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Who Is the Actor and Whose Goals Will Be Pursued? Rethinking Some Concepts of Actor Network Theory

Ingo Schulz-Schaeffer

Introduction

Summarising the main ideas of actor network theory, Bruno Latour (1994; reprinted in Latour 1999, 174–215)[1] proposes four concepts to describe the role of technological artefacts in society: (1) interrelated programmes of action, (2) action as a property of associations of heterogeneous entities, (3) black boxing and (4) inscription. In his contribution "Translating Medical Practices" Bernhard Wieser (2006b) refers to these four concepts as a means to analyse prenatal testing and changes that occur in conjunction with the increased use of ultrasound screening and additional non-invasive examination methods. The interest he shares with the authors of actor network theory is to gain an understanding of the role of technology that is neither obscured by technological determinism nor by social determinism.

Actor network theory—and still more Latour's pronounced position within this strand of thinking—contradicts common sense views about technological artefacts. The empirical examples Latour provides in his texts are carefully chosen to clarify his counterintuitive point of view— e.g. the street bump (Latour 1992, 244) or the Berlin key (Latour 1996a, 37–51). Likewise, he presents thought experiments that are carefully designed to tell his story—such as the hypothetical reconstruction of the programmes of action and anti-programmes concerning the issue of leaving hotel keys at the front desk (Latour 1991) or his considerations concerning the combined action of the shooter and the gun (Latour 1994). In order to illustrate his concepts Latour applies them to a purified reality. There is nothing wrong with this but in empirical reality, as Michel Callon (1992, 79) states, "(i)mpurity is the rule". There, the ideal typical entities and events which provide the most striking evidence for the theorist's concepts are seldom to be found. However, it is with respect to understanding impure reality that the theoretical concepts have to prove their usefulness. In the case of Latourian actor network theory this means reconsidering some of its main concepts. I will do this by discussing Wieser's considerations about applying actor network theory to the case of prenatal testing.

Interrelated programmes of action

"Programme of action" is a general term introduced by Latour to denote goal-directed behaviour of human actors as also of technological artefacts. In this terminology a certain human strategy of goal attainment and an algorithm determining the behaviour of a technological artefact are both programmes of action. The unorthodox terminology leads to an interesting question: Whose goals will be pursued in technically mediated human action? Whose goals will be pursued when the outcome of a course of events not only depends on human action but also on technological artefacts with their programmes of action? Conventional wisdom holds it to be a characteristic of well designed technology to do nothing else but serve its users' goals. In Latour's words this is the view of technological artefacts as "pliable and diligent slaves" (Latour 1994, 31). On the other hand, conventional wisdom implies the fear that this relation may turn upside down and that we may in time be

[1] A German version of this article "Über technische Vermittlung" (cf. Latour 1998) translated by Gerald Wagner has been published in a book edited by Werner Rammert (cf. Rammert 1998).

condemned to adopt the goals predetermined by the programmes of action of an omnipresent technological environment. Pessimists and not only those of today, believe that such a change is already in progress (Schelsky 1979 [1961]).

According to Latour both views result from what he has called the "diffusion model": a set of common but false beliefs to the end that society and technology are separate spheres: "Social determinism courageously fights against technical determinism, whereas *neither exist* except in the fanciful description proposed by the diffusion model" (Latour 1987, 141). Consequently, he suggests a different answer to the question of whose goals will be pursued and whose programmes of action will be realised. His answer is that the programmes of action will affect each other with the result that neither of the original goals will be realised but a new programme of action will emerge and a new goal to which it leads. To establish or to change a certain relation with an entity means to redefine—to "translate"—this entity's programmes of action. In such a process the redefining entity's programmes of action will change to a certain degree, too. According to actor network theory, translation—i.e. redefining other entities' identities, characteristics, and programmes of action—is the elementary operation of network building (Callon 1991, 143). Not believing that society and technology are separate spheres, actor network theory holds that relations between humans, between technological artefacts and between humans and technology do not develop separately but as the co-evolving result of translation operations with humans and artefacts both being translators and subject to translations. Implementing and using technology within a certain context of human action thus implies a redefinition of the respective human programmes of action as well as a redefinition of the technical artefacts' programmes of action and this leads to a new overall programme of action.

As an illustration, Latour introduces the hypothetical example of the man and the gun. The programme of action of the man in this example is to take revenge. Obviously it makes a difference whether or not this man has a gun. Before the gun arrived on the scene the man may have intended to beat up his enemy but now it may appear to be a more satisfying revenge to shoot. The gun's programme of action to speed up small pieces of metal redefines the man's programme of action. With the gun in his hand, being about to take revenge means something different. And the man's programme of action transforms the gun's accelerating-metal-pieces programme into a programme of damaging human tissue. "You are different with a gun in hand; the gun is different with you holding it" (Latour 1994, 33). The original programmes of action both are reshaped while becoming part of a new overall programme of action.

Prenatal testing technologies have obviously changed the situation of pregnant women. They open up the new option "to tie the birth of a child to a condition" (Wieser in this volume, 111). Since the examination methods allow Down's syndrome to be predicted with a high degree of reliability or the gender of the child to be identified in advance it becomes possible to use prenatal diagnoses as decision criteria for or against proceeding with the pregnancy. Becoming pregnant becomes a necessary but non-sufficient condition of giving birth to a child. Barbara Katz Rothman (1986) has called this new pattern "the tentative pregnancy".

Applying Latour's considerations, Wieser argues that the pregnant woman's programme of action becomes translated by prenatal testing and vice versa. According to his reconstruction, the original goal of the pregnant woman is to give birth to a healthy child while the programme of action of prenatal testing is to abort foetuses with Down's syndrome. He suggests conceiving the tentative pregnancy to be the new overall programme of action which emerges from these redefinitions (cf. in this volume, 110–111).

If we start with the assumption that to give birth to a healthy child was the original goal of the typical pregnant woman we will, however, end up with a different story than Latour. In this story the programme of action is redefined but the goal remains the same. In earlier days what a woman could do to pursue the goal of giving birth to a healthy child was to take care of her own health, to avoid overexertion, possibly to keep a special diet, and so on. With the possibility of gaining knowledge about genetic defects of the unborn child, pursuing this goal now includes the option to abort a foetus with Down's syndrome. Thus, with prenatal testing pursuing the goal to give birth to a healthy child does mean something different. It is a different programme of action. Nevertheless, the goal itself does not change. The story we end up with is the old-fashioned story of technology as a means to human ends, a story strengthening the position of social determinism Latour wants to avoid.

Why is prenatal testing such a powerless actant within this story? The answer is that there is no conflict or contradiction between what Wieser imputes to be the programme of action of prenatal testing (abortion of foetuses with serious genetic defects) and the goal of the pregnant woman to have a healthy baby. Within the frame of reference of this story the pregnant woman easily integrates prenatal testing as an additional means of realising her goal. Moreover, within this story it makes more sense to say that aborting foetuses with Down's syndrome is part of the programme of action of the pregnant woman than to attribute it to prenatal testing. What amniocentesis or ultrasound screening devices as actants really do is only to generate the data for prenatal diagnoses. Within this story their programme of action is nothing more than to provide means for the realisation of human goals.

This is not the only possible reconstruction. A very different story unfolds if one takes the opposite to the tentative pregnancy as point of departure. Wieser describes the tentative pregnancy by the characteristic that it "changes (…) the relationship between the pregnant woman and the child in her body (…) It is not an unconditional love for the child, yet. It is a love that makes a stipulation or that develops only under certain circumstances" (ibid., 111). This characterisation implies a description of what the opposite to the tentative pregnancy would be: a pregnancy characterised by a woman who accepts her unborn child without reservation, who develops an unquestioning love for this new being, and who is ready to care for it whatever the circumstances will be. Admittedly, it is overly idealistic to believe that this "unconditional pregnancy" was the pregnant women's programme of action until prenatal testing technologies came into existence. We know only too well that it is not a new behavioural pattern for parents to make desired attributes—e.g. concerning the baby's gender—a precondition of winning their (the parents') love. In one crucial respect, however, the prior situation of not having prenatal testing devices and techniques at one's disposal was different: if the pregnant woman was to develop a loving relationship with her unborn child it was necessarily to a certain degree a relationship of unconditional love. This is not to say that pregnant women necessarily did develop such a relationship. There are and have been many other ways to interpret a pregnancy, e.g. as a misfortune that should be unmade or as a provision for old age. Nevertheless, if an emotional relationship was to emerge this was a process which could not be attached to certain conditions of the unborn child since these were unknown. Thus, to the degree that the mothers-to-be entered into emotional relationships with their unborn children, it is safe to say that the underlying programme of action was that of the unconditional pregnancy.

With the unconditional pregnancy as the point of departure the new option of determining health conditions or the gender of the unborn child in advance has the potential not only to add a new means to an already existing goal but to affect the pregnant woman's programme

of action as a whole. The preceding state of not being able to acquire this knowledge, as it were, hustles the pregnant woman into a relationship of unconditional love if she develops positive feelings at all. Thus, when she eventually learns that the child is not of the desired gender or finds out about a disability, she will already have taken the baby into her heart. Consequently, there is a good chance that her love and acceptance will continue. Prenatal testing destroys this blissful ignorance. Knowing ahead about her unborn child's disability it will perhaps become much more difficult for the pregnant woman to accept it without reservation. Where unconditional love is to some extent a by-product of the blissful ignorance of pre-prenatal testing days it is something that parents who learn in advance about the disability of their baby may find impossible to develop. Telling the story this way prenatal testing embodies an antiprogramme to the pregnant woman's programme of action. Now ultrasound screening or amniocentesis do much more than only generate the data for prenatal diagnosis. They participate in providing a knowledge which may greatly affect the pregnant woman's orientations and actions. Exposed to this anti-programme, the unconditional pregnancy becomes transformed into the tentative pregnancy as the new overall programme of action.

Both stories certainly reflect some truth. Women in different circumstances and situations may pursue different goals and employ different programmes of action. Additionally, it should be taken into account that both stories represent only a partial view of a larger picture and perhaps of the same picture. The differences between the two reconstructions, however, show that empirical reality is less elegant than actor network theory. The view advocated by Latour that from the interrelation of human and technical programmes of action something new results, "the creation of a new goal that corresponds to neither agent's program of action" (Latour 1994, 32), is a constricted view. Wishing to avoid social determinism and technical determinism as well, he conceals that the power to push through one's own goals can be distributed very unevenly between the parties involved. It is true that there are pregnant women who successfully resist changing their programmes of action—for example by not allowing the physician to tell them the child's gender in advance. On the other hand a few everyday experiences with ticket machines should be enough to prove that the same holds for technological artefacts. Thus, what results from the interrelation of human actors and technological artefacts can be described more comprehensively as a continuum with the social deterministic outcomes and technical deterministic outcomes being its poles.

Additionally, it should be noted that the resulting programme of action does not merely depend on the particular human actor or the particular technical device. Rather, it depends to a large degree on the allies which can be mobilised to support one or another programme of action. Analysing the establishment and changes of programmes of action as processes of mobilising allies lies at the core of actor network theory. Latour's paradigmatic example is the hotel manager and his goal to cause the guests to leave their room keys at the front desk (Latour 1991, 104–110).

The relevance of this concept to the subject of prenatal testing is easy to show. For example, it could be asked why, in contrast to the situation in India or China, the possibility to determine the unborn child's gender has not led to increasing abortion rates of female foetuses in western countries. The answer is obvious: aborting foetuses because of their gender is against the law and the legal authorities are willing and able to enforce this law effectively. Additionally, to give birth to a girl is neither an economic disaster nor a cultural stigma. The incentives to run the risk of violating the law, therefore, are limited. Consequently, there are at least three powerful allies supporting the anti-programme to the programme of using

prenatal testing as a means of this kind of selection, allies which may prove to be less powerful or absent in Hindu India or in rural China: a culture which does not stigmatise the female gender, a social environment that does not make male children a question of survival and a legal system capable of enforcing the anti-programme.

To arrive at a comprehensive picture of how prenatal testing changes the concept of pregnancy it would be necessary to take all these allies into account. There is, for instance, the tradition of European humanism which may turn out to be a strong ally to the unconditional pregnancy even in the age of prenatal testing. On the other hand, Wieser (in this volume, 120 f.) mentions the neo-liberal policy of reducing society's responsibility for the individual, which may put pressure on a woman who is pregnant with a disabled child. Another ally to the tentative pregnancy is a legal system which does not outlaw the terminating of pregnancy in the case of disabilities of the foetus. From this extended point of view the new programme(s) of action which emerge in relation to prenatal testing do not only result from the interrelation between a certain kind of human actors (pregnant women) and a certain kind of technology (prenatal testing devices and techniques) but are the result of a much more extensive association of heterogeneous entities. Moreover, the same applies to the already existing programmes of action from which this development departs. In all instances action is "a property (…) of an association of actants" (Latour 1994, 35).

Who is the actor?

In Latour's example of the man and the gun, a new overall programme of action and a new goal emerge out of the mutual translations between the man and the gun. Inevitably, this leads to the question: "Who, then, is the actor …?" (ibid., 32). Latour's answer is that together with the new programme of action a "new composite agent" (ibid.) comes into existence who is the actor, a "hybrid actor composed (…) of gun and gunman" (ibid., 33). Wieser adopts this view by arguing that in his empirical case the "association of a pregnant woman and prenatal testing becomes a new actor" (in this volume, 112). Against the background outlined in the preceding paragraph, however, it should be clear that many more actants participate in bringing about a certain programme of action. So for what reason does Latour privilege those two actants? And does it make sense to single out the pregnant woman and "the" prenatal testing in the same way?

It is my impression that Latour takes only the two actants into account for the sake of the example's simplicity. He wanted to demonstrate what results from combining human and technical programmes of action and has chosen the simplest possible scenario: a two-actant scenario, one actant being a human the other being a technological artefact. Thus, the example is not intended to be empirically exhaustive but to be concise. Its message, thus, is not that a certain subset of the actants involved makes up the new actor. Rather, Latour's point of view is that *all* actants participating in bringing about a certain action together constitute the actor of this action. This becomes clear when Latour moves to examples which are empirically more substantial. He describes, for instance, the hybrid actor of the action "flying" in such a way: "It is by mistake, or unfairness, that our headlines read, 'Man flies,' 'Woman goes into space'. Flying is a property of the whole association of entities that include airports and planes, launch pads and ticket counters. B-52s do not fly, the U.S. Air Force flies" (Latour 1994, 35).

However, this view of the hybrid actor raises a difficulty: the more comprehensive the list of actants becomes which contribute in one way or another to the action in question the more difficult it is to conceive the association of all these as one actor, i.e. as one entity to which

one overall action can be addressed. The man with the gun is a persuasive example of a hybrid actor because this combination evokes the picture of a cyborg and because the language provides distinct terms for this combination of actants: shooter or gunman. But if one adds, for instance, the influence of the National Rifle Association on the accessibility of the gun and the influence of the man's tough neighbourhood on his willingness to use force it would not be this easy to imagine the unified hybrid actor to which the resulting action is to be attributed. Latour seems to avoid this problem with the aviation example. Nevertheless, it remains unsolved. The reason why the much more comprehensive list of actants in this example can be easily subsumed under one hybrid actor is that this hybrid entity—the U.S. Air Force—is a corporate actor. And corporate actors are a kind of hybrid entity which we are already used to seeing as actors—without having to refer to actor network theory. It is certainly not this corporate actor alone, however, that makes the B-52 fly. Without the government funding the Air Force and without the oil industry providing kerosene the B-52 would certainly not fly. So, one again runs into the problem of identifying the hybrid actor. These considerations do not speak against analysing actions as properties of associations of heterogeneous entities. But they show that it is impossible to conceptualise such an association as a whole to be a hybrid actor. Identifiable hybrid actors always include only a subset of the whole array of entities contributing to the action in question. Thus, the question remains open why one should privilege such a subset by calling it the hybrid actor of this action. I will come back to this point later.

There is a second problem with the concept of the hybrid actor. It is related to the already mentioned fact that the interrelated actants' power to redefine each other may be distributed unevenly. The existence of prenatal testing devices and methods, for example, may have an influence on how pregnant women define their pregnancy. In Latour's terminology one might say that prenatal testing translates her into being tentatively pregnant (if we leave aside all the other actants' contributions to this translation). Only a small part of her programmes of action, however, is subject to this redefinition. Most of the pregnant women's activities take place in spheres of action in which prenatal testing devices certainly do not play a part: at work, with her family at home, in the supermarket, and so on. In contrast, the physician's examination room is the only sphere of action of amniocentesis or ultrasound screening. Thus, the programmes of action of these devices and methods develop completely under the influence of this single context (or more generally: under the influence of the devices' domains of application). The asymmetry between the pregnant woman and the prenatal testing devices is obvious: these devices' identity is largely defined by actants within the context of medical examination whereas the pregnant woman lives a life outside of the examination room where she is out of these actants' reach. Within an association of heterogeneous entities different actants will usually have different degrees of freedom to join and to leave, to accept and to reject attempts to redefine them. If one takes this into account, the observation that a certain action is a property of such an association of heterogeneous actants is not a sufficient reason to view it as a hybrid actor.

Finally, a third difficulty of the concept of the hybrid actor shall be mentioned. The actors of the pre-Latourian age, that is to say, the human individuals and the corporate actors, have the irritating habit of accepting only their own kind as actors—at least in important matters. For example, in the case of an incident they take pains to find out if this event is caused by human individuals or corporate actors or if it results from technical failure, from fateful coincidence or whatever. And they react very differently to such an event depending on whether they believe the former or the latter to be true. Using the conceptual tools of actor network theory, it is easy to identify this behaviour as translation operation: by reserving actorhood to

themselves, humans (and corporate actors) constantly define their relation to each other and to the non-human world. If, according to actor network theory, translation is the operation from which the interrelated programmes of action emerge, we cannot ignore this kind of translation. In this sense actor network theory itself does not allow associations of heterogeneous actants to be treated indiscriminately as hybrid actors.

Michel Callon, the second founding father of actor network theory, has suggested distinguishing between actors and intermediaries. This suggestion can help to deal with the three difficulties of the concept of the hybrid actor I have highlighted here. According to Callon, "(a)n intermediary is anything which passes from one actor to another, and which constitutes the form and substance of the relation set up between them" (Callon 1992, 74; cf. Callon 1991, 134). Intermediaries, thus, are the "translation operators". In actor network theory actors are defined by the capability to translate other entities. "By 'actor' we mean any entity (…) which defines and constructs (more or less successfully) a world peopled with other entities, gives them a history and identity, and qualifies the relationships between them" (Callon 1992, 79). This definition of Callon's is in line with Latour's view of actors (or actants) as "entities that *do* things" (Latour 1988a, 303; cf. Latour 1991, 121). However, since intermediaries are also defined as entities which translate other entities this definition alone does not allow a distinction to be made between actors and intermediaries. "If we held to this definition alone, it would not be wrong to say that an intermediary can be an actor" (Callon 1992, 79–80). According to Callon the translation operation has a further characteristic: the need to attribute authorship (Callon 1991, 140–141). It is this characteristic from which the difference between actors and intermediaries stems. Among all the entities which translate each other, actors are those to whom authorship of translations is attributed. "Any translation operation is accompanied by an attribution process, as a result of which the intermediaries in circulation are imputed to groups, who are thus transformed into actors" (Callon 1992, 85). Or to put it another way: "an actor is an intermediary attributed with putting other intermediaries into circulation" (ibid., 80).

Latour's question "Who is the actor?" now splits into two different questions: Who are the entities which—by translating each other— together build up and realise a certain overall programme of action? And who are the entities to whom the resulting action is attributed? The answer to the first question lists all the intermediaries or actants (in Latour's terminology) which contribute in one way or another to a certain action. The answer to the second question reduces this list to the actant(s) or group(s) of actants which is (are) viewed to be this action's author(s). Latour's concept of the actant presupposes the difference expressed by these two questions, too. An "actant" is "any entity that acts in a plot until the attribution of a figurative or nonfigurative role" (Latour 1994, 33). In other words: the entities are actants until the authorship of the action in question is attributed. Afterwards they are actors or objects. Thus, we have to deal with two different questions: the question of agency (who are the actants or agents[2] of an action?) and the question of actorhood (who is imputed to be the author?).

It is the methodology of actor network theory to treat all entities observed counterfactually as if the attribution of authorship had not yet happened and as if all these entities, thus, still were actants. Without doubt this approach has proved to be very fruitful in reconstructing the respective contributions of the heterogeneous entities to the observed overall programmes of action. However, this analytical perspective addresses only the first question, the question of

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[2] Latour uses "agent" and "actant" as synonyms but prefers the latter for reasons of terminological neutrality (cf. Latour 1994, 33).

agency. Consequently, it is misleading to conclude that the association of actants identified in this way is the hybrid actor of the action resulting from these actants' interrelated programmes of action—at least if one is in search of an answer to the second question, the question of actorhood.

Against the background of these considerations I shall now come back to the concept of the hybrid actor. There is a simple answer to the first problem mentioned above, i.e. to the problem of privileging a certain subset of all actants which co-produce a certain outcome by calling only this subset the hybrid actor of the outcome: actorhood is a result of attribution and attribution means selecting between actants and, consequently, privileging some of them. But why do we select this and not that subset of actants? Why do we possess terms to address certain associations of heterogeneous entities as actors (e.g. the U.S. Air Force or the Lufthansa as the actor of "flying") and why do we use certain terms elliptically to denote certain subsets of actants (such as in "a car drives by" where the term "car" means the hybrid of car driver and car) while other actants and subsets of actants are left aside?

One part of the answer lies in what Callon calls the convergence and irreversibility of an actor network. The degree of convergence of an actor network is the extent to which "any one actor's[3] activities fit in easily with those of the other actors, despite their heterogeneity" (Callon 1992, 87). The degree of irreversibility is the extent to which each actant in an association of entities "is inscribed in a *bundle* of interrelationships" (Callon 1991, 150). To the extent that this is the case, "any attempt to modify one element by redefining it leads to a general process of retranslation" (ibid.). The interrelatedness of translations creates irreversibility because it is usually more difficult to redefine a whole array of actants than only a single one.

There are different ways leading to the effect that a set of actants' activities fit together. Callon treats convergence mainly as a result of alignment, meaning that in the process of "interdefinition" (ibid., 82) the actants develop congruent definitions: "When the translation is 'perfect', what A says about A, I and B is the same as what B says about A, I and B or what I says about A, I and B" (ibid., 84).[4] It follows, then, that an association of entities which is strongly convergent in this sense at the same time is a strongly irreversible network. Because of its irreversibility and because every element defines itself as parts of the same whole, such a network becomes an unified entity, that is to say, an entity whose elements "act as one" (Latour 1987, 131).

Contributing to a certain outcome does not presuppose a sharing of other actants' definitions. For this reason, to act as one is always a property of subsets and not a property of the entire association of heterogeneous entities who contribute to an overall programme of action. The most prominent of these subsets are the corporate actor and the cyborg. The corporate actor's "structure of positions (…) that exists independently of the occupants of those positions" (Coleman 1990, 427) certainly is the most explicit way to make actants act as one. In social sciences, corporate actors are usually conceived as composed only of human individuals. Raymund Werle (2002, 126), however, has suggested a more comprehensive view of

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[3] To avoid confusion, the term "actor" in this quotation should be replaced by "actant" or "agent". Convergence addresses the matching of all entities' activities and not only of those to which actorhood is attributed.

[4] This understanding of convergence leaves aside that convergent actions as well may result from highly disparate definitions of the situation as John Law and Callon's case study of the development of the British TSR.2 fighter shows (cf. Law & Callon 1992).

corporate actors which includes the activities of technological artefacts. Empirically it is evident that artefacts as well as human individuals may act as occupants of positions. Obviously, my interaction with the bank as corporate actor is more or less the same whether I withdraw money at the counter or use the automated teller machine. Moreover, the concept of the corporate actor provides a useful model to analyse the combined action of users and technological artefacts as I have argued elsewhere (cf. Schulz-Schaeffer 2005). The term "cyborg", as I use it, refers to the single human individual which, in combination with one or more artefact(s), constitutes (or is perceived as) a hybrid entity. To act as This is one of the core notions of concepts of heterogeneous cooperation (Strübing et al. 2004). one in this case refers to the phenomenon that it is impossible to describe the combined action without having the human activities and the artefact's activities in mind. This is obviously true with respect to the action "to shoot someone down" or the action "to drive by".

The perception of a certain subset of actants to act as one seems to be a necessary condition for attributing actorhood to hybrid entities. It is not, however, a sufficient condition. The fact that without this or that tool or machine a certain action would be impossible does not prevent us from attributing combined activities of this kind to humans alone. Here, the second and third difficulties with the concept of hybrid actors come into play. In the face of observed differences in the actants' power to define other actants' programmes of action it is not unusual to attribute the action's authorship only to the actant(s) perceived as most powerful in this respect—even when it is seen that the action in question would not occur without the other actants' contributions. This may lead to an attribution of actorhood to technical as well as to human actants, but more often than not actorhood is attributed to humans.

This is not especially surprising since humans have brought numerous intermediaries into circulation through the ages in order to ensure their actorial primacy over the non-human world. According to Callon (1992, 80), authorship "is often inscribed in the intermediaries themselves. The scientific article, for instance, is signed, and the technical object is trademarked. Incorporated skill is attributed, under our law at least, to the body itself and to the subject who is said to 'animate' it. One of the essential elements of the description contained in an intermediary is the identification of the actor who claims attribution of the author's rights". Inscriptions of this kind are powerful means of attributing authorship. As Callon's examples indicate, their power depends on the degree to which they are backed by legal norms, by social conventions or by the beliefs of everyday knowledge. Many of these norms, conventions and beliefs confine actorhood to human individuals, thus being themselves powerful intermediaries for ensuring human actorial primacy.

"Distinguishing between actors and intermediaries", Callon (1992, 80) says, "has nothing to do with metaphysics, ontology, or the philosophy of the rights of man. It is above all an empirical problem whose solution is to be found in observation". The preceding considerations indicate that the space for attributing actorhood to hybrid associations of actants is limited. At least this is true if one follows Callon and treats actorhood to be the result of empirically observable attribution of authorship. An alternative would be not to observe how actorhood is attributed empirically but to claim that actorhood should be attributed in a certain way. This is what Latour does when he denounces the attribution of flying to the human pilot alone as a mistake or unfairness. To argue this way means to bring a normative aspect of the attribution of actorhood into play: for good or for bad, the action's actants should all be held responsible for the outcome. Or as Latour says: "Responsibility for action must be shared among the various actants" (Latour 1994, 34). This is also the rationale behind Bernhard Wieser's claim to view the association of the pregnant woman and prenatal

testing as a hybrid actor. He claims: “Obviously it is not possible to presuppose an exclusive responsibility of a single actor, e.g. of a pregnant woman, who takes an ‘autonomous’ decision (or that technology is to blame for everything). If action is distributed this can only mean that responsibility is also distributed” (in this volume, 125). Empirically, the opposite is true: this is not only possible but the usual form of attributing actorhood. Thus, the background of normative claims of this kind is that there is a difference between the list of actants contributing to the emergence of a certain programme of action and the one or more actant(s) to which authorship and responsibility are actually attributed. To grasp this difference we are in need of concepts for distinguishing between agency and actorhood. The topics of black boxing and inscription which are the subject of the following sections will show this more clearly.

Black boxing

Convergence and irreversibility are the two features by which the interrelated activities of humans and non-humans become black boxes. Convergence and irreversibility rely on successful processes of enrolment and alignment, i.e. on the degree that the actants have matching expectations[5] of their respective activities and show the expected behaviour. As pointed out above, convergence and irreversibility describe an association of heterogeneous actants’ property to act as one. To act as one is Latour’s criterion to call such an association a black box (cf. Latour 1987, 131). Black boxing means that the complex interrelatedness of the many actants contributing to the overall programme of action becomes invisible. Black boxing is an implication of the network’s property to act as one. From the preceding section it is clear that “becoming invisible” has two different meanings depending on how actorhood is attributed. In the case of attributing actorhood to a hybrid entity black boxing is part of creating this entity. The other actors orient their actions to the association as a whole—because they are used to doing so for practical reasons or convenience, because it is legally required, or for several other reasons— whereby the association becomes the unified actor as which it is treated, and whereby the association’s actants and their activities become more or less invisible. For example, knowing how the preparation of a bank statement is distributed between the bank clerks’ and the bank computers’ activities is completely irrelevant for all practical purposes. The regular customer has virtually no idea of what happens inside the bank, nor is this knowledge necessary, since the customer interacts with “the bank”, i.e. with the hybrid corporate actor (cyber criminals, on the other hand, will be interested in deconstructing this actor and dealing only with one bank computer or another).

An association of heterogeneous actants’ property to act as one, however, as we have seen, may as well go along with the attribution of the resulting action’s authorship to only one (and often to a human) actant from this association. For example we will usually view a medical examination as the physician’s action rather than as a hybrid actor’s action. In these cases, a different form of invisibilisation occurs. The other actants’ contributions do not become invisible in the way the components of a technical device are enclosed in its casing. The picture for describing this form of invisibilisation is rather the sun outshining the stars. This is

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[5] “(W)hatever term is used for humans, we will use for nonhumans as well” (Callon & Latour 1992, 353). This is one of actor network theory’s terminological strategies to develop an unbiased vocabulary, but in my opinion not the best way since it provokes misunderstandings. However, it makes sense to use the term “expectation” in this way symmetrically because the shape of technological artefacts and their algorithms literally embody certain expectations—such as the expectation that human users are of a certain height in the case of the usual door knob.

to say that their contributions to the overall programme of action become invisible because the actant to which actorhood is attributed diverts attention away from them.

For analysing the case of prenatal testing this second form of invisibilisation may prove to be more important than the first. In the part of his contribution where Wieser examines the black box qualities of ultrasound screening he distinguishes between two kinds of situations. In the first case no abnormality of the foetus is detected. He describes this as a situation where ultrasound examination acts as a black box. Since everything is fine there is little reason to ask who has produced this result and how (cf. in this volume, 116–117). Perhaps not even the question of the result's authorship occurs so that we do not have to decide whether we should interpret the contributing actants' invisibilisation according to the encasing model or according to the outshining model.

A different situation occurs when the examination shows abnormal features of the foetus. In this case, Wieser argues, "(t)he black box falls apart" (ibid.). He compares the situation to Latour's (1994, 36) example of the malfunctioning overhead projector. The malfunction, in Latour's example, leads to opening the black box whereby the overhead projector's true nature as an association of heterogeneous entities is revealed (until it is repaired and becomes a black box again). Wieser's main reason for drawing this analogy is that it is only in the case of a positive result that the pregnant woman finds out what is implicit in every ultrasound examination but remains (more or less) invisible (to the pregnant woman) unless this examination indicates an abnormality: "that ultrasound is an element in an action sequence" (in this volume, 117) with the much more risky amniocentesis as the next step in the case of a positive finding and the decision about having or aborting a disabled child as the then following step if this examination confirms the finding indicated by ultrasound screening.

A positive finding of an ultrasound examination is something pregnant women usually do not expect and the consequences of which are unforeseen and invisible to many of them in advance. However, this is not true for most of the other actants contributing to prenatal testing as the overall programme of action: in the case of positive findings skilled physicians stand by to perform amniocenteses, laboratories stand by to analyse the samples. And in the case that these examinations confirm the findings, legal norms stand by to regulate the conditions of a legal abortion and so on. The situation of a positive finding, thus, seems not to be comparable to the malfunctioning overhead projector. The roles and respective expectations of the actants and their interrelated activities seem to fit in very well both in the case of a positive finding and in the case of a negative finding. What is certainly a crisis for the pregnant woman is not a crisis for prenatal testing or prenatal medical care because these are contexts which exist for dealing exactly with events of this kind.

What remains invisible in the case of a negative result of ultrasound screening but becomes visible in the case of a positive finding is the status of the pregnant woman as an actor. In the case of a negative result ultrasound screening remains a part of the normal routine of prenatal care— not a medical treatment that is felt to need much deliberation on whether or not to go through with it. Many parents-to-be see it more as a family event than a medical examination: they meet their physician for watching "baby TV" as ultrasound screening is nicknamed. In the case of a positive finding, however, it becomes clear that to undergo the treatment is a decision that may have far reaching consequences. It is a decision to search for a possible disability of the foetus. And in the case of a positive finding this decision inevitably imposes on the pregnant woman (or the couple) a subsequent decision: knowingly, then, she has (they have) to decide whether or not to have and to raise a disabled child. "Non-invasive screening tests", thus, "lead to 'inescapable decisions'" (Wieser 2006a, 50). To undergo these tests is a

decision which in the case of a positive finding creates a path of subsequent decision making and actions. This is exactly what, according to Bernhard Wieser, is invisible and blackboxed as long as ultrasound examinations are part of the routine of normal prenatal care. Invisibilisation here means that the pregnant women and their partners do not realise that to undergo ultrasound screening is a decision by which subsequent decisions are "pre-informed" (ibid., 53), which ultimately may lead to the decision alternative between aborting and raising a disabled child.

This invisibilisation obviously does not follow the pattern of the encasing model. The reason for the pregnant woman's decision to become invisible is not that there is a hybrid actor to which the overall action is attributed and under which her activities are subsumed and thus invisibilised. Rather, the invisibilisation under discussion here shows the pattern of the outshining model: the setting of ultrasound examination—being perceived as normal routine, as harmless and without risk for mother and child, as an event rather than as a medical examination—draws the attention away from the fact that undergoing this test is a decision that may bring the parents into a situation where they cannot avoid making a life or death decision about their probably disabled child.[6] Either the examination as an action is unproblematically attributed to a single physician or to a medical unit. Then, the invisibilisation can easily be understood to show the pattern of the outshining model. Or it is simply seen to be part of the normal practice of prenatal care—rendering unnecessary explicit attribution of actorhood (as it is often the case in routinised, habitualised or taken-for-granted practices). In this case the invisibilisation can be interpreted by a variant of the outshining model. Metaphorically speaking, the normal and unproblematic practice of conduct makes the active contribution of the pregnant woman invisible in the way the daylight diffused by the atmosphere outshines the stars.

To sum up: the positive finding brings to light the character of ultrasound examination as a tool to detect possible disabilities whereas in the case of a negative result this remains more or less invisible. For the pregnant woman (or the couple) to learn in retrospect to have contributed to an action in gathering this information may or may not turn out to be part of the crisis precipitated by the positive finding. Some parents-to-be may feel it would have been better for them not to have known in advance about the disability of their child. Others, however, will feel differently, and use their early knowledge either to adjust their life to the new situation of raising a disabled child or to decide against giving birth to the child. The main effect of the black boxing phenomenon under consideration, thus, is to deprive the pregnant woman of the option to voluntarily decide against gaining the predictive knowledge about her child's possible disability. This may contribute to a change from the "unconditional pregnancy" to the "tentative pregnancy"—at least if it is true that unconditional love is to some extent a by-product of blissful ignorance, as argued above. Wieser adds to this point a second observation: not only is the positive finding a knowledge that generates the new situation of having to decide for or against the child. Additionally, the predictive knowledge

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[6] As Wieser has observed empirically, "(i)t is remarkable that counselling is always provided prior to an amniocentesis, but not prior to ultrasound, where thorough counselling is usually carried out only if an amniocentesis is indicated, i.e. only after the ultrasound findings are already at hand" (in this volume, 117). There is little counselling in advance concerning the character of ultrasound examination as a tool to detect possible disabilities and the consequences of searching for this information. There can be little doubt that this practice of medical counselling contributes to the perception of ultrasound screening as a normal, harmless, and enjoyable procedure.

about the child's disability becomes a means to influence this decision. To make this point, he refers to Latour's concept of inscription.

Inscription

Latour believes that "whenever we discover a stable social relation, it is the introduction of some non-humans that accounts for this relative stability" (Latour 1991, 111). According to Latour (1996b) it is one of the main differences between primate societies and human societies that in primate society social structures are created and maintained solely through direct social interaction whereas in human societies sociality is created and maintained mainly through objects in which certain programmes of action are inscribed and which prescribe certain programmes of action to humans (and other objects). "Whereas for monkeys it constructs social life step by step, one could say that, for humans, interaction was never more than a *residual category*" (ibid., 230). The paradigmatic example of his assumption that "technology is society made durable" is the street bump, a low hump across the street that forces car drivers to reduce their speed, since "(i)t is impossible for us not to slow down, or else we break our suspension" (Latour 1992, 244; cf. Latour 1994, 38).[7] The example is chosen to demonstrate that technological artefacts perform the tasks delegated to them in a more relentless way than the actants who would otherwise have to perform these tasks: the street bump's activity of damaging fast driving cars follows inevitably and, therefore, this device is more efficient in slowing down the traffic than a policeman or a traffic sign (cf. Latour 1992, 244). Of course it is not the street bump only in its material form that produces this effect: "The street bump is not made of matter, ultimately; it is full of engineers and chancellors and lawmakers, commingling their wills and their story lines with those of gravel, concrete, paint, and standard calculations" (Latour 1994, 41). There are several other actants, the allies, who contribute to the programme of action of slowing down the traffic—for example the engineers by designing the street bump so that the fast driving car does not damage it but is itself damaged. Even the reckless car drivers involuntarily contribute to it as long as they prefer their cars to remain intact over driving fast. Within this set of interrelated activities and expectations, however, the road bump's presence adds its specific relentlessness to the overall programme of action.

According to Latour, with the introduction of the street bump a shift from a negotiable to a non-negotiable situation takes place. While the reckless driver may decide to ignore the traffic sign, ignoring the street bump is no option because of its immediate consequences. However, "(t)he shift is not from discourse to matter because (…) the street bump is one meaningful articulation (…) Thus, we remain in meaning *but no longer in discourse*" (cf. Latour 1994, 39). This change explains the relentlessness of the street bump: in contrast to the appeal articulated by norms, signs and symbols, the appeal articulated by the technological artefact can hardly be disputed.

Wieser argues that with the introduction of ultrasound screening the pregnant women are confronted with a similar shift from a disputable to an undisputable appeal. His line of reasoning presupposes the existence of a normative appeal comparable to the traffic rules and signs in the example of the street bump. In his opinion, there is such an appeal which "expresses the quintessence of a specific (neo-liberal) reproduction policy" (Wieser in this

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[7] As Latour (1992, 244) reports, this device is called "un gendarme couché" in France. In English it is colloquially called "sleeping policeman". In Germany different variants of this device are known as "Krefelder Kissen", "Berliner Kissen", or "Kölner Teller".

volume, 120). It says: “If you want to have children think carefully under what circumstances you want to have them and take on the responsibility for your decision!” (ibid.). In the case of a positive finding, he argues, the ultrasound image appeals to the pregnant woman in a similar but not discursive and therefore less disputable way: “Our woman now looks at the image. Doesn’t she stand in front of a ‘bump in the road’ that is as unyielding as concrete? For a woman in such a situation it will be equally difficult to ignore the appeal addressed to her as it is for a shock absorber of a car confronted with a speed bump made of concrete” (ibid., 121).

I will leave aside the question to what degree it is justified to assume that pregnant women (or parents-to-be) are exposed to the pressure of neo-liberal norms which demand that they should not become a burden to society by giving birth to a disabled child. The question I will focus on is: assuming that a social pressure of this kind exists, is the ultrasound image (or more general: prenatal testing) a more relentless way to articulate it? In my opinion the answer is “no” in one respect, but to a certain degree “yes” in another. There are two different answers because there are two different mechanisms by which norms become less disputable when their enforcement is delegated to technological artefacts.

The one source of the technological artefact’s relentlessness is its property as a “means/end/sanction combination” (cf. Linde 1982, 23: “Mittel/Zweck/Sanktion-Kombination”). The enforcement of social norms is an activity which in principle is independent of the norm itself. It requires sanctioning mechanisms which typically are not specific to the norm in question but can have a different shape (e.g. social disapproval or legal punishment of the violator) and a different intensity (the aim can be to punish each delinquent as in the case of murder or can be less ambitious as in the enforcement of traffic rules). The observance of social norms, thus, is (of course to different degrees) disputable because social norms are only externally connected with their sanctioning mechanisms and because of the different intensity of the enforcement efforts. The punishment following the violation of technologically embodied rules, in contrast, is an integral part of using technology. The sanctioning mechanism, as it were, is part of the technological artefact’s algorithmic structure. Jürgen Habermas (1969, 63) puts it this way: “In both cases the violation of the rule has different consequences. *Incompetent* behavior that violates well-tried technical rules (…) is per se doomed to failure; the ‘punishment’ is quasi built into reality as failure. *Deviant* behavior that violates applicable norms provokes sanctions which are connected only externally by convention”.

The shift from the disputable to the undisputable, however, has a second dimension. Latour addresses this dimension in his statement on the street bump quoted above “we remain in meaning *but no longer in discourse*”. The meaning of the street bump is more or less the same as the meaning of the traffic sign it substitutes (or supplements): to serve as a contributor to the slowing-down-the-traffic programme of action. The traffic sign and the street bump both are allies in the fight against the anti-programmes of reckless drivers. But the traffic sign is a useful ally in this fight only as long as the opponents know that this is the traffic sign’s meaning. In contrast, the street bump plays its part as a contributor to the slowing-down programme, no matter whether the reckless driver realises its meaning. Approaching a street bump, the reckless driver applies the brake as he or she would have to do in the case of a pothole, too—i.e. independent of whether the obstacle has the meaning to cause drivers like him or her to slow down. For practical reasons, the immediate reaction in an interaction with technological artefacts and procedures is usually directed at the events that are perceived to be its effects (and to the question of how to bring or not to bring them about) and not to the

meaning it embodies. And as long as the attention is drawn away from the artefacts' meaning this meaning is indisputable. It is invisible, and we are no longer in discourse.

In Latour's example of the street bump—as well as in his story about weighting the hotel keys—the artefacts' property as a means/end/sanction combination clearly explains the major part of the relentlessness of these non-humans as proponents of the respective programmes of action. In the case of prenatal testing, however, a comparable "punishment"—following immediately from the violation of technologically objectified rules and evoking an immediate reaction of the pregnant woman in order to avoid it—obviously does not exist. Thus, if ultrasound screening leads to a shift from disputable neo-liberal norms to a less disputable situation of technical mediation it must be due to the effect of technology to draw away the attention from its meaning by focusing attention on its effects. Wieser's metaphor "images like concrete" should be interpreted in this direction: the neo-liberal reproduction policy as characterised by him claims that the pregnant woman's (or the couple's) decision should be based on a cost-benefit calculation. Prenatal testing, then, can be seen as a tacit way to impose the rationality of cost-benefit calculation on her (or them). The ultrasound screening that provides a positive finding and the subsequent amniocentesis that allows the probability of a possible disability of the child to be specified clearly provide a necessary precondition for such a cost-benefit calculation. Moreover, the procedure of gaining this knowledge itself may affect the parents-to-be with the logic of calculation without them realising this. If empirically observable, this would be a further exemplification of the outshining phenomenon. However, the argument that such a tacit transformation of the pregnant women (or the parents) into rational calculating decision makers would express a technical mediation of a neo-liberal reproduction policy has two weak points. First, it includes the more or less pronounced assumption that there are actors who actually use prenatal testing as a means to enforce neo-liberal norms. Otherwise it would make no sense to view prenatal testing as a less disputable way to implement them. The fear that such an instrumentalisation might occur surely is justified but Wieser does not present empirical data indicating that strategies of this kind are actually employed. Second, it is plausible to assume that being involved in a course of action leading from one examination to the next and more precise one may influence pregnant women such that they adopt the logic of calculation inherent in the technical procedure. However, it does not follow that the calculation criteria then used in the decision making are those the proponents of neo-liberal governmentality would like them to use.

Conclusion

Those who are convinced that the established concepts of the social sciences are insufficient to analyse and understand the interrelated roles of humans and non-humans which constitute the "socio-technical imbroglios" (Latour 1988a, 309) of our world have two different conceptual options: post-sociality or post-human sociality. The first conceptual option is the more radical. It means abandoning sociology and starting a new enterprise, for example a "science of associations" (Latour 1988b, 40). The second option is more conservative but for most sociologists radical enough. It means abandoning the assumption that human actors are the only movers of social processes and thus requires established concepts and categories to be broadened and supplemented in order to conceive the non-human entities' social activities as well as those of the human actors. Actor network theory oscillates between post-sociality and post-human sociality. Most of what I have characterised to be a purification of empirical reality in my opinion goes back to the tendency to develop actor network theory as a post-social theory. For example, the failure to take power relations into account in the concept of the hybrid actor, or the missing differentiation between exercising agency and attributing

actorhood, are consequences of post-social thinking. At the same time, actor network theory provides many insights that can and should be exploited for developing a post-human sociality point of view (cf. Rammert & Schulz-Schaeffer 2002). This is what this chapter was about: to reinterpret central concepts of actor network theory as concepts of an emerging approach towards post-human sociality.

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