20220306 the Issue of Structure (audio) and 20220308 dynamics

http://entropynetwork.com/word/run/
220308

{20220308011846 [
viewing it not as a structure , because it is not static , but as a process ; we can call it power dynamic , as encoding it in a structure is a failure to measure it precisely and continuously ;] }

{20220308011901 [
in circularity accounting , we must note an agenda to modify behaviors; let us restate that in simpler terms : to instigate change in a repeating actions; then let us decode and list the component processes of behavior modification ;] }

{20220308011910 [
behaviors are classes of actions which repeat , as identified by the classifier ; for example , i ran ; when i run more than once , this is a behavior; then we can specify the details of the behavior; for example , i ran to the ocean ;] }

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the establishment of behaviors , is a means to classify the past , and predict a future;] }

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it is in the universe of behaviors that we operate ; we make intervention into behaviors , by the introduction of new information ;] }

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if we are to define structures of behaviors , we must have a means to specify how precisely two actions match ; where behaviors match , we can account them to the same class ; where they do not match we must discriminate between them ;] }

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the measure of difference can be an entropic value , a common method is to use the kullback–leibler divergence $D_{\mathrm{KL}}(P \parallel Q) = -\sum_{x \in \mathcal{X}} P(x) \log\left(\frac{Q(x)}{P(x)}\right)$, or cross entropy $H(p,q) = -\sum_{x \in \mathcal{X}} p(x)\, \log q(x)$, among others ; the measure in most presently used methods is entropic , all of them requiring a form including the measure , *p log p* ;] }

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within the process , there are repeated actions , these are the apparent conserved structure ;] }

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the people , in as much as they can be identified , are also not static , and even their cells , excepting some lifetime structures , are mostly replaced within a decade ;] }

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so it is not what it was before , though it may be identified as the same ;] }

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we can describe repeating actions as structures in graphs or networks ; graphs are a method to encode relationships in links between elements which compose them , while networks perform the same function 1 ;] }

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1 the words have different traditions of use , where the word network is often used to describe static links which transfer entropy between nodes , and the word graph is often used to describe links edges that change connections among different vertices while entropy transfer between vertices is ignored or minimal ; graphs are a view of networks and the reverse is also true ;] }

Ignoring structure

Engaging with the city, builds the city: in the transaction between the participant and the network that is the city. Action from the participant is absorbed into multiple resulting transactions that spread like ripples though the network of actors that is the city.

A structure exists by the donation of action to maintain the structure. Such donation occurs clearly in the locality of the structure, and not as clearly as energy (potential action, in its context) from distant sources is transferred to the structure. For observers of a structure which does not benefit the observers,

By addressing a structure, the observer devotes energy to its measurement. This makes the measured more probable, while obtaining from the measurer the time and action required for measurement, and interrupting the observer's default behaviors. If this concept is taken to an extreme, we find that the probability of the observer goes to zero and the observed goes to one. This is Zeno's paradox, it was also Turing's cautionary remark on 'standard theory', and Szilárd's exposition on the energy and entropy of observation.

"*It is easy to show using standard theory that if a system starts in an eigenstate of some observable, and measurements are made of that observable N times a second, then, even if the state is not a stationary one, the probability that the system will be in the same state after, say, one second, tends to one as N tends to infinity; that is, that continual observations will prevent motion*" (Alan Turing [71])

L. Szilárd. Ü ber die Entropieverminderung in einem thermodynamischen System bei Eingriffen intelligenter Wesen. Zeitschrift für Physik. 1929. 53: p. 840-856.

{20220306 audio [
I tried to ignore it.
If we ignore it, to the degree that we ignore it, it doesn't exist. But this is the cruelty of ignorance, because it may exist for someone else. For some group of observers, the structure does exist, and has an interaction with the observers of that group. For the the observers of that group, the interaction might be a net positive or negative transaction in units of potential action.

(0:55)

Let us consider net positive potential action as not detrimental to survival (for simplicity), and that it is the capacity for action in the future. Negative potential action will be a reduction of capacity for action, which in the face of danger, imperils survival.

For members of a group V in which a transaction T yields negative potential action, engaging in the transaction must be detrimental to an isothermal state, and homeostasis for people. Without other intervention the transaction may be detrimental to development or survival of members of V. Those structures which are negative for V, if analyzed by this group, may be candidates for modification or dissolution.

Given that interaction of V with structure P is net negative and destabilizing of homeostasis, avoidance behavior in V in regard to P may increase probability of survival. We can see then that those who would benefit from structure modification, would be prone to avoidance of interaction with the structure: people who would wish to change it, cannot.

It is in this capacity, that we analyze how to change the structure. Because some people can not change the structure, but other people can. Those who might be able to change the structure who should change it for other people who would wish to change it, but cannot.

<u>How do you change ? why?</u>

The objective is to reduce $CO2$. The current structure of economies, creates $CO2$ at a measurable rate, we wish to reduce that rate. It is hypothesized here that we may affect the emission rate of $CO2$, by modifying the structure of economies.

For those whom the structure benefits, changing the structure has a negative impact on current and future benefits. There are clear benefits to $CO2$ emitting processes for their closely affiliated

"To the degree that we ignore it, it doesn't exist. "
The effects of rising $CO2$ levels are not instantly perceived, it has no odor, nor flavor, it does not color the sky nor the ocean. The cruelty of ignorance, in which we ignore the plight of others as it has no bearing on our own, though appealing as allegory, is misplaced. It is ourselves to whom we are being cruel, or to our children; we are only insensitive, not immune.

(02:55)

<u>How do you modify the structure?</u>

The fastest way to change a network structure, is by changing every node in the structure. This method also requires the highest transfer of energy (our potential action). For example, imagine that the water of a lake in one moment becomes ice, all molecules loose heat simultaneously. For this to happen, all the energy removed - must be removed at the same moment. This does not happen without a design, and it is also greatly unlikely. As we find from the engineering and production of crystals: ie. in implementation Si crystals approach this concept of everywhere-simultaneously, as waves in the crystal are largely the same, over the expanse of the crystal. The preparation of designed networks or crystal motifs is such that energy must be contributed to the network beforehand to reach saturation and thereafter simultaneity of some variety in the material may be considered.

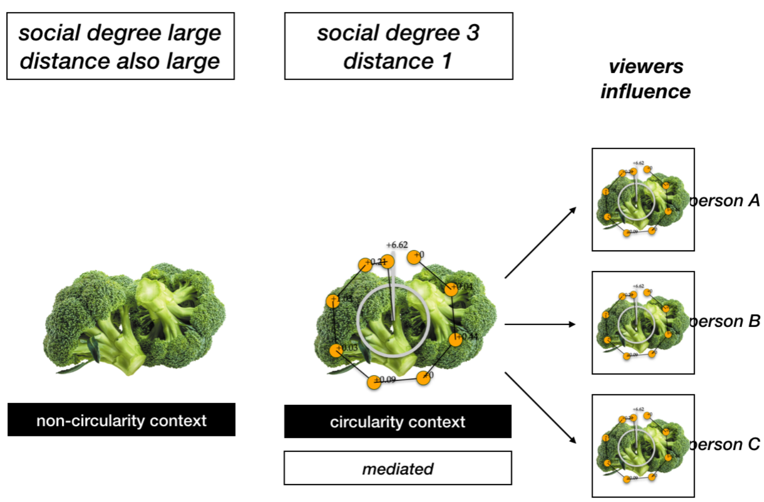
We see then that all-at-once changes are energy expensive.

Insert expression

In the case of changing each node in the structure simultaneously, for each node to be changed, each agent of change required to implement such a simultaneous change, may need only commit one action, or a relative small quantity of actions. This is because the complexity of network traversal (actions) that they must accomplish is at or near distance 1.

Alternatives to simultaneity:

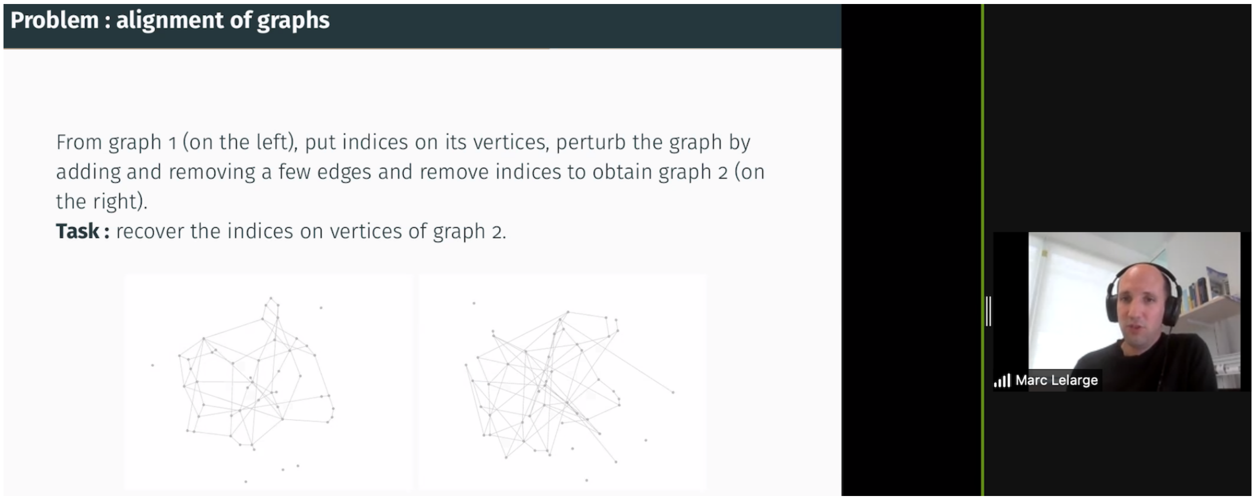
By moving through hierarchies, or moving through distances, the distance to change is higher and the energy required from the agent of change to the destination of change is higher. The decisions required, are greater in quantity.



From a thermodynamic perspective, the interaction of the agency of change, and the receiver of change happens at the greatest rate when the entropy of the medium is highest, for example in a high temperature mixture.

(This hypothesis is circular.)

Is it necessary to interact with the structure that exists from the perspective that, there may be some efficiencies involved? Assuming that there is a structure, is there a key to it? A key to open it's doors? a key to change it, or to dissolve it? If there is a structure, then there must be some agenda to its behavior.



The structure is a graph: how do you convert one graph into another graph?

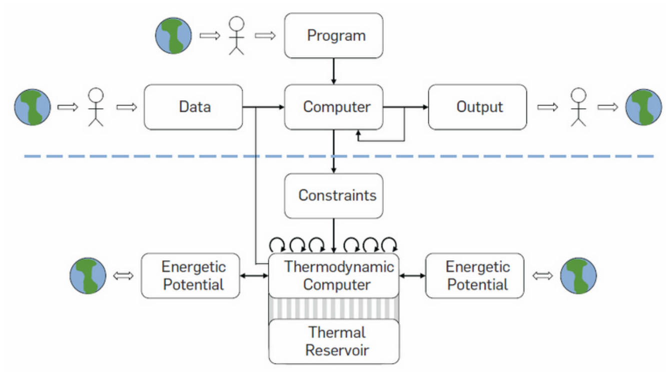
It is in knowing the agenda, that actuation of the structure may be accomplished, including its dissolution. The key is the blueprint to the actions of the structure, and we might find such a key, or design it, by researching the structure and its behaviors, as a network. By knowing the structure, we may know to control it or change it. This is an efficiency of control gained from knowledge of the structure. We may call this efficient method for control of the structure, and articulation method, M.

However,
an efficiency M has a time and energy cost associated with its development (1)
M also has a time and energy cost associated with its action to using that structure (2)
and a time and energy cost associated with its action to dissolving or disentangling a particular structure (2);

The costs for (1,2,3) may be compared to the cost of not employing M.
The costs may also be compared with abandoning the current structure to use another structure (which in social technical and economic structures, may not be an option).

There may be efficiencies that may be found, and there may be methodologies that can be used across different structures which are hyper efficient methodologies for disassembling particular structures. Is it worth trying to analyze particular structures and find efficiencies for disentangling them? In our work, we do not. We choose another strategy, considering that it is possible to disentangle structure piece by piece, without strategy.

If there is any particular structure over the course of its reaching thermodynamic equilibrium, the structure will dissolve so if we do want to change anything, we only need for it to reach thermo-equilibrium with the new structure.



(diagram from the discussion on thermodynamic computing: https://cacm.acm.org/magazines/2021/6/252841-a-vision-to-compute-like-nature/fulltext)

It's not that the smaller pieces should reach equilibrium with that structure, because then that structure would then modify those pieces, but instead the small pieces should modify the structure. The greater number of smaller pieces should reach equilibrium with the structure and then the structure will need to adapt to those pieces.

So in our survey of efficiencies, what we would want to do is find whether there are particular structures which we should disentangled first, if we want to achieve the results which we seek without wasting energy or time. So perhaps - it is not that we need a particular methodology for disentangling particular structures, instead it is - which structures would we disentangle first.

If we should look at precedence only, then we should look to which structures generate carbon at the highest rate, compared to their susceptibility to being dissolved. This strategy may be wrong, but it is clear, and if it is quantitatively wrong then it is easily modified.

Consider petroleum infrastructure-
To replace that, while ensuring that there is not undue hardship, an agenda would have to proceed piece by piece. That infrastructure is large, and so change requirements are large; downstream implications are large. It could only proceed in small manageable pieces.

Design agency in small pieces: individual agency.

When we design agency in small pieces, the smallest piece is perhaps individual agency. This is the opportunity to design in a way which is aware of the requirements of individual people. People are generally aware of their capabilities, and perhaps somewhat expert in their own requirements. When people make decisions based on their own capabilities and own requirements, in their own space, people generally make decisions with survival as the objective.

This is a reason to use individual agency as the means to change: it may maintain an individual's capacity to survive and operate within economic, social and environmental homeostasis.

<u>This is the issue raised by our reviewers:</u>

It is not the economic or thermodynamics which is important: it is the social dynamics; and the psychological, the implications of change to power dynamics. The group structures and psychological connections overwhelm the economic and physical factors.

It is the group structures that both create and prohibit change. Which group structures are conserved through change and which group structures are not. If this is the objective, then maybe we can ignore anything that is not a group structure of people.

The group structure has social interaction which needs to be described. We are expected to use social theory.

Why don't we start from survival and skip social theory.

Assume that social structures exist so that people can survive, and think that they can survive. People will start form survival, once that has been maintained sufficient for a few minutes (or longer) other considerations may be processed

<u>From strict survival</u>
Let's ignore what is necessary for more complex agendas.

A primary goal is to ensure that they will not be attacked. Will they be attacked? An actor needs to present an appearance sufficient to not inspire or risk attack. This starts from physical, but proceeds to the social, familial, professional, and on.

1] don't be attacked (avoid being killed)
2] maintaining requirements for metabolic survival: air, water, food, shelter

I cant't examine [1] as it is too far outside our present work.

It seems that our work directly interfaces with [2] via CO_2 as air pollution. However this is not perceived as an immediate threat to survival. From the fundamental needs, CO_2 is oppressive but it is a slow generational oppressive pollution. It modifies biology but it is not immediately apparent to the senses. It is not sensed as a danger that people are aware of, it does not get the immediate danger classification.

We also interact with water pollution, as water absorbs CO_2 which modifies the PH of the sea water. It is an assault but not for human life immediately, and not very social.

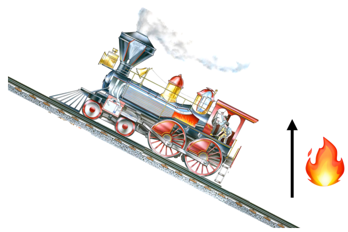
Social interaction is dominated by danger signals which are agreed on among social participants. When one person presents a danger signal, which another person does not acknowledge, there is social disequilibrium. When the danger is CO_2 - some people are sensitive, others are not, and this fractures the social structure, it instigates a social disequilibrium.

Such instances of disequilibrium cause problems in the social structure. The leadership of the structure will try to remove the disequilibrium or control it to be beneficial to the process and survival of the social structure. So long as there is a leader of the social structure who is in control of it, and especially in control of its benefits.

So what we've come to is : *leadership and social dynamics: acquiring the benefits of society*.
This is examined in the following section, where I look at that directly: who benefits from any change.

Thermodynamics in long term human development

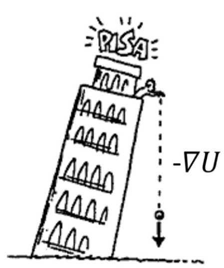
Thermodynamic gradients, which are present in Nature, are often reversed in sub-domains of the gradient, by human action.

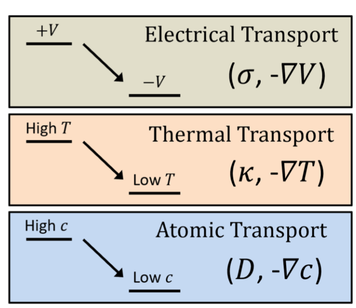


We can view human projects as engineering the modification of thermodynamic gradients. These projects which might not possible in Nature, but have been instigated by humans to be locally valid, by modifying local thermodynamic gradients. For example, it is not possible to grow soy beans in nature at the yield which was common in 2021. The reason it became possible is by the addition of chemicals. The thermodynamic contribution of the added chemicals reversed (or modified) the previously existing thermodynamic gradient of soy bean agriculture production at particular sites. This intervention reversed gradients locally, around the site and in the network-system of its agricultural production.

Human projects may be gradients that are valid within a small realm, but in the larger span are not possible. However they can exist, because there has been a sufficient gradient provided somewhere else, balancing a local gradient. The small individual gradients that we modified are beneficial to our survival, but in aggregate, the sum of all our actions imperils our long term survival.

"thermodynamic potentials are analogous to the gradient in potential energy (∇U)"





(Matthias T. Agne. Thermodynamic insights and microscopic models for characterizing vibrations in solids (Ph.D Dissertation): Figure 2.2.)

As we have modified (or reversed) gradients, if has become dangerous to long term survival
We have reverse small area gradients, in a way that enhances short term survival, with the assumption that the long term survival may be enhanced by other gradients which are developed when they are needed.

This is what economy might assume, that when needed, a gradient will be developed, which allows satisfaction of the conditions required for the existence of a different gradient. For example, if we have too much CO2, then remedies (machines) will be developed to sequester CO2. Economy seems to assume that there are no boundaries to capacity for action and invention. However there might be such barriers, and in our work we use the 'planetary boundaries' concept as the boundary conditions for economy.

Human development and innovation has produced smaller gradients by capturing larger ones. But having captured the largest gradients, we can no longer reverse those gradients by smaller gradients. We (perhaps) don't have enough smaller gradients on the planet which we might use to reverse the larger ones that we have already initiated.

At the largest scale, all the gradients that we employ, have been acquired from larger gradients. As human society has developed, it has made mastery of larger and larger gradients, until we mastered the largest gradients. CO2 is one of the largest gradients, but to reverse it, we may need energy sources that are larger than the energy which was used in the production of CO2. Reversing the CO2 gradient requires the energy used in producing the CO2.

This quantity of energy can perhaps only come from insolation and stored energy. The stored energy (fossil fuels and other molecular energy storage) is limited, and all the stored energy may not be sufficient to reverse the present CO2 gradient. (There are vast resources for energy on the planet, we concern ourselves with the common ones. In comparison, atomic energy may be possible, but it is not deployed sufficiently to reverse CO2, and it faces social resistance).

Can development continue physically? Perhaps it can not in the combustion paradigm. Regardless - it will for some, and the result of the combustion program is that it gets more difficult as we develop. This is different from the story of 'development' that we learned. There is an edge, there are planetary boundaries. Will the humans survive, the answer has always been: not forever.

From that view, how do we improve the situation? We can reduce CO2. In the social structure what prohibits us from doing this? The question may be perhaps: In the social structure, who benefits?

Assuming that if the currently existing social structure beneficiaries do not benefit from a change, they will not allow change to happen.

There are two possibilities:
1] Are we willing to upset the current structure? if we are willing, then it can be modified;
2] If we re not willing to change the social structure, are there ways around it, are we willing to keep the same beneficiaries?

Populations are divided between those segments. Who prefers which path, and where are they on the scale of benefits? Those who are current beneficiaries don't want change their status as beneficiary. Those who are not beneficiaries, those are given to revolution when pressed to survival imperatives.

Assuming preservation of the current structure, if we are to modify CO2, we might need acknowledge of the current leaders, the current beneficiaries. As the energy-economy structure changes, those who are in control of the previous / current structure, would like to be in control of the new paradigm.

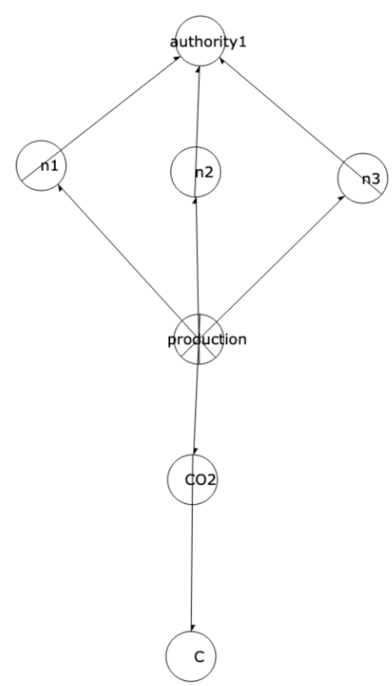
For example - the petroleum infrastructure leads toward solar: why? Because then they can survive.

Individual agents of change

A structure may or may not allow agents of change to supersede it. But if there are enough people (agents of change), it will happen regardless. If there are not enough individual agents of change, then change will not happen. If there is no acknowledgement of the currently existing social structure, and provision for its care, when action occurs in opposition to the incumbents' structure, incumbents might resist the action.

What is the quantity of *agents of change*?
What is the quantity of *nodes* that must be changed?

Assume a network, which encodes incumbents' CO2 production, and benefit structure. The network might also encode the social and economic structure. Precisely what it encodes is not so important because this is just an example: in practice our work creates an intervention which operates on real social and behavioral actions in the social and economic fabric, rather than a mathematical model. The real actions might be able to be described by the network outlined here, but that network is mostly outside the scope of our explanation.



We describe the relevant part:
The diagram on the right attempts to depict a carbon (*C*) to *CO2 production* structure which is implemented into economy by the nodes *n1, n2, n3,* under direction of *authority1*. *Authorities* are those incumbents who administer CO2 production and its benefits. They control production structures.

let the set *b*{} containing *Ac1*, *Ac1*, *Ac1* … , be a set containing *agents of change* and *bq* be the quantity of the items in *b*. Agents of change are individual people, and *bq* is their quantity. The people in this set, share a common *behavior* (*b*), which is the action sequence that produces a change.

b { *Ac1*, *Ac1*, *Ac1* … }

let the sets: authorities (*authority1, authority1, …*) contain nodes *n (n1, n2 …*) nodes which when acted upon by any of the items in set *b*, (*Ac1, Ac1, …*) via their characteristic *behavior* (*b*), which is a sequence of actions (*actions* is another set which we will ignore here), change their characteristic links to other nodes. The links between nodes are the structure.

authority1 { n1, n2, n3, … }
authority2 { n1, n2, n3, … }
authority3 { n1, n2, n3, … }

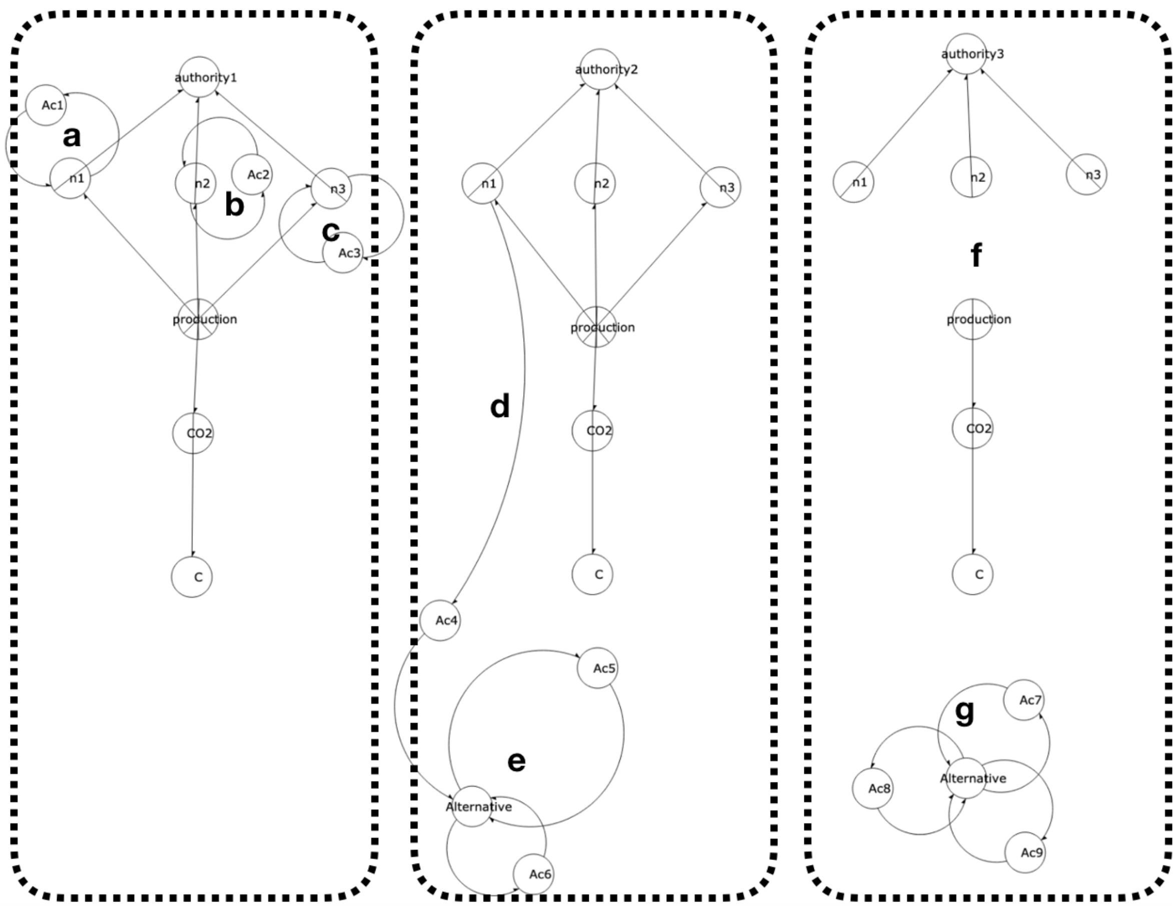


Fig.1 **Fig.4** **Fig.3**

We can follow one sequence of structure change:

In Fig. 1, the area around **a** shows the interaction of *Ac1* and *n1*. The are engaged in economic-social transaction. *Ac1* is an '*agent of change*', a person, a customer, a decision maker. The *n1* node represents the items on the provider/seller side of economic transaction, including the object for sale, the sales system or salesperson, and related necessities for committing the transaction. The area **a** is the same type of transaction, as well as **c**. The transactions occurring in Fig. 1, are all CO2 producing transactions, attached to the CO2 producing infrastructure, which is drawn in the middle of the figure.

Fig. 2 shows that the transactions are no longer occurring at the *n1*, *n2*, *n3* nodes. The customers are transacting with an 'Alternative': the drawing shows *Ac5* and *Ac6* engaged in interaction, while *Av4* has already completed a transaction with *n1* but has moved toward the 'Alternative', while *n1* is still providing resources from the already committed (past) transaction.

Fig. 2 shows at **g** that the 'Alternative' has captured all the transactions with *Ac7*, *Ac8*, *Ac9*. The nodes *n1*, *n2*, *n3* have no transactions and eventually do not continue to interact with production, **f** shows the network has broken apart as production no longer connects to transactions.

Authority is the incumbency that controls *n* (the nodes in our graph), authority determine whether a greater or fewer quantity of nodes can be changes or removed from the social-economic production structure. As a management figure the authority controls the size and function of the structure, while the nodes implement the precise actions such as sales or ordering production.

Authority is necessarily a smaller group (set) than nodes. It is the Authority, and the nodes, which comprise a structure that I call the *Closely Affiliated*. These are the actors who receive the social and economic benefits of production (or structured action). This is the management group and the financial controllers. They direct production, resource allocation, sales. Who composes the *closely affiliated,* how many are they, what is their interaction density - these are the characteristics which are the key to dissolution of the group. In a simple way we can ask, what is the energy required for keeping them together, what is the energy required for taking them apart - but it is not so simple in reality. In our work, we don't even consider them, nor bother with examining them.

Our work needs to point out how individual action may disentangle the link between production and the nodes which provide social-economic transaction to production. That link is removed when our *agents of change* choose an alternative, instead of continuing their interaction with extant CO2 production networks, and they do this one transaction at a time.