5. How closed systems interact

Improbable interactions

Poerksen: Professor Maturana, for a week now we have been meeting day after day for the purpose of this interview. Sometimes we sit together in your house, then we see each other in the rooms of the University of Santiago de Chile, and frequently our appointments take place in the institute you have just established in the city centre. What precisely is happening here? In the terminology you have introduced so far, we would have to say: a single structure-determined observer with a closed nervous system encounters another structure-determined observer with a closed nervous system. How can that be? How can two closed systems – an epistemologist from Chile and a journalist from Germany – meet for an interview in this mega-city of Santiago? Why do we not miss each other most of the time? Why are we apparently successful after all?

Maturana: The reason is that our encounters take place in a domain of interactions that must be clearly distinguished from the operational domain of our nervous system. When we make appointments and meet, we act as organisms, as wholes in a sphere of relations. Our meetings do not take place on the level of the internal operations of the nervous system; that is certainly not the place where we meet.

Poerksen: Nevertheless, we have so far been talking exclusively about *lonely systems*. Therefore, the thought suggests itself that we cannot but permanently misunderstand each other, that we ought to be permanently annoyed by each other's self-directed, autonomous behaviour. This simply is not the case, it does not happen. How is it

possible to transcend the loneliness? How can the two of us – closed systems – converse and even attempt to compile a book together?

Maturana: As human beings, and as the mammals that we are, we share the property of enjoying the company of others, conversations and communal action, – and so we keep returning to these enjoyable forms of communality in our everyday life. The fact that we are closed systems is irrelevant in the domain of interactions; we remain lonely inside but together we create a domain in which our encounters take place. Our conversations take place in the flow of interactions, in a domain that must be distinguished from what goes on inside us.

Poerksen: We are, as you claim, closed systems, and exist in a sphere of unbridgeable loneliness, but at the same time we also meet with each other and make plans together. How does that fit together? The two positions flatly contradict each other.

Maturana: No, they do not. Faulty thinking causes the contradiction you suspect here. The mistake is to confuse two domains that must be kept distinct, and to try erroneously to connect what happens inside the nervous system with the events in the domain of social relations. That cannot work because each of the two domains must be considered separately. Therefore, the closure of the nervous system and the fact that we are able to make appointments do not contradict each other at all.

Poerksen: I cannot follow. To arrange a successful appointment, surely the originally closed system must open up, switch to reception, make itself permeable, and engage in resonance. Everything will fail if it remains closed.

Maturana: Here is a little analogy. Imagine you buy a new pair of shoes and begin wearing them from time to time. A year later, your feet and your shoes will inevitably have changed. They are no longer the same. The shoes have become much more comfortable although they have not in any way mingled with your feet; shoes and feet still exist as separate and closed entities. Their boundaries are clearly recognisable and have not become permeable for each other in any way.

The comfortable feeling due to the continual use of the shoes is not the result of an opening of the two distinct systems; it simply arises in a different domain.

POERKSEN: If we continue with this analogy, how could the interaction be described more precisely?

MATURANA: The central point is that foot and shoe, to stay with this ordinary example, both have a plastic, variable, structure. It transforms itself depending on the recurring and recursive interactions – and therefore foot and shoe can change together and in mutual correspondence in the course of time. The degree of congruence increases. This mutual change requires, however, that the shoes are used with certain regularity and frequency, and that there is a certain comfortable feeling that invites us to put them on more often. I claim that we can describe the encounters between human beings and other animals in the same way as the interaction between feet and shoes. The congruent changes – that is the whole secret – are the simple result of recurrent and recursive interactions between systems. These interactions trigger mutual structural changes that do not affect the organisation of the systems.

POERKSEN: What we have now is a theory of interaction, which does not contradict the fundamental autonomy of the systems and necessarily excludes any kind of reductionism. Keeping different domains and the phenomena arising in them distinct makes it impossible, if I understand you correctly, to play the game of reductionism – *this* is really nothing else but *that*.

MATURANA: Exactly. And suddenly it is possible to perceive phenomena which do not take place inside a system but in the domain of its relations, although they are, of course, in no way independent from the internal features of the interacting systems. Just look at the microphone through which our conversations are recorded. It is standing on the table on the tablecloth. When you pack it away this evening, we will both notice a slight indentation in the tablecloth due to an interaction. The indentation in the cloth is neither an internal feature of the microphone nor of the cloth but is certainly dependent on the characteristics of both – and belongs to the domain of their relations.

If we apply this to living systems, we can say: The nervous system and the whole organism may be closed, but if they have a plastic structure that changes in the course of the interactions they undergo, then a history of relations may unfold that does not intersect with the internal dynamics of the nervous system or the organism (and *vice versa*).

STRUCTURAL COUPLING

POERKSEN: How would you describe in your language what happens between us? What happens when we meet, talk to each other, make further appointments, and then continue with our discussions?

MATURANA: In my terminology I would say that the recurrent and recursive interactions generate *structural coupling*. With this term I want to refer to the history of mutual structural changes that makes it possible for a consensual domain to emerge, a behavioural domain of interlocking and reciprocal interactions between two structurally plastic organisms. With regard to our interview: We keep meeting and, therefore, are not only in recurrent, constantly repeated interaction but also in recursive interaction. Our conversations form the basis for further conversations, the elements of our conversations refer to themselves and build on each other, – and that is recursion. Our meetings trigger structural changes inside each one of us, and they continue as long as we move in the dynamic congruence that leads to structural coupling. Structural coupling arises if the structures of two structurally plastic systems change through continual interaction without destroying the identity of the interacting systems. In the flow of such coupling, a consensual domain is formed: a behavioural domain within which we act together and in reciprocal correspondence; the changes of state of the coupled systems – more generally – are reciprocally conditioned through interlocking sequences.

POERKSEN: These three concepts, – *recursive and recurrent interaction, structural coupling* and *consensual domain* – contain answers and problems. However: What problem do they solve? What question do they answer?

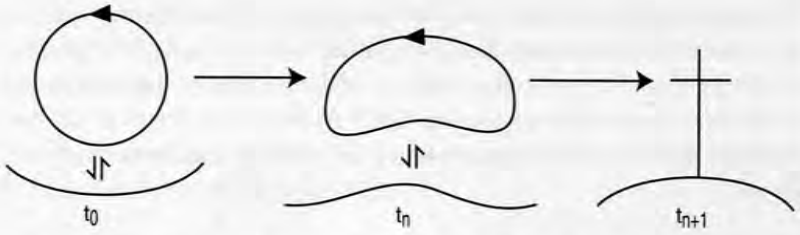

Fig. 7: This diagram shows a living system changing in interactions with a medium in the various phases of its history. The realisation of living occurs in the interactions of the organism and the medium in a spontaneous flow of structural changes in which the organism and the medium change together congruently as long as the organism conserves its organisation and its adaptation to the medium through those structural changes. This dynamics of structural congruence that takes place between organism and medium is called structural coupling. The organism dies when the structural coupling is lost, when the organisation and the adaptation of the organism is lost.

MATURANA: For me these concepts are elements of an answer to the following question: How is it possible that we, as closed, structure-determined systems, can interact in a harmonious way? As all systems are structure-determined, an external agent cannot determine what happens inside them. The change is triggered by the perturbing agent but determined by the structure of the perturbed system. Instructive interactions are impossible. Of course, an external impact may lead to the disintegration of a system by destroying its organisation. It is also possible for the systems – due to structural change – to lose contact. They may, however, continue interacting by preserving some form of cohesion and maintain their organisation. Here we are concerned with the last variant of interaction.

POERKSEN: What is the foundation of such an encounter, of such continual contact between systems?

MATURANA: There must be some structural congruence. To use another everyday example: If you want to enter a locked room without breaking the door open or destroying the lock, you will need the right kind of key to gain access to the new domain. I would say, therefore, that lock and key must have a congruent structure.

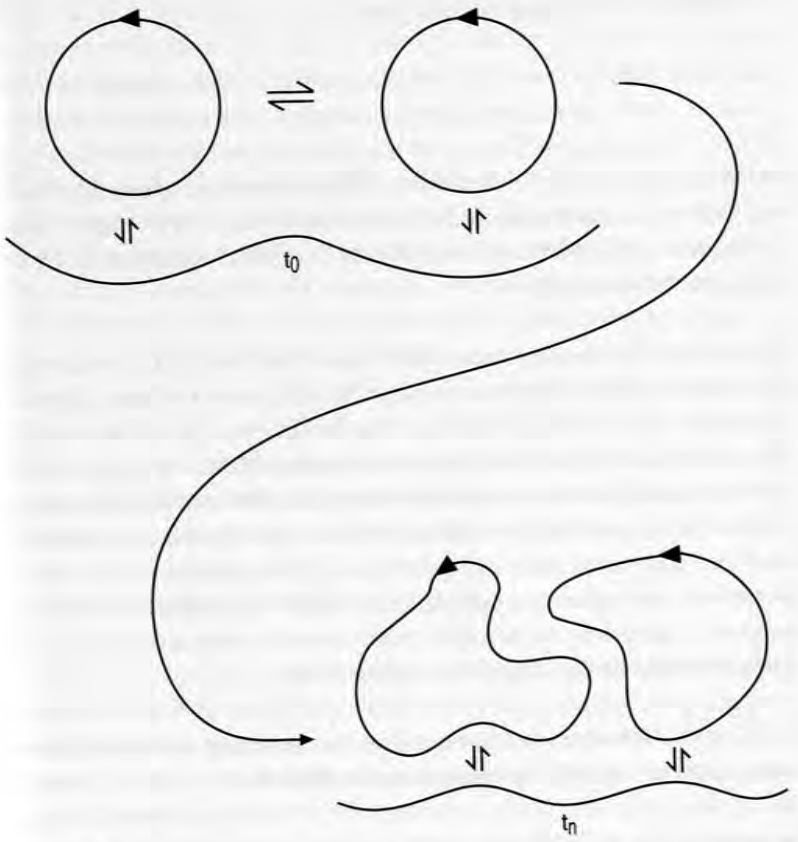

Fig. 8: The diagram shows two living systems and their interactions in a medium.

POERKSEN: Is this your answer to the question of how to enter a closed system? The motto would then be: Find the fitting key!

MATURANA: What matters is a specific relation between the lock and the key, which in this case is the result of planned production: someone designed lock and key in this particular way. – However, when a young man and a young woman find each other and, after a number of unimportant encounters with other people, fall head over heels in love, something very similar to the example of lock and key takes place. They look at each other – and stay together. Their particular congruent structures that enable them to enjoy their relationship is the result of our evolution that started billions of years ago.