

The practice of the physician's understanding | Tinkering with embedded bodies beyond naturalism and constructivism | Jörg Niewöhner

Over the last four years, I have been working with medical colleagues on cardiovascular disease, particularly overweight management and prevention. When I say »working with«, I mean that I have not only observed primary health care and biomedical research in practice as an ethnographer. I mean that I have cooperated with physicians in a joint project; analysing data together; preparing conference papers together and presenting them jointly at medical conferences; publishing papers together. This experience has taught me over and over again that medicine is an extremely heterogeneous field of practice. And many regions of this field are so acutely aware of the manifold contingencies inherent in ailing bodies and treatment attempts that, for all intents and purposes, you may refer to them as constructivist. They are aware that they are central to assembling a particular (view of the) world with very real consequences for their patients and many of them are very critical of this process. On the other hand, in many quarters of the social sciences and anthropology concerned with medical discourse and practice, the constructivist banner is held up high with such a critical gesture by a good number of scholars that, for all intents and purposes, you may refer to them as naturalists. Critical reflection positions them in that crucial distance to the field that allows them to reveal the constructedness of the biomedical assemblage every time with near absolute certainty – as if they are unearthing a hidden truth with an omnipotent set of methods.

This tongue-in-cheek opening paragraph is meant to illustrate my uneasiness with the current way of *doing bodies* in the social sciences and anthropology (cf. Mol 2002). We are not helping to improve care and this has a lot to do with the theme of this book: naturalism and constructivism. Naturalism, to my mind, argues that it is matter »all the way down« (Jay 2002, 267), that is that pre-cultural materiality exists and is accessible to scientific analysis through the right set of methods. Constructivism, understood first of all as social constructivism, argues that »all the way down«, there is nothing but meaning. Culture precedes matter and thus becomes the basic analytical unit of the constructivist. With this modern separation, social science lost all respect for matter and medicine lost all respect for social science. In a more recent reading of constructivism, notions such as material-semiotic practice (Haraway 1992), actor-network (Law/Hassard 1999),

biosociality (Rabinow 1992) or natureculture (Franklin 2003) have started to overcome the dichotomy of matter and meaning and instead argue that we need to focus on their entanglement in practices (Barad 1999). While this shift has deconstructed the primitive concept of nature, thus also naturalism and constructivism in their respective modern readings and ultimately rendered the distinction between naturalism and constructivism obsolete, medical knowledge and practice have remained unimpressed. And rather than trying to engage medicine and its way of doing bodies, much of social inquiry has remained rooted within a modern analytical framework, deconstructive and critical, with little interest to overcome the »vagueness« and »laziness« that Maurice Bloch attests many of the analyses of practices in social anthropology (cf. Bloch 1998); little interest for good reasons, I hasten to add, but nevertheless.

In this article, I want to use overweight and obesity as an example to show how and perhaps why praxiographic analyses should be made relevant for medicine and how current biomedical research actually supports a view of nature and culture as entangled. I will first briefly sketch current biomedical research on metabolism and cardiovascular disease to point out an emerging concept of the body as *embedded* (Niewöhner et al. forthcoming; Niewöhner/Kontopodis 2011). I will then present two short ethnographic sequences from overweight and obesity management in primary care in Germany. Both of these reveal what Annemarie Mol and others have begun to call tinkering as an important mode of medical care (Mol 2008). Lastly, I will conclude that we ought to take tinkering seriously not only as a mode of medical care but also as producing a form of medical knowledge; and that this knowledge may be useful for better understanding the embedded bodies that are emerging in research.

Biomedical research

Despite plenty of biomedical research into weight regulation, metabolism and the nature of fatty tissue over the last twenty years, a simple truth remains significant: if you take in more energy than you expend, you will build up reserves in the form of fat. You become heavier. The medical advice to those wanting or needing to lose weight thus focuses on eating less energy dense food and exercising more. This continues to be so even though the technoscientific understanding of energy regulation in the human body has increased vastly over the last ten to fifteen years. From an observant social science perspective, this mismatch between knowledge and possibilities to intervene is startling. It raises important questions that are not answered by the realisation that representing and intervening present distinct logics (Hacking 1983). This section deals with two of these questions. The first one is simple and has little to do with the theme of this book: How can this lack of translational success from bench to bedside

be explained? The second question is less obvious but has at its core everything to do with this book: What do these explanations of failed translation mean for dominant modes of social scientific commentary? This second question asks not about translation in the medical sense, that is the application of research findings in clinical contexts. It asks about translation in Callon's actor-network sense, that is the continuous modification of relationships that is provoked by, through and with knowledge (Callon 1999).

Biologists today consider energy regulation, that is the coordination of input and output particularly under conditions of fluctuating input, an absolutely central physiological competence in humans. Energy supply particularly to the brain but also to other critical organs must be maintained at all times and under all conditions. Failure to do so will result in severe damage or death rather quickly. Thus biologists are not particularly surprised to find out that energy management, for example maintaining blood glucose levels within fairly narrow limits, is regulated not through a single parameter or pathway. This to them would be evolutionary negligence. Instead energy balance or allostasis, so the current biological view, is managed and protected by a series of complex and, importantly, highly redundant physiological systems involving energy storage, communication and control, for example fatty tissue, hormones and central and peripheral nervous system. The redundancy makes sense from an evolutionary perspective. If one control mechanism is knocked out, for example through a change in environmental conditions or some random defect, another mechanism quickly subs in to maintain normal functioning. This redundancy may bring a sense of stability and calm to those who perceive the human body to be a fragile phenomenon. To those who are trying to intervene, it presents a nightmare. From molecular genetics to women's magazines: vaguely healthy intervention strategies that can overcome this redundancy in the system and reduce the amount of energy stored are virtually non-existent; other than living a different life, of course, but that can hardly be considered an intervention.

Interventions in the more common sense of the word – technoscientific, pinpointed, short-term measures – are bound to fail as the example of pharmaceutical interventions illustrates. Pharmaceutical interventions are faced with a principled problem. Biomedical research has identified plenty of *targets* for biochemical intervention, particularly in appetite and energy regulation. *Mechanisms for intervention* are also established. In the currently dominant biological understanding of physiology as a kind of circuitry, knowing targets and mechanisms should be enough to change the system in the desired direction. This is where redundancy raises its ugly head and presents a currently insurmountable problem. Pharmaceutical interventions tend to focus on single targets, e.g. one receptor. They need to be specific to be able to control side effects. Designing such specific interventions is not pharma's main problem. Relatively few experimental drugs fail due to toxicity or an unwanted side-effect profile. Yet the downside of

specificity, and energy regulation is a prime example for this downside, the downside is that specific interventions in redundant regulatory systems tend to have no effect. The system quickly finds a way to rewire or at least activate a different set of pathways that relieves the pharmaceutically treated region of its responsibility. The system continues as if nothing had happened. The drug fails not on toxicity but on efficacy. Alternatively, designing a drug that produces a response is also relatively easy. One only needs to design a set of compounds that act on enough elements of the circuitry so that alternative routes cannot be found anymore. This overcomes the problem of redundancy. Yet such interventions tend to kill organisms or at least produce a side effect profile that no one would deem acceptable, particularly not for a »condition« such as overweight.

A second dimension of the redundancy problem brings me to the question whether biomedical researchers, supposedly the naturalists, really are finding matter »all the way down« there. It is obvious that biomedical research is investing more and more in a molecular understanding of energy regulation. There is a huge interest in the molecular mechanisms underpinning, for example, the regulation of appetite in relation to energy intake and blood sugar control. Candidate genes are being identified, neuroendocrinological pathways mapped, receptors and related circuitry in the central nervous system charted. The concepts of biomedicalisation (Clarke et al. 2003), geneticisation (Lippman 1991), molecularisation (Rose 2007) and global biopower (Rabinow/Rose 2006) attest to these developments and their social, political, economic, moral and epistemological implications.

Importantly, however, a molecular understanding of physiological mechanism does not mean that understanding the molecular level of physiology tells the whole story. To the contrary: molecular methods are producing an understanding of physiology, metabolism and cardiovascular disease, that reveals that the closer you focus on the matter »all the way down there«, the more you realise how it is shaped by something other than itself. Molecular biologists, for decades now the dominant species in advancing our knowledge about life, increasingly understand the molecular level as linked with phenomena on other levels of analysis; phenomena on organismic, socio-cultural and environmental scale. The *embedded body* that emerges in current molecular biological research cannot be understood on the molecular level alone. It turns out to be heavily impregnated with its own past and with its social and material environment. Biologists become increasingly aware of evolutionary, inter-generational, parental and early life effects on metabolic performance. The amount and kind of fat deposited is not only shaped by the energy input, which is converted by a stable »inner laboratory« (Landecker 2010). Rather the inner laboratory itself is shaped by factors from different time horizons and factors outside of the human body. The circuitry-like models of energy balance to understand metabolism still prevail. Yet the components of the circuitry are distributed across space and time

far more widely than an older skin-bound model of the human body suggested. Integrating them in platforms based on linear pathways and binary circuitry becomes increasingly difficult.¹

This is not to say that new platforms in systems biology, epigenetics or synthetic biology will not continue to operate with a »pragmatic reductionism« (Beck/Niewöhner 2006: 226). Biology remains largely naturalist in method. It is always on the look-out for matter down there. Yet, as always, reality kicks back and an increasing number of biologists are beginning to register the manifold entanglement of the molecular body with other levels of analysis. Thus the embedded body and associated developments in biological methods may be opening a window even in molecular biology itself to understand nature as modelled not only *on* but also *by* culture as practice (cf. Rabinow 1992).

The obesity centre

In the day-to-day business of a social paediatric obesity centre in a major German city, discussions about aetiology on a molecular level seem a million miles away. The obesity centre is part of a university medical school and deals with obese children that are either sent to the centre by their local paediatrician, who does not know how to handle the situation anymore, or whose parents have found the centre on the web and have turned to it directly. The centre is one of the few places explicitly dedicated to the management of obesity in children in the city and the wider region. Accordingly, demand is high and children come from far away. The centre is busy and it is clearly a medical space: located on the medical school's campus in the paediatrics building, the centre is fronted by a reception and a waiting room, followed by a number of treatment rooms, labs and offices along typical clinic corridors: white, clean, with a busy but somewhat hushed atmosphere. The centre is staffed with two physicians (paediatricians), a psychologist, a nutritionist, a physiotherapist, a social worker and a number of nurses – almost needless to say that the entire staff is female. *Real* medical careers are built elsewhere on campus, so it is exclusively women who feel that this is worth their while, training and effort.

According to the centre's staff, work here is »80% social work and 20% medical work«. ² And you do not need to spend much time in the corridors to realise what the staff mean by that. Most kids come from difficult family constellations. Migratory backgrounds and associated language difficulties are only one of the issues. In most cases, poverty plays an important role and often alcohol and different forms of abuse are involved. One of the staff members comments that »it is hard to imagine the kind of opportunism in many of these families«. Typical middle class ideas of upbringing, support and mutual respect within families often have little to do with the constellations in which many kids find themselves.

Many times it seems to an outsider like myself that their (over)weight should be the least of their worries. Yet this is not true. Health risk, particularly cardiovascular health risk, is pretty much the least of their worries. But this is not how weight is relevant in their lives. Weight is relevant to most of them, because they are relentlessly bullied at school. With trouble at school and little or no support at home, there are few places to turn to for many of them. Eating is one of these few places. The potential vicious circle is blatantly obvious.

The distinction between social and medical work that the staff themselves make is, of course, typically modern (cf. Latour 1993). It separates technical skills and knowledge about the physical body from the kids' everyday life, from their family troubles, from their lack of material means. It separates nature from culture, biological from social, matter from meaning. It is a distinction that is inscribed into every aspect of the centre. Staff competences are divided up into body, mind and social work. They all have separate rooms. Almost all of the technical devices that are in use – from scales to blood pressure cuffs to lab work – are strictly medical devices to measure physiology. The financial resources rest on health insurance companies that are primarily interested in physical bodies. It is unusual that a social worker is integrated as part of the staff. Yet she, of course, deals with the social issues only, for example contacting social services and sorting matters of social support.

It is striking then that this centre, which is clearly a medical space, says about itself that 80% of its work is social work. To an outsider, the overwhelming majority of work is clearly medical. It is directly concerned with the human body, measuring and treating physiological parameters. This apparent mismatch becomes understandable only when taking a closer look at the everyday running of the centre. The central question that guides the centre's activities is »who needs what?« To answer this question the centre uses a so called »building site poster«, a sheet of paper that presents a modular approach to weight problems. Food and drink, physical activity, media consumption et cetera are depicted on the sheet and the centre's staff together with the kids run through the different elements to see where problems may lie. The modular elements – or building sites – are the standard causal factors for obesity found in the relevant literature. They are prioritised together with the kids and specific measures for the top priorities are agreed upon. That way, the amount of change and »to do's« per visit remains manageable. Depending on their specific problems, the kids will see specialists, for example those who eat too many sweets will spend more time with the nutritionist, those who could be more active may see the physiotherapist and later be ushered into a health sports group that is associated with the centre.

This modular approach is not unusual, it is typically modern and it still looks like a lot of medical work and little social work. When observing the staff at work, however, it becomes apparent very quickly that all the medical tasks *in practice* do much more than measure a specific physiological parameter. The entry exam, for

example, consists of an assessment of weight and motor skills, basic blood work, physical exam and family anamnesis. The kids then move on to an initial session with the nutritionist and, if necessary, psychotherapist and social worker. This is the typical initial fact gathering session that stands at the beginning of almost every entry of people into medical spaces. The kids' medical facts are co-produced in these constellations through their own answers, the preformed questions and templated forms to record the answers, the medical knowledge and insurance system in the background etc. People are fitted to, or become entangled with, medical classifications. This is not new (Hacking 2006).

A lot of the important information that is gathered during these entry sessions into the obesity centre, however, is not recorded on any sheet. It is the many clues that the specialists gather about what the kids' lives are like outside of this medical space. This is information that often cannot be made explicit, and certainly cannot be asked directly at this early stage. Nevertheless it is crucial for understanding *how* kids *are* overweight or obese, how they do their bodies and how they might be able to do their bodies differently when relating to the obesity centre. This information is gleaned from the interaction itself: are both parents present, how is the kid handling the physical examination, who is answering the questions, do they contradict each other, at whom is the kid looking when speaking, what is his or her posture? The paediatricians here are almost working in a para-praxiographic mode (cf. Marcus 2008). They are not led by superficial details or pre-established structural information, that is anamnestic templates and facts. Parents may smell of alcohol, sound as if they smoke two packets of cigarettes a day and look as if the clothes have not seen a washing machine in a long time. Yet they have a way of dealing with their son that seems loving. The kid is switched on and while nervous and uncomfortable, it somehow relates to his parents in a way that seems trusting. Such information is crucial to the upcoming steps, because it may mean that parental concern can be expected, that the family is open to communication, that a relationship can be build. This kind of information is not recorded on any sheet. It is not formal knowledge about the patient. Yet it is passed along the corridors: when the family is handed over to the next specialist; when staff meet in the coffee room or over a file, in centre meetings, through nurses that switch between treatments rooms. There is a constant flow of informal information about kids, parents and families that is absolutely crucial in building a treatment network that works. »Working« at this stage means staying in touch, building a relationship, having the kids come back. Only in the long run is weight loss an issue.

This is what the staff mean when they say 80% is social work. It is finding out what really goes on: how is this kid obese beyond the physiological parameters? And the medical practices are used more or less deliberately to create constellations that allow more of that information to flow from the kids' everyday lives to the centre. For example: many of the kids come to the centre regularly for a

weight check. They have scales at home and they could simply send a text message with their current weight. Yet they are asked to come in initially as a means of what Callon would probably refer to as *interessement* (Callon 1999) and increasingly many of them also want to come in. *Interessement* is created literally *interactively*. The kids talk to a few people, tell stories about life at school or at home. It would probably be too much to talk of friendship, because it remains hierarchical through age and profession. Yet if »the treatment« works well, a trusting relationship develops that supports the kids and builds self-confidence, which in turn helps them to stick to a healthier everyday life and thus slowly starts to have an impact on weight and physiology more generally.

Physicians are used to prescribe drugs off-label, that is for a different condition than originally intended and approved through regulation. The centre uses its devices such as scales not so much off-label but multi-label. It takes seriously the fact that being overweight is more than having too many large fat cells and to help the kids they make use of the fact that any technology can always have multiple uses (cf. Bijker et al. 1987). Annemarie Mol and her colleagues have recently begun to look into such practices of care and have coined the term *tinkering* or *doctoring* to take seriously the important clinical practice of working with the patient to adapt existing things and processes to meet the needs of a specific person in relation to an established set of medical practices (Mol et al. 2010).

Tinkering is not merely the adaptation of generic knowledge to a specific case. Stephen Toulmin pointed out over 30 years ago that physicians constantly bring together very different types of knowledge from general knowledge, to generic knowledge to specific cases (Toulmin 1976). Tinkering, however, is rooted in a praxiographic perspective and takes seriously that knowledges are situated. Adaptation of general knowledge is only a small part of tinkering. Much more goes on and makes tinkering always a productive practice, a relational practice that changes how things are through altering configurations. The resultant phenomena are always partial and always already different. Given the emerging concept of the *embedded body* in biomedical research, it seems high time to take tinkering seriously as a practice that produces medical knowledge rather than analysing it in constructivist mode as merely a matter of clinical experience that applies medical knowledge.

General Practice

Across the Western World, many health care professionals see the prevention and management of overweight as primary care's responsibility. The primary care physician is supposed to conduct a formal risk assessment on the basis of established risk factors and medicate and counsel the patient accordingly. In countries with a centralised health system, such as the UK's national health service,

this process is already heavily standardised, tied into the financing system and evaluated regularly. In such contexts, a change in best practice guidelines, for example a lowering of the body mass index from 25 to 24 as the lower limit for overweight, has immediate consequences for the number of patients diagnosed and treated - nationwide. Much of the medicalisation critique has been developed in and from Anglo-American contexts (e.g. Conrad 2005). The German situation, however, differs significantly. Largely due to historical developments, the health system is heavily fragmented balancing political, medical, economic and patient interests against each other in a number of administrative bodies (Rosenbrock/ Gerlinger 2004). Health policy is a matter of the Länder rather than federal government so that central legislative means are limited. And, importantly, the audit culture that has spread across the Anglo-American world over the last two decades has not reached the same degree in Germany. Relative to the UK, German primary care physicians, while constrained by a rigorous financial framework, retain a significant degree of *therapeutic freedom*. It is an important part of their ethos and they strongly resist efforts to curb that ethos through various means of standardisation.

This constellation opens up room for significant variations in primary care treatment across the country. Medical associations see this as a major problem and try to enforce best practice and various means of quality control to stop physicians in local practices from falling behind cutting edge knowledge. This diversity in practice is an important context to recognise when analysing overweight management in German primary care particularly against the dominant medicalisation critique voiced by the social sciences. There is not the space in this paper to report details of the findings of our interdisciplinary study of primary care overweight management in Germany (for example Heintze et al. 2010; Niewöhner 2010). Rather I want to briefly report a significant choreography that occurs in weight counselling talks between physician and patient. These sessions typically take about 15min. The physician opens with the patient's lab results – blood pressure, lipids etc. – and the patient is reduced to quietness and the occasional acknowledging »mhm«. The physician is on home turf, confident and in control of the situation. S/he then concludes that the patient ought to do something about his or her weight. Rather than prescribing medication and simply going through a number of standard tips on nutrition and exercise, many physicians, particularly women, now allow the patients to come in with an open question such as »why do you think this has happened and what do you think you can do about it?«. This open question changes the roles entirely. Now the patient is talking confidently about favourite meals, walks with the dog, the stresses of the job, etc. and the physician sits quietly reduced to the occasional acknowledging »mhm«. It then follows an often a little awkward part where physician and patient negotiate a little what might be a sensible strategy to change the energy balance. Yet this never ends in a formal agreement, shared targets or something tangible.

Rather the counselling usually ends in a diffuse agreement that it would be good to do something about the weight through a somewhat different lifestyle. Another meeting is arranged where things can be reviewed.

The split into lab values and everyday life that comes out of this choreography reminds us immediately of the 80% social and 20% medical work in the obesity centre. The primary care physicians argue in a similar pattern. They are happy to deal with the lab results, because they feel that it is their genuine domain. They allow the patient to talk, because (1) they do not have any »real« treatment to offer, (2) they believe that changing patients' lifestyles is not their responsibility and (3) narrative medicine, as this is often called, may give them a better access to some of the problems the patient may have and help them to tailor their messages. The problem is that physicians lack the systematic means to deal with the narrative that patients unfold. In an important difference to the obesity centre, physicians are alone in this matter and they are not specialised on weight issues. Thus they cannot modularise the issue and bring their patient into contact with different people to build a network of relationships. Yet they follow the same aim. »The most important thing« one physician states in an interview, »the most important thing is that patients come back to me. That I stay in contact and retain control.« So while physicians know that there is really nothing »medical« they can offer and thus feel uncomfortable dealing with the issue or even reject responsibility for treatment altogether, many of them nevertheless start tinkering. They try to build a supportive relationship using their very limited means. They do not enforce targets, they are extremely careful not to put pressure on their patients, they set up check-up appointments that from a strictly physical point of view are not necessary but offer the patient the chance to come back and talk.

Compared to the obesity centre, the means to tinker with overweight and obesity in German general practices are very limited. Contact time between physician and patient is limited and so are the technical and financial resources with which to work. Nevertheless, primary care physicians often succeed in building long-term relationships with their patients. While the numbers do not suggest that this relationship leads to significant weight loss, this should not be taken to mean that the contact with the physician has no effect. It is important to note that physicians do not simply apply risk factor thinking and ever-tighter thresholds for overweight. Instead, they view these thresholds with more than a pinch of salt and not too dissimilar to the multi-label use of technology we already saw in the obesity centre. Thus overweight management in German primary care does not necessarily medicalise people in any straightforward manner. The fact of the matter is that we simply do not know whether this kind of physician contact has any effect, because we do not value tinkering and the resulting way of doing bodies as part of medical knowledge. We evaluate the effect of treatment regimen on the basis of physiological endpoints. While this is understandable, it follows the modern distinction between medical and social and thus misses

tinkering as an important part of doing bodies differently and thus understanding embedded bodies.

Tinkering as medical knowledge about embedded bodies

The previous sections have sketched overweight and obesity in three very different sets of practices: biomedical research, a specialised clinical centre and general practice. The analysis of current biomedical research shows that a new concept of the body as embedded is beginning to emerge. While this does not readily translate into clinical practice, it produces an understanding of overweight that begins to foreground the manifold interactions between biology, biography and social and material context. While medical practice has always appreciated the fact that their patients are not purely biological, they understand their own work in modern terms. Thus their medical knowledge applies to their patients as biological beings, while biography and social context are handled as matters of clinical experience, doctor-patient communication and problems of compliance. The analytical concept of tinkering goes some way to dissolving this modern distinction. It makes visible that physicians *do embedded bodies*. While the nature of the physician's understanding (Toulmin 1976) remains modern, the practice of this understanding is non-modern.

It is this epistemic slippage between practice and nature of understanding that is at the heart of my unease about naturalism and its constructivist critique in many areas of the social sciences. The constructivist critique is really aimed at the *nature* of understanding. Yet it has a tendency to pretend that that nature is the dominant factor in shaping practice; in other words, it short-circuits practice and medical knowledge in a way that is not productive. The critique then reveals that medical knowledge's failure to capture adequately the complexity of the world is problematic in many ways, for example, because it denies many people agency. Constructivism thus deconstructs naturalism but by turning it on its head (or feet) and operating with a pre-material concept of culture or *the social*, it really reproduces a social science version of naturalism. The analytic form or gesture remains the same, whichever way around you place the dichotomy of naturalism and constructivism.

A praxiographic approach (Mol 2002) on the other hand escapes this dichotomous, modern analysis by focusing on the *practice* of the physicians' and the researchers' understandings. The result - tinkering with embedded bodies - are patterns of practice within which medical and social are constantly being reproduced as always already entangled. Systematising these patterns of practice, rather than purifying them into knowledge and experience, would produce a very different body of knowledge about bodies and about medicine in practice. It would be practical knowledge, that is knowledge that emerged from practice

thus containing not only abstract knowledge about bodies but situated knowledge about regularities in the way groups of specific bodies are done and do themselves in practice. The resulting biomedicine would understand and co-produce bodies not on the basis of law-like rules about biological pathways in social contexts but rather attempt to tease out different patternings of practice always aware of its own entanglement in these processes of patterning: an epistemic culture of care beyond naturalism and constructivism.

Notes

- ¹ See McEwen (2007), Rosmond/Bjornorp (2000), Szyf (2009), Van der Ploeg et al. (2006) and Zheng et al. (2008) for useful introductions to the biological and medical phenomena alluded to here.
- ² All fieldwork notes stem from ethnographic fieldwork in a social-paediatric obesity ambulance in Berlin and a number of general practices in the inner city in Berlin. The work was conducted between July 2007 and November 2008.

References

- Barad, Karen (1999): Agential Realism: Feminist Interventions in Understanding Scientific Practices. In: Mario Biagioli (Hg.): *The Science Studies Reader*. New York, 1-11.
- Beck, Stefan/Jörg Niewöhner (2006): Somatographic Investigations across Levels of Complexity. In: *BioSocieties* 1/2, 219-227.
- Biagioli, Mario (Hg.) (1999): *The Science Studies Reader*. New York.
- Bijker, Wiebe E. u.a. (Hg.) (1987): *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge.
- Bloch, Maurice (1998): Book review: Edwin Hutchins' *Cognition in the Wild*. In: *The Journal of the Royal Anthropological Institute* 4, 150.
- Callon, Michel (1999): Some Elements of a sociology of translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay. In: Mario Biagioli (Hg.): *The Science Studies Reader*. New York, 67-84.
- Clarke, A. E. et al. (2003): Biomedicalization: Technoscientific transformations of health, illness, and US biomedicine. In: *American Sociological Review* 68, 161-194.
- Conrad, Peter (2005): The shifting engines of medicalization. In: *Journal of Health and Social Behavior* 46, 3-14.
- Franklin, Sarah (2003): Re-thinking nature-culture: Anthropology and the new genetics. In: *Anthropological Theory* 3, 65-85.
- Hacking, Ian (1983): *Representing and Intervening: Introductory topics in the philosophy of natural science*, Cambridge.
- Ders. (2006): *Kinds of People: Moving Targets*. London.
- Haraway, Donna J. (1992): The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others. In: Lawrence Grossberg et al. (Hg.): *Cultural Studies*. New York, 295-337.
- Heintze, Christoph u.a. (Hg.) (2010): Counseling overweight in primary care: An analysis of patient-physician encounters. In: *Patient Education and Counseling*, 80/1, 71-75.
- Jay, Martin (2002): Cultural relativism and the visual turn. In: *Journal of Visual Culture* 1, 267-278.

- Landecker, H. (2010): Essen als Exposition. Epigenetik der Ernährung und die Molekularisierung der Umwelt. In: Susanne Bauer u.a. (Hg.): Essen in Europa. Kulturelle ›Rückstände‹ in Nahrung und Körper. Bielefeld, 135-162.
- Latour, Bruno (1993): We have never been modern. New York.
- Law, John/John Hassard (Hg.) (1999): Actor Network Theory and After. Oxford.
- Lippman, Abby (1991): Prenatal genetic testing and screening: Constructing needs and reinforcing inequities. In: American Journal of Law and Medicine 17, 15-50.
- Marcus, George (2008): The End(s) of Ethnography: Social/cultural anthropology's signature form of producing knowledge in transition. In: Culture Anthropology 23, 1-14.
- McEwen, Bruce S. (2007): Physiology and Neurobiology of Stress and Adaptation: Central Role of the Brain. In: Physiological Reviews 87, 873-904.
- Mol, Annemarie (2002): The body multiple: Ontology in medical practice. Durham.
- Dies. (2008): The Logic of Care: Health and the Problem of Patient Choice. London.
- Dies. u.a. (Hg.) (2010): Care in practice: On tinkering in clinics, homes and farms. Bielefeld.
- Niewöhner, Jörg (2010): Entscheidungsprozesse in der hausärztlichen Übergewichtsberatung: Von shared decision-making zu distributed doctoring. In: Christoph Heintze (Hg.): Adipositas und Public Health: Rahmenbedingungen, interdisziplinäre Zugänge und Perspektiven für erfolgreiche Präventionsstrategien. Weinheim, 137-152.
- Ders. et al. (forthcoming): Cardiovascular disease and obesity prevention in Germany: An investigation into a heterogeneous engineering project. In: Science, Technology & Human Values.
- Ders./Kontopodis, Michalis (2011). Leben selbst bilden. Ethnographische Betrachtungen kardiovaskulärer Prävention in Deutschland. In: Jörg Niewöhner u.a. (Hg.): Leben in Gesellschaft. Biomedizin - Politik - Sozialwissenschaften. Bielefeld.
- Rabinow, Paul (1992): Artificiality and Enlightenment: From Sociobiology to Biosociality. In: , Sanford Kwinter/Jonathan Crary (Hg.): Incorporations. New York, 234-252.
- Ders./Nikolas Rose (2006): Biopower today. In: Journal of BioSocieties 1, 195-217.
- Rose, Nikolas (2007): The politics of life itself. Princeton.
- Rosenbrock, Rolf/Thomas Gerlinger (2004): Gesundheitspolitik: Eine systematische Einführung. Bern.
- Rosmond, Roland/Per Bjorntorp (2000): Quality of life, overweight, and body fat distribution in middle-aged men. In: Behavioral Medicine 26, 90-94.
- Szyf, Moshe (2009): Dynamic epigenome as interface between environment and genome. In: Medizinische Genetik 21, 7-13.
- Toulmin, Stephen (1976): On the Nature of the Physician's Understanding. In: Journal of Medicine and Philosophy 1, 32-50.
- Van der Ploeg, Lex H.T. et al. (2006): Design and synthesis of (ant)-agonists that alter appetite and adiposity - Progress in Brain Research. In: Andries Kalsbeek et al. (Hg.): Hypothalamic Integration of Energy Metabolism, Amsterdam, 107-118.
- Zheng, Huiyuan et al. (2008): Appetite control and energy balance regulation in the modern world: Reward-driven brain overrides repletion signals. In: 11th Annual International Symposium in Obesity. Quebec, 8-13.