« Non-humans in social action: between tackling a problem and a problem to solve »
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Introduction

The purpose of this text is to show the advantages of the Actor Network Theory approach. This approach was developed in the eighties around the work of Bruno Latour and Michel Callon. Actor Network Theory was first specialised in the sociology of sciences and techniques. It then was applied to a wide range of subjects, such as innovation, dissemination processes, and the marketing of new products in the commercial sector. After a few remarks about the working tools and methods, we propose to discuss two examples taken from a study financed by the Prime Minister's scientific, technical, and cultural offices. The first example concerns the Belgian orchard sector and the case of a group of orchardists, the GAWI, who practice integrated cultivation. This example tends to show how a complex made of 'non-human' elements structures the changes that are made in the growers' technical supervision and the orchard operator's trade and in the warning schemes used and finally lead to collective action through the growers' joining together in a non-profit association. The second example concerns a farmers' co-operative that sells local products and some members of which raise and fatten cattle. The rise in the demand for meat and the introduction of a butcher in the sales circuit lead to a change in all of the operators' skills. The point of friction, that is to say, the evaluation of and pricing based on the meat's quality will be settled by a particular object, that is, the carving table *(i.e.,* grid*)*.
Our main hypothesis is that objects and, as a rule, non-human entities - such as animals - act, even interact, just as much as the human entities - individual or collective actors - do.[1] These non-human entities (NHs) may facilitate action, provide the resolution of a point of tension, constitute barriers to or even structure collective action, depending on the circumstances. In the examples that we shall discuss, the NHs' actions reconfigure the forms of collective action, modify the actors' individual or collective powers, and even resolve points of tension. The links between non-human and human entities and the associations that they form can then shed light on collective action and the shape it takes.

Tools and methods

Actor Network Theory is not a constraining frame for the researcher who uses it. In the final analysis it works on the basis of some simple hypotheses, to wit:

- follow the actors without preconceptions as to their interests, strategies, or the games in which they take part and/or consider objects to be actors on a par with human entities, which is to say that they, too, are capable of action.
- consider the action taken by the actors to be a dynamic process, that is to say, a temporal process but also a transforming process (a translator).
- consider action to be the work of associating as much as dissociating various entities of different natures.

[1] This point deserves some attention. Our aim is not to consider non-human and human entities as one. Ethical work, for example, continues to remain the sole domain of human entities.

The product of such work often consists of an account or relation of events. This relation has a chronological structure, like a conventional narration. However, its starting point is not the result of the researcher's sole decision. Rather, it is the product of a process of stating the problem that involves various actors: the researcher, of course, but also the entities that commissioned the work and, last but not least, the entire set of interactions with the subject of the research itself. This process serves to validate the starting point.

The usual investigative techniques may be used, that is, interviews, participatory or non-participatory observation, and document analysis.

Enter Psylla pirisuga*, the red spider, and collective action*

The pear sucker problem: larvae, honeydew and other sooty moulds

T1

Psylla pirisuga is an insect pest specific to the pear tree. It breeds three to four generations a year. The larvae suck up the sap through the leaves and shoots. This upsets the sap's circulation. This sets back the tree's general growth, formation and development of flower buds, and consequently flowering the next year. The larvae's sucking action - to suck up the sap - produces a honeydew that burns the leaves, shoots, and fruits' skins. Sooty mould - a microscopic fungus - then develops on the honeydew, which leads to depression of the tree's photosynthetic activity. This can lead to early leaf drop and depressed flower induction (fewer flower buds). The honeydew flows, which are especially noticeable in very hot weather, form blackish spots on the fruits that make them unmarketable.

Box 1

As we can see, the combination of pear sucker larvae, honeydew formation, and sooty mould infestation is a real problem for the professional orchardist. The fruits that are blemished by the sooty mould must be taken out of the usual fresh fruit marketing circuits whilst the depressed flower induction has a direct influence on the amount of fruit that develops. The consequences are considerable economic losses for the professional grower.

Chemical control of the pear sucker is tricky. The discovery of pyrethrinoids in the late seventies and their massive use led to the development of resistance as early as the first half of the '80s, at which point the number of sprayings rose from 5 to 20 without any tangible results on the pear sucker populations. What is more, the use of chemicals with wide spectra of activity also caused lasting damage to the populations of natural predators, *Anthocoris nemoralis* being foremost amongst them.

The dead-end in which many Belgian orchardists found themselves at the time called for a rethinking of the chemical pest control programmes for orchards. At the time, many research and

extension work networks were working on what was customarily called 'directed control'. This type of chemical control involved the use of selective - that is, narrow spectrum - pesticides and a more reasoned spraying schedule. To achieve, this, the technical supervision of orchard operators had to be reconfigured. The agricultural technician had to provide support for the decisions taken by the orchardist and help him, in particular, to work out his spraying schedule. Various orchard observation schemes were set up to warn the grower of changes in the pest populations and enable him to choose the best time to act. The orchardist also had to master various orchard observation techniques that he was not in the habit of using until then.

The various operators' abilities have been transformed as a result of this process: the technicians now engage in more dialogue with the orchardists about the best time to spray, and how to draw up a control programme, for example; the orchardists are willing to make greater efforts to monitor their orchards; and research centres and especially the pesticide manufacturers are setting up a research programme to develop narrower-spectrum pesticides. So, as we can see, not only the various actors' skills and competence, but also the intervention and control networks - warning systems, technical supervision, etc. - have changed. Directed chemical control thus called for reconfiguring the orchardist and extension workers' jobs but also setting up warning systems and schemes.

Box 2

In the eighties the pesticide industry put a new selective miticide, amitrase, on the market. This juvenile hormone analogue circulated via various networks. It reached Belgium's Flemish research centres via the Netherlands and Walloon research centres via Switzerland. This narrow-spectrum pesticide was tested in various European orchards and was officially recommended by Gorsem's centre in 1989. The chemical's spectrum effectively makes it possible to spare the pear sucker's natural predator, *Anthocoris nemoralis*. The subsequent rise in the auxiliary's numbers, coupled with a reasoned chemical control programme, made it possible to check the pear sucker infestations that had been common until then.

Whilst the pear sucker problem could be partly held in check by this twofold break with conventional pest control schemes, the spread of *Anthocoris nemoralis* shows the usefulness of another technique already well known in Switzerland, that is, biological pest control.

Box3

T2

Belgium's apple orchards were likewise plagued by infestations of another mite species, the fruit-tree red spider mite,[2] in the eighties. The proliferation of this predatory mite was not linked to the development of resistance in the species, but rather to massive spraying of broad-spectrum pesticides that decimated the populations of its natural predator, *Typhlodromus pyri*. The name of the game thus became to find resistant strains of *Typhlodromus pyri* that could be reintroduced

[2] European red mite (US)

into the orchards as a means of biological pest control. Such strains were found in Switzerland and the Netherlands and reintroduced into the two countries' reservoir orchards before being released to commercial orchards.[3]

This work involved an experimental phase to check that the Swiss strains could adapt to the Belgian context, *i.e.*, fruit-tree varieties, climate, and soil type and structure. After a trip to Switzerland to bring back some *T. pyri* specimens, a handful of orchardists from the Lower Meuse region, Liège Province - all members of Wallonia's applegrowing leagues - came together and signed an agreement with the regional public authorities to conduct some of the testing required to reintroduce *Typhlodromus pyri* (ability to survive, development of reservoir orchards) and carry out the more general work of validating the integrated techniques used in Switzerland (economic profitability and technical feasibility). It must be said that the trip to Switzerland had enabled the orchardists to learn the rudiments of what was customarily called integrated pest management, which spans a much broader notion than that of biological pest control through the reintroduction of natural predators.

Box4

The agreement was successful and culminated in the conclusion that a permanent supervisory centre had to be set up for the main purpose of implementing and developed integrated pest control techniques.
The association of IPC orchardists in Wallonia or GAWI (Groupement des Arboriculteurs pratiquant en Wallonie les techniques Intégrées) was created in 1990. It was set up as a non-profit association and consisted of some thirty professional orchardists. The GAWI hired some technicians to provide technical supervision but also to carry out the validation and testing work with various Belgian and foreign research centres. An original communications system - the Fruitel minitel - was set up to allow the circulation of pest control files and various types of information. It also enabled the member orchardists, technicians, and many researchers in Belgium and abroad to engage in a running dialogue.

Today, this centre is a recognised reference and testing centre and vocational training centre. It is in charge of implementing integrated pest control, which has since become integrated crop (or orchard) management, and has some sixty members.

A group label was registered in 1990 already and a second non-profit association and a co-operative were created in its wake to promote the new label. The fruits bearing this label are sold in a major Belgian supermarket chain while the new market co-operative is trying to develop its potential clientele, notably on the export markets.

The marketing of fruit bearing the ICM label could be the subject of a separate talk. What, however, can we learn from this story?

[3] In 1986 (the Netherlands) and 1989 (Switzerland).

Box5

Let's go back to the introduction.

Follow the actors without preconceptions as to their interests, strategies, or the games in which they take part and/or consider objects to be actors on a par with human entities, which is to say that they, too, are capable of action.

We have seen how the strange combination of pear sucker larvae, insect honeydew, and sooty mould leads to the fruit's 'disqualification' and thus removal from conventional market circuits. This 'group', composed of larvae, mould, blemished fruit, but also the customers' demands concerning the products that circulate in our grocery sections, calls for a reaction as much as the red spider mites do. The pear suckers or red spider mites and their effects on orchards are the foci around which both a technical supervision network - warning systems, cropping advice - and the technicians and orchardists' jobs (ability to communicate and ability to observe, respectively) are recomposed. Making such a finding means observing the ability of a 'collective' composed of non-humans to act and forging a meaningful link between these 'collectives' and the structuring of collective action, *i.e.*, changing the technical supervision or job of the orchardist, networking, and developing an innovative communication system.

Consider the action taken by the actors to be a dynamic process, that is to say, a temporal process but also a transforming process (a translator).

The recomposition mentioned above occurs over a relatively long time span. Some fifteen years elapsed from the discovery of pyrethrinoids to the first signs of resistance in the pear sucker and then the GAWI's founding. It took the GAWI another five or six years to market the fruit produced under integrated orchard management on a wide scale. More basically, the past score of years has been marked by noticeable changes in the operators' skills and competence (jobs) and technical (and commercial) supervision of the orchards. The honeydew that is 'colonised' by sooty mould produces blacks spots on the fruit's skin. To solve this problem, warning systems had to be devised to monitor the pest populations and determine the best time to act. The orchardist also had to be 'converted' to new orchard observation techniques and teach the extension worker to communicate more effectively so as to get a better assessment of the orchard's state and thus advise the control programme more effectively. Finally, there was a need for better mastery of the available knowledge through collaboration with various research centres but also learning to working with the professional orchard operator.

Consider action to be the work of associating as much as dissociating various entities of different natures.

The pear sucker, honeydew, and sooty mould form a collective that is detrimental to the production of marketable fruit in conventional circuits. Of course, this collective does not have a will of its own, but does have the ability to act. In any event it calls for an association amongst research centres and orchard operators, but also amongst less powerful or more selective

pesticides. It also calls for the inclusion of the pest's natural predator(s) if an effective biological control programme is to be carried out. The pear sucker-honeydew-sooty mould association or red spider mite also calls for a dissociation of factors. For example, whilst *Typhlodromus pyri* must be included to control the red spider mite, the red spider mite must also be 'thrown out of the ring' to protect the fruit from the pest's devastating effects and ensure a marketable harvest. This means joining with *Typhlodromus pyri* and divorcing from the red spider mite.

The carving table or how to get prices to reflect quality

Our interest in the objects of our field analysis is based on the hypothesis that these objects, far from being inert and smooth, can, in embodying the ideas of their (invisible) generators, co-ordinate action and silence the incessant disputes that normally occur by transforming the various actors' attributes and stabilising the agreement for the purpose of collective action. The empirical material proposed is part of a study of the problems that are encountered in lengthening, *i.e.*, adding levels to, agrifood networks. In particular, it refers to a farmers co-operative for the sale of quality regional products. This co-operative markets a normal range of farm products (dairy products, chickens, vegetables, etc.). In addition, some of its members also raise beef cattle, but sell the meat individually and informally to private consumers, who buy the meat and store it in bulk in their freezers. This is our starting point or T0.

t o Individual cattle rancher (member of the co-operative) ñ Consumer (freezer)

In response to rising consumer demand the beef farmers decide to adopt a more structured and official way of selling their products by taking over a butcher's shop. They are then forced by law and the organisation of their work to hire a butcher. The beef marketing project now reaches point t0'.

t oí Co-operative beef farmers ñ butcher (butcherís shop) ñ consumer (butcherís shopís customers)

Including the butcher in the sales network changes the deal, for it adds a new actor and all his equipment (refrigerated counters, cold storage, slicing machines, leftover meat, etc.) to the network. More generally, it raises the question of the alliance between the producers' network (co-operative organisation of a farmers' association) and the butcher's network (a regulated profession, competence, codes, etc.). The producers' aims are to get above-market prices, which they justify by the quality of their produce and fewer middlemen. However, these goals come up against the plans of the latter, the visible face of which is represented by a young butcher (employee) and a few wise investments (purchase of a butcher's shop).

This attempt to form an alliance has to grapple with an issue that is crucial for the smooth co-ordination of the meat-selling action, namely, how to establish and set numbers (in the form of a

price) to the link between the crude commodity (cattle on the hoof) and the final retailed product (the cuts of meat in the butcher's shop) that will both ensure the undertaking's viability and yield prices that truly reflect the differences in quality.

Box 1: Who sets the prices and defines the products?
The rancher's or butcher's rationale?

The system created initially by the co-operative has reached a dead-end. Under this system, the purchase price of an animal for slaughter is set by co-operative thinking. It is proposed by the co-operative's cattle-breeding members according to the notion of 'fair' pay for raising the livestock and is systematically higher than the prices practised in the sector, which are set per kilo of live weight without allowing for the quality of the delivered product. The co-operative has been developing this idea of fair prices for the past ten years. The butcher's retail prices, on the other hand, are aligned with the prices practised in some ten traditional points of sale in the region. This is the market rationale.

Although the carcass purchase price accounts for more than 75% of the meat's retail price, there is no link between the two! This raises two problems, one of equivalence, *i.e.*, how to set the price of a kilo of roast based on the price of a kilo of carcass, and one of defining the raw material, *i.e.*, how to assign a price to a raw material of variable quality. The better conformation of certain animals yields a larger proportion of prime cuts and thus higher retail prices.

The butcher's shop's accounts plunge into the red. It takes more than a year for the hired butcher to step in. However, he is young, inexperienced, and one against seventeen producers. What, then, is the source of the force that will put an end to the price dispute practically overnight?

The butcher devises a carving table that puts an end to the price discussion, for it enables the co-operative to reinstate the double link between purchase price and retail price and price-setting as a function of the raw material's quality.

Box 2: The carving table

The butcher's work consists in transforming crude produce, that is, a carcass (the slaughtered animal) into a range of finished products (steak, roast, rib steak, chopped meat, etc.). These various cuts meet the consumers' various known needs and requirements: preparation, cooking, eating, status. The carving table gives the percentage of each recognised category. It has three functions, as follows:
(1) The table cuts up the carcass precisely into various categories with known characteristics (filets, steaks, stew meat, chopped meat, etc.). This precise division is based on both the butcher's butchering skill and the consumer's competence (ability to identify, prepare, cook, and appreciate the various cuts of meat).
(2) The table qualifies the carcass. A 'well-formed' animal has a higher percentage of prime cuts. Consequently, it has a higher market value. The grid contains several columns that correspond to the various classes of carcass.

Illustration: Carving table. Source: Fed. Nat. des Bouchers et Charcutiers de Belgique

(3) The table is also a management tool, for the mean price of all of the cuts making up the carcass is a fixed amount. This fixed amount can be achieved by simultaneously raising the prices of the cuts in great demand and lowering the prices of the unpopular cuts. The type of demand may vary from one site to the next.

With a calculator in one hand and the carving table in the other, the butcher then redefines the double purchase price/retail price and price/quality link by calculating the cost price according to the carving table. Using this table, the butcher manages to convince the seventeen livestock farmers that the either the retail prices are too low or the animals are being sold at too high a price. If, logically, the retail prices are raised in the first phase, applying the carving table at a later stage gets the farmers to acquiesce to modulating the purchase prices according to three carcass categories with different prices per kilo.

The carving table is the keystone of the beef retailing system. It was devised by the butcher's trade over a period of time. It establishes a stable connection between the technical value of the animal (carcass, purchase price) and the meat's consumption and exchange value (cuts of meat, retail prices) based on the butcher's skill and experience. In creating this alliance between butchers and producers, this table gradually redefines the actors' roles. This brings us to time t1:

t 1 Rancher-fattenersí co-operative ñ carving table + butcher (butcherís trade) ñ consumer (customerís knowledge of meat - fridge)

The carving table enables a new actor and a new product to join forces and impose their wills on the co-operative's project. The table lets the butchers' trade (skills, school, a federation and its

representatives) to enter the picture. Through this table, a powerful collective resource enters the co-operative. It offers stabilised abilities that are recognised by consumers. When mobilised, these abilities enable the co-operative to deploy its sales network through a network of butcher's shops. This deployment is made possible only through the transformations that it imposes on the livestock farmers first and foremost, as follows:

- The demands of the butchers as a group will ascend, via the beef cattle prices, and reconfigure the classifications used by farmers and consumers alike. The better prices paid for well fattened animals with better conformations encourage the farmers to breed for the meatier carcasses that offer more prime cuts. As a result, the farmers not only change their trade, but breed and fatten animals that meet the butchers and their customers' demands. At the same time, they gradually agree to give up some of their prerogatives when it comes to setting the prices at which they sell their animals to the butchers.
- The consumers' competence when it comes to identifying and using the cuts of meat is then aligned with that of the butchers. The stability of their competence and accessibility to knowledge opens up the network to more consumers, for it is no longer necessary for the consumer to buy a side of beef that requires skilful management in his/her freezer and deal with the preparation and consumption of the less attractive cuts, such as stew meat, tongue, etc. It now suffices for the consumer to know the general butchering code to buy the cuts that he/she wants.
- The carving table also requires the co-operative to classify the animals for slaughter in five classes matching those in the carving table. These classes then make it possible to refer to current market prices, which are collected and circulated each week in the agricultural papers. The co-operative now has the possibility of comparing and adjusting its prices.
- The carving table also makes some choices irreversible. Notably, it shuts out other choices, since it was built around one breed (the Belgian Blue), a 16- to 20-month fattening schedule, and a certain conformation (the stocky, high meat-to-bone ratio Belgian Blue conformation). Tts existence and the alliance with the butcher's world close the network's doors to other innovations, such as range-bred animals and breeds other than the Belgian Blue, that might be more attractive to consumers. But does the co-operative actually have a choice between using an efficient, existing network and creating a new school of butchering?

Conclusions

The 'collectives', be they the deliberate or unwitting results of associations between humans and non-humans, deserve the researcher's attention. The two examples discussed in this talk tend in any case to point to the merits of performing an analysis that takes them fully into account. In the first example, how indeed can one understand the creation of a non-profit association that currently boasts some sixty orchard operators who have been converted to integrated orchard management without looking at the starting points of a ten-year process. Interests, strategies, and market are all concepts that cannot shed light on the true underpinnings of such action, or at least that is what we believe. Why would the technical supervision of the farmers change; why would professional orchardists consent to investing heavily in learning new techniques; why would networking be instituted, and why would one accept to set up sophisticated monitoring and

warning systems if these collectives did not have a true ability to act or, in other words, if this long chain consisting of pyrethrinoids (that is, broad-spectrum pesticides), pear sucker resistance, and the work of *Typhlodromus pyri* had not imposed them on the actors involved, that is, the technicians, orchard operators, and research scientists? In the second example, how can one understand that the object changes[4] in particular the interactions amongst the various actors in the network and permits more generally the development of an alliance between the cattle-raising co-operative members' network and the butchers' professional network? These changes did not come about without resistance: the co-operative took a long time before hiring a butcher and the breeders became finishers as well only gradually. However, at the end of the day these changes did much more than give an undistorted picture of the reality of butcher/breeder co-operation as it might have been at time t0', with each party contributing its skills and abilities. Rather, they resulted in a new alliance that was more stable because it recomposed a collective in which the transformation of the actors present at t0' would ensure the co-operative's viability at t1. Through these transformations and the creation of this new alliance, the object actually translated or mediated between two initially incommensurable worlds.

In both cases, the object or non-human entity either imposed the recomposition of trades and thus the actors' competence and the invention of novel arrangements or made it possible to handle a point of considerable tension.

One last remark: The advantages of using Actor Network Theory lie in the fact that it treats the objet or non-human entity as an actor, that is to say an individual or collective hybrid or uniform entity that has the ability to act. This principle imposes the use of an original, specific methodology. What is more, it enhances understanding of social action and, more generally, collective action. It also opens up an ethical debate in a 'hypertechnical' society characterised by an explosion of machines and technology of all sorts.

Indeed, who, in the man/machine relationship, has the last word when it comes to defining good and evil or justice and injustice, that is to say, the 'ethical' work that people - this time - have made so many efforts to achieve since the dawn of mankind, unless the question ultimately is poorly stated and this work is now done by these same 'collectives', in which people obviously have their place but must agree to share in ways that doubtless were never as clearly defined in the past?

[4] We could have examined the point that brings up the interactions the produced the objects, but we preferred to show how an object makes it possible to extend an agrifood network by mobilising new networks that eventually force the actors to change between t0 and t1. In this regard we must mention the introduction of the still current manual (1999) of the butchers' federation, which contains the carving table: '*In 1974-1975 experts from the Economic Affairs Ministry and National Butchers' Federation and some neutral referees carried out a large number of comparative butchering exercises. These served as the basis for drawing up the carving tables that were accepted as the foundations on which prices would be set.' (National Federation of Butchers and Pork Butchers of Belgium).*

References