

February 1994

A CONFERENCE TOWARDS SPIRITUAL CONCORD

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METAPHOR OF SPIRITUAL CONCORD

Configuring Globally and Contending Locally

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CONFIGURING GLOBALLY, CONTENDING LOCALLY

Enfolding differences: There are many environment/development issues, priorities and proposals. And the Earth Summit will recognize many of them. A central challenge is that of interrelating these different, and often conflicting, perspectives in some coherent way. There is a need to move beyond simplistic, reductionistic mind-sets that reinforce the inadequacy of the linear thinking of the past.

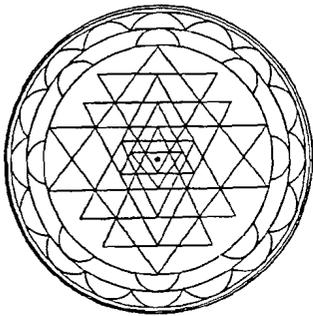
Consensus, despite its intuitive resonance with globality, is often marked by institutional impotence -- especially when characterized by superficiality and tokenism, and the failure to acknowledge real long-term dilemmas.

Embodying new forms: Beyond the challenge of recognizing the issues, and devising appropriate strategies, is that of the institutional forms appropriate to the task of implementing any responses. Where are the clues to these new styles of organization -- that can give form to "paradigm shifts" and "new thinking"?

Why does Agenda 21 offer no visual aids to comprehension of how its component elements interweave in response to the many strategic dilemmas of sustainable development? New imagery is required to carry understanding of imaginative responses, both for policy-makers and for the media.

Evocative imagery: It is possible that the sustainability of development can only be grasped and achieved through new imagery that anchors understanding of new structures and communication pathways. Sustainability is a global property of systems and should not be confused with the specific (local) strategic bargains through which it emerges. Imagery should help to maintain such distinctions.

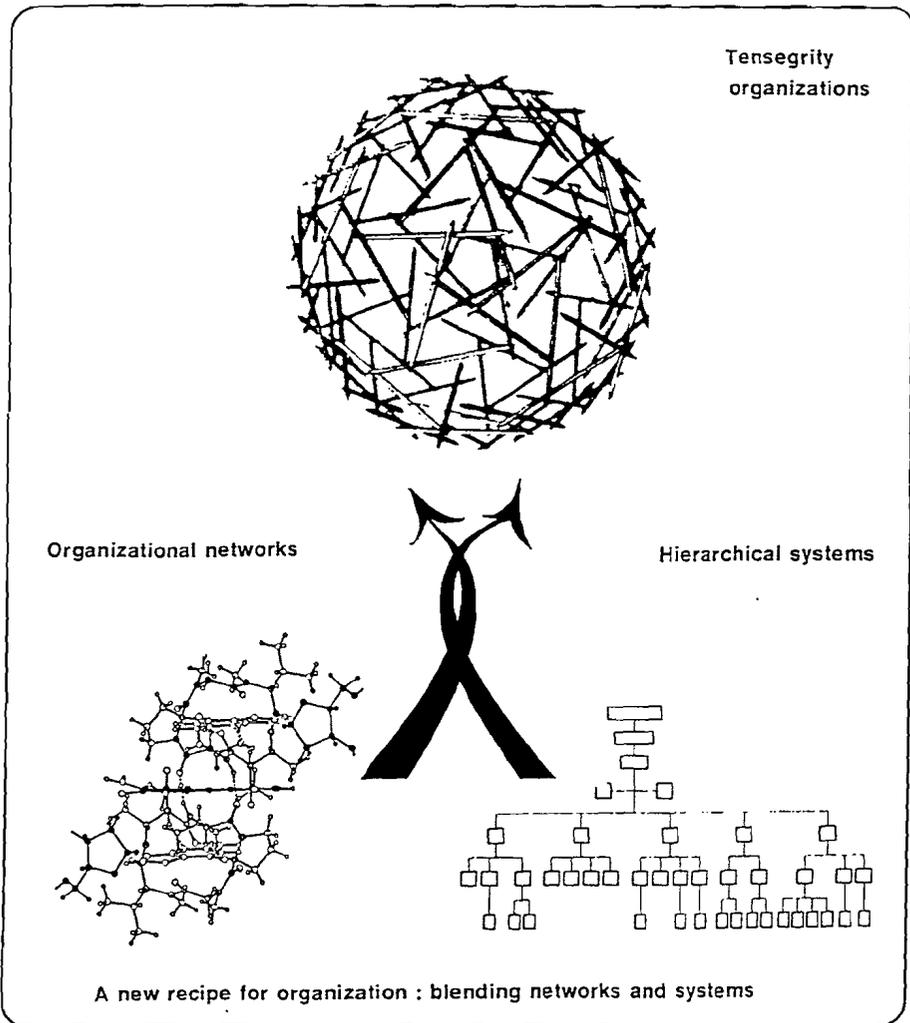
Conventional organization charts reflect the inadequacies of fragmented institutional responses. Network maps lack coherence or global structure. System diagrams are alienating in their complexity.



Thirty spokes share the wheel's hub;
It is the centre hole that makes it useful.
Shape clay into a vessel;
It is the space within 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.

« 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.



TENSIONAL INTEGRITY

There is however a little-explored structural form called a tensegrity -- from tensional integrity. Tensegrity structures are effectively patterns of sustainability. Spherical tensegrities have many properties which allow them to be used to carry richer insights about sustainability.

- **Based on polyhedra:** As such may be used to map systems. Buckminster Fuller, investigator of tensegrity, notes that all systems are polyhedra. A polyhedron may also be considered as a device to identify systems of symmetry.
- **Approximation to spherical form:** As such their global properties become intuitively clearer. The more complex polyhedra approximate most closely to a sphere, but are more difficult to understand.
- **Globally continuous network:** The global coherence of the structure is highlighted by a continuous network of tension lines. These may be understood as the lines of mutually supportive communication between those with functionally distinct preoccupations. This global network reflects the aspiration of the many concerned with universal consensus.
- **Discontinuous separators:** The global network is kept from losing form, and falling in upon itself, by a number of separators which do not touch each other. These may be used to map the real strategic differences (or "struggles") between the functional preoccupations so separated (eg between "production" and "marketing" in an enterprise).
- **Local communication networks:** The classical studies of communication in social groups focus on star, Y, circle and line formations. These are effectively local features of the global continuous network. Despite its potential, communication in tensegrity organizations has not yet been studied.
- **Circuits:** These are the distinct pathways around the functional sphere. It is the intersection between three or more such pathways which defines a polyhedral system of functions. Each basic function of a system may be associated with one such circle (or with a policy cycle).
- **Facial areas:** The areas (triangle, pentagon, etc) defined by the above elements may usefully be thought of as decision or bargain arenas. These are the roundtables in which an appropriate balance has to be struck between competing functions.
- **Synergy:** Tensegrity structures have totally unexpected strength. Through an effect of elasticity multiplication, they act globally as though the local tensile links were over 600 times stronger than they actually are. (A 10 percent displacement of the separators results in a change in connector length of only 0.17 percent, which is well within the elastic capabilities of most tensile materials.)
- **Redistribution of stress:** The symmetry of a tensegrity system is a measure of its ability to absorb rearrangement. Under stress the system's symmetry is not deformed. The system expands as a whole or contracts as a whole. Such a system may be designed on the assumption that local stresses will be transmitted throughout its extent and shared by all its members.
- **Empty centre:** The global structure is upheld by local surface features which do not require the centre to be occupied. This maps a form of decentralization which is configured around a virtual centre whose nature remains undefined and "uncolonized" -- and always open to further clarification. The structure is lifted outward by the tensional network. It resembles a contained explosion in which the forces pulling out are also coming from the web. The structural members are not falling in together, nor in any important way leaning on one another.

Sustainable development is then a function of the pattern as a whole rather than of its components. Tensegrity structures suggest ways of interlocking the specialized (local) bargain arenas so that a sustainable (global) whole may emerge.

Paradoxically, if there is a "zen of sustainability" it might be sought in ways of deliberately using those differences which prevent easy consensus as the basic structuring features for consensus of a higher order.

tahedron (expanded) using diamond pattern



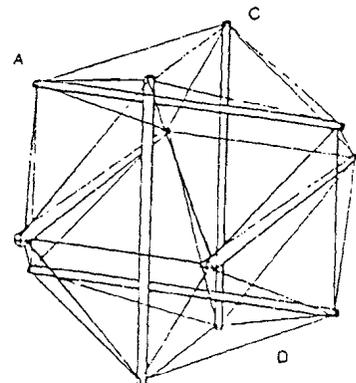
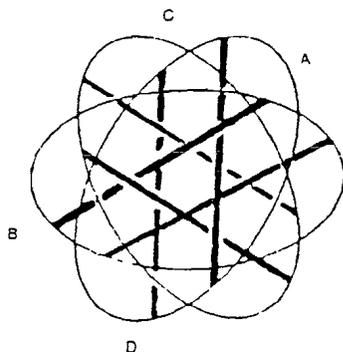
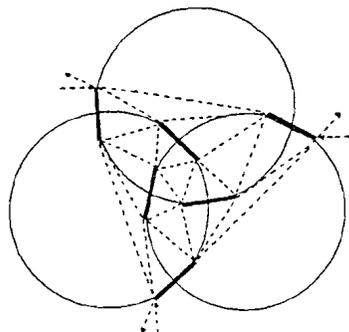
TENSEGRITY CONSTRUCTION

Cuboctahedron (expanded) using diamond pattern



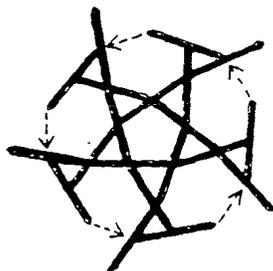
Tendons : For string or line :
 — tendons outlining squares marked « K », or dotted lines : 13.7 cm
 — other tendons : 11.9 cm.

MATERIALS : **Struts :** Use dowel approx. 9 mm in diameter (or less) approx. 23 cm in length (or less).
Tendons : 1. Use rubber bands approx. 5 cm long (or less) to experiment and for temporary models

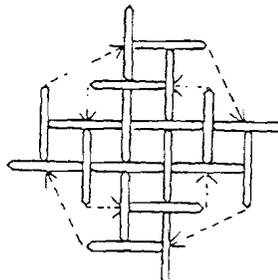


INTERMEDIATE STAGES IN THE CONSTRUCTION OF MORE COMPLEX MODELS (tendons not shown)

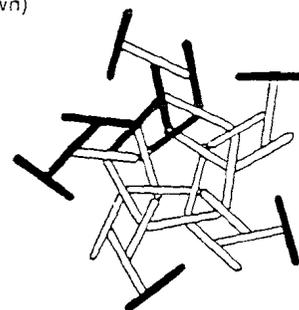
A. Circuit Pattern



Icosidodecahedron
30 struts; 90 tendons

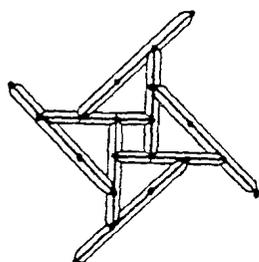


Small Rhombicuboctahedron
24 struts; 48 tendons

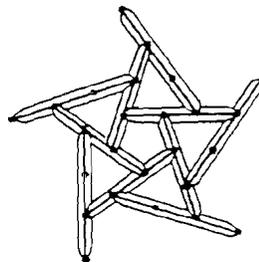


Small Rhombicosidodecahedron
60 struts; 120 tendons

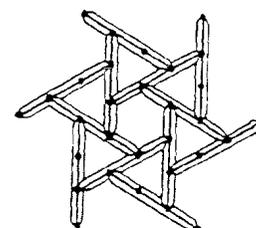
B. Zigzag Pattern



Octahedron (6-F geodesic)
48 struts; 144 tendons



Truncated Tetrahedron
(3-F geodesic)
42 struts; 126 tendons.



Dodecahedron (3-F geodesic)
90 struts; 270 tendons

Full details in Anthony Pugh : Introduction to Tensegrity, 1976)

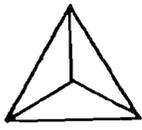
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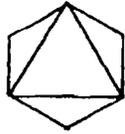
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PATTERNS OF SUSTAINABILITY -- FROM 2D TO 3D

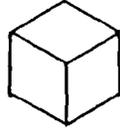
Possible maps of globally sustainable local bargains basic to the design of tensegrity organizations



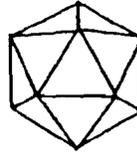
tetrahedron



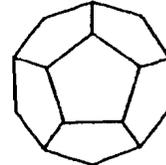
octahedron



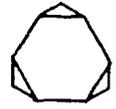
cube



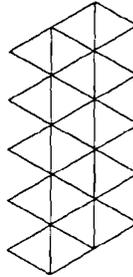
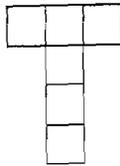
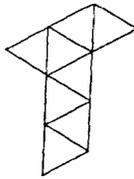
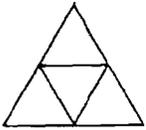
icosahedron



dodecahedron
pentagonal

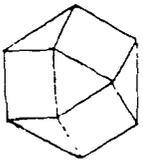


truncated
tetrahedron

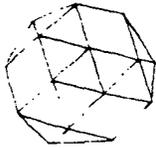


5. Platonic Polyhedra
(i.e. edges equal; one face type)

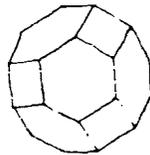
13. Archimedean Polyhedra
(i.e. edges equal; several face types, identically arranged)



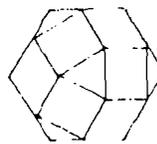
snub cube



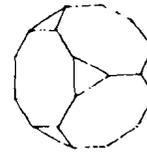
cuboctahedron



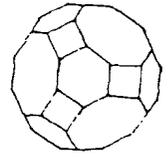
truncated
octahedron



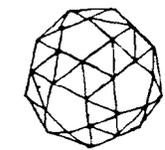
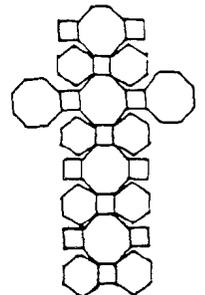
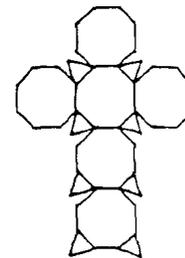
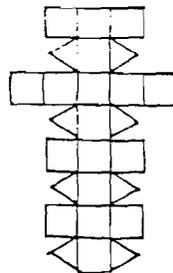
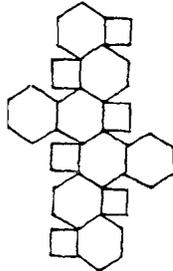
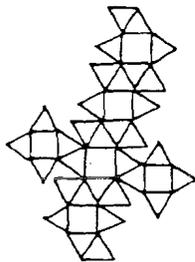
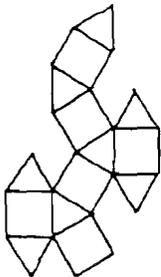
small
rhombicuboctahedron



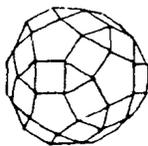
truncated
cube



great
rhombicuboctahedron



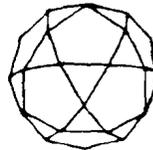
snub dodecahedron



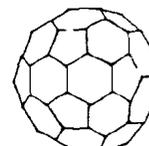
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rhombicosidodecahedron



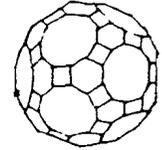
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dodecahedron



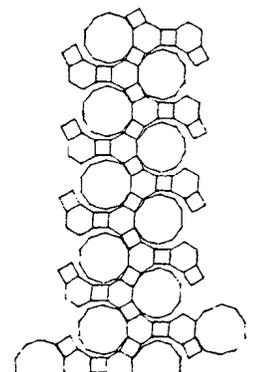
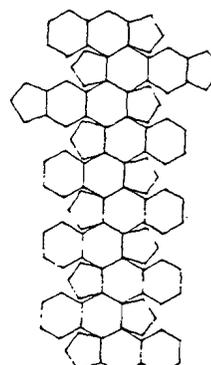
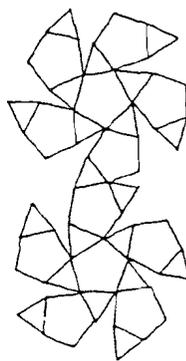
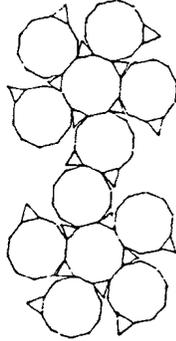
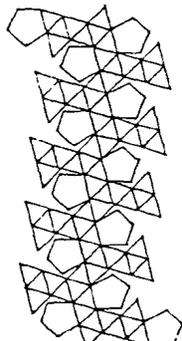
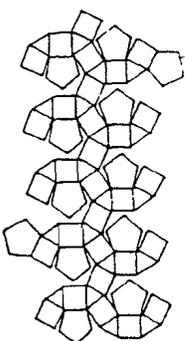
icosidodecahedron



truncated
icosahedron



great
rhombicosidodecahedron



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