-to-left) or down-to-up (or left-to-right), or else the code may be mis-read in an « inverted » form. The traditional circular sequence does not distinguish between these two possibilities.

The second point as applied to Figure 1 means that in relating the 64 condition names to their traditional hexagram representations a decision has to be taken as to the direction in which a hexagram is to be read. In Figure 1 the decision has been made to read the hexagrams with the « top » of each towards the centre and the numbered conditions have been allocated accordingly. This means that there is an alternative interpretation, Figure 2, in which the bottom of each is towards the centre. Note that the order of the numbered conditions is then quite different. The pattern of transformation pathways remains the same, although the sub-conditions to which they relate are now different. The 3 transformation pathways for each hexagram that were originally indicated inside the circle in Figure 1 are indicated by the lines outside the circle in Figure 2.

Interpretation problems

The diagrams give rise to three problems :

a) Either Figure 1 or Figure 2 can thus be considered as a very compact map of the 384 high probability transformation pathways. But the existence of two different and seemingly conflicting maps is obviously cause for reflection.
b) Also of concern is their non-evident relation to the numbered sequence of conditions, which itself constitutes a single transformation cycle. This lack of relationship is especially evident when lines are traced between the conditions in that traditional sequence, as in the case of Figure 3 (using the Figure 1 order) or Figure 4 (using the Figure 2 order).
c) In addition, other than the striking elegance of the pattern, it is not obvious why either the order of Figure 1 or 2 should be the basis for an appropriate map.

With regard to the first problem, the existence of two interpretations can be explained as due to the manner in which the **I Ching** perspective is grounded on **alternation between perspectives** rather than being tied arbitrarily to one perspective. If two interpretations are possible there is necessarily an alternation between them according to the Chinese perspective. What then could the alternation between such contrasting interpretations signify ? From the significance traditionally attached to the top and bottom of the **I Ching** hexagrams, it could be argued that in the case of organizations the two contrasting interpretations could relate to an inward global worldview alternating with an outward local worldview. The top-in perspective (Figure 1) would then correspond to a map of consciously interrelated contrasting perspectives on the wholeness in which they are embedded, signalled to some extent by the process whereby leaders of a group « put their heads together » and « share their views ». The « enemy » is recognized as being within the group (« he is us »). The alternative top-out perspective would then correspond to a map of unexplicated solidarity in response to the challenges of the immediately perceived external environment, signalled to some extent by the process whereby group members « stand back-to-back » to face an external « enemy » as he manifests differently to each. To survive the group must to some extent alternate between these contextual and particular worldviews, rather as an individual alternates between right and left-brain perspectives (***).

With regard to the second problem, using Figure 3 or 4, inspection will show that the continuing alternation between « global inwardness » and « local outwardness » forces every second hexagram in the numbered sequence into its opposite form (e.g. 3 in Figure 1 becomes 4 in Figure 2; 5 becomes 6; etc) and back again. Only the hexagrams 1, 2, 27, 28, 29, 30, 61 and 62 are not « driven » through the numbered sequence by this alternation process (which here acts in a manner reminiscent of the effects of current alternation in the coil windings of an electric

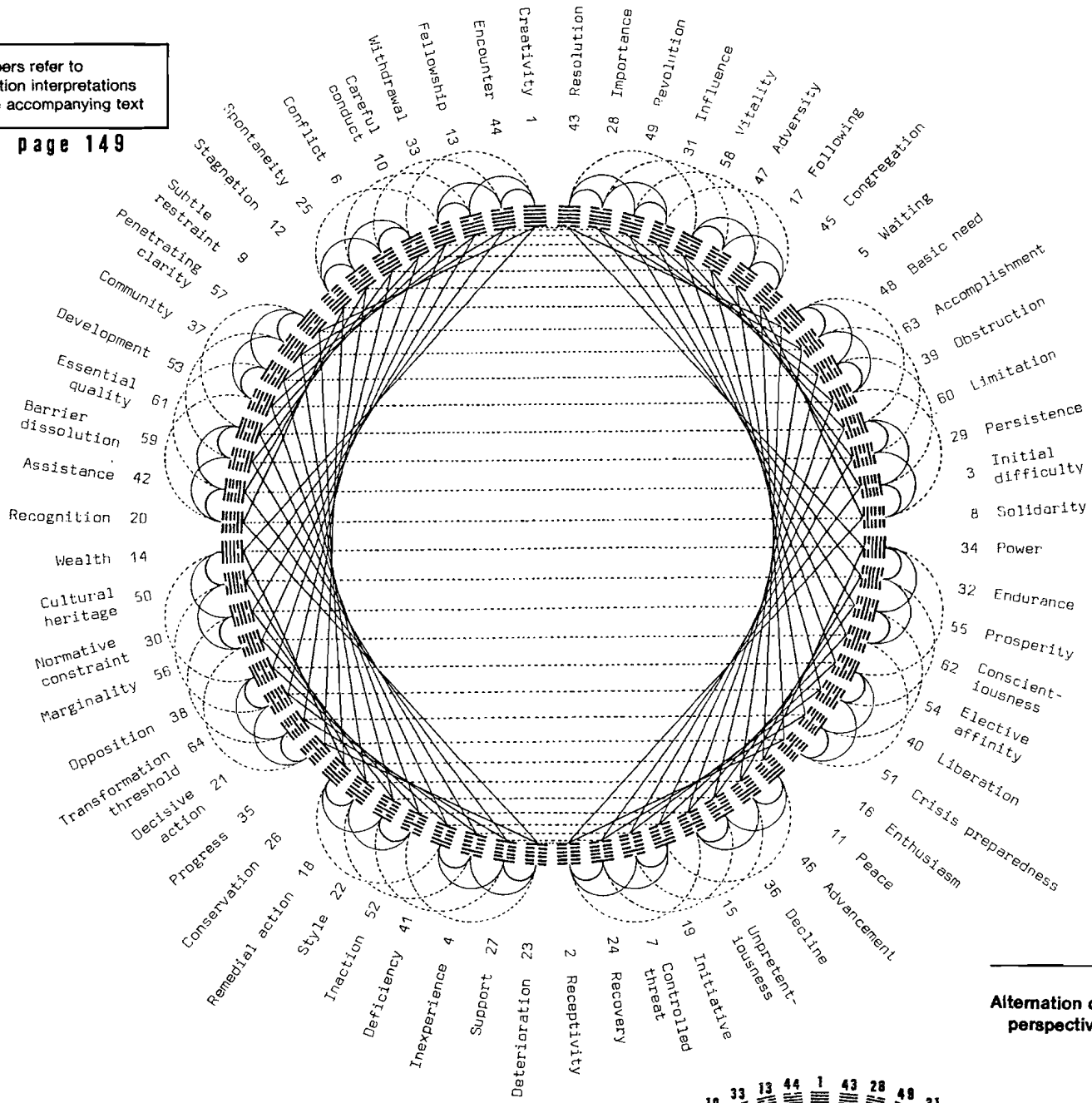
(*) It was Shao Yung's scheme which so excited Leibniz in the course of his reflections on the binary system (41).

(**) See page 149

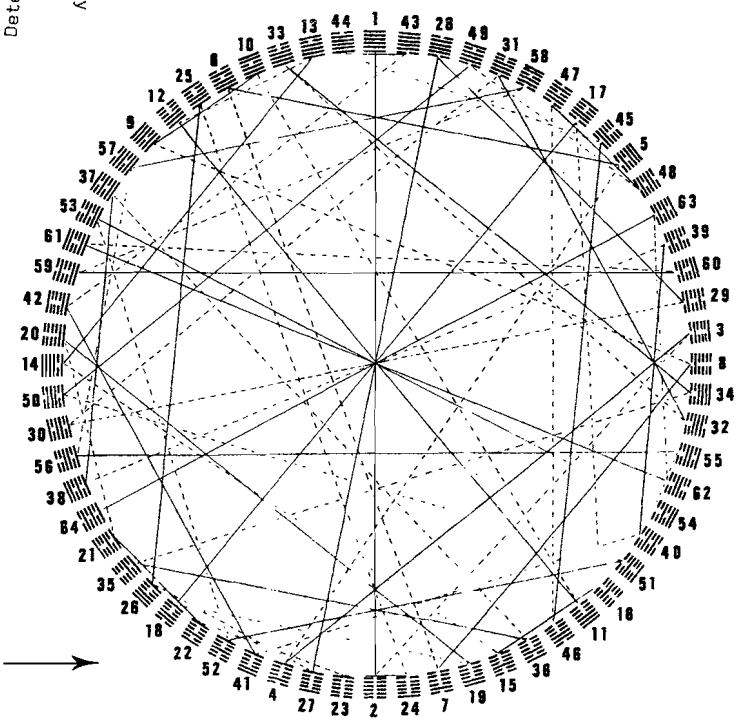
(***) Lama Govinda notes that hexagrams are traditionnally read from bottom-to-top to represent the sub-conditions of individual life, in contrast to the top-to-bottom direction for more fundamental or universal transformations (42, p. 136).

Numbers refer to condition interpretations in the accompanying text

See page 149



Alternation of perspective



Transformations (curves)		Transformations (straight lines)	
(- - -)	3rd sub-condition	(- - -)	6th sub-condition
(long)	2nd sub-condition	(long)	5th sub-condition
(short)	1st sub-condition	(short)	4th sub-condition

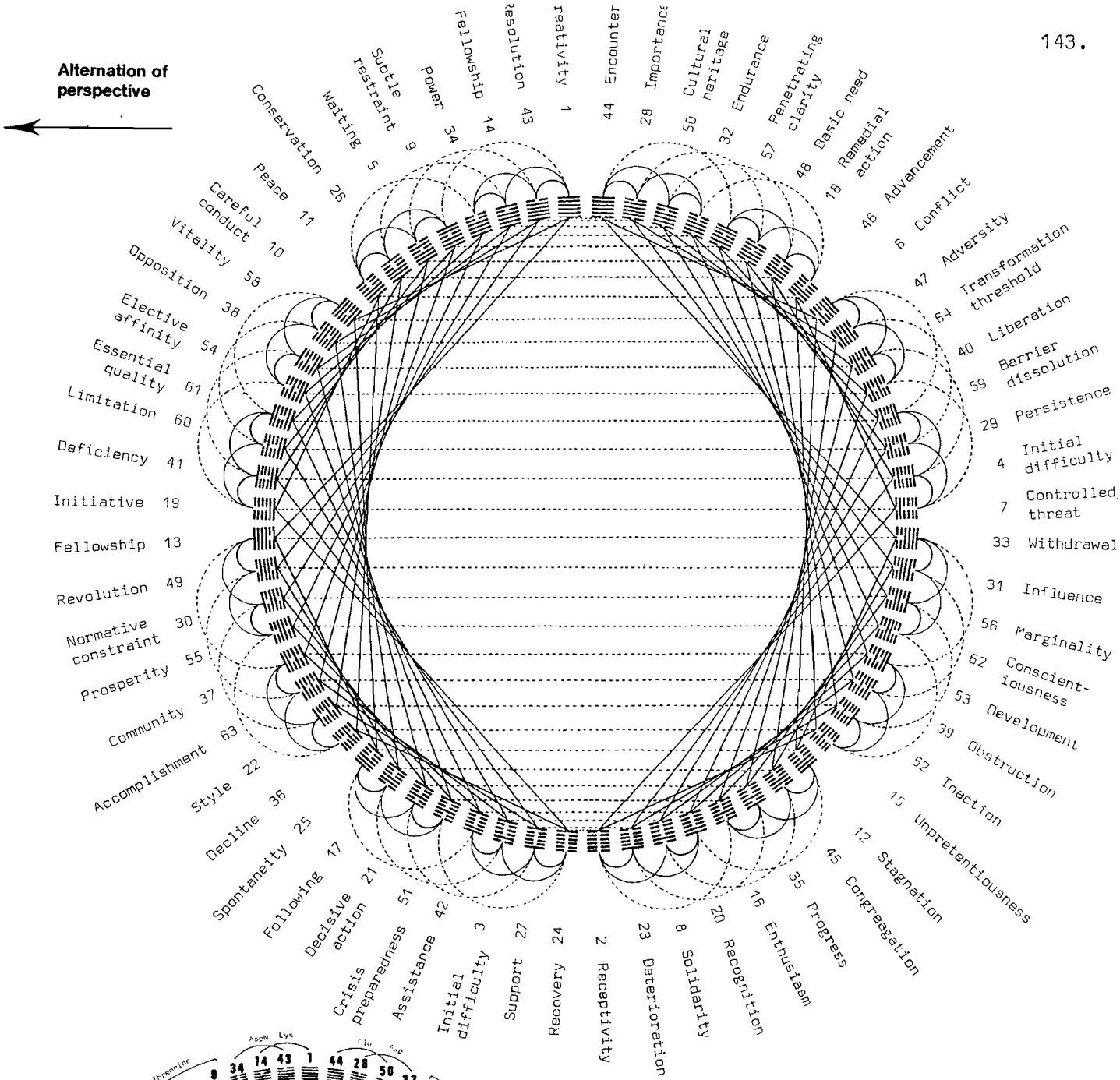
Figure 1 - Map of transformations between global, « heads-together » networking conditions (« top-in »)

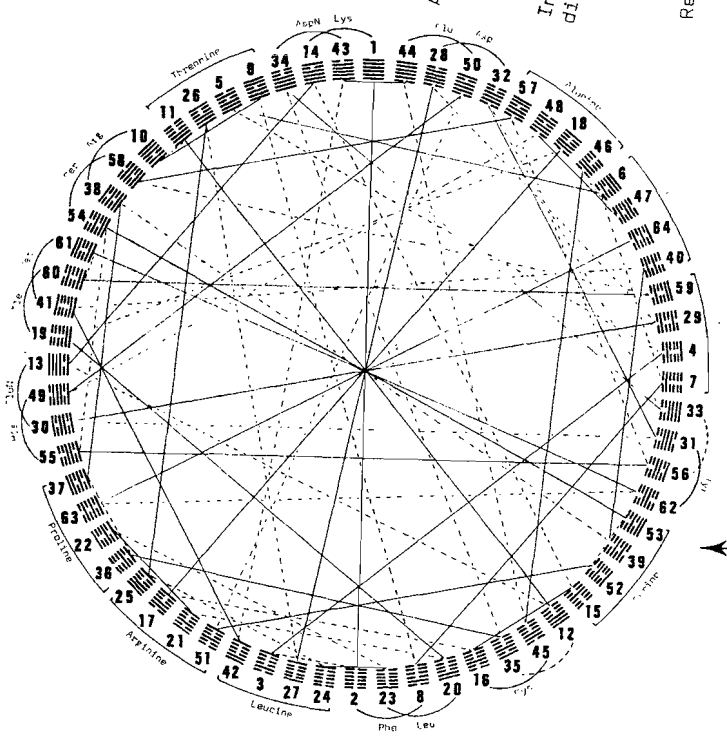
The conditions are denoted by hexagrams in a traditional circular order (each facing its negative image). The 6 transformations shown interlinking these conditions are those described in the accompanying text (in which only one line of each hexagram code is modified; see Figure 5 for multiple line modifications).

The hexagram code is read here with the **top line closest to the centre** (in contrast to Figure 2), thus determining the condition numbers added. Note that a 7th transformation from each condition is that to its negative across the circle; an 8th is to its inversion, in the equivalent position in Figure 2.

Figure 3 - Transformation sequence through conditions in numerical order using Figure 1 hexagram positions

Odd-to-even transformations indicated by unbroken lines.





Transformations (lines)		Transformations (curves)	
(- - -)	1st sub-condition	(- - -)	4th sub-condition
(long)	2nd sub-condition	(long)	5th sub-condition
(short)	3rd sub-condition	(short)	6th sub-condition

Figure 2 - Map of transformations between local, « back-to-back » networking conditions (« top-out »)

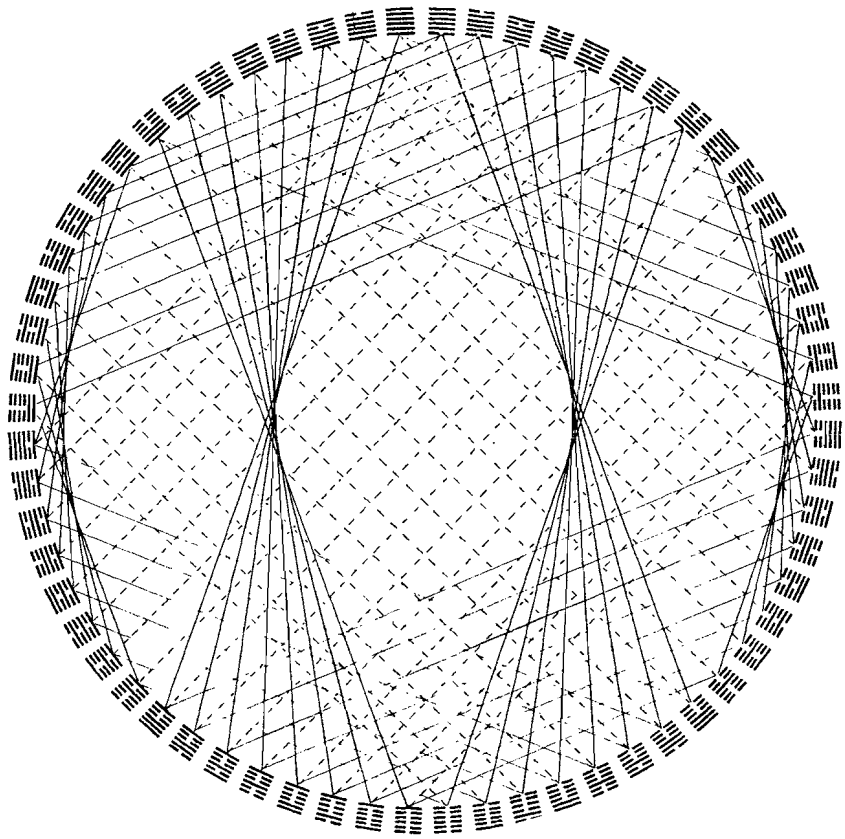
The hexagram codes appear here in the same order as in Figure 1, but because each code is read here with the **bottom line closest to the centre** (in contrast to Figure 1), the codes represent different numbered conditions in many cases. Only conditions 1, 2, 27, 28, 29, 30, 61 and 62 do not change position.

Figure 4 - Transformation sequence through conditions in numerical order using Figure 2 hexagram positions

Odd-to-even transformations indicated by unbroken lines. The hexagrams bracketed together around the circumference are those described as denoting the 20 basic amino acids in the genetic code (34). In the Figure 1 order, these are denoted by the long transformation lines (5th sub-condition).

Figure 5 - Map of selected complex transformations between network conditions

Using the same circular order as for Figures 1 to 4, transformations are indicated between hexagrams for cases where **two** lines of the hexagram code are modified (see Figures 1 and 2 for single line transformations). The transformations selected are for different combinations of the **inner** three lines of each code (since those for the outer three link neighbouring hexagrams in a pattern similar to that around the circumference of Figures 1 and 2). Other combinations do not appear to result in significantly different patterns. The hexagram codes may be read either in terms of the Figure 1 (« top-in ») or the Figure 2 (« top-out ») orders from which the corresponding numbered conditions may be obtained.



motor). The map is a map of alternation **dynamics** and cannot be appropriately understood as a conventional map of **static** structural elements.

With regard to the third problem, the « logic » of the circular representation is that every condition denoted by a hexagram is conterbalanced by its « opposite » across the circle. In effect the broken lines are converted into unbroken lines and vice versa (thus partially containing the variations in significance of broken and unbroken lines noted above). In addition to the six high probability transformations from (and to) each condition, there is therefore a seventh transformation through the numbered sequence (by inversion of the code reading direction) and an eighth transformation into its opposite (through « negative » code bits of a hexagram acquiring a « positive » connotation and vice versa).

Given the striking relationship already noted by Schönberger between the **I Ching** 64-hexagram code and the genetic 64-codon code (35), the fundamental nature of the circular representation may also be illustrated by using it to map the 20 amino acids basic to biological organization. In Figure 1 these are denoted completely by the set of (long) transformation lines linking quarters of the circle. For example, according to Schönberger, asparagine is denoted by (the transformation between) the hexagram pair 34-43, the more complex amino acid threonin is denoted by (the symmetrically balanced transformation lines) 11-5 : 26-9, and the « stop » codes amber and ochre are denoted by the individual hexagrams 56 and 33 respectively. In the Figure 2 map the hexagrams denoting each amino acid, rather than being equidistant, are brought **together** side-by-side, as is illustrated around the circumference of Figure 4. Whether this suggests that certain well-defined transformation processes are as essential for the life of an organization or network as those 20 amino acids are for biological organization, is a question for further investigation.

Transformation cycles

A striking feature of Figure 1 (or 2) is the manner in which the transformation pathways of different types differentiate the circle so clearly into :

(a) 2 halves of 32
(b) 4 quarters of 16
(c) 8 groups of 8
(d) 16 groups of 4
(e) 32 groups of 2
(f) 64 groups of 1

In the light of current interest in the distinct functions of right and left brain perspectives, group (a) can be considered an interesting representation of the limited number of pathways linking such halves and the manner in which the halves are each separately integrated. In the light of Jungian investigation of the four basic psychological functions (sensation, feeling, intellect, intuition), group (b) can be considered an interesting representation of the transformation pathways by which these are linked and separately integrated as semi-independent functions. The 4 masculine and 4 feminine archetypal versions of these functions distinguised by Jungian psychoanalysts can in turn perhaps he usefully represented by group (c).

The question that now emerges is whether it is possible to elaborate some kind of typology of transformation « cycles » for organizations or networks. Such a typology would clarify the different kinds of way that, for example, the two functional halves, or the four functional quarters are interlinked. For it is highly probable that organizations or networks can « survive » by using the simplest possible transformation cycles that enable them to renew themselves, but that richer and more effective networking is only possible when more complex transformation pathway cycles are used. It is therefore to be expected that some organizations only manage a 4-transformation cycle linking four functional quarters but are quite incapable of handling the subtler functional transformations between an 8-condition cycle, or one with an even larger number of transformations. Many organizations probably get stuck in cyclic « traps » because they cannot enrich the transformative cycles on which they depend.

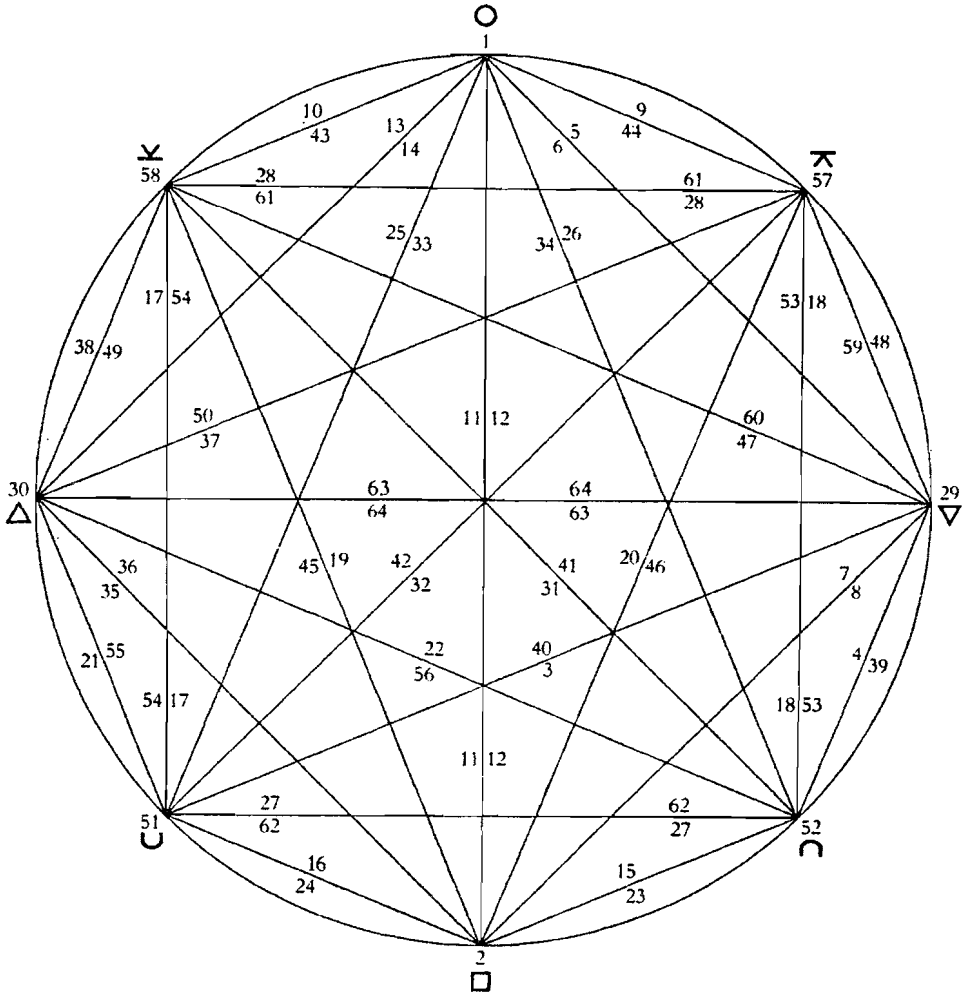
In addition to what has been termed the « high probability » transformations, based on the modification of a single line in a hexagram denoting a network condition, some other transformations of lower probability are shown in Figure 5. These too may form part of transformation cycles.

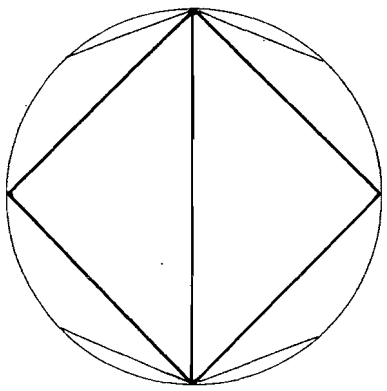
Circular representation : inner structure

A different approach to circular representation forms part of the conclusion of an extensive study by the renowned Buddh-

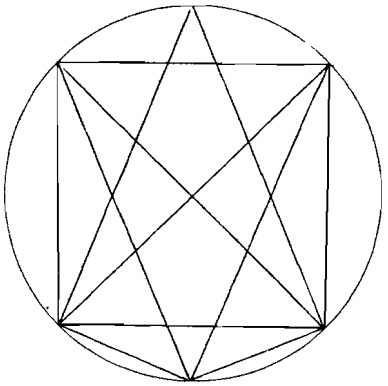
Figure 6 - Projection of all conditions (hexagrams) onto a circle (Reproduced with the kind permission of Lama Anagarika Govinda, author of the **Inner Structure of the I Ching; the Book of Transformations** (42)).

In Figures 1 to 5 the transformations between conditions are indicated by lines and curves (whether broken or unbroken). In Figure 6 those transformations are all represented as occurring within the 8 points around the circumference, whereas the lines represent the dynamic conditions denoted by the individual hexagrams positioned in a circle in Figures 1 to 5. Each line in Figure 6 indicates two possible conditions of change (just as each line in Figures 1 to 5 indicates two possible directions of transformation). The order of the 8 points around the circumference of Figure 6 corresponds to the order of the same points around the circumference of Figure 2 (« top-out » interpretation).

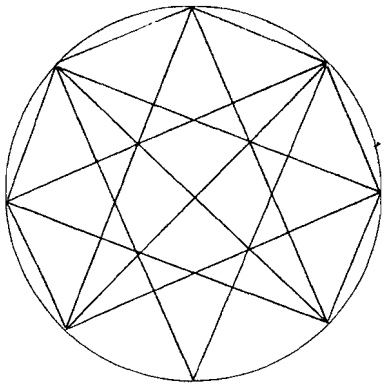




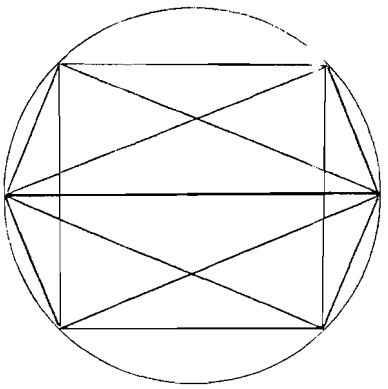
Network conditions 1 to 16



Network conditions 17 to 32



Network conditions 33 to 48



Network conditions 49 to 64

Figure 7 - Sub-patterns of networking conditions extracted from Figure 6 (Adapted from diagrams of Lama Anagarika Govinda (42)).

The numbered sequence of 64 conditions is split into 4 groups in numerical order. The patterns for each group are shown in the relevant diagram as a part of Figure 6. This establishes a relationship between the numerical sequence and an abstract order (which is the basis for Figures 1 to 5).

Note that the reconstruction of this arrangement is only possible as a result of recognition, from internal structural evidence, of the error noted below.

N.B. In producing Figure 6 from the elements of Figure 7, Lama Govinda concludes (42, pp 145-147) with Richard Wilhelm (12), that the traditional numerical order of the hexagrams in current works is slightly in **error**: 35 and 36 should replace 3 and 4; 21 and 22 should replace 35 and 36; and 3 and 4 should be inserted between 56 and 57.

This **does not affect** the patterns in Figures 1 to 5, with the exception of the broken lines in Figures 3 and 4. It **does affect** the « logic » of the italic sequence of text linking the conditions. The explanation given for the error is that the Chinese original was on loose-leaf pages of which some were misplaced.

ist scholar Lama Anagarika Govinda in a recent book entitled : **The Inner Structure of the I Ching : The Book of Transformations** (42) (*). His preference for « transformation » in the title is to be compared with the conventional translation as « change ».

The special interest of this study, in contrast to the many studies of **I Ching** commentaries, is that it focuses on the structure of the **I Ching** itself as a system of signs in which « two values were alternated and finally combined into eight symbols, which by replication yielded sixty-four hexagrams » (42, p. ...).

Lama Govinda concentrates on the problem of the relationship between two traditional representations of the set of transformations. The first is the « abstract order » of Fu Hi which essentially determines the order of balanced polarities from which Figures 1 and 2 were derived. The second is the « temporal order » of King Wen which emphasizes the developmental sequence of phenomena. In order to make the movements from one condition to another graphically visible the author concludes that it only seems possible to find a unifying principle in the Fu Hi system.

His detailed investigations lead him to propose Figure 6. This shows the position of all 64 **I Ching** conditions projected onto a circular diagram. A unique feature of his focus on the « inner structure » is that this diagram results from the interplay between the 8 fundamental conditions from which the 64 are derived. The 8 are each denoted by a half-hexagram, namely a trigram. Depending on the order in which any given pair of trigrams is read, one of two hexagrams is thus defined. It is the condition numbers of these alternatives which are indicated on the straight lines within the circle. Each line thus represents two transformative movements. The eight conditions around the circumference represent those cases when the two trigrams are identical. Thus the straight lines denote transformations governed by the relationship between the 8 fundamental conditions denoted by each doubled trigram on the circumference.

What then is the relationship between Figure 6 and Figures 1 to 5 ? As noted above, in Figures 1 to 5 the circle of hexagrams may be split into eight parts in each of which the trigram on the inside is identical. One of the hexagrams in each part also has the outside trigram equal to the inside one. It is these eight (1, 2, 29, 30, 51, 52, 57 and 58) that are positioned around the circumference in the « top-out » order of Figures 2 and 4. Comparison with these Figures will show that the transformations from any numbered condition are here indicated by the lines (or points) to which it is connected through these fundamental positions, whether one *or more* hexagram lines are modified. In this sense Figure 6 is a much more compact representation than Figures 2 and 5 (**). In graph theory terms, Figure 6 is a « dual » of Figures 2 and 5 combined, in that the transformation *lines* in the latter correspond to the transformation *points* in th former. It could be argued that even in this representational convention there is advantage in alternating between both forms.

Also of great interest is Lama Govinda's very detailed investigation of sub-patterns of transformation (**) connecting groups of 8 conditions traditionally called « houses ». These patterns provide an important basis for any further investigation of the typology of transformation cycles called for above. It also enables him to clarify the relationship between the numerical sequence and the abstract order of Figure 6 by determining in Figure 7 the four symmetrical sub-patterns from which Figure 6 is Constituted.

Elaboration of a spherical map

One interesting approach to this is to consider how Figure 6 would be transformed if it were to correspond to the alternative « top-in » order of Figures 1 and 3, instead of the « top-out » order of Figure 2. In effect the square formed by conditions 51, 52, 57, 58 in figure 6 is simply rotated about the axis of conditions 1, 2; Conditions 1, 2, 29 and 30 do not move. The new sequence around the circumference is then 1, 58, 29, 51, 2, 52, 30, 57, as in Figures 1 and 3. If conditions 1 and 2 are considered as fixed « poles », a continuous rotation between the fixed positions 29 and 30 may be seen as transforming the circular representation into a spheric one. This dynamic model would need to be interpreted in terms of lines of force, as in the analysis of an electric motor or dynamo.

For reasons discussed in earlier papers (38), there are advantages in seeking a representation whose completeness is highlighted by basing it on an approximation to a spheric surface. The question then becomes how to cut up that surface into 64 units which will be assumed firstly to take the form of regular areas and secondly to be of identical form. (Other approaches are of course worth exploring.)

Since the 64 phases (hexagrams) result from a conceptual system based on an eightfold complexification of 8 fundamental phases of change (trigrams), the problem can initially be reduced to one of representing the latter on a spherical approximation. The simplest such polyhedral approximation is the regular octahedron with eight triangular facets (see Figure 8). In allocating the 8 phases to these facets it would obviously be advantageous to do so such that their three high probability transformation pathways are highlighted.

Returning to the 64 phases, the problem can now be defined as one of how to divide up each of the triangular facets of the octahedron into eight equal parts so that eight phases can be represented within each such triangle. This can be done as shown in Figure 9. In this way the 64 phases can each be given a unique location on a polyhedral structure which can be easily projected onto the surface of a sphere.

There remains the problem of how to order the eight phases within each facet in Figure 8 so that within the completed figure the six high probability transformation pathways of the 64 phases are highlighted. It would seem, as with the standard problem of geographical map projections onto a two-dimensional surface, that there are a number of approaches to be explored. Each would be based on a different convention and would lead to a different arrangement with different advantages. Some possibilities are discussed in the inset.

Conclusion

The **Book of Changes** is recognized as striking a remarkable balance between logical, structural (left-brain) precision and intuitive, contextual (right-brain) nuances of comprehension. For 3,000 years it has proved to be a unique achievement in relating the qualitative to the quantitative in a manner which is both practical and poetically appealing. These are qualities to be sought in any blueprint for a new world order.

In the exercise for this paper, most of the poetic appeal has been sacrificed. It does demonstrate that it is possible to interpret the insights of an Eastern classic into the jargon of Western management, however much of a « profanation » this may appear to those who know the original. An important consequence of the elimination of metaphor is the loss of vital mnemonic keys with which the original is replete with good reason. Much of value has therefore been lost, as in any interpretation, despite the seeming advantages to be gained from the precision of the alternative presentation. Clearly some of the distortion is due to the alternative framework, whilst much is due to the limitations of the interpreter. Hopefully other interpretations will be produced that will strike a more graceful balance between jargon and insight.

The acid test is of course whether this interpretation is useful to those engaged in networking. Is it possible to relate the conditions described to the practical experience of networking ? Can networkers use or adapt the maps of transformation pathways reproduced here ? The answers are for the future. But the precision of the framework of the **Book of Changes,** linking such contemporary topics as « development », « liberation », « peace », « revolution », with what have here been termed « basic need », « deficiency » and « cultural heritage », offers an intriguing chal-

(*) My attention was drawn to this book (after the first part of this paper had gone to print) by Zentatsu Baker Roshi, Abbot of the San Francisco Zen Center, who contributed the preface. He pointed out the resemblance between Figures 1 and 2 and diagrams in Lama Govinda's book. I wish to express my gratitude to him for this information and to the Zen center for furnishing me a copy across the Atlantic at miraculous speed.

(**) There is an intriguing resemblance between some of Lama Govinda's other diagrams of transformation between trigrams (represented by « curves » and « lines ») and aspects of the structure of Figures 1 and 2.

lenge to reflection and comprehension. The topics recall many of the concerns of the Goals, Processes and Indicators of Development project (1978-82) of the United Nations University.

With regard to the important problem of representation, it is appropriate to note that schematic diagrams of similar form have already been produced in combining Eastern insights and a Western management emphasis. A striking example is that of Figure 10, from **Zen and Creative Management** by Albert Low (43), Erich Jantsch, in his wide-ranging synthesis of self-organizing systems and their implications for policy-making and human development, draws attention to metabolic transformation cycles such as the carbon cycle shown in Figure 11 (44). Indeed, given the fundamental nature of the representation system and its relationship to the basic amino acids (34), it is worth investigating to what extent the set of interconnected metabolic cycles and pathways does not illustrate the kinds of transformation pathways which need to be identified for organizations. The map of metabolic pathways could prove to be a very provocative challenge to organizational sociologists of the future (45).

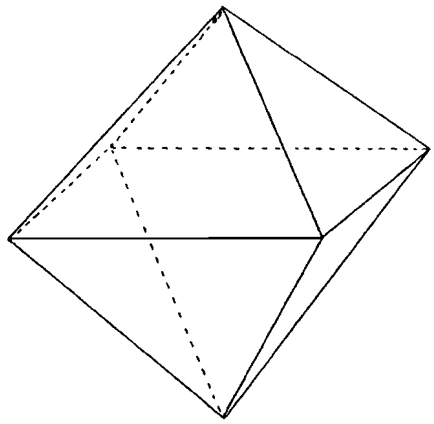


Figure 8 - Octahedron as basis for mapping 8 fundamental networking conditions onto a sphere

The 64 networking conditions are derived from 8 fundamental conditions (represented by the doubled hexagrams indicated on the circumference of Figure 6). Each of the 8 may be denoted by one triangular facet of the octahedron. The allocation of the conditions, and the transformational relationships between them, can then be mapped onto the geometry of the octahedron (as one of the simplest polyhedral approximations to a sphere). This is discussed in the inset (below).

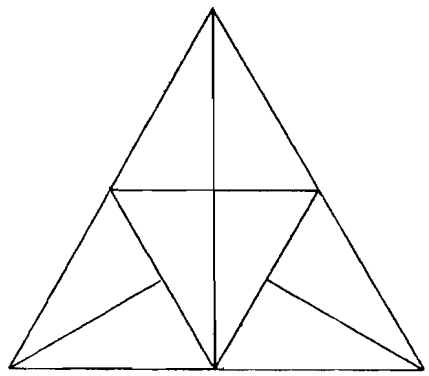


Figure 9 - Eightfold subdivision of the triangular facet of an octahedron.

In order to represent all 64 networking conditions on an octahedron (Figure 8), each triangular face can be sub-divided into 8 equal areas as shown. Some of the possible conventions concerning the allocations of sub-conditions to the triangle, and the transformational relationships between them, are discussed in the inset (below).

Some possible approaches and conventions

The approaches listed below are split into three groups. The first focuses on the ordering of the eight facets of an octahedron. The second focuses on the ordering of the eight facets within each triangular face of an octahedron. The third identifies some conventions which merit further exploration.

1. Octahedral facet ordering

1.1. Primary arrangement : if it is assumed that this arrangement is in some way more fundamental, then use can be made of the « Primal Arrangement » given in the commentaries to the **I Ching.** Here the stress is on pairing opposites across the centre.
1.2. Sequential arrangement : the alternative to the previous approach is to use the sequential arrangement which traditionally suggested the temporal relationship between the phases.
1.3. Transform juxtaposition : the three phases into which a given phase has a high probability of transforming can be allocated to the three triangles which surround it on the octahedron.
1.4. Circular transform pathways : an octahedron is partially defined by the interlocking of three great circles through its points of symmetry. Each circle may be considered as a transformation pathway linking the facets it crosses.

2. Ordering within octahedral facets

2.1. Primary arrangement : a form of the traditional primary arrangement may also be adapted within the triangular facets.
2.2 Sequential arrangement : a form of the traditional sequential arrangement may also be adapted within the triangular facets.
2.3. Transform juxtaposition : various approaches to juxtaposing intertransforming facets are possible. They draw attention to the problem of how such solutions transform across the boundary to other facets of the octahedron.
2.4. House arrangement : one traditional arrangement groups the 64 phases into 8 « houses », where each house would be equivalent to an octahedral facet. The arrangement of the houses and the order within each house calls for further investigation (see especially reference 42). This approach has the advantage of de-emphasizing the boundaries constituted by the octahedral facets.

3. Possible conventions

3.1. Triangle boundary single signifier : each side of a triangle represents one line of the trigram represented by the enclosed area. Sides are therefore denoted either by unbroken or by broken lines. Sides are common to neighbouring triangles.
3.2. Triangle boundary double signifier : as for 3.1., except that sides are not common to neighbouring triangles. Each inter-triangle boundary is denoted by two signifiers (broken or unbroken in parallel lines), one for each of the two contiguous triangles.
3.2.1. Inter-triangle like-to-like bonding : triangles can be bonded as neighbours if they have identical signifiers on a common boundary (either broken or unbroken lines).
3.2.2. Inter-triangle like-to-unlike bonding : triangles can be bonded as neighbours if they have different signifiers on a common boundary.
3.3. Line ordering : three alternative conventions are possible for ordering the sides of a right angle triangle to correspond to the lines in a trigram.
3.4. Triangle transformal relationships : more complex relationships may be considered between proximate triangles where the type of transformation is governed by the types of line (of the right angled triangles) which are contiguous. These include various inversions and reversals of the trigrams represented.
3.5. Variable lines : given the fundamental significance of resonance bonding and hybrids in organic chemistry (eg. Kekulé and models of the benzene molecule as noted in the first part of this paper), it is work considering a representation based upon alternation of triangle side signifiers between broken and unbroken forms. The representation then becomes a shifting pattern in which particular phases emerge and disappear at different locations.